2.5 DIVISION OF ENVIRONMENTAL SCIENCE AND TECHNOLOGY

The division was established in 1995 as a new division in environmental science of wide range, free from classical academic domain field. It is now 10 years after the establishment, much intimate relationship between elemental research groups may be found. Although the organization has been changed a little from the original, in relation to the Graduate School of Environmental Studies, present organization is as follows.

Division of Environmental Science and Technology consists of 7 chairs and 16 laboratories i.e. Chair of Comparative Agricultural Science which research regions from international viewpoint (Lab. of Comparative Agricultural Science), Chair of Bio-environmental Science which is based on the forest and biomaterial science (Lab. of Forest Ecology, Lab. of Forest Hydrology and Lab. of Forest Biochemistry), Chair of Agro-ecosystem Science which is based on bio-ecology and bioscience (Lab. of Tropical Agriculture, Lab. of Soil Science. Lab. of Environmental Mycoscience and Lab. of Ecological Information), Chair of Environmental development Engineering which aims engineering improvement of rural production site (Lab. of Agricultural Facilities Engineering and Lab. of Water Resources Engineering), Chair of Land and Water Resources Management which aims physical and social improvement of rural area(Lab. of Irrigation, Drainage and Hydrological Environmental Engineering, and Lab. of Rural Planning), Chair of Bioproduction Engineering which aims creation and application of various engineering techniques in fields (Lab. of Agricultural Systems Engineering, Lab. of Field Robotics and Lab. of Agricultural Process Technology), and Chair of Nuclear Science and Engineering(Research Reactor Institute) which aims application of radiation science to environmental science (Lab. of Radiation Safety Control). Much collaborations of these laboratories are expected in future.

The division had a total enrollment of 164 (106 in the Master's Program including 2 foreign students and 58 in the Doctor's Program including 12 foreign students) in this year.

Chair of Comparative Agricultural Science

2.5.1 Laboratory of Comparative Agricultural Science

Staff *Associate Professor: Torii, Kiyoshi, Dr. Agric. Sci.*
Akamatsu, Miki, Dr. Agric.Sci.
Tanaka, Ueru, Dr. Agric. Sci. (Graduate School of Global Environmental Studies)
Mori, Yoshiaki, Dr. Agric. Sci. (Academic Center for Computing and Media Studies)
Assistant Pprofessor: Morita, Katsuko

Students and research fellows
Doctor's program: (1)
Master's program: (2)

A. Research Activities (2005.4-2006.3)

A-1. Main subjects

a) Constructing GIS (Geographic Information System) in the field of comparative agricultural Science

We are intending to integrate information on agricultural water management, hydrological data, geographical data, topographical data, irrigation system, land use and vegetation, watershed, and regional development plans on the basis of satellite image data and to review regional agricultural water management utilizing data processing center and personal computer networks in order to construct efficient system to comprehend water environment in the whole basin. At present, accuracy of satellite image is improving rapidly, and the number of observation satellites is increasing. With powerful satellite image analysis software which has become applicable, we are carrying out analysis of the satellite image data on Kojima Bay, Okayama, inside the country, and in overseas, on Yangsangan Tideland Reclamation Project Area in Korea, the large-scale irrigation projects in the suburbs of Bangkok in Thailand, flood plain in Bangladesh, semi-arid area in Iran, Inner Mongolia and Hetao district in China and the southern part of Taiwan together with field investigations. (Torii)

b) Application of image measurements to regional environmental studies and development of a numerical simulator

We are observing regional environments based on high-resolution satellite image data and analyzing water balance and flow patterns in the basin by linking to the results of numerical calculations to develop a simulator of high prediction accuracy. We are getting interesting results by applying numerical calculation to coastal flows and flows in fresh water lakes. (Torii)

c) Interaction mechanism of the neurotoxic insecticides with the receptors

Chloronicotinyl insecticides including imidacloprid act at the nicotinic acetylcholine receptor of insects as agonists. To clarify the interaction mechanism of chloronicotinyl compounds, the several receptors having amino-acid mutations have been constructed based on the crystallographic structure of acetylcholine binding protein by computer graphics and binding of

the model receptor and agonists such as imidacloprid has been simulated by a molecular mechanics calculation. In this year, using PDFAMS and simulated annealing methods, mutant receptors in loop D and E regions were modeled. (Akamatsu)

d) Permeation of drugs having diverse structures across artificial model membranes and prediction of permeability across monolayers of human intestinal epithelial (Caco-2) cells

It is important to examine transport of various chemicals across the intestinal epithelium from the point of view of the development of orally bioavailable therapeutic agents. In this year, the permeability of various pharmaceuticals and agrochemicals across artificial lipid membranes was measured to evaluate absorption of the compounds by the transcellular route. The relationship between the Caco-2 cell permeability coefficient and the measured artificial membrane permeability coefficient of hydrophobic compounds was then determined. (Akamatsu)

e) Evaluation of estrogen- and androgen-receptor binding affinities of DDT derivatives and their metabolites

Recently, environmental implications of endocrine active substances are important issues. One mode of action of endocrine active substances is to bind to estrogen- and androgen-receptors. Several kinds of pesticides and their metabolites are considered to show estrogen- and androgen-receptor binding affinities. In this year, the binding affinity of methoxychlor and their metabolites was evaluated using the radio-labelled estradiol. In addition, using a newly developed GC/MS with the high sensitivity, the possibility of the detection of those compounds was investigated. (Akamatsu)

f) Analysis of pesticide residues in environment around the suburban agricultural fields of Bangkok

Used pesticides were surveyed at the suburban agricultural fields of Bangkok, Thailand, to know whether pesticides are used safely and appropriately. In last two years, river bottom and field soils around the area were sampled and pesticide residues in the samples were analyzed. A few pesticides were detected in several samples although the amount was small. In this year, we examined how much pesticides in soils are decomposed during transportation before analyses. (Akamatsu, Torii, Mori, Tanaka)

g) Studies on soil management systems and socio-ecological resilience in Semi-arid Africa (Niger, Tanzania and Zambia):

Field studies were conducted in the Sahel region of West Africa to elucidate the characteristics of ecosystems, soils, local husbandry systems which lead approaches to ecologically sound land use systems, prevention of desertification and restoration of degraded lands. In Tanzania and Zambia, preliminary field servey was conducted for establishing a research roject on socio-ecological resilience in rural community under fragile ecosystems (Tanaka)

h) Studies on rural development, environmental conservation and disaster management at human scale (Viet Nam)

Field studies were conducted in some villages of Central Viet Nam, where natural disaster frequently hits. Agro-ecological characteristics and local husbandry systems were described in order to design research/development project for participatory rural development, environmental conservation and disaster management. (Tanaka)

A-2. Publications and presentations

a) Publications

Books

Miyashita, M., T.Shimada, S. Nakagami, N. Kurihara, H. Miyagawa and M. Akamatsu: Evaluation of estrogen receptor binding affinity of DDT-related compounds and their metabolites. Environmental Fate and Safety Management of Agrochemicals (Eds. J.M. Clark, and H. Ohkawa), pp. 159-166, American Chemical Society, Washington, DC, 2005

Hayashi, Y., B. Nicholson, K. Tanaka, A. Oda, G.K. Lloyd, M. Akamatsu, M.A. Palladino and Y. Kiso: Effect of the phenyl ring modification on the antitumor activity of anti-microtubule agent dehydrophenylahistin. Peptide Science 2004 (Ed. Y. Shimohigashi), pp. 405-406, The Japanese Peptide Society, 2005

Original papers

Torii, K., H. Kutsuna and K. Yaota: An attempt of building agricultural inventories in Zambia, Africa, based on Landsat images. CD-ROM Paper, 6 pages, The 2nd Asian Space Conference 2005

Yaota, K., Y. Ogino, K. Torii, M. Iwasaki, Y. Mori and Pictiaw (Paul) Chen: Analysis on Land Use Status in Developing Countries and Its Application to Agricultural Policy Using Satellite Images. CD-ROM Paper 6 pages, The 2nd Asian Space Conference 2005

Miyashita, M., T. Shimada, H. Miyagawa and M. Akamatsu: Surface plasmon resonance-based immunoassay for 17*b*-estradiol and its application to the measurement of estrogen receptor-binding activity. Anal. Bioanal. Chem. 381; 666-673, 2005

Yamagami, C., M. Akamatsu, N. Motohashi, S. Hamada and T. Tanahashi: Quantitative structure activity relationship studies for antioxidant hydroxybenzalacetones by quantum chemical and 3-D-QSAR (CoMFA) analyses. Bioorg. Med. Chem. Lett. 15; 2845-2850, 2005

Fujikawa, M., R. Ano, K. Nakao, R. Shimizu, and M. Akamatsu: Relationships between structure and high-throughput screening permeability of diverse drugs with artificial membranes: application to prediction of Caco-2 cell permeability. Bioorg. Med. Chem. 13; 4721-4732, 2005

Reports

Shinjo, H., S. Sugihara, K. Hayashi and U. Tanaka: Temporal dynamics of organic matter and water in a sandy soil of the Sahel under different management practices. JIRCAS and ICRlSAT Symposium on the improvement of fertility of sandy soils in the semi-arid zone of West Africa through organic matter management, 10 September, Niamey, Niger, 2005

Tanaka, U., K. Ikazaki and H. Shinjo. 2005: Behaviors and functions of organic materials under Sahelian environment in relating to soil fertility management. ibid

Tanaka, U., S. Seto, H. Shinjo and H. Miyazaki: Realities and problems of external commitment as viewed from desertification study at a life-size scale. In Abstract of J-FARD & JIRCAS International Symposium: Perspectives of R&D for improving agricultural productivity in Africa – what and how can Japan contribute to Africa? –, 38-41, July 14 -15, United Nations University, Tokyo, 2005

Shinjo, H., K. Hayashi, R. Matsunaga, U. Tanaka and T. Kosaki: Roles and functionsof animal feces on land use in the Sahel, southwestern part of Niger. J. Topical Agriculture 49(2); 29-30, 2005

Tanaka, U.: Some remarks for the external commitment to community-support activities with respect to the locality, indigenousness and people's participation. Annual report of GSGES Asia Platform: Education and research cooperation on environment and disaster management for human security in Asia, GSGES, 17-20, 2005

b) Conference and seminar papers presented

The 31th Annual Meeting of Pesticide Science Society of Japan: 2 reports

The 32nd Symposium on Structure-Activity Relationships: 1 report

The 7th China-Japan Joint Symposium on Drug Design and Development: 1 report

The 21th Pesticide Design Workshop ; 1 report

2005 meeting of Japanese society of International Rural Development: 1 report

A-3. Off-campus activities

Membership in academic societies

Torii, K.: Japanese Agricultural Systems Society(Board member), Japanese Society of Irrigation, Drainage and Reclamation Engineers (Member of Research and Advisory Committee)

Akamatsu, M.: Pesticide Science Society of Japan (Board member), Division of Structure-Activity Studies, the Pharmaceutical Society of Japan (Board member)

Tanaka U.: Japanese Society of pedology (Editorial board member)

Research grant

Akamatsu, M.: Monbukagakusyo Research Grant, Research (C): Prediction of behavior of endocrine disrupting chemicals and their metabolites in human bodies (Akamatsu, Head)

Akamatsu, M.: Monbukagakusyo Research Grant, Research (B): Pesticide behavior and monitoring system in environment around the suburban agricultural fields in tropical areas (Akamatsu, Head)

Akamatsu, M.: CREST: Development of the highly sensitive mass spectrum and the analysis of endocrine disruptors (Osaka University Katakuse, Head; Akamatsu, Member)

Tanaka, U: Global Environment Research Fund (Ministry of Environment), Fragility of Saherian farmers and soil degradation: a consideration of policy intervention, (Tanaka, member)

A-4. International cooperations and overseas activities

International meetings (roles)

Akamatsu, M.: The 7th China-Japan Joint Symposium on Drug Design and Development, Hangzhou, China (presentation)

Tanaka, U.: J-FARD & JIRCAS International Symposium: Perspectives of R&D for improving agricultural productivity in Africa, United Nations University, Tokyo (presentation, member of organizing comitee), JIRCAS and ICRISAT Symposium on the improvement of fertility of sandy soils in the semi-arid zone of West Africa through organic matter management, ICRISAT-Niamey, Niger (presentation), International symposium on Management of Tropical Sundy Soils for Sustainable Agriculture, Khon Kaen University, Thailand (presentation)

Memberships in international academic societies abroad

Torii,K: Membership of American Society of Civil Eng., International Association of Hydraulic Research

Akamatsu, M.: American Chemical Society

Tanaka, U: International Society of Soil Science

International joint researches, overseas research surveys

Akamatsu, M.: Pesticide residue analysis in environment around the suburban agricultural fields of Bangkok (Bangkok, Thailand)

Tanaka, U.: Development of soil fertility management in Semi-arid tropical Africa (Niger), Studies on rural development, environmental conservation and disaster management at human scale in central Viet Nam (Viet Nam), Soci-ecological resilience in African rural community under fragile ecosystems (Tanzania, Zambia)

B. Educational Activities (2005.4-2006.3)

B-1. On-campus teaching

a) Courses Given

Undergraduate level: Scientific English (Agriculture) (Akamatsu, Tanaka), Japan-Korea HR (Akamatsu, Tanaka)

Graduate level: Comparative Agricultural Science (Torii), Comparative Study of Resources and Environment (Akamatsu, Tanaka), Agriculture and environment in Japan (Akamatsu, Tanaka)

B-2. Off-campus teaching, etc

Part-time lecture

Torii K.: Processing of topographical Information, Dept. of Agriculture, Shiga Prefectural University, Kobe University, Faculty of Agriculture (Photogrammetry & remote sensing)

Mori, Y.:, Nara Women's University (Statistics for Social Sciences, Exercise of Statistics for Social Sciences), Osaka International College (Exercise for computer basic practice), Sonoda Women University (Food marketing, Food economics)

Tanaka U.: Japan International Cooperation Agency, Lecture on rural development course (Africa and rural development)

C. Other Remarks.

Torii, K.: Member of committee of the Faculty level: Committee of Information system in Faculty of Agriculture.

Akamatsu, M.: Member of committee of the Faculty level: Committee of International academic exchange, The Ministry of Agriculture, Forestry, and Fisheries of Japan, tentative member of Councils of agricultural materials, pesticide division; Chemicals Evaluation and Research Institute, Japan, tentative member of committee of research development and assessment; National Institute of Technology and Evaluation, Japan, member of committee of quantitatitive structure-activity relationships; The Ministry of Economy, Trade and Industry, tentative member of Councils of chemicals.

Mori, Y.: Member of Field Science Educational Research Center committee.

Tanaka U.: Member of committee of the Faculty level: Committee of International academic exchange; Committee of KUINEP; Global Environmental Forum (member of advisory committee), Organizing committee of J-FARD & JIRCAS International Symposium (member)

Chair of Bio-environmental Science

2.5.2 Laboratory of Forest Ecology

Staff *Professor* : *TAKEDA, Hiroshi, Dr. Agri.*
Lecturer : *OSAWA, Naoya, Dr. Agri.*
Assistant Professor : *OSONO, Takashi, Dr. Agri.*

Students and research fellows:

JSPS Research Fellow: (1) (DC: 1) *Research Fellow* : *(1)*
Doctor's program : *(4)* *Master's program* : *(8)*
Undergraduate : *(2)*

A. Research Activities (2005.4-2006.3)

A-1. Main subjects

a) Decomposition process of leaf litter in forest ecosystems

Decomposition process of leaf litter has been studied at a cool temperate forest in Ashu, a pine plantation in Kamigamo and Tanakami, mainly focused on the interaction among leaf litter, decomposer-microorganisms, and soil.

b) Fine root dynamics and the role of soil animals in a forest soil

Fine root dynamics at a forest ecosystem is studied at Kamigamo Experiment Station Japan, and evergreen forest, Thailand. The manipulated experiments for the analysis of community structure and the function of soil animal are mainly perfomed at Kamigamo Experiment Station, and that for the fine root dynamics are mainly done at evergreen forest, Thailand.

c) Module Dynamics of Forest trees

Forest trees are characterized by their foraging behaviors for capturing the nutrients and light. Foraging behavior of trees has been studied through the population dynamics of modules, such as buds, current shoots, and leaves. The knowledge of module dynamics is important for the understandings of plant community.

d) Community structure of insect community and the role of herbivore in forest ecosystem

We are performing our research to clarify the impact of herbivorous insects on the community structure and its dynamic of the forests in Ashu and Tanakami experimental station, from a view point of the seasonal and spatial variation of plant quality and plant growth.

e) Impacts on ground arthropod community by artificial logging

Arthropod community at the Kamigamo Experiment station has been studied to clarify to clarify the impact of logging on forest ecosystem since July 1999.

A-2. Publications and presentations

a) Publication

Original papers

Cho, M., K. Kawamura and H. Takeda: Scaling architecture and growth in the co-occuriring species *Castanopsis cuspidata* and *Quercus glauca* in secondary forest in western Japan. Journal of Forest Research 10; 143-150, 2005

Fukasawa, Y., T. Osono and H. Takeda: Decomposition of Japanese beech wood by diverse fungi isolated from a cool temperate deciduous forest. Mycoscience 46; 97-101, 2005

Fukasawa, Y., T. Osono and H. Takeda: Small-scale variation in chemical property within logs of Japanese beech in relation to spatial distribution and decay ability of fungi. Mycoscience 46; 209-214, 2005

Hasegawa, S. and H. Takeda: Behavior of current year shoots as mechaniism to determine the floral sex allocation at the level of individual tree and population in Siberian alder (*Alnus hirsuta* var.sibrica). Trees 19; 26-31, 2005

Hishi, T. and H. Takeda: Dynamics of heterorhizic root systems: protoxylem groups within the fine-root system of *Chamaecyparis obtusa*. New Phytologist 167; 509-521, 2005

Hishi, T. and H. Takeda: Life cycles of individual roots in fine root system of *Chamaecyparis obtusa* Endl. et Zucc. Journal of Forest Research 10; 181-187, 2005

Ishimaru, K., N. Tokuchi, N. Osawa, K. Kawamura and H. Takeda: Behavior of four broad leaved tree species used to revegetate eroded granite hill slopes. Journal of Forest Research 10; 27-34, 2005

Koide, K., T. Osono and H. Takeda: Colonization and lignin decomposition of *Camellia japonica* leaf litter by endophytic fungi. Mycoscience 46; 280-286, 2005

Koide, K., T. Osono and H. Takeda: Fungal succession and decomposition of *Camellia japonica* leaf litter. Ecological Research 20; 599-609, 2005

Mizuki, I., N. Osawa and T. Tsutsumi: Thrips (Thysanoptera; Thripidae) on the flowers of a dioecious plant, *Dioscorea japonica* (Dioscoreaceae). The Canadian Entomologist 137; 712-715, 2005

Mori, A. and H. Takeda: Changes in shoot properties in relation to vertical positiion within the crown of mature canopy trees of *Abies mariesii* and *Abies veitchii*. Journal of Forest Research 10; 51-55, 2005

Mori, A. and E. Mizumachi: Season and substrate effects on the first-year establishment of current-year seedlings of four major conifer species in an old-growth subalpine forest in central Japan. Forest Ecology and Management 210; 461-467, 2005

Mori, A., T. Osono, S. Iwasaki, M. Uchida and H. Kanda: Initial recruitment and establishment of vascular plants in relation to topographical variation in microsite conditions on a recently-deglaciated moraine in Ellesmere Island, high arctic Canada. Polar Bioscience 19; 85-95, 2006

Ohhashi, K., Y. Sakuratani, N. Osawa, S. Yano and A. Takafuji: Thermal microhabitat utilization by the ladybird beetles, *Coccinella septempunctata* (Coleoptera: Coccinellidae) and its life history consequences. Environmental Entomology 34; 432-439, 2005

Osada, N., H. Takeda, T. Okuda and M. Awang: Within-crown variation in the timing of leaf emergence and fall of malaysian trees in association with crown development patterns. American Journal of Botany 92; 50-54, 2005

Osawa, N.: The effect of prey availability on ovarian development and oosorption in the ladybird beetle *Harmonia axyridis* (Coleoptera: Coccinellidae). European Journal of Entomology 102; 503-511, 2005

Osawa, N., A. Terai, K. Hirata, A. Nakanishi, A. Makino, S. Sakai and S. Sibata: Logging impacts on forest carabid assemblages in Japan. The Canadian Journal of Forest Research 35; 2698-2708, 2005

Osono, T.: Colonization and succession of fungi during decomposition of *Swida controversa* leaf litter. Mycologia 97; 589-597, 2005

Osono, T. and A. Mori: Seasonal and leaf age-dependent changes in occurrence of phyllosphere fungi of giant dogwood. Mycoscience 46; 273-279, 2005

Osono, T., S. Hobara, K. Koba, K. Kameda and H. Takeda: Immobilization of avian excreta-derived nutrients and reduced lignin decomposition in needle and twig litter in a temperate coniferous forest. Soil Biology & Biochemistry 38; 517-525, 2006

Wiwatwitaya, D. and H. Takeda: Seasonal changes in soil arthropod abundance in the dry evergree forest of north-east Thailand, with special reference to Collembolan communities. Ecological Ressearch 20; 59-70, 2005

Yamashita, H., C. Tanaka, H. Nakayama, N. Tuno and N. Osawa: New host record for three species of scuttle fly, *Megaselia flava, M. kanekoi*, and *M. gotoi* (Diptera: Phoridae), on a poisonous fungus, *Amanita ibotengutake* (Agaricales: Amanitaceae). Entomological Science 8; 2.23-225, 2005

b) Conference and seminar papers presented

The 53th annual meeting of Japanese Ecological Society. (Niigata, 2006, March). Number of presentations 6 (Takeda et al.)

The 49th annual meeting of The Mycological Society of Japan. (The University of Hawaii, 2005, August). Number of presentations 2 (Osono et al.)

The 56th annual meeting of Kansai Branch of Japanese Forestry Society (Nara Wemen's University, 2005, October). Number of presentations 1 (Takeda et al.)

Forest Science Seminar. (Canadian Forest Service, 2005, November). Number of presentations 1 (Osono)

XXVIII Symposium on Polar Biology. (National Institute of Polar Research, 2005, December). Number of presentations 1 (Osono)

Coastal Silviculture Committee Winter Workshop. (The Coast Bastion Hotel, 2006, February). Number of presentations 1 (Osono)

The 6th East Asia-Pacific Regional International Long-Term Ecological Research Conference. (Kyoto University, 2006, March). Number of presentations 1 (Osono)

A-3. Off-campus activities

Membership in academic societies (roles)

H. Takeda: The Society of Population Ecology (Editor), The Japanese society of Tropical Ecology (Commendatory member), The Japanese Society of Soil Animals (Councilor)

Research grants

Ministry of environment. Environmental studies on tropical carbon metabolism (Rep. co-researcher, H. Takeda).

Grant-in-Aid for Scientific Research from the Ministry of Education, Science and Culture, Japan. Carbon input/output in tropics. (H. Takeda).

Grant-in-Aid for Scientific Research from the Ministry of Education, Science and Culture, Japan. Studies on dispersal and colonization of pioneer fungus species in forest succession. (Rep. co-researcher, N. Osawa).

Grant-in-Aid for Scientific Research from the Ministry of Education, Science and Culture, Japan. Community studies on the interaction among insects and mushrooms. (Rep.

co-researcher, N. Osawa).

Ministry of environment: Evaluation of biodiversity for rapid assessment (Rep. co-researcher, N. Osawa).

A-4. International cooperation and overseas activities

International joint researches, overseas research surveys

Takeda, H. : Decomposing process in tropical forests, JSPS ronpaku program, in Thailand.

B. Educational activities (2005.4-2006.3)

B-1. On-campus teaching

a) Courses given

Undergraduate level: Practice of Forest Ecology (H.Takeda and N.Osawa), Seminar of Forest Ecology (H.Takeda and N.Osawa), Forest Ecology ((H.Takeda), Community Ecology (N.Osawa), Practice of Forest Sciences II & III (N. Osawa and T. Osono). The Practice of Ecology (N. Osawa and T. Osono).

Graduate level: Practice of Forest Ecology (H.Takeda and N. Osawa), Seminar of Forest Ecology (H.Takeda and N. Osawa). Special Lecture of Forest Ecology (H.Takeda).

B-2. Off-campus teaching

Part-time Lectures

H. Takeda: Undergraduate and Graduate Course, Kyoto Prefectural University (Lecture of Forest Ecology). Meijyo University (Forest Ecology).

2.5.3 Laboratory of Forest Hydrology

Staff *Professor : Tani, Makoto, Dr. Agric. Sci.*
Associate Professor : Ohte, Nobuhito, Dr. Agric. Sci.
Assistant Professor : Kosugi, Yoshiko, Dr. Agric. Sci.
Research Associate : Matsuo, Naoko, Dr. Agric. Sci.
Research Associate : Takanashi, Satoru, Dr. Agric. Sci.

Student and research fellows

JSPS Research Fellow: (1) *Doctor's program: (4)*
Master's program : (6) *Undergraduate : (2)*

A. Research activities (2005.4-2006.3)

a) Runoff process and biogeochemistry

Detailed runoff processes and effects of their heterogeneities on biogeochemistry in forested catchments are studied to evaluate roles of forest in water and nutrient cycles.

Biogeochemical processes on hillslope have been mainly studied to evaluate stream-water quality in small mountainous catchments, but our recent study also focuses on hydrological and biogeochemical processes in riparian and hyporheic zones within stream channel. New interesting

findings have been obtained on hydrological structure in the riparian deposit behind a check-dam, its effects on nitrogen dynamics including denitrification and methane emission. Our observations on spatial distributions of water chemistry at scales ranging from 0.1 to 500 ha aim to separately assess each role of hillslope and stream processes in changes of water quality. We also study on runoff mechanisms on hillslope considering effects of its topographic properties and phosphorus dynamics in Sugi cedar forests with various ages.

b) Gas exchange between forest and the atmosphere

Our laboratory is conducting long-term observations on gas exchange processes between forest and the atmosphere using the eddy covariance method to evaluate the physical and physiological control by forest ecosystem. Our main fields are a Hinoki Cypress forest in Japan and a tropical rainforest in Malaysia.

Seasonal characteristics of evapotranspiration and energy exchange were accurately estimated from the cypress forest through the cross-checking of catchment water budget and eddy covariance methods. In our recent study both in Japan and Malaysia, we are checking the flux estimation by the eddy covariance method with the data of CO_2 dynamics in forest consisting of soil, trunk and leaf respirations as well as the vertical distribution of CO_2 concentration not only to assess the accurate flux estimation but also to understand the responses of ecosystem to environmental conditions. Our multi-scale study of the gas exchange is extended to evaluation of water use efficiency by stable isotope fractionation at an individual leaf, assessment of patterns of leaf conductance and water potential for each tree species and test of spectral reflectance index to assess the carbon uptake of forest from satellites.

A-2. Publications and Presentations

a) Publications

Books

Original papers

Kosugi, Y., H. Tanaka, S. Takanashi, N. Matsuo, N. Ohte, S. Shibata and M. Tani: Three years of carbon and energy fluxes from Japanese evergreen broad-leaved forest. Agricultural and Forest Meteorology, 132; 329-343, 2005

Kosugi, Y. and N. Matsuo: Seasonal fluctuations and temperature dependence of leaf gas exchange parameters of co-occurring evergreen and deciduous trees in a temperate broad-leaved forest. Tree Physiology 26; 1173-1184, 2006

Katsuyama, M., N. Ohte and N. Kabeya: Effects of bedrock permeability on hillslope and riparian groundwater dynamics in a weathered granite catchment. Water Resources Research 41; W01010, doi: 10.1029/2004WR003275, 2005

Takanashi, S., Y. Kosugi, Y. Tanaka, M. Yano, T. Katayama, H. Tanaka and Tani, M.: CO_2 exchange in a temperate Japanese cypress forest compared with that in a cool-temperate deciduous broad-leaved forest. Ecological Research 20; 313-324, 2005

Takanashi, S., Y. Kosugi, M. Tani, N. Matsuo, T. Mitani, Abdul Rahim Nik: Characteristics of the gas exchange of a tropical rain forest in Peninsular Malaysia. Phyton 45; 61-66, 2005

Kawasaki, M., N. Ohte and M. Katsuyama: Biogeochemical and hydrological controls on carbon export from a forested catchment in central Japan. Ecological Research 20; 347-358, 2005

Ito, M., N. Ohte, M. Katsuyama, K. Koba, M. Kawasaki and M. Tani: Temparal and spatial variability of methane flux in a temperate forest watershed. J. Japan Doc. Hydrol. &

Water Resour. 18; 244-256, 2005 (in Japanese with English summary)
Osaka, K., N. Ohte, K. Koba, M. Katsuyama and T. Nakajima: Hydrologic controls on nitrous oxide production and consumption in a forested headwater catchment in central Japan. J. Geophys. Res. 111; G01013, doi:10.1029/2005JG000026, 2006
Konishi, S., M. Tani, Y. Kosugi, S. Takanashi, Mohd Md Sahat, Abdul Rahim Nik, K. Niiyama and T. Okuda: Characteristics of spatial distribution of throughfall in a lowland tropical rainforest, Peninsular Malaysia. Forest Ecology and Management 224; 19-25, 2006
Sidle, R.C., M. Tani and A. D. Ziegler: Catchment processes in Southeast Asia: Atmospheric, hydrologic, erosion, nutrient cycling, and management effects. Forest Ecology and Management 224; 1-4, 2006

Reports

Tani, M.: Influences of forest disturbance history on rainfall-runoff responses in Japan. Proceedings of International Seminar on "The Role of Forests for Sustainable Water Resources in the 21st Century", pp. 31-43, Korea Forest Research Institute, Seoul, 2005
Ohte, N.: Symptom and potential effect of nitrogen saturation in forested catchments in Japan. Proceedings of GWSP (Global Water System Project) Asia meeting, August 29-31 2005, Kyoto, Japan, pp. 57-58, 2005
Itoh, M., N. Ohte, K. Koba, N. Suzuki, M. Katsuyama, K. Hayamizu and M. Tani: Hydrobiogeochemical influences on methane emission from temperate forested wetlands in central Japan, Proceedings of International Conference on Hydrology and Management of Forested Wetlands; pp. 454-463, 2006
Takanashi, S. et al., Understanding the roles of tropical forest in climate change through the energy/H2O/CO2 exchange processes, Annual Report of the NIES/FRIM/UPM Joint Research Project on Tropical Ecology and Biodiversity 2004, pp. 1-9, 2005

b) Conference and seminar papers presented

The 116th Annual Meeting of Japanese Forestry Society: 10 topics
The Annual Meeting of Japan Society of Hydrology and Water Resources: 2 topics
The 53th Annual Meeting of Japanese Ecological Society: 1 topic
The 68th Annual Meeting of Japan Society of Limnology: 2 topics
Joint Meeting on Environmental Engineering in Agriculture: 1 topic
AsiaFlux Workshop 2005: 2 topics
The Second Scientific Congress of East Asian Federation of Ecological Societies (EAFES2): 3 topics
Seventh International Carbon Dioxide Conference (ICDC7): 1 topic
Slope Intercomparison experiment (SLICE) Workshop: 3 topics

A-3 Off-campus activities

Membership in academic societies (roles)

Tani, M.: Steering Committee member of AsiaFlux Network, and sub-editor of a special issue on 'Catchment processes in Southeast Asia' of Forest Ecology and Management.
Ohte, N.: Japan Society of Hydrology and Water Resources (Member of Editorial Review Board), and Journal of Forest Research (Member of Editorial Review Board),
Kosugi, Y.: Japan Society of Revegetation Technology (Secretary of Editorial Review Board), and AsiaFlux Network (Member of News Letter Editorial Board).

Membership in Science Council of Japan, etc.

Tani, M.: Member of Hydrological Sciences in Science Council of Japan, Chairman of Eco-hydrology Sub-Committee in Science Council Japan

Ohte, N.: Member of GWSP (Global water System Project) Sub-committee in Science Council of Japan, Member of Eco-hydrology Sub-Committee in Science Council Japan.

Research grants

Mission Project of the Research Institute for Sustainable Humanosphere of Kyoto University : Testing a spectral reflectance index to assess the carbon uptake of a temperate Japanese cypress forest. (Kosugi and Tani, members).

Global Environmrnt Research Fund (Ministry of the Environment): Integrated Study for Terrestrial Carbon Management of Asia in the 21st Century Based on Scientific Advancements: Carbon balance in temparate forest ecosystems (Tani, Ohte and Kosugi, members) and Carbon balance in tropical forest ecosystems (Tani and Kosugi, members).

CREST R&D of Hydrological Modeling and Water Resources System (Tani, member).

A-4. International cooperation and overseas activities

International Meetings (roles)

Tani, M.: Co-chair of IUFRO Forest Hydrology Working Group.Ohte: Speaker Western Pacific of Geophysics Meeting Honolulu 2004 (Presentaion), and the fall meeting of AGU (presesntation).

Ohte, N.: Cary Conference on Ecology of Infectious Desieseas, Invited presentation, Acid Rain conference 2005 (Chairman and presentation).

International joint researches, overseas research surveys

Tani, M. and Y. Kosugi: Investigation on carbon balance in tropical rainforest (Malaysia).

Ohte, N.: Investigation on nutrient dynamics in taiga forests, Eastern Siberia (Russia).

B. Educational Activities (2005.4-2006.3)

B-1. On-campus teaching

a) Courses given

Undergraduate level: Basic Science for Forest and Biomaterials 3 (Tani), Forest and Biomaterials Sceince 3 (Ohte), Forest Hydrology (Tani), Interaction of Forest and Environment (Ohte), Laboratory Course in Forest and Biomaterials Sceince 3 (Tani, Ohte), Laboratory Course in Physics of Forest and Biomaterials (Ohte, Kosugi), Laboratory Course in Forest Hydrology and Erosion Control (Ohte, Kosugi), Practice in University Forest 2 (Ohte, Kosugi).

Graduate level: Special lecture in Forest Hydrology (Tani), Seminar of Forest Hydrology (Tani, Ohte, Kosugi), Special Laboratory Work in Forest Hydrology (Tani, Ohte, Kosugi).

B-2. Off-campus teaching, etc.

Part-time lecturer

Tani, M.: Faculty of Agriculture of Kyoto Prefectural University.

Ohte, N.: Faculty of Integrated Arts and Sciences of Hiroshima University, Graduate School of Agriculture of Kyoto Prefectural University.

2.5.4 Laboratory of Forest Biochemistry

Staff *Professor* *: Azuma, Jun-ichi, D. Agric. Sci.*
Assistant Professor : Sakamoto, Masahiro, D. Agric. Sci.
Students and research fellows
Doctor's program : (2) *Master's program : (8)*
Undergraduates : (4) *JSPS Researcher : (1)*

A. Research Activities (2005.4-2006.3)

A-1. Main subjects

a) Biosynthsis and improvement of plant biomass constituents (Sakamoto)

Characterization of biosynthetic mechanism of biomass constituents is a key step for their better use. In this theme, biochemical and molecular biological approach is carried out for characterization of photosynthetic products and secondary metabolites in woody and monocotyledonous plants. In addition, enzymic approach is carried out to give information about biosynthesis of cell-wall polysaccharides/glycoconjugates and elongation growth of monocot. For improvement of biomass production, a system of chloroplast DNA from bamboo and cotton, the very important non-woody biomass-plants, is also investigated.

b) Structure and function relationships of biomass constituents and their biodegradation mechanism (Azuma)

Carbohydrates, which comprise more than 70% weight of cell-walls of higher plants, not only play various physiological functions but also are important for recycling of C on the earth. In this theme, characterization of interactions between cellulose and hemicellulose in the helical fibrous network of plant cell-wall was carried out to find out ways to produce biodegradable artificial woody materials and improve the physical properties of lignocelluloses. In addition, because of importance of cellulolytic enzymes in the ecosystem, biodegradation mechanisms of cellulose by termite-protozoa and termite-fungi symbiotic systems are also investigated.

c) Recycling of biomass and zero-emission (Azuma, Sakamoto)

Biomass plays a key role in recycling of organic matters on earth. Therefore, the behaviors of environmental aspects of biomass in ecosystem are very important problems. The object of this study is to develop new technologies which make recycling of biomass possible and lead to attaining zero-emission.

In addition, microwave energy is used to develop comprehensive method for utilization of diverse woody, agricultural and food-waste biomass materials. Hydrothermal effects of microwave on diverse biomass materials are mainly studied under high temperature and high pressure as well as low temperature and low pressure.

A-2. Publications and presentations

a) Publications

Books and reviews

Azuma, J.: Why is Boron so poisonous to termites, 28th Symposium of Sustaibnable Humanosphere, Germinative Mission Symposium, Research Institute for Sustainable Humanosphere, Kyoto University, 14-17, 2005

Azuma, J.: Degradation of wood by dry-wood termites and development of anti-termite reagents by using inhibitors for carbohydrate degrading enzymes, 29th Symposium of Sustainable Humanosphere, DOL/LSF Cooperative Research Symposium, Research Institute for Sustainable Humanosphere, Kyoto University, 30-32, 2005

Azuma, J.: Recycling use of waste bio-based materials for Foods by Microwave Energy, 1-30, Financial Support System of Technology of Wakayama, The Industrial Technology Center of Wakayama Prefecture (WINTEC), and Congress of Development of Industrial Cluster Technology, 2005

Azuma, J.: Comprehensive recycling of marine waste materials containing poisonous heavy metals, Research Report for Scientific Research Program for Treatment of Waste Materials, April, 2005

Original papers

Sasakura, Y., K. Nakashima, S. Awazu, T. Matsuoka, A. Nakayama, J. Azuma and N. Satoh: Transposon-mediated insertional mutagenesis revealed the functions of animal cellulose synthase in the ascidian *Ciona intestinalis*. Proc. Natl. Acad. Sci. USA, 102, 15134-15139 (2005)

Yudianti, L. Indrarti, J. Azuma and M. Sakamoto: Cellulose-Hemicellulose Present in Hydrocolloids from salvia spp.. Proc. The Sixth Intern. Wood Sci. Symp., Bali, Indonesia, 273-277, 2005

Indrarti, L., J. Amuma, R. Yudianti and M. Sakamoto: Hemicellulosic Polysaccharide Present in the Cellulosic Hydrogel of Oscimum seed. Proc. The Sixth Intern. Wood Sci. Symp., Bali, Indonesia, 278-283, 2005

Indrarti, L., R. Yudianti, H. Takeda, M. Sakamoto and J. Amuma: Hemicellulose attached with cellulose seed hairs. Intern. Symp. Woods Sci. and Technol., Vol. II, 336-337, 2005

b) Conference and seminar papers presented

International Congress on Plant Mitochondrial Biology ICPMB2005, Obernai, France (1 paper in English): (Sakamoto, M. et al.)

Open Symposium of Regeneration Technology Center of Tokyo University of Science (1 paper in Japanese): (Sakamoto, M.)

55th Annual Meeting of the Japan Wood Research Society (7 papers in Japanese): (Azuma, J. et al.; Sakamoto, M. et al.)

52nd Annual Meeting of the Japan Society for Food Science and Technology (1 paper in Japanese): (Azuma, J. et al.)

23nd Annual Meeting of the Japanese Society of Plant Cells and Molecular Biology (2 papers in Japanese): (Azuma et al., Sakamoto, M. et al.)

27th Annual Meeting of the Japanese Society of Molecular Biology (2 papers in Japanese): (Azuma, J. et al., Sakamoto, M. et al.)

5th Chlamydomonas Work Shop (1 paper in Japanese): (Azuma, J. et al.)

A-3. Off-campus activities

Membership in academic societies (roles)

Azuma, J.: The Japan Society for bioscience, Biotechnology, and Agrochemistry (Councilor of the Kansai Branch),

Azuma, J.: Councilor of NPO 'Society of Maintenance of Earth Environment by Recycling'.

Research grant:

Monbusho Research Grant:

Cooperative Research (B)(2) Reguration of High Sinc Function System of Bamboo (Main, Masahiko Sakamoto, cooperative, Jun-ichi Azuma)

Monbusho Research Grant: Cooprative Research (Sprouting Research), (Main, Masahiko Sakamoto, cooperative, Jun-ichi Azuma)

Kankyosho Research Grant: Recycling of Wasted Marine Products (Main, Jun-ichi Azuma, cooperative, Masahiko Sakamoto and others)

Cooperative Research Grant between University and Others:

Recycling use of waste bio-based materials for Foods by Microwave Energy, Wakayama Technical Cluster Research, 2005 (cooperative, Jun-ichi Azuma).

Innovation Project for Recycling of Marin Products in Heisei 15, Marine Products Systems Association, Ministry of Environment of Japan, 2005 (cooperative, Jun-ichi Azuma).

A-4. International cooperations and overseas activities

International meetings (roles)

Azuma, J.: Preparation and properties of cellulosic hydrocolloids : (JSPS Core University Program, Indonesia) April 1-May 30, 2005: Inivitation for Rike Yudianti, a young researcher in LIPI.

Azuma, J.: Production of cellulosic materials and biomass chemicals from unutilized Plant resources : (JSPS Core University Program, Indonesia) November 25 - December 1, 2005: Inivitation for Lucia Indrarti, a senior researcher in LIPI.

Azuma, J.: Search and utilization of cellulosic hydrocolloids : (JSPS Core University Program, Indonesia) August 28 – September 3, 2005 (Indonesia).

Sakamoto, M.: International Congress on Plant Mitochondrial Biology ICPMB2007, Organizing Committee.

B. Educational Activities (2005.4-2006.3)

B-1. On-campus teaching

a) Courses given

Undergraduate level: Laboratory course in the basic forest and biomaterials chemistry, (Jun-ichi Azuma, Masahiko Sakamoto), Laboratory course in the biomaterials chemistry I (Jun-ichi Azuma, Masahiro Sakamoto), Laboratory course in the biomaterials science II (Masahiro Sakamoto), Basic Science for Forestry II (Jun-ichi Azuma), Forest biochemistry I (Jun-ichi Azuma, Masahiro Sakamoto), Forest biochemistry II (Masahiro Sakamoto, Jun-ichi Azuma), Seminar in forest and biomaterials science (Jun-ichi Azuma, Masahiko Sakamoto), Forest analytical science (Jun-ichi Azuma)

Graduate level: Laboratory Course in Forest Biochemistry (Jun-ichi Azuma, Masahiko Sakamoto), Seminars in Forest Biochemistry (Jun-ichi Azuma, Masahiko Sakamoto), Special lecture on Forest Biochemistry (Jun-ichi Azuma)

C. Other remarks

Micellaneous

University level

Azuma, J.: Member of Committee of University Students, Kyoto University, Member of Committee of Safe Committee for Radioisotopes and Radiation, Kyoto University Radioisotopes and Radiation

Azuma, J.: Member of Committee of Chemistry for University Students, Kyoto University, Member of Committee for Education System of Chemistry of Kyoto University

Faculty level

Azuma J.: Member of Safeguard Committee of Faculty of Agriculture for Radioisotopes and Radiation

Sakamoto, M.: Member of Transaction of Inorganic Waist Liquor.

Chair of Agro-ecosystem Science

2.5.5 Laboratory of Tropical Agriculture

Staff *Professor* *: Sakuratani, Tetsuo, D. Agric. Sci*
Associate Professor: Nawata, Eiji, D. Agric. Sci.
Assistant Professor : Higuchi, Hirokazu, D. Agric. Sci.

Students and research fellows

Doctor's program : (7) *Master's program : (7)*
Undergraduates : (4) *Research fellow : (4)*

A. Research Activities (2005.4-2006.3)

A-1. Main subjects

a) Bio-resources, farming and cropping systems and sustainability in Mainland Southeast Asia

In La Distict, Oudomxai Province, North Laos, field surveys on the effects of reduced fallow period on fallow vegetation were continued. It was clarified that the qualitative changes in climax species contributed to overall changes in fallow vegetations in shifting cultivation fields. In Chanpong District, Savanakhet Province, South Laos, a filed survey on traditional plant utilization of Phuthai, an ethnic minority in this area, revealed that diversity of plant use could be comparable to that in Phuthai in Northeast Thailand. In Mae Chaem District, Chiang Mai Province, North Thailand, dynamics of farming systems in Karen, an ethnic minority in this area, were investigated, indicating that recent agricultural intensification was also observed in the survey area.

b) Evaluation of agricultural resources and sustainability in upland crop areas, developed on a large scale, in the tropics

In Central Thailand, studies on the diversity of farming and cropping systems were carried out It is suggested that although both farming and cropping systems were simplified, relatively

sound and sustainable agriculture are practiced in this area.

c) Distribution and dissemination of tropical crops

Flowering and fruiting characteristics of indigenous *Capsicum frutescens* varieties in Seinan and Bonin Islands were studied. It was revealed that those varieties showed peculiar responses to day-length, different from those of *Capsicum annuum*.

d) Evaluation of crop tolerance to environmental stresses

An experiment on effects of partial heat stress in maize in a controlled environment clarified that some effects appeared in plant organs which did not receive heat stress directly. Effects of heat stress after flowering and fruiting in chilli pepper were also studied and it was indicated that development, germination and vigor of seeds were remarkably reduced by heat stress irrespective of slight influences on plant appearance. Effects of waterlogging on plant growth were also investigated using chilli pepper with artificially divided two root systems. Half-waterlogged plants showed intermediate physiological activities between control and whole-waterlogged plants.

e) Allelopathy under agroforestry systems using Eucalyptus

As mixed planting with eucalyptus plants suppressed growth of upland rice, a series of experiments on allelopathy of Eucalyptus roots were carried out, and slight suppressive effects was shown.

f) Photosynthetic characteristics of mango leaves

To understand the mechanism of drought tolerance of mango tree and to elucidate the characteristics of leaf gas exchanges, a series of experiments were conducted. The mango leaves had an osmotic adjustment mechanism that leaf water content is sustained under dry atmospheric condition. Leaf photosynthesis was higher for young leaves with the age of several months, while it was lower for old leaves with the age of several years, which was considered to be attributable to the difference of chlorophyll content and Rubisco content.

g) Mountainous agriculture in tropics –A case studies in Mbozi and Ulubguru District in Tanzania

In Tanzania, where the most country was under hot and dry climate conditions, the mountainous areas are known to be suitable for agriculture. In the mountainous areas in Mbozi and Uluguru Districts, the agro-ecological survey was conducted. In the Mbozi area, seasonal swamps were utilized for traditional slash and burn finger millet cultivation and newly introduced paddy cropping. The transition of the land utilization in the seasonal swamps told of the agricultural changes in this region. In the Ulurugu area, the homegarden that consisted of various herbaceous and tree crops developed at every homestead, while a large diversity in crops and cultivation patterns were observed at different homegardens.

h) Flower visitors to cherimoya, *Annona cherimola* in Japan

Fauna of Annona flower, the tropical fruit crops cultivated in south-eastern Japan and Okinawa, was studied. The most abundant species was *Cortinicara gibbosa* (Lathridiidae) and the secondary abundant one was a species of the genus *Phloeonomus* (Staphylinidae). *Mimemodes monstrosus* (Rhizophagidae), *Carpophilus marginellus* and *Haptoncus ocularis* (Nitidulidae) were also common. Among these, *Cortinicara gibbosa* and *Carpophilus marginellus* are thought to be favorable. Most of these beetles have not been reported in tropics as likely pollinators, indicating that new relationships have established between Annona trees, new trees, and indigenous beetles in Japan.

A-2. Publications and presentations

a) Publications

Books and reviews

Nawata, E.: 7. Agricultural systems in Asia 7.3. Vegetables), *In* Agricultural systems (edited by T. Inamura), pp.115-126, Asakura Publishing Co. Ltd., Tokyo, 2005. (in Japanese)

Kono Y. and E. Nawata: 8. Research methodologies 8.2 Agroecological approach, *In* Agricultural systems (edited by T. Inamura), pp. 181-192, Asakura Publishing Co. Ltd., Tokyo, 2005. (in Japanese)

Nawata, E.: Present situation and trend in vegetable production in Mainland Southeast Asia. Jpn. J. Trop. Agr. 49; 346-349, 2005

Original papers

Yamamoto S. and E. Nawata: *Capsicum frutescens* L. in Southeast and East Asia, and its dispersal routes into Japan. Economic Bot. 59; 18-25, 2005

Yamane Y. and H. Hirokazu: Factors influencing cropping patterns for agriculture in the mountainious area of Tanzania: Case study in northern slope of Uluguru Mountains. Jpn. J. Trop. Agr., 49:; 84-97, 2005

Higuchi, H. and T. Sakuratani: The sap flow in the peduncle of the mango (*Mangifera indica* L.) inflorescence as measured by the stem heat balance method. J. Jpn. Soc. Hort. Sci., 74 ; 109-114, 2005

Kabir M. E., A. Hamid, M. M. HAQUE, E. NAWATA and M. A. KARIM: Effect of nitrogen fertilizer on salinity tolerance of mungbean (*Vigna radiata* L. Wilczek). Jpn. J. Trop Agric. 49; 119-125, 2005

Haque M. S., M. A. Karim, M. M. Haque, A. Hamid, and E. Nawata: Effect of elevated CO2 on growth, chlorophyll content and yield of mungbean (*Vigna radiata* L. Wilczek) genotypes. Jpn. J. Trop. Agric. 49; 189-196, 2005

Kotera, A., E. Nawata, L. V. Thao, N. V. Bung and T. Sakuratani: Impact of high-yielding varieties of rice on flooding damages in the Red River Delta, Vietnam. Japanese J. Trop. Agric. 49; 197-206, 2005

Yonemoto, Y., H. Inoue, M. Majikina, H. Okuda, and H. Higuchi: Effect of temperature on floral induction and development of floral organs in white sapote (*Casimiroa edulis* Llave and Lex.) cv Florida. Jpn. J. Trop. Agr. 49; 8-13, 2005

Tsukada,M, Higuchi H., T. Furukawa and A. Yoshida: Flower visitors to cherimoya, *Annona cherimola* (Magnoliales: Annonaceae) in Japan. Appl. Entomol. Zoo. 40; 317-324, 2005

Yamane Y. and H. Higuchi: The changes of agriculture along with cultivated land spread on mountains in Tanzania. The case study on northern slopes on the Uluguru mountains. Jpn. J. Trop. Agr. 49;169-180, 2005

b) Conference and seminar papers presented

97th Meeting, Japan. Soc. Trop. Agric. (6)

98th Meeting, Japan. Soc. Trop. Agric. (2)

A-3. Off-campus activities

Membership in academic societies

Sakuratani, T.: The Society of Agricultural Meteorology of Japan (Awards committee member), The Kinki Chapter of the Society of Agricultural Meteorology of Japan (Regional director),

Japanese Society for Tropical Agriculture (Board member).

Nawata, E.: Japanese Society for Tropical Agriculture (Board member, Editorial board member, Secretary for public relations).

Research grants

JSPS Research Grant: Research (B); Ecological study on reducing crop environmental stress under agroforestry system (leader Sakuratani, collaborator Nawata, Higuchi), Research (B); Inter-regional comparison of ecological resources management, based on the construction of integrated database in Southeast Asia (leader Kono, Center for Southeast Asian Studies, collaborator Nawata), and Research (B); Proposal of optimized land use in irrigated area by large-scale salt dynamics model using geographical information – Case study in irrigated farming area in Syr Dar'ya river in southern Kazakhstan – (leader Funakawa, Laboratory of Soil Science, collaborator) and Research (S); Integrated Research on African Way of Rural Development Based on Area Studies (leader Kakeya, collaorator Nawata)

A-4. International cooperation and overseas activities

International meetings (roles)

Nawata, E.: International Society of Food, Agriculture and Environment (Editorial board member)

Nawata, E.: International Workshop "Indigenous Eco-knowledge and Development in Northern Laos" (Oudom Xai, Laos, Chairperson)

International joint researches, overseas research surveys

Sakuratani, T.: Water balance of field crops in Northeast Thailand (Thailand, Khon Kaen University),

Nawata, E.: Evaluation of sustainability in rapidly intensified slope land agriculture in Mainland Southeast Asia (Thailand, Chiang Mai University and ICRAF), Evaluation of agricultural resources and sustainability in upland crop areas, developed on a large scale, in the tropics (Thailand, Kasetsart and Khon Kaen Universities), Evaluation of vegetation resilience in shifting cultivation in northern Laos (Laos, National Lao University), and Utilization of bio-resources in home gardens in Phuthai people in Laos (Laos, National Agriculture and Forestry Research Institute)

Higuchi, H.: Sustainable water use by mango tree in tropical semi-arid area (Thailand, Khon kaen University), The Integrated Research on African Way of Rural Development based on Area Studies; - Towards the Endogenous Development through the Thoroughly Understanding of the Reality of the Areas and the Appreciating a New Value of the Indigenousness -

B. Education Activities (2005.4-2006.3)

B-1. On-campus teaching

a) courses given

Undergraduate level: Outline of Bioresource Science IV (Sakuratani, Nawata), Food and environment under economic development and globalization (Nawata), Introduction to Tropical Agriculture (Sakuratani, Nawata), Environmental Stresses for plants (Nawata, Sakuratani), Introduction to Foreign Literatures IV (Nawata), Laboratory Course in

Bioresource Science I・II (Nawata, Higuchi), Seminar in Tropical Agriculture (Sakuratani, Nawata)

Graduate level: Meteorological Ecology (Sakuratani), Agroecology of Tropical Crops (Nawata), Seminar in Tropical Agronomy (Sakuratani, Nawata), Special Laboratory Work in Tropical Agronomy (Sakuratani, Nawata)

B-3. Overseas teaching

Students and research fellows from abroad

Foreign student 1 (Thailand)

2.5.6 Laboratory of Soil Science

Staff *Professor : Kosaki, Takashi, Dr. Agric. Sci.*
Associate Professor: Funakawa, Shinya, Dr. Agric. Sci.
Assistant Professor : Yanai, Junta, Dr. Agric. Sci.
Assistant Professor : Shinjo, Hitoshi, Dr. Agric. Sci.

Students and research fellows

Doctor's program : (10)	*Master's program : (10)*
Undergraduate : (3)	*Research student : (2)*

A. Research Activities (2005.4-2006.3)

A-1. Main subjects

a) Soil characterization, development of the soil management and environment conservation in the tropics and arid regions:

The laboratory of soil science widely concerns soil management strategies for sustainable use and conservation of environment in the tropics and the arid regions. In Central Asia (Kazakhstan, Ukraine, Hungary), researches on soil degradation due to continuous cereal cropping in the steppe region were conducted. In Southeast Asia (Thailand and Indonesia), soil processes under traditional shifting cultivation systems were investigated with special reference to soil organic matter dynamics and the agro-ecological degradation due to excessive land use under increasing population pressure was also analyzed to establish a sustainable land use system there. In Africa (Burkina Faso, Tanzania), human-environment relationship was investigated through the research on the response of soils to the soil management practices under conventional farming systems by small-scale farmers.

b) Dynamic pedology on the soil acidification processes:

The acid-buffering and/or storing capacity of the amorphous sesquioxides in the course of pedogenetic acidification of soils derived from several parent materials were studied in the cool and warm temperate forests in Japan and in the tropical forests in Southeast Asia. Conditions for formation and weathering of expandable 2:1 type soil clay minerals in leaching environments were investigated and electro microscopic investigation were carried out for examining the response of soils in Japan and Tropical Asia to addition of acids.

c) Studies on the remediation of polluted soils:

With expansion of human activities, soil pollution with heavy metals such as Cd has been one of the serious problems, and establishment of the method to remediate polluted soils is urgently required. In this study, the dynamics of ^{137}Cs were investigated based on the kinetic study on adsorption/desorption experiments.

d) Studies on the mechanisms of nitrate leaching:

Excessive application of chemical fertilizers and manures has caused nitrate leaching, which would lead to the groundwater pollution. To elucidate the mechanisms of nitrate leaching, the nitrate adsorption capacity was investigated in eastern Hokkaido, including the experimental forest of Kyoto University.

A-2. Publications and presentations

a) Publications

Original papers

Hartono A, Funakawa S, and Kosaki T 2005: Phosphorus sorption-desorption characteristics of selected acid upland soils in Indonesia. Soil Sci. Plant Nutr., **51**, 501-512

Mori, K., Shinjo, H., and Kosaki, T. 2005 Comparison of different soil classification systems using 5 profiles from different forest ecosystems in Japan. Pedologists, 49, 10-21

Yanai, J., Mishima, A., Funakawa, S., Akshalov, K., and Kosaki, T. 2005. Spatial variability of organic matter dynamics in semi-arid croplands in northern Kazakhstan. Soil Science and Plant Nutrition, 51, 191-199.

Nakao, A., Yoshida, T., Ozaki, T., Ohnuki, T., Funakawa, S., and Kosaki, T. 2005. Cs Accumulation Behavior by *P. fluorescens*. Journal of Nuclear and Radiochemical Sciences, 6, 109-112

Nishiyama, Y., Yanai, J., and Kosaki, T. 2005: Potential of *Thlaspi caerulescens* for cadmium phytoremediation: Comparison of two representative soil types in Japan under different planting frequentcies., Soil Sci. Plant Nutr., 51(6), 827-834

Sano, S., Yanai, J., and Kosaki, T. 2006. Relationships between labile organic matter and nitrogen mineralizationin Japanese agricultural soils with reference to land use and soil type. Soil Sciece and Plant Nutrition, 52, 49-60

Yanai, J., Zhao, F-J., McGrath, S.P. and Kosaki, T. 2006: Effect of soil characteristics on Cd uptake by the hyperaccumulator *Thlaspi caerulescens*. Environmental Pollution, 139, 167-175

Reports

Kosaki, T.: Soil organic matter dynamics in Eurasian Steppes. (Report for Grant-in-Aid for Scientific Research (B) (2) Soil organic matter dynamics in Eurasian steppe – Proposal for optimizing land use to alleviate global warming and desertification, 2001～2003) pp.223, 2005

Funakawa, S.: Analysis on soil erosion using soil moisture monitoring system. (Report for Grant-in-Aid for Scientific Research (B) (2) Analysis on soil erosion using soil moisture monitoring system., 2000～2002) pp.69, 2004

Funakawa, S.: Removal of 137Cs from ecosystems using phytoremediation in former Soviet Union. (Report for Grant-in-Aid for Scientific Research (B) (2) Removal of 137Cs from ecosystems using phytoremediation in former Soviet Union, 2001～2002) pp.40, 2004

Sano, S.: Report on the 7th International Conference of ESAFAS, Jpn. J. Soil Sci. Plant Nutr. 76;

679-680, 2005

Funakawa, S. and Kosaki, T.: Characteristics of soils in steppe regions of Kazakhstan. Pedologist Jpn., pp. 52-66, 2005

b) Conference and seminar papers presented

Annual meeting of Japanese Society of Soil Science and Plant Nutrition (Shimane, 2005. 9.6-9.8): 10 papers

Annual meeting of Japanese Society of Tropical Agriculture (Kochi, 2005.10): 1 paper

The 7th International Conference of ESAFAS: 2 papers

First Symposium on the management of Tropical Sandy Soils for Sustainable Agriculture: 4 papers

A-3. Off-campus activities

Memberships in academic societies (roles)

Kosaki, T.: Japanese Society of Soil Science and Plant Nutrition (council member), Japanese Society of Pedology (council member, Head of editorial committee)

Funakawa, S.: Japanese Society of Pedology (Editorial committee member)

Shinjo, H.: Japanese Society of Pedology (Editorial committee member)

Research grants

Monbusho Research Grant: Grant-in-Aid for Scientific Research (A)2, Evaluation of agricultural resources and sustainability in the tropical upland fields under the large-scale development (Funakawa, member). Grant-in-Aid for Scientific Research (A)2, Development of the technology for sensing the yield controlling factors, and the fertilization system at the variable rate in fields under irrigated paddy rice and upland crop rotation system (Kosaki, Yanai, member). Grant-in-Aid for Scientific Research (A), Proposal of optimized land use based on C dynamics model in humid tropics (Kosaki, chief; Funakawa, member). Grant-in-Aid for Scientific Research (B)2, Proposal of optimized land use in irrigated area by large-scale salt dynamics model using geographical information – Case study in irrigated farming area in Syr Dar'ya river in southern Kazakhstan – (Funakawa, chief; Shinjo, member)

Entrust Research Fund by Japanese International Research Center for Agricultural Sciences: Studies on the relationship between the fragility of Sahel farmers and soil degradation (Shinjo), Characterization of the natural resources in the sandy soils in the semiarid tropics of Africa (Shinjo)

Sumitomo Foundation: Assessment and prediction of soil degradation processes using the archive of soil monoliths. (Kosaki, chief)

Toyota Foundation: Self-dependent and evironmentaly harmonized rehabilitation of grain farming system in Central Asia through participatory approach. (Kosaki, member)

A-4. International cooperation and overseas activities

International joint researches, overseas research surveys

Kosaki, T.:Establishment of ecologically sustainable land use in continental temperate regions. (Argentine) Assessment and prediction of soil degradation processes using the archive of soil monoliths. (Russia) Study on extension activities of organic farming for environment conservation and efficient water use. (Jordan)

Funakawa, S.: Study on agricultural ecosystems in tropical Asia. (Thailand, Indosesia); Study on agricultural ecosystems in East Africa. (Tanzania); Study on agricultural ecosystems in South America (Brazil)

Shinjo, H.: Study on desertification in West Africa. (Niger); Study on social-ecological resilience in semi-arid Tropics (Zambia)

Scholars from aboroad

Invited researcher: 1 person (Research Institute for Soil Science and Agricultural Chemistry of the Hingarian Academy of Sciences, Senior Researcher)

B. Educational Activities (2005.4-2006.3)

B-1. On-campus teaching

a) Courses given

Undergraduate level: Outline of Biological and Environmental Science, Science of Biosphere-Life, Environmental Sciences A, Resource, Environment and Technology and World Food Production, Environmental Information Processing, Soil Science- Part I (Kosaki); Basic Laboratory Cousrse in Biological and Environmental Science II, Soil Science- Part II (Funakawa); Practice in University Forest III, Livestock Production Techniques and Practice, Introduction to Plant Investigations, Laboratory Course in Biological and Environmental Science IV, Seminar in Soil Science, (Kosaki, Funakawa, Yanai, Shinjo).

Graduate level: Research in Soil Science, Seminar in Soil Science (Kosaki, Funakawa, Yanai); Tropical Soil Science (Kosaki)

B-2. Off-campus teaching

Kosaki, T.: Special lecture (Soil Analysis and Improvement, Agricultural and Rural Development with Environmental Conservation, Forage Production and Utilization Technologies, Envrionment oriented rural development in Peru) in Japan International Cooperation Agency

Funakawa, S.: Part-time lecture (Engineering for Ecological Environment) in Faculty of Life and Environmental Science, Simane University

B-3. Overseas teaching

Students and research fellows from abroad

Doctor course student: 2 (Indonesia, New Zealand)

2.5.7 Laboratory of Environmental Mycoscience

Staff *Professor* *: Futai, Kazuyoshi, D.Agric.Sci*
Associate Professor: Tanaka, Chihiro, D.Agric.Sci
Students and research fellows
Doctor's program: (11) *Master's program: (8)*
Undergraduate : (2)

A. Research Activities (2005.4-2006.3)

A-1. Main subjects

a) Ecological Studies on the Microorganisms-mediated interactions

Host-parasite interactions involved in the Pine Wilt Disease, the most serious forest epidemic in East Asian countries, has been studied from the viewpoints of gene expressions for host registance, and from resulting chemical products. A new molecular method sensitive enough to detect very low density of pathogenic nematodes was developed, applied for field pine stands, and found many latent carrier trees. This suggests the current control methods of this disease are still problematic. In the Japanese black pine stands at coastal area, reforestration with seedlings seems to face to difficulty. To elucidate the causal reason we have been studying on soil eutrophication, changes in microenvironments, and in microflora after devastation due to this disease.

Biological control trials for another forest epidemic, the Japanese Oak Wilt, have also been ongoing. candidate fungi which can be antagonistic to pathogenic fungus, or to bait yeasts of the vector beetle have been examined. Phylogenetic studies of several yeast isolates which were supposed to be involved in this disease were also studied. Host responses after infection with pathogenic fungus, especially the changes in the products of secondary metabolism were analyzed.

b) Biochemical and ecological genetics on fungi

Our previous studies on the mutants of *Cochliobolus heterostrophus* showing dicarboximide resistance revealed that the histidine kinase (HisK) signal-transduction system is involved in their fungicidal activities. For further elucidations of their mode of actions, MAPK signal-transduction system which accepts signals from HisK system was studied. We have cloned the gene encoding MAPK (*Bmhog1*) and made knock-out mutants (*Bmhog1*$^-$). The *Bmhog1*$^-$ strains expressed a reduced growth on the basal medium, implying that the non-phosphorylated form of BmHog1p is essential for housekeeping in the cell. The *Bmhog1*$^-$ strains also exhibited low-level resistance to iprodione. The level of the fungicide-resistance was quite different between the *dic1*$^-$ strains of *C. heterostrophus*. This suggests that the antifungal activity of the fungicide is not caused only by the abnormal activation of Hog1-related MAPK.

To examine the herbicidal mechanism of *Exserohilum monoceras,* we have cloned a putative non-ribosomal peptide synthetase (NPRS) gene, named *EMPS2*. Sequence analysis of the gene fragments revealed that *EMPS2* had 14 kbp ORF with no introns. And flanking *EMPS2*, three additional genes for putative short-chain dehydrogenase/reductase family protein, major facilitator superfamily protein, and transcription factor were identified. They formed a gene cluster which is resemble to the gene cluster for HC-toxin biosynthesis of *C. carbonum*. We are

currently trying to disrupt these genes to elucidate the functions.

A-2. Publications and Presentations

a) Publications

Books

Tsuda, M. and Tanaka, C. Diversity and species differentiation of fungi (Sugiyama, J. Ed.), pp. 137-143, Shokabo, Tokyo, 2005 (in Japanese)

Tsuda, M. and Tanaka, C. Morphological and molecular evolution of *Amanita* spp. (Sugiyama, J. Ed.), pp. 293-294, Shokabo, Tokyo, 2005 (in Japanese)

Original papers

Akema, T. and Futai, K.: Ectomycorrhizal development in a *Pinus thunbergii* stand in relation to the location on a slope and their effects on tree mortality from Pine Wilt Disease. J. For. Res. 10 (2); 93-99, 2005

Asai, E. and Futai, K.: Effects of inoculum density of pinewood nematode on the development of pine wilt disease in Japanese black pine seedlings pretreated with simulated acid rain. For. Path. 35; 135-144, 2005

Kanzaki, N. and Futai, K.: Description of *Bursaphelenchus parvispicularis* n. sp. (Nematoda: Parasitaphelenchidae) isolated from a dead oak tree, *Quercus mongolica* var. *grosseserrata*. Nematology 7(5); 751-759, 2005

Maehara, N., Hata, K. and Futai, K.: Effect of blue-stain fungi on the number of *Bursaphelenchus xylophilus* (Nematoda: Aphelenchoididae) carried by *Monochamus alternatus* (Coleoptera: Cerambycidae). Nematology 7; 161-167, 2005

Takemoto, S., Kanzaki, N. and Futai, K.: PCR-RFLP image analysis: a practical method for estimating isolate-specific allele frequency in a population consisting of two different strains of the Pinewood Nematode, *Bursaphelenchus xylophilus* (Aphelenchida: Aphelencoididae). Appl. Ent. and Zool. 40; 529-535, 2005

Takeuchi, Y., Kanzaki, N. and Futai, K.: A nested PCR-based method for detecting the pinewood nematode, *Bursaphelenchus xylophilus*, from pine wood. Nematology (accepted), 2005

Yamashita, H., Tanaka, C., Nakayama, H., Tuno, N. and Osawa, N.: New host recoded for three scuttle flies, *Megaselia flava*, *M. kanekoi*, and *M. gotoi* (Diptera: Phoridae), on the poisonous fungus *Amanita ibotengutake* (Agaricales: Amanitaceae). Entomol. Sci. 8; 223-225, 2005.

Yoshimi, A., Kojima, K., Takano, Y. and Tanaka, C.: Group III histidine kinase is a positive regulator of Hog1-type mitogen-activated protein kinase in filamentous fungi. Euc. Cell 4; 1820-1828, 2005

b) Conference and seminar papers presented

The 116th Annual Meeting of the Japanese Forestry Society: 6 papers

The 13th Annual Meeting of the Japanese Nematological Society: 3 papers

The 49th Annual Meeting of the Japanese Society of Applied Zoology and Entomology: 1 paper

The Annual Meeting of the Phytopathological Society of Japan, 2005: 2 papers

The 5th Conference on Fungal genetics and Molecular Biology : 1 paper

The MSA/MSJ Joint Meeting 2005, Hilo: 5 papers

A-3. Off-campus activities

Memberships of Academic Societies

Futai, K.: Japanese Society of Nematology (President), Tree Health Research Society (member of editorial board).

Tanaka, C.: Japanese Society of Pesticide Science (member of editorial board), The Mycological Society of Japan (trustee, member of editorial board).

Research grants

Futai, K.: Grant-in-Aid for Scientific Research from the Ministry of Education, Science and Culture, Japan, Survey and Application of antagonistic fungi in controlling of a forest epidemic, Japanese Oak Wilt.

Futai, K.: Grant-in-Aid for Scientific Research from the Ministry of Education, Science and Culture, Japan, The expression pattern of resistance genes of Japanese black pine, *Pinus thunbergii*, infected with pinewood nematode.

Tanaka, C.: Grant-in-Aid for Scientific Research from the Ministry of Education, Science and Culture, Japan, Population-ecological studies on interactions of mushrooms and their mycovorous insects.

Tanaka, C.: Grant-in-Aid for Scientific Research from the Ministry of Education, Science and Culture, Japan, Studies on exotic ectomycorrhizal fungi invaded into New Zealand native forest.

A-4. International cooperation and overseas activities

International meetings (roles)

Futai, K.: The 1st International Congress of Crop Security, Malang (Indonesia): (Invited speaker)

Futai, K.: IUFRO, Brisbane (Australia): (coordinator of a business session)

Tanaka, C.: The MSA/MSJ Joint Meeting 2005, Hilo (USA): (Invited speaker, 5 papers presented)

International joint researches, overseas research surveys

Tanaka, C.: A study on fungal flora in a tropical and monsoon South-East Asia (Malaysia).

Tanaka, C.: Studies on exotic ectomycorrhizal fungi invaded into New Zealand native forest (New Zealand).

B. Educational Activities (2005.4-2006.3)

B-1. On-campus teaching

a) Course given

Undergraduate level: Microbes in Ecosystem (Futai), Seminar in Environmental Microbiology (Futai, Tanaka), Laboratory course in Biological and Environmental Science III, IV (Futai, Tanaka), Outline of Bioresource Science IV (Futai, Tanaka), Microbiology (Futai, Tanaka), Pesticide Science (Tanaka), Introduction to Foreign Literature Bioresource Science IV (Tanaka).

Graduate level: Seminar in Environmental Mycoscience (Futai, Tanaka), Research in Environmental Mycoscience (Futai, Tanaka), Special Lecture on Microbial Management (Tanaka).

B-2. Off-campus teaching,etc.

Part-time lecturer

Futai, K.: Kyoto Institute of Technology (Environmental Biology), Minami Kyushu University (Conservation Biology), Doshisha University (behavioural ecology, Life Science)

2.5.8 Laboratory of Ecological Information

Staff *Professor* : *Takafuji, Akio, Ph. D.*
Associate Professor: Osakabe, Masahiro, Dr. Kyoto Univ. (Agric. Sci.)
Assistant Professor : Yano, Shuichi, Dr. Agric. Sci.

Students and research fellows

Doctor's Program : (7) *Master's Program : (2)*
Research Student : (1) *Foreign Visiting Fellow : (1)*

A. Research Activities (2005.4-2006.3)

A-1. Main subjects

The central research topic in this laboratory is the ecological, molecular and biochemical analysis of the interactions among plants, herbivors and predators, along with basic ecological and genetical studies of individual components comprising of these systems.

a) Inter- and intra-specific variations in the ecological performance of spider mites

Phytophagous mites of the family Tetranychidae occur in a variety of environments, while their adaptive traits such as diapause, dispersal and host plant range vary within species and between them. We have studied experimentally and theoretically, the genetic basis of this variation, and the ecological factors responsible for and the significance of the variation.

b) Management of spider mites in orchards

We have compared the abundance of spider mite populations in pear and persimmon orchards that have different cultural and control programs, and determined the artificial factors responsible for outbreaks of the mites. Based on this survey, we proposed strategies for controlling the mites, including the use of natural enemies, such as phytoseiid mites, and the development of new cultural management techniques.

c) Ethological interactive studies of spider mites and their predators

In general, herbivors and their predators are connected with diffuse food webs. Moreover, members within a trophic level also interact through inter-specific competition and/or intra-guild predation. We have investigated direct and indirect consequences of these interactions on the population dynamics of herbivors.

d) Evolutionary ecology of plant-herbivore interactions

Diverse interactions between plants and herbivors are maintained by the balance between herbivore defense of plants and counter adaptation by herbivors. From this viewpoint, we have examined the reason why host ranges of phytophagous insects and mites are generally restricted to the small fraction of the plants available to them. We also investigated proximate factors responsible for the interactions such as secondary metabolites of host plants.

e) Meta-population structure and maintenance of genetic variation in spider mites

Neutral mutations are frequently lost or fixed by genetic drift within a finite population. Nevertheless, genetic variations in pesticide susceptibilities are maintained in a selection free, wild population of spider mites. Such variations may be maintained by the meta-population structure of spider mites. We have analyzed the structure using molecular markers such as DNA polymorphism, and discussed the maintenance mechanism of the genetic variations.

A-2. Publications and Presentations

a) Publications

Original papers

Ehara, S. and K. Ohashi: A new spider mite species of *Schizotetranychus* (Acari: Prostigmata: Tetranychidae) from *Quercus gilva* in Japan. Zootaxa 884; 1-5, 2005.

Furuichi, H., S. Yano, A. Takafuji and M. Osakabe: Prey preference of the predatory mite *Neoseiulus womersleyi* Schicha is determined by spider mite webs. Journal of Applied Entomology 129 (6); 336-339, 2005.

Furuichi, H., K. Oku, S. Yano, A. Takafuji and M. Osakabe: Why does the predatory mite *Neoseiulus womersleyi* Schicha (Acari: Phytoseiidae) prefer spider mite eggs to adults? Applied Entomology and Zoology 40 (4); 675-678, 2005.

Kasai, A., S. Yano and A. Takafuji: Prey-predator mutualism in a tritrophic system on a camphor tree. Ecological Research 20 (2): 163-166, 2005.

Kamezaki, H., Y. Sasaki, K. Ohasi and A. Takafuji: Lethal effects of two types of oxygen absorbers on three hous dust mites, *Dermatophagoides farinae*, *D. pteronyssinus* and *Tyrophagus putrescentiae*. Journal of the Acarological Society of Japan 14 (2): 127-133, 2005.

Komeda, K., M. Inoue, H. Ichinose and A. Takafuji: Avoidance of bird damage on grapes with a simple net and viticulture method. Japanese Jouranl of Applied Entomology and Zoology 49: 245-250, 2005.

Kongchuensin, M., V. Charanasri and A. Takafuji: Geographic distribution of *Neoseiulus longispinosus* (Evans) and its habitat plants in Thailand. Journal of the Acarological Society of Japan 14 (1): 1-11, 2005.

Nishimura, S., N. Hinomoto and A. Takafuji: Gene flow and spatio-temporal genetic variation among sympatric populations of *Tetranychus kanzawai* (Acari: Tetranychidae) occurring on different host plants, as estimated by microsatellite gene diversity. Experimental and Applied Acarology 35 (1/2): 59-71, 2005.

Ohashi, K, Y. Sakuratani, N. Osawa, S. Yano and A. Takafuji: Thermal microhabitat use by the ladybird beetle, *Coccinella septempunctata* (Coleoptera: Coccinellidae), and its life cycle consequences. Environmental Entomology 34 (2): 432-439, 2005.

Oku, K., S. Yano, Mh. Osakabe and A. Takafuji: Mating strategies of *Tetranychus kanzawai* (Acari: Tetranychidae) in relation to mating status of females. Annals of the Entomological Society of America 98 (4); 625-628, 2005.

Osakabe, Mh., K. Goka, S. Toda, T. Shintaku and H. Amano: Significance of habitat type for the genetic population structure of *Panonychus citri* (Acari: Tetranychidae). Experimental and Applied Acarology 36 (1/2); 25-40, 2005.

Takafuji, A., N. Hinomoto, C. I. T. Shih, T. Gotoh, C. C. Ho and C. C. Wang: Diapause characteristics of the Taiwanese populations of *Tetranychus kanzawai* Kishida and *T.*

urticae Koch (Acari: Tetranychidae). Plant Protection Bulletin 47: 103-114, 2005.

Toyoshima, S. and M. Osakabe: Effect of artificially released Neoseiulus californicus (Acari: Phytoseiidae) and naturally occurring Orius minutus (Hemiptera: Anthocoridae) on Tetranychus urticae (Acari: Tetranychidae) population in apple orchard without insecticides. Annual Report of the Society of Plant Protection of North Japan 56: 188-190, 2005.

b) Conference and seminar papers presented

50th Annual Meeting of Japanese Society of Applied Entomology and Zoology: 9 papers

53th Annual Meeting of the Ecological Society of Japan: 1 paper

14th Annual Meeting of the Acarological Society of Japan: 3 papers

The 77th Annual Meeting of the Genetics Society of Japan: 2 papers

2nd International Symposium of COE Entomomimetic Sciences: 3 papers

15th Annual Meeting of the Biological Control Society of Japan: 1 paper

A-3. Off-campus activities

Membership in academic societies (roles)

Takafuji, A.: Japanese Society of Applied Entomology and Zoology (Councilor), The Acarological Society of Japan (President), The Society of Population Ecology, The Kansai Plant Protection Society

Osakabe, M.: Japanese Society of Applied Entomology and Zoology (Councilor), The Genetics Society of Japan, Pesticide Science Society of Japan, The Society of Population Ecology, The Acarological Society of Japan (Editor), The Entomological Society of America

Yano, S.: Japanese Society of Applied Entomology and Zoology, The Society of Population Ecology, The Acarological Society of Japan, The Ecological Society of Japan

Research grants

JSPS Research Grant: Basic Research (B) Ecological and molecular phylogenetic analysis of the distribution expansion process of spider mites in South-east and East Asia (Takafuji, Head)

JSPS Research Grant: Basic Research (B) Management of spider mites in orchards by using native phytoseiid predators (Takafuji, Partial).

JSPS Research Grant: Encouragement of Young Scientists (B): Conformism determining the group characteristics of spider mites (Yano, Head)

The 21st Century COE Program: Innovative food and environmental studies pioneered by entomomimetic sciences (Takafuji and Osakabe; Partial)

Research Project funded by the Japan Ministry of Agriculture, Forestry and Fisheries: Development of new biorational techniques for sustainable agriculture (Partial: Osakabe and Yano)

A-4. International cooperation and overseas activities

International meetings (roles)

Takafuji, A. The 5thAsia-Pacific Congress of Entomology (Oct. 18-21,05, Jeju, Korea) (Symposium organizer.

Membership in international academic societies

Takafuji, A.: Experimental and Applied Acarology (Chapman and Hall; Editorial board),

International Congress of Acarology (Executive committee)

Oversea joint research surveys

Takafuji, A.: Ecological and genetic divergence of spider mites in South-east and East Asia. (Nanjing Agricultural University, China; Bogor Agricultural University, Indonesia; National Institute of Plant Protection, Vietnam; Department of Agriculture, Thailand, National Chung-Hsing University, Taiwan-China)

B. Educational Activities (2005.4-2006.3)

B-1. On-campus teaching

a) Courses given

Undergraduate level: Ecology (Takafuji), Ecological Management (Osakabe), Seminar in Ecological Management (Takafuji and Osakabe), Basic Bioresource Science II (Takafuji), Outline of Bioresourse Science IV (Osakabe), Fundamentals of the Experiments of Bioresource Science (Yano), Laboratory Course in Bioresource Science I・II (Osakabe and Yano)

Graduate level: Ecological Information (Takafuji), Seminar in Ecological Information and Management (Takafuji and Osakabe), Research in Ecological Information and Management (Takafuji, Osakabe and Yano)

B-2. Off-campus teaching

Part-time lecturer

Takafuji, A.: Kyoto Institute of Technology (Environmental Ecology), Osakabe, M.: Kyoto Prefectural University (Environmental Entomology)

Open seminar

Yano, S.: 69th meeting of insect physioecology (National Agrivultural Research Center for Kyusyu Okinawa Region)

B-3. Overseas teaching

Takafuji, A.: National Chung-Hsing Univ. (Taiwan; Lecture), Thailand Deaprtment of Agriculture (Seminar)

Research fellow from abroad

Ronpaku research fellow: 1 (Thailand)

Chair of Environmental Development Engineering

2.5.9 Laboratory of Agricultural Facilities Engineering

Staff *Professor* *: Aoyama Shigeyasu, Dr. Agric. Sci.*
Associate Professor: Kobayashi Akira, Dr. Eng. Sci.
Assistant Professor : Kiyama Shouichi, Dr. Agric. Sci.
Assistant Professor : Yamamoto Kiyohito

Students and research Fellows

Doctor's Program : (3) *Research Fellow : (1)*
Master's Program : (8) *Undergraduate : (5)*

A. Research Activities (2005.4-2006.3)

A-1. Main subjects

a) Non-destructive method for long used hydraulic facilities for irrigation

To make the strategy for the maintenance of long used hydraulic facilities for irrigation activity, non-destructive methods such as impact acoustic method, electrical resistivity survey or electro-magnetic method to investigate the state of the structure or subsoil has been developed.

b) Maintenance and renewal or rehabilitation of the long used facilities

Nowadays, it is important decision making how to choose among rehabilitation work, repair, or renewal of facilities by the new project, based on the grasp of various functional loss of the deteriorated facilities. Also the need of the farmers to various facilities has been changed from the past. From this point what is the best strategy for the economical use of the finance is investigated.

c) Validation of the coupled mechanical, hydraulic and thermal analysis

By applying the simulation method for the coupled mechanical, hydraulic and thermal phenomena, the numerical method is tried to be validated.

d) Experimental research on failure mechanism of irrigation dike caused by overtopping and risk analysis of the irrigation dike damages

Many traditional irrigation dikes easily fail due to the overtopping of the pond water by a heavy rain. But the mechanism of the failure is not clarified because of the lack of the exact observation. So the experimental test of overtopping has been carried out. Also based on the data of many failed irrigation dikes in AWAJI island caused by the heavy rain of a typhoon, a risk analysis was carried out.

e) Mechanics of solute transport through ground sea water intrusion

To understand the environmental problem near coast area, the solute transport through the area having sea water intrusion is investigated by the 2-D tank and numerical approach.

f) Agent based economic values on water environmental problem and its planning

Regarding dam lake utilization planning, gaps in values of water environmental goods and in sociality for the further river basin management is analyzed in region and the corresponding dynamic model is developed for the water environmental planning.

g) Mechanical Property change in rocks and concrete due to degradation

For long use of irrigation structure, mechanical characteristics of degraded rock and concrete are investigated. Mechanical characteristics of degraded mortal are grasped using compression strength test. Analysis model of damage mechanism is examined.

A-2. Publications and presentations

a) Publications

Original Papers

Tsukada, Y., A. Kobayashi, S. Kiyama and S. Aoyama: Numerical analysis method for hydraulic fracturing – criterion for hydraulic fracturing in rock foundation of embankment dams –, Trans. of JSIDRE 236;1-14,2005.

Tsukada, Y., A. Kobayashi, S. Kiyama and S. Aoyama: Proposal of criteria for hydraulic fracturing based on measured properties of rock s and rock classification and their applicability – criterion for hydraulic fracturing in rock foundation of embankment dams –, Trans. of JSIDRE 236; 15-23, 2005.

Kobayashi, A., K. Inoue and S. Aoyama: Improved estimation method of permeability distribution with multiple soft information. Trans. of JSIDRE 236; 85-91, 2005 (in Japanese)

Shemsu, K., S. Kiyama, S. Aoyama and A. Kobayashi: Laboratory study on shear behavior of unsaturated granular soil during cyclic suction loading. Trans. of JSIDRE 238; 1-7, 2005.

Kawachi, T., S. Aoyama, M. Yangyuoru, K. Unami, T. Matoh, D. Acquah and S. Quarshie: An irrigation tank for harvesting rainwater in semi-arid savannah areas. J. of Rainwater Catchment Systems 11(1); 17-24, 2005

Yamamoto, K., A. Kobayashi and S. Aoyama: Numerical Analysis with damage mechanics for degraded rocks. Proceeding of Int. Conf. on Computational & Experimental Eng. & Sciences '05; 1973-1978, 2005

Kobayashi, A., S. Momoki, K. Yamamoto, S. Aoyama and A. Kawakami: Hydraulic fracturing of highly compacted bentonite. Proceeding of Proceeding of Int. Conf. on Computational & Experimental Eng. & Sciences '05; 1990-1995, 2005

Fujisawa, K., K. Shemsu, S. Kiyama, S. Aoyama: Subloading model for collapse behavior of unsaturated soils. Proceedings of Int. Conf. on Computational & Experimental Eng. & Sciences '05; 1967-1972, 2005

Alonso, E. E., J. Alcoverro, F. Coste, L. Malinsky, V. Merrien-Soukatchoff, I. Kadiri, T. Nowak, H. Shao, T. S. Nguyen, A. P. S. Selvadurai, G. Armand, S. R. Sobolik, M. Itamura, C. M. Stone, S. W. Webb, A. Rejeb, M. Tijani, Z. Maouche, A. Kobayashi, H. Kurikami, A. Ito, Y. Sugita, M Chijimatsu, L. Börgesson, J. Hernelind, J. Rutqvist, C.-F. Tsang, P. Jussila: The FEBEX benchmark test ; case definition and comparison of modeling approaches. International Journal of Rock Mechanics & Mining Sciences 42; 611–638, 2005

Yamamoto, K., A. Kobayashi and S. Aoyama: Change in mechanical properties of mortar due to effect of mixing of extraneous subject. Proc. of 6th GeoEnvironment Symposium; 65-72, 2005 (in Japanese)

Yanagimoto, T., R. Niwa, K. Yamamoto, A. Kobayashi and S. Aoyama: Development of simple nondestructive inspection method for soil structure. Symp. of Geoenvironmental and Measurement techniques, Kansai branch of JGS; 67-72, 2005 (in Japanese)

Inoue, K., I. Masaki, A. Kobayashi and T. Tanaka: Effect of spatial distribution of hydraulic

conductivity on dispersivity and comparison of parameter estimation method. Journal of Hydraulic Engineering-JSCE 50; 235-240, 2006(in Japanese)

Fujisawa, K., S. Shemsu, S. Kiyama and S. Aoyama: A subloading model for collapse behavior of unsaturated soils. J. of Applied mechanics JSCE 8; 403-412, 2006 (in Japanese)

Kiyama, S.: Influence of gap in values among local residence and their sociality on evaluation of utility value of dam lake. JSCE Journal of Environmental systems and Engineering 62(1); 85-93, 2006 (in Japanese)

Reports

Aoyama, S.: Degeneration and rehabilitation of irrigation structures, Annual Meeting of Materials & Construction board of JSIDRE 44 ; pp. 1-8, 2006 (in Japanese)

Kobayashi, A.: Res. Report of the Commission regarding the understand of the mechanical state of irrigation ponds in Yamato-plain hazard prevention project by non-destructive method ; 45p, 2006 (in Japanese) of Design of Embankment Dams JSIDRE; pp. 19-40, 2005 (in Japanese)

Aoyama, S., T. Oka and A. Kobayashi: Risk analysis of hazard on irrigation ponds in AWAJI island during the attack of the typhoon 16, 2004. Res. Rep. to the committee of design of embankment Dams JSIDRE, 2006 (in Japanese)

b) Conference and seminar papers presented

H-17 National conference of JSIDRE: 6 papers

H-17 Kyoto regional conference of JSIDRE: 2 papers

40th National conference of JGS: 2 papers

H-17 National conference of JSCE: 1 paper

6-th Symposium on Groundwater Environmental Geo-engineering: 1 paper

Symposium on Geo-environmental and Measurement techniques: 1 paper

H-17 Seminar on Kyoto branch of JSIDRE: 1 paper

Int. Conf. on computational & Experimental Engineering and Sciences 2005 India: 3 papers

A-3. Off-campus activities

Membership in academic society

Aoyama, S.: Japanese. Soc. of Irrigation, Drainage and Reclamation Eng. (Director, Chairman of Kyoto branch, member of task committee on Dam Eng.), Japanese Geotechnical Soc., Japan Soc. of Civil Eng. (Squad leader of Kansai-branch), Japan Rainwater Catchments System Association.

Kobayashi, A.: Japanese Society of Irrigation, Drainage and Reclamation Eng. (member of committee of long term usage of dam), Japanese Geotechnical Society (Domestic member of ATC8, member of technical committee of soil and groundwater pollution and countermeasure in Kansai branch, Editor of Soils & Foundation), Japan Soc. Civil Eng. (member of committee of nondestructive inspection method of concrete), Japanese Association of Groundwater Hydrology, J. Soc. Computational Eng., Int. Soc. of Rock Mechanics, Japan Rainwater Catchments System Association.

Kiyama, S.: Japanese Society of Irrigation, Drainage and Reclamation Eng. (member of Committee of education organization of agricultural engineers, Kinki branch, JSIDRE.), Japanese Geotechnical Society, Japan Soc. of Civil Eng.

Yamamoto, K.: Japanese Society of Irrigation, Drainage and Reclamation Eng., Japanese

Geotechnical Soc. (Committee member on the shearing & application of geotechnical information, Kansai branch), Japan Soc. of Civil Eng., Japanese Soc. of Experimental Mechanics.

Research grants

Monbusyo Grants-in-Aid : Basic research (A) Soundness diagnostic of agricultural facilities and evaluation of environmental impact assessment. (Aoyama, head researcher)

A-4. International cooperation and oversea activities

International meeting (role)

Kobayashi, A.: International Congress of Geotechnical Engineering(Secretary), DECOVLEX Work shop in Canada(presentation), DECOVLEX Task Force Meeting in Sweden(presentation), International Conference on Computational & Experimental Engineering and Sciences (presentation)

B. Educational Activities (2005.4-2006.3)

B-1. On-campus teaching

a) Courses given

Undergraduate level: Planning and Design of Rural Facilities (Aoyama), Structural Analysis (Aoyama), Seminar in Rural Facility Engineering (Aoyama and Kobayashi), Applied Mechanics (Kobayashi), Soil Mechanics and Concrete Engineering (Kobayashi), Laboratory Course in Soil Mechanics, Concrete Engineering and Environmental Geotechnique (Kobayashi), Exercise in Information Processing, Basics (Kobayashi), Introduction to Agricultural and Environmental Engineering I (Aoyama shear), Seminar in Agricultural and Environmental Engineering (Aoyama, Kobayashi shear).

Graduate level: Planning and Design of Rural Facilities (Aoyama), Numerical Science of Structural Design (Kobayashi), Laboratory Course in Agricultural Facilities Engineering (Aoyama and Kobayashi), Advanced Course of Data Processing for Design I (Aoyama and Kobayashi), Advanced Course of Data Processing for Design II (Aoyama and Kobayashi)

B-2. Off-campus teaching, etc.

Part-time lecturer

Aoyama, S.: SHIGA prefectural university (Structures for Environmental Water Use), KOBE University (Special lecture for productive environment)

Kobayashi, A.: Tokyo Institute of technology (Underground environment)

B-3. Overseas teaching

Students from abroad

JSPS postdoctoral foreign research fellow: 1 (Ethiopia)

Foreign student (PhD Course): 1 (Kenya)

C. Other Remarks

Aoyama, S.: Special Member of technical subcommittee of rural development subdivision for Council of Food, Agriculture and Rural Area, Policies (MAFF)., Watch committee member for bids in KINKI regional office of ministry of agriculture, forestry & fisheries.,

Evaluation committee member of public projects conducted by Kyoto prefectural government., Member/Chairman of the committee for engineering problems in design and construction of dams for irrigation use (JIID)., Chairman of the committee for soil-water-farmland environment creation in KINKI regional office of ministry of agriculture, forestry & fisheries., Member of the committee for engineering problems in design and construction of structures of agricultural use (MAFF).,Chairman of the evaluation committee of national projects conducted by KINKI regional office of ministry of agriculture, forestry & fisheries., Chairman of the committee for countermeasure against earthquake hazard of irrigation structures(Osaka prefecture).,Chairman of research committee of the hazard of irrigation dikes & farmland in AWAJI island (JSIDRE)., Chairman of research committee of the design method for spillways of irrigation dikes (JSIDRE)., Member of the technical committee of KUZURYU downstream national irrigation project

Kobayashi, A.: Member of council for engineering problems in design and construction of dams for irrigation use, JIID., Member of committee on long use of dams for irrigation use, JSIDRE Member of the committee on cooperative research with university, Japan Nuclear Cycle Development Institute, Member of the committee on the research activity of geological disposal, Japan Nuclear Cycle Development Institute, Member of the committee on the HLW disposal technology, Nuclear Safety Research Association, Member of the committee on the HLW disposal R&D program, Radioactive Waste Management Funding and Research Center

Kiyama, S.: Party organizer KATSURA river network (voluntary organization), Committee member of lake planning of HIYOSHI dam water resource region, Ministry of land, infrastructure and transport, Committee member of environmental planning of HIYOSHI dam water resource region

2.5.10 Laboratory of Water Resources Engineering

Staff *Professor : Kawachi, Toshihiko, Dr. Agric. Sci.*
Associate Professor: Unami, Koichi, Dr. Agric. Sci.
Assistant Professor : Maeda, Shigeya, Dr. Agric. Sci.
Assistant Professor : Takeuchi, Junichiro

Students and research fellows

Doctor's program: (2) *Master's program: (7)*
Undergraduate : (5) *Research student: (1)*

A. Research Activities (2005.4-2006.3)

A-1. Main subjects

a) Hydraulic and environmental modeling

Numerical strategies for prediction and control of water quality affected by water resources utilization are explored standing on environmental hydraulics. Major research effort is focused on

developing tough, versatile and efficient models for simulating flow and/or substance transport in a wide variety of bodies of water (water conveyance system (open channels or pipelines), rivers, embayment, lakes, etc.), with the ultimate aim of offering hydraulic engineers an integrated family of powerful computation tools that encompasses all possible water quality problems encountered.

b) Optimum management and control of water resources systems

Optimum strategies for management and control of water resources systems are fundamentally investigated to give better answers for tasks of water resources development, management and conservation. For storage systems (dam reservoirs, lakes, groundwater, etc.), reliability problems with input/output uncertainties, problems of designing robust controllers to determine the release strategy of reservoirs or optimum fertilizer application strategy in open fields using genetic algorithm, etc. are being tackled. For water conveyance systems (canals, rivers, etc.), the focus of interest is put on the way of optimally controlling discharge, water level and/or water quality in streams. Automatic management of a water resources system based on the linear control theory is also one of the major subjects.

A-2. Publications and presentations

a) Publications

Original papers

Zhang, Q., S. Maeda, and T. Kawachi: Optimal allocation of irrigation water by balancing water use and food production. Journal of Rainwater Catchment Systems, 11(1); 11-15, 2005

Kawachi, T., S. Aoyama, M. Yangyuoru, K. Unami, D. Acquah and S. Quarshie: An irrigation tank for harvesting rainwater in semi-arid savannah Areas -design and construction practices in Ghana/West Africa-. Journal of Rainwater Catchment Systems, 11(1); 17-24, 2005

Maeda, S. and T. Kawachi: Optimal management of agricultural wastewaters for improving river water quality. Proceedings of Pawees 2005 International Conference; 98-104, 2005

Maeda, S. and T. Kawachi, T.: Evaluation of river water quality management level based on COD-loads optimally allocated to point and nonpoint sources. Proceedings of XXXI IAHR Congress; 2252-2262, 2005

Takeuchi, J. and T. Kawachi: Optimal landuse arrangement for environmentally sound watershed management. Proceedings of XII World Water Congress; CD-ROM, 2005

Unami, K., T. Kawachi, M. Yangyuoru, and K. Ishida: A finite volume scheme for simulation of rainwater harvesting process. Proceedings of the Second IASTED International Conference, Advanced Technology in the Environmental Field; 124-129, 2006

Unami, K., and T. Kawachi: Systematic assessment of flood mitigation in a tank irrigated paddy fields area. Paddy and Water Environment, 3; 191-199, 2005

Reports

Kawachi, T.: Optimum Design and Management of Small-scale Irrigation Scheme with Rainwater Harvesting. Report of Monbukagakusho Grant-in-aid: Basic Research (A) (2)

b) Conference and seminar papers presented

2005's Annual Conf. of Jap. Soci. Irri. Drain. Recl. Eng.: 3 articles

62th Kyoto-Branch Conf. of Irri. Drain. Recl. Eng.: 5 articles

13th Congress of Jap. Rain. Catch. Sys. Associ.: 6 articles

2005 JSIDRE Workshop of Applied Hydraulics: 2 articles

A-3. Off-campus activities

Membership in academic societies

Kawachi, T.: Rainwater Catchment Systems Association (President, Executive)

Unami, K.: Rainwater Catchment Systems Association (Secretary General, Councilor)

Research grants

Monbukagakusho Grant-in-aid: Basic Research (A) Hydro-environmental modeling and optimal management of water-network system in rural area (Kawachi, Unami, Maeda, Takeuchi)

Monbukagakusho Grant-in-aid: Young Scientists (A) Construction of stochastic process model for fish behavior in water control structures (Unami)

Monbukagakusho Grant-in-aid: Exploratory Research Development and verification of runoff models for sudden floods (Unami)

Monbukagakusho Grant-in-aid: Young Scientists (B) Developing decision support system for river water quality management using integrated GIS-optimization model (Maeda)

A-4. International cooperation and overseas activities

International meetings (roles)

Kawachi, T.: Member of the Steering Committee of 2005 PAWEES International Symposium

Membership in international academic societies

PAWEES 2005 International Conference: 1 article

XXXI IAHR Congress: 1 article

XII World Water Congress: 1 article

The Second IASTED International Conference, Advanced Technology in the Environmental Field: 1 article

Kawachi, T.: International Water Resources Association/IWRA (Member of Peer-reviewers Committee)

International joint researches, overseas research surveys

Unami, K.: Development and Verification of Runoff Models for Sudden Floods (Ghana)

Kawachi, T.: Technical and Research Co-operation with Rural Research Institute, Korea Agricultural & Rural Infrastructure Corporation (Korea)

B. Educational Activities (2005.4-2006.3)

B-1. On-campus teaching

a) Courses given

Undergraduate level: Applied Mathematics (Unami), Hydraulics (Unami), Water Resources Utilization (Kawachi), Water-Use Systems Engineering (Kawachi), Seminar in Computational Hydraulics (Kawachi, Unami), Laboratory Course in Hydraulics (Unami), Seminar in Agricultural and Environmental Engineering (Kawachi)

Graduate level: Hydraulic and Environmental Modeling (Unami), Seminar-I in Water Resources Engineering (Kawachi, Unami), Seminar-II in Water Resources Engineering (Kawachi, Unami), Laboratory Course in Water Resources Engineering (Kawachi, Unami)

B-2. Overseas teaching

Students and research fellows from abroad

Students: Doctoral course/2 (Bangladesh, China)

C. Other remarks

Kawachi, T.: Member of the Japan National Council on Food, Agriculture and Rural Policies, Chair of the Consultation Committee for Restoration of Irrigation Tanks in Shiga, Chair of the Council for Environmentally Sound Rural Developments in Fukui, Member of the Council for Local Community Use of Irrigation Water in Yasu River Area, Chair of the Council for Environmentally Sound Kuzuryu-Project Implementation, Member of the Council for Building Flood-Proof Towns in Southern Biwa-Lake Areas, Member and Subcommittee General of Information Security Organizers Committee of Kyoto University, Member of the Council of the Academic Center for Computing and Media Studies (Kyoto University), Member of the Information Security Chairman of the Steering Committee of KAIS-Information System, Head of Information Technology Service Office

Chair of Land and Water Resources Management

2.5.11 Laboratory of Irrigation, Drainage and Hydrological Environment Engineering

Staff *Professor : Mitsuno, Toru, Dr. Agric. Sci.*
Lecturer : Nakamura, Kimihito, Dr. Agric. Sci.

Students and research fellows

Doctor's program : (1) *Master's program : (9)*
Undergraduate : (5) *Research fellow : (1)*

A. Research Activities (2005.4-2006.3)

A-1. Main subjects

a) Hydrological evaluation of multipurpose functions of agricultural lands and irrigation ponds (Sennan, Osaka and Kibogaoka, Shiga). Meteorological studies on controlling air temperature rising by agricultural lands and ponds (Sennan, Osaka and Kibogaoka, Shiga). Evaluation of hydrological and meteorological characteristics in forested catchments (Oshinohara, Shiga and Kamigamo, Kyoto).

b) Prevention of nitrogen contamination of hydro-geological environment.

Water management of paddy fields as wetland in order to reduce nitrogen load to Lake Biwa (Omihachiman, Shiga). Optimal water management for the environmental agriculture (c.f. the physical and chemical consideration of cyclic irrigation system in paddy field district and groundwater level control for the reduction of nitrogen load) (Konohama, Shiga). Management of manure application into fields in dairy regions in California, USA.

c) Functions of agricultural lands in the resources recycling system

Fates of fermentation manure liquid nitrogen and carbon in paddy fields (Nantan, Kyoto)

A-2. Publications and presentations

a) Publications

Books

Mitsuno, T.: Reclamation of basin and urban coexisting with nature, Workshop executive committee on reclamation of basin and urban coexisting with nature, Sankaido, 307p., 2005

Mitsuno, T.: Coexistence of agriculture and nature, 2005, Organizer of research promotion of coexistence of agriculture and nature, Zenkoku Noson Kyoiku Kyokai, 130p., Sankaido, 2005

Original papers

Takeshita, S and T. Mitusno : Secular Variation in the Property of Daily Rainfall at Kyoto Basin. J. Japan Soc. Hydrol. & Water Resour., 18(2), 106-115, 2005 (in Japanese)

Matsuno, Y., K. Nakamura, T. Masumoto, H. Matsui, T. Kato, and Y. Sato : Multifunctionality of Paddy Rice Cultivation: Review and Future Prospects for Japan and other Monsoon Asia Countries, Proceeding of PAWEES 2005 International Conference on Management of Paddy and Water Environment for Sustainable Rice Production, pp.39-45, 2005

Nakamura, K., T. Hama, and T. Mitsuno : Assessment of Environmental Loadings from Paddy Field District as Affected by Cyclic Irrigation Management Practice, Proceeding of 2005 International Conference on Paddy and Water Environment, pp.13-20, 2005

Hama, T., K. Nakamura, and T. Mitsuno : Evaluation of Measures to Reduce Murky Water Load in Riparian Low-lying Paddy Fields around Lake Biwa, Proceeding of 2005 International Conference on Paddy and Water Environment, pp.139-145, 2005

Matsuno, Y., K. Nakamura, T. Masumoto, H. Matsui, T. Kato, and Y. Sato : Multifunctionality of Paddy Rice Cultivation: Review and Future Prospects for Japan and other Monsoon Asia Countries, Proceeding of 2005 International Conference on Paddy and Water Environment, pp.125-138, 2005

Reports

Mitsuno, T. and K. Nakamura: Annual report of "Research for revise of design criteria -estimation method of irrigation water requirements-", 2005 (in Japanese)

Mitsuno, T.: Annual report of "Research on mechanisms of water-use adjustment", 2005 (in Japanese)

Mitsuno, T. and K. Nakamura: Annual report of "Research for estimate of multipurpose functions of agricultural lands and irrigation ponds - Sennan, Osaka -", 2005 (in Japanese)

Mitsuno, T. and K. Nakamura: Annual report of "Research on establishment of water management engineering for the reduce of environmental loads", 2005 (in Japanese)

Mitsuno, T. and K. Nakamura: Annual report of "Research on functions of forest for water environmental conservation", 2005 (in Japanese)

b) Conference and seminar papers presented

Annual Meeting of the Japanese Society of Irrigation, Drainage and Reclamation Engineering in 2005: 7 papers

The 62st Annual Meeting of the Japanese Society of Irrigation, Drainage and Reclamation Engineering Kyoto Branch: 7 papers

The 13th Annual Meeting of Japan Rainwater Catchment Systems Association: 1 paper

PAWEES 2005 International Conference on Management of Paddy and Water Environment for

Sustainable Rice Production: 1 paper

2005 International Conference on Paddy and Water Environment: 3 papers

A-3. Off-campus activities

Membership in academic societies

Mitsuno, T.: Japanese Society of Irrigation, Drainage and Reclamation Engineering (Director, Member of the study committee on the vision of JSIDRE, Member of the committee of change of appellation of JSIDRE), The association of rural planning (Director)

Nakamura, K.: Japanese Society of Soil Physics (Councilor), Japanese Society of Irrigation, Drainage and Reclamation Engineering (Member of editorial board of Journals)

Membership in Science Council of Japan, etc.

Mitsuno, T.: Science Council of Japan (Member of the research committee on IDRE)

Research grants

Mitsuno, T. and K. Nakamura: Research (B) (1) Functional analysis and estimate of irrigation and drainage system as social common foundation for the coexistence of rural and urban areas (Head: Mitsuno, T., Co-researcher: Nakamura, K.)

Mitsuno, T.: Research on mechanisms of water-use adjustment, Research on revise for design criteria, Research on enhancement of multipurpose functions, Research on establishment of water management engineering for the reduce of environmental loads (The Ministry of Agriculture, Forestry and Fisheries Entrust Research), Analyzing of the effect of agricultural reclamation and community which consists of farmers and non-farmers on water and mass balance in small catchments (National Institute of Rural Engineering), Research on functions of forest for water environmental conservation (Shiga Prefecture), Research and development project of new technology in collaboration with public and private sectors on drainage water management for reduction of management costs and environmental loadings in paddy field areas (Co-researcher)

Nakamura, K.: Recycling use of organic resources by methane fermentation liquid fertilizer application system (Ministry of Agriculture, Forestry and Fisheries) (Co-researcher)

A-4. International cooperation and oversea activities

International meeting (role)

Nakamra, K.: 2005 International Conference on Paddy and Water Environment (presentation)

B. Educational Activities (2005.4-2006.3)

B-1. On-campus teaching

a) Courses given

Undergraduate level: Agricultural Hydrology (Mitsuno), Irrigation and Drainage (Mitsuno), Practice in Irrigation and Drainage Planning (Mitsuno), Fundamentals of Agricultural and Environmental Engineering (Mitsuno), Soil Physics (Nakamura), Laboratory Course in Soil Physics and Hydrological Environment Engineering (Nakamura), Science of Soil, Practice in Data Processing I (Nakamura)

Graduate level: Seminar in Irrigation, Drainage and Hydrological Environment Engineering I (Mitsuno and Nakamura), Seminar in Irrigation, Drainage and Hydrological Environment Engineering II (Mitsuno and Nakamura), Laboratory Course in Irrigation,

Drainage and Hydrological Environment Engineering (Mitsuno and Nakamura), Applied Hydrology (Nakamura)

B-2. Off-campus teaching, etc.

Part-time lecturer

Mitsuno, T.: Symposium on Groundwater (Keynote Speech, Higashiohmi, Shiga)

Nakamura, K.: Symposium on Water Cycle in Agricultural Area (Speech, Ritto, Shiga)

C. Other remarks

Mitsuno, T.: Member of the council of food, agriculture, and rural area policies in the Ministry of Agriculture, Forestry and Fisheries, Chairman of the planning council of agricultural and rural development division in the Ministry of Agriculture, Forestry and Fisheries, Member of the committee of policies and researches at Agriculture, Forestry and Fisheries Research Council in the Ministry of Agriculture, Forestry and Fisheries, President and Director of the Upland Agricultural Development Association, Researcher of Association for Disaster Prevention Research, Specialty division chairman of the committee of public projects evaluation (Osaka Prefecture), Member of the oversight commission of public constructions (Nara Prefecture), Member of the oversight commission of river development projects, (Nara Prefecture), Member of the oversight commission of public projects (Shiga Prefecture), Member of the scientific research committee on the integral conservation of Biwa Lake (Shiga Prefecture), Member of the council of water resources development in the Ministry of Land, Infrastructure and Transport, Member of the council of land in the Ministry of Land, Infrastructure and Transport

Nakamura, K.: Member of the committee of effective use of irrigation water in agricultural area, Member of the committee of regional ecological conservation in Yasu River basin, Member of the subcommittee of strategically research, Member of the committee of international technical training of agricultural engineers in irrigation and drainage (Japanese Society of Irrigation, Drainage and Reclamation Engineering)

2.5.12 Laboratory of Rural Planning

Staff *Associate Professor: Ushino, Tadashi, Dr. Agric. Sci.*
Assistant Professor : Kuki, Yasuaki, Dr. Agric. Sci.
Students and research fellows
Doctor's program : (1) *Master's program : (6)*
Undergraduate : (6)

A. Research Activities (2005.4-2006.3)

A-1. Main subjects

a) Studies on making a comprehensive district plan in rural areas by inhabitants.

In case of implementating land consolidation project in order to mobilization of land for agricultural use and formation of land use order, it is desirable to make a comprehensive district plan in Meiji administrative village scale. It is effective to use "Kande Method" as planning method. In order to examine the above assumption, the following six points had been studied; ① historical review of a comprehensive district plan, ②the effectiveness of a conflict model as a rural planning system, ③planning units of a comprehensive district plan, ④planning method of a comprehensive district plan, ⑤planning organization of a comprehensive district plan, ⑥ planning composition of a comprehensive district plan.

"Kande Method" has been applied to Jindaiminami district (Mihara town, Hyogo prefecture), Kitaama district (Nandan town, Hyogo prefecture), Oozo district (Kobe city, Hyogo prefecture), Ogawa district (Kanaya town, Wakayama prefecture), Osakatobu district (Osaka town, Gihu prefecture) and Mikanohara district (Kamo town, Kyoto prefecture) since 1997. And this study points the actual conditions of the applied examples of the "Kande Method" and makes clear the issues of its applications.

b) Studies on making a database of Meiji administration village in Kyoto prefecture and its utilization

We made a municipal border map and a Meiji administration border map by using GIS technology to grasp land use conditions of each municipality and Meiji administrative village in Kyoto prefecture. And we are going to understand their features by using above map, agricultural census, old village charts, population census, digital national land information and so on.

Municipal land use plan is included among municipal basic plan, municipal master plan, plan for agricultural promotion area, green zone master plan, environmental basic plan and so forth. It is important that those land use plans get consistency with environmental basic plan and municipal basic plan.

c) Consideration of measures to prevent wildlife damage in mountainous areas

In this study in mountainous area, the spatial characteristics of wildlife damage on the agricultural land are clarified. The scope and trail of wild boar are revealed by hearing and field survey, as well as the spatial structure of settlements and land use, especially uncultivated farmland. The advices of land use and land maintenance plans of typical rural settlement of this study are noted from the view of defence against wildlife damage.

d) Study on the measures to manage suburban farmland in the UK

The purpose of this study is to get information about conservation and management of farmland and brown field in suburban areas in the UK. The project of community gardens and city farms is focused in this study. Although the federation of city farms and community gardens mainly helps these projects, each community garden and city farm has a wide-ranging role and is maintained by strong commitment of local communities. This study aims to reveal structure of continuity and success of the project.

A-2. Publications and presentations

a) Publications

Original papers

Takeyama, E., Y. Kuki, K. Matsumura, Y. Miyake: Animal Path to Invade into a Unit of Paddy Fields in Mountainous Areas –A case study of wild boar invading path in Ryujin-mura, Wakayama Prefecture–. Transactions of JSIDRE 241; 59-65, 2006 (in Japanese)

Reports

Ushino, T.: Present situation of agriculture and rural areas, and the second basic plan for food, agriculture and rural area, Proposals of new national land policy. A society for scientific research in Japan Association for Planning Administration, 33-38, 2006 (in Japanese)

Ushino, T.: What's "Ryokunou-Juku (Mixed Farming and Residential Area)"?, A report of examination and social experiment on urban regeneration vision of the east area in Kizu town, Ministry of Land Infrastructure and Transport, Regional Development Bureau, 48-73, 2006 (in Japanese)

Suzuki, T., Nakamura, T., Ushino T. et al: Rural areas in Kyoto prefecture where the world people are going to visit as Toscana and Cotswolds, policy venture business in Kyoto prefecture, 1-86, 2005 (in Japanese)

Kuki, Y.: Project of the measures to maintain agricultural land use. The Japanese Institute of Irrigation and Drainage, 7-14・118-129, 2006 (in Japanese)

Kuki, Y.: Studies on the planning method of rural development in hilly and mountainous area –Research Project of the Grant-in-Aid for Scientific Research (B)-, 65-98, 2006 (in Japanese)

b) Conference and seminar papers presented

2005 annual meeting of JSIDRE.: 1 paper

62th annual meeting of the Kyoto Branch of the JSIDRE.: 2 papers

A-3. Off-campus activities

Membership in academic societies

Ushino, T.: The Japanese Society of Landscape (Director), The Japanese Society of Landscape (Sub Chairman of the Editor Committee), The Association of Rural Planning (Board member), The Japan Association for Social Informatics (Conductor of the Kansai Branch)

Kuki, Y.: The Association of Rural Planning (Member of Academic Exchange Committee)

Research grants

Kuki Y.: Grant-in-Aid for Scientific Research B (1), Studies on the planning method of rural development in hilly and mountainous area. (Head: Matsumoto)

A-4. International co-operations and overseas activities

International joint researches, overseas research surveys

Ushino, T.: Research survey on green tourisms in Toscana (Italy)

B. Educational Activities (2005.4-2006.3)

B-1. On-campus teaching

a) Courses given

Undergraduate level: Rural planning (Ushino), Land consolidation engineering (Ushino), Surveying (Odani), Rural planning and practice (Ushino and Kuki), Practice in surveying (Ushino and Kuki)

Graduate level: Planning of rural environment (Muneta), Special seminar in rural planning I (Ushino), Special seminar in rural planning II (Ushino), Laboratory course in rural planning (Ushino)

B-2. Off-campus teaching, etc.

Part-time lecturer

Ushino, T.: Kyoto Prefectural College of Agriculture (Rural planning)

C. Other Remarks

Ushino, T.: Member of the Research Committee for Rural Environment Projections (Japanese Center for Rural Environmental Projections), Member of the JSIDRE Committee of Consideration of Japanese Rural Beauty, Member of the Meeting of Making Villages with Water, Green and Beauty of Kinki Regional Agricultural Administration Office, Member of the Council of Environmental Information of Comprehensive Rural Improvement Project in Nanndann District, Member of the Council of Environmental Information of Improvement Projects of Agriculture and Rural Area (Kyoto Prefecture), Member of Conservation of Rural Region-Water and Soil- (Shiga Prefecture), Member of the Council on Environment in Hirakata City, Chief Planner of Making a Comprehensive District Plan of Mikanohara in Kamo, Kyoto Prefecture

Kuki, Y.: Chief Secretary of the JSIDRE Committee of Consideration of Japanese Rural Beauty, Adviser of Making the Taniguchi Rural Improvement Plan, Kobe, Hyogo Prefecture

Chair of Bioproduction Engineering

2.5.13 Laboratory of Agricultural Systems Engineering

Staff *Professor* *: Oida, Akira, D. Agric. Sci.*
Associate Professor: Nakashima, Hiroshi, D. Agric. Sci.
Assistant Professor : Miyasaka, Juro, M. Agric. Sci.
Assistant Professor : Ohdoi Katsuaki, D. Agric. Sci.
Students and research fellows
Doctor's program : (4) *Master's program : (8)*
Undergraduate : (7)

A. Research Activities (2005.4-2006.3)

A-1. Main subjects

a) Terramechanics

The Distinct Element Method is applied to elucidate the interaction between machine parts and soil. In order to simulate the discrete behavior of soil such as crack and separation caused by machine actions, we suppose that soil should be an assembly of discrete particles and try to find the soil behavior and reaction by computer calculation according to equations of motion of each particle. We are now simulating the soil behavior by a tire, a rotary blade and a subsoiler. An effective method is also developed, combining DEM and FEM. Experrimental researchs on tire mobility by using a in-door soil bin and bionics study to reduce the draft of cutting blade are also conducting.

b) Development of electric agricultural vehicle using microwave power transmission

A no-emission vehicle is under development in order to contribute the environmental conservation. A test electric vehicle, which has no battery but only electric motors which are driven by electricity transmitted in form of microwave, is designed, made and tested. In order to improve the transmission efficiency a parabola anntena, direction control of antennae and a radio data transmission method are tried. Furthermore, the effect of microwave on plant growth is studied.

c) Systems engineering study on farm management, mechanization and rural development

An appropriate mechanization system is searched on agriculture in Indonesia and Mexico, gathering in-situ data and applying a neural network and a data envelopment analysis.

The management state of agriculture company are surveyed in order to find frontiers among companies by the data envelopment analysis.

Questionaire study is done to get the optimum allocation of so-called Klein Garten in order to activate rural areas.

The optimum cultivation system is studied to maximize the income of competitive vegetable farmer by means of a simulated annealing method.

d) Biomass energy

It is clear that the fossil energy resources will be exhausted and the energy production by way of recycling agricultural wastes will be one of the necessary technologies in future. We are

now investigating the following technologies; (i) Efficient production of methane gas, (ii) Methane gas production from biodegradable plastics.

e) Fundamental study on precision farming

We are now trying to develop a sensing technology of soil crushing degree by a rotavator using optical sensors and/or image processing technology in order to contribute to the future precision farming.

f) Root growth simulation by cellular automaton

A simulation of plant root growth in soil is conducting by cellular automata in order to find a relation between various soil conditions and growth of plant roots.

A-2. Publications and presentations

a) Publications

Original papers

Izumi, T., A. Oida, H. Nakashima, J. Miyasaka, H. Itoh: Nondestructive real-time measurement of soil clod fineness during rotary tillage. Journal of Japanese Society of Agricultural Machinery 67(3); 90-95, 2005.

Nakashima, H., Y. Kawase, M. Momozu and A. Oida: Soil-wheel interaction simulation by a cyclic parallel DEM. Terramechanics 25; 65-73, 2005 (in Japanese)

Kawase, Y., H. Nakashima and A. Oida: An indoor traction measurement system for agricultural tires. Terramechanics 25; 87-93, 2005 (in Japanese)

Oida, A., H. Nakashima, J. Miyasaka, K. Ohdoi, H. Matsumoto, N. Shinohara: Development of a new type electric off-road vehicle by means of microwave power transmission in the air. Proceedings of 15th International Conference of ISTVS, Hayama, No. 101; 1-15, 2005 (CD-ROM)

Konishi, T., A. Oida, H. Nakashima, Y. Kawase: Cone penetration resistance of a "mesoscopic" soil model. Proceedings of 15th International Conference of ISTVS, Hayama, No. 201; 1-8, 2005 (CD-ROM)

Itoh, H., K. Kitazawa, A. Oida, H. Nakashima, J. Miyasaka, T. Izumi: Image analysis of aggregate fineness. Proceedings of 15th International Conference of ISTVS, Hayama, No. 202; 1-13, 2005 (CD-ROM)

Adachi, N., A. Oida, H. Nakashima: Indoor experiments on soil cutting reaction by using non-smooth surface blade. Proceedings of 15th International Conference of ISTVS, Hayama, No. 5B09; 1-8, 2005 (CD-ROM)

Tanaka, H., A. Oida, M. Daikoku, S. Sumikawa, H. Nakashima, T. Kuroyanagi: Effect of design parameters of vibrating wide subsoiler on its performance simulated by the Distinct Element Method. Proceedings of the 15th International Conference of ISTVS, Hayama, No. 5A10; 1-11, 2005 (CD-ROM)

Nakashima, H., A. Oida, Y. Kawase: Simulation of soil-tire system interaction by a combined Finite element-Discrete Element Method. Proceedings of 15th International Conference of ISTVS, Hayama, No. 5B08; 1-10, 2005 (CD-ROM)

Oida, A.: An approach to solve environmental and energy problems: on an innovative energy transmission method. Proc. International Agricultural Engineering Conference, Bangkok, KNL004; 1-16, 2005 (CD-ROM)

Adachi, N., A. Oida, H. Nakashima: Effect of blade surface properties on soil cutting reaction

using a cohesive soil. Proc. International Agricultural Engineering Conference, Bangkok, STR007; 1-6, 2005 (CD-ROM)

Konishi, T., A. Oida, H. Nakashima, Y. Kawase: Cone penetration and DEM simulation in a "mesoscopic" soil model. Proc. International Agricultural Engineering Conference, Bangkok, MSA004; 1-6, 2005 (CD-ROM)

Nakashima, H., A. Oida, Y. Kawase: Possibility of PC-based soil-tire system interaction analysis. Proc. International Agricultural Engineering Conference, Bangkok, MSA007; 1-5, 2005 (CD-ROM)

Nakashima, H., S. Aoki, H. Kanamori, A. Oida: Concept of virtual soil bin by DEM for lunar locomotion studies. Proceedings of Earth & Space 2006 - 10th Biennial ASCE Aerospace Division International Conference on Engineering, Construction, and Operations in Challenging Environments and 2nd NASA/ARO/ASCE Workshop on Granular Materials in Lunar and Martian Exploration; 1-8, 2006 (CD-ROM)

Miyasaka, J., M. Watanabe, K. Ohdoi, H. Nakashima, A. Oida, H. Matsumoto, K. Hashimoto, N. Shinohara, and T. Mitani: Development of Microwave-Driven Agricultural Vehicle —Vehicle Drive Control and Orientation Control of Transmitting and Receiving Antennae—. Technical Report of IEICE, SPS2005-21, 1-8, 2006 (in Japanese)

Reviews

Miyasaka, J. and K. Ohdoi: Optimization methods and its case studies for farm work scheduling. Japanese Journal of Farm Work Research 40(4); 205-209, 2005

Reports

Nakashima, H., H. Fujii, A. Oida: Wheel performance analysis for a micro lunar rover by DEM. Proceedings of Symposium on Elastoplasticity for Prof. K. Hashiguchi Retirement Anniversary; 257-262, 2005

Kitamura, S., A. Oida, H. Nakahisma, J. Miyasaka, K. Ohdoi, M. Watanabe, H. Matsumoto, K. Hashimoto, N. Shinohara and T. Mitani: Study on development of microwave-driven agricultural vehicle —seeder vehicle and its motion control—. Kansai Branch report of JSAM 98; 4-5, 2005

Matsuoka, K., A. Oida, H. Nakahisma, J. Miyasaka, K. Ohdoi, M. Watanabe, H. Matsumoto, K. Hashimoto, N. Shinohara and T. Mitani: Study on development of power receiving rectenna and its orientation control for microwave-driven agricultural vehicle. Kansai Branch report of JSAM 98; 6-7, 2005

Adachi, N., A. Oida, H. Nakashima and Y. Kawase: Basic study on an effect of surface properties of tool blade on soil cutting resistance. Kansai Branch report of JSAM 98; 12-13, 2005

Konishi, T., A. Oida, H. Nakashima and Y. Kawase: On a penetration resistance of cone into a mesoscopic soil model. Journal of Kansai Branch of JSAM 98; 14-15, 2005

Araki, T., A. Oida, H. Nakshima and K. Ohdoi: Investigation study on management of corporate farms. Kansai Branch report of JSAM 98; 78-79, 2005

Okada, H., A. Oida, H. Nakahisma, J. Miyasaka, A. Tanaka and A. Yamakawa: Optimum cropping schedule for potherb mustard (mizuna) in green houses in Kyoto prefecture using simulated annealing method. Kansai Branch report of JSAM 98; 80-81, 2005

Kobayashi, T., A. Oida, H. Nakashima, J. Miyasaka, K. Ohdoi. A. Oda and M. Seki: Study on efficiency improvement of methane fermentation by carrier for bacteria —a case of biodegradable plastic—. Kansai Branch report of JSAM 98; 122-123, 2005

Oida, A.: Electric drive of agricultural machinery by microwave power transmission in the air. Final report on research project (No. 14360149) under Grant-in-Aid for Scientific Research (B) for 2002 to 2005, 2006

b) Conference and seminar papers presented

Joint Meeting of Environmental Engineering in Agriculture 2005: 4 papers

114th Meeting of Kansai Branch of JSAM: 1 papers

115th Meeting of Kansai Branch of JSAM: 4 papers

5th Meeting of SPS Technical Group: 1 paper

15th International Conference of ISTVS: 6 papers

26th Meeting of Japanese Society for Terramechanics: 3 papers

International Agricultural Engineering Conference: 4 papers

10th Int. Conf. Aerospace Division, ASCE: 1 paper

A-3. Off-campus activities

Membership in academic societies

Oida, A.: JSAM (Councilor), Kansai Branch of JSAM (Secretary)

Nakashima, H.: JSAM (Councilor, Member of International Exchange Committee, Member of Information Comittee), Kansai Branch of JSAM (Secretary)

Miyasaka, J.: Japanese Society of Farm Work Research (JSFWR) (Regional Secretary)

Research grants

Monbusho Research Grant: Scientific Research (B) (2): Study on electric drive of agricultural machinery by microwave power transmission (Project Leader: Oida, Project Members: Nakashima, Miyasaka), Scientific Research (A)(1): Bioinstrumentation of plant and XML soft-sensing in speaking plant approach (Project Leader: Murase, Osaka Prefectural University, Project Member: Nakashima)

Other Grant: Japan Space Forum: Evaluation of terrain in lunar and space exploration (Project Leader: Kobayashi, Kyushu University, Project Member: Nakashima)

A-4. International cooperation and overseas activities

International meetings (roles), etc.

Oida, A.: 15th Int. Conf. ISTVS, Hayama (Organizing Committee Member, Rapporteur)

Nakashima, H.: 15th Int. Conf. ISTVS, Hayama (Organizing Committee Member, Chairman, Presentation), International Agricultural Engineering Conference (Chairman, Presentation), 10th Int. Conf. Aerospace Division of ASCE (Presentation)

Miyasaka, J.: 15th Int. Conf. ISTVS, Hayama (Presentation)

Membership in international academic societies

Oida, A.: ISTVS (Secretariat of Japan), AAAE (Vice President)

International Journals

Oida, A.: Journal of Terramechanics (Associate Editor, Editor for Special Issue), Agricultural Engineering Journal of AAAE (Editorial Board Member, Editor for Special Issue), Agricultural and Biosystems Engineering (Advisory Board Member)

Nakashima, H.: Agricultural Engineering Journal of AAAE (Editorial Board Member)

B. Educational Activities (2005.4-2006.3)

B-1. On-campus teaching

a) Courses given

Undergraduate level: Practice in Fundamental Data Processing (Nakashima, shared), Introduction to Agricultural and Environmental Engineering II (Oida, shared), Applied Mechanics (Nakashima, shared), Strength of Materials (Nakashima), Mathematical Programming (Oida), Energy and Prime Movers in Agriculture (Oida), Laboratory Course in Agricultural Machinery I (Nakashima, Miyasaka, Ohdoi, shared), Laboratory Course in Agricultural Machinery II (Nakashima, Miyasaka, Ohdoi, shared), Practice in Data Processing (Nakashima and Miyasaka, shared), Seminar in Agricultural Machinery (Oida, Nakashima, Miyasaka, Ohdoi, shared), Seminar in Agricultural and Environmental Engineering (Oida, Nakashima, Miyasaka, Ohdoi, shared), Practice in Data Processing II (Nakashima, and Ohdoi, shared)

Graduate level: Agricultural Systems Engineering (Oida), Terramechanics (Nakashima), Special Seminar in Agricultural Systems Engineering I and II (Oida and Nakashima), Laboratory Course in Agricultural Systems Engineering (Oida and Nakashima)

B-2. Off-campus teaching, etc.

Part-time lecturer

Oida, A.: Kobe University (Design of Off-road Vehicles)

Nakashima, H.: Osaka Prefectural University (Engineering for Energy Utilization)

B-3. International activities

Students and research fellows from abroad

Students: Doctor's program: 2 (Mexico and Indonesia)

C. Other remarks

Members

Oida, A.: Education Committee in the Faculty of Agriculture (Member), International Exchange Committee in the Faculty and Graduate School of Agriculture (Member)

Awards

Oida, A.: Best Session Paper Award at 15th International Conference of ISTVS

Nakashima, H.: Best Session Paper Award at 15th International Conference of ISTVS, 3rd Kansai Branch Award of Kansai Branch of JSAM

Miyasaka, J.: Best Session Paper Award at 15th International Conference of ISTVS

Ohdoi, K.: Best Session Paper Award at 15th International Conference of ISTVS

2.5.14 Laboratory of Field Robotics

Staff	*Professor*	*: Umeda, Mikio*	*Dr. Agric. Sci.*
	Associate Professor	*: Iida, Michihisa*	*Dr. Agric. Sci.*
	Assistant Professor	*: Suguri, Masahiko*	*Dr. Agric. Sci.*
	Assistant Professor	*: Masuda, Ryouhei*	*M. Agric. Sci.*

Students and research fellows

Teaching assistant: (4)	*Doctor's program: (2)*
Master's program : (11)	*Undergraduate : (4)*

A. Research Activities (2005.4-2006.3)

A-1. Main subjects

It is afraid that a un-balance of the material cycle due to increase in the food import deteriorates environment in Japan.

This laboratory researches mainly on precision agriculture and field robot based on the thought with "Food should be produce within the country to preserve an environment of the country" and "Agriculture has always adopted the most advanced technology of the age."

a) Precision agriculture based on the field map and variable rate fertilizer application.

The Precision agriculture is the information-orientated agriculture that the field is separated imaginary into small fields, and fertilizer is implicated based on the soil condition, plant growth and yield on those small fields, and cope with stabilization of the yield and the quality of the products and protection of the environment.

In order to decide the amount of fertilizer, the nutriment in the soil and the amount of growth must be measured. This laboratory in cooperation with Laboratories of Plant Production Systems and Soil Science starts research on precision agriculture in 1997. In 2004, the field tests were conducted in Sakurai, Yagi and Takatsuki.

b) Estimation of nitrogen contents of rice plant using remote sensing.

The ideal amount of topdressing fertilizer is the amount possess subtracts from the necessity. Plant growth sensor is required to estimate the nitrogen possessed by the plant. In 2004, both basal- and top-dressing were applied at the prescribed variable rate in a paddy field (0.5ha) of the Takatsuki Experimental Farm, Osaka, Japan. After that, the airborne images were taken using hyperspectral and multispectral meter in order to estimate the plant growth.

c) Estimation of nitrogen contents and proper time of harvesting for tea plant using remote sensing.

Tea cultivation requires a lot of nitrogen fertilizer. Therefore, it is important to analyze the relationship between the amount of applied nitrogen and the quality of tea leave. Information of tea leave was collected using the portable plant growth measuring device and satellite images in order to measure the quality of tea leave.

d) Development of grain yield monitor for head-feeding combines

A grain yield monitor for head-feeding combine has been developing with Mitsubishi Agricultural Machinery Co., Ltd. It consists of two impact sensors, GPS, and a grain moisture sensor. The monitor has another sensor to compensate the return flow of grain. In 2005, the combine equipped with the grain yield monitoring system measured the spatial variability of

grain yield in the paddy fields of Takatsuki Farm and Yagi Town, Kyoto.

e) Automatic control of separation mechanism for head-feeding combine

It is important for combine harvester to separate and clean the grain from chaff and straw at the high quality. Therefore, in order to enhance the quality of separation, the automatic control system of separation mechanism using two grain flow-rate sensors was proposed and tested in the field and the laboratory.

f) Harvest system by unmanned combine

The unmanned head-feeding combine equipped with a GPS and IMU (Inertia Measurement Unit) was developed to harvest rice automatically. The unmanned combine was tested to harvest rice by autonomous navigation in the paddy field in 2005.

g) Variable rate applicator for wheat seeding and fertilizing in crop rotation paddy.

It is important to improve the food self-sufficiency in Japan. For the purpose, it is necessary to increase the production of not only rice but also wheat and soybean. Therefore, crop rotation, that grows rice, wheat and soybean for two years, is applying in Japan. In this study, a variable rate applicator for wheat seeding and fertilizing has been developed in order to improve the efficiency of wheat cultivation. This machine can apply variable amounts of wheat seeds and granular fertilizers at the same time in the field after harvesting rice. A field test was conducted to seed and fertilize according to the map that prescribed the amounts of seeds and fertilizers in advance.

h) Development of float type autonomous robot for paddy fields

We are developing Multi Agent System that can do some tasks, i.e. weeding, scouting and so forth in paddy fields. We developed an autonomous robot that constitutes the Multi Agent System. The basic performance was evaluated and Q-learning was applied to the robot for the purpose of having the robot acquire the obstacle avoidance behavior.i) Mechanical properties and geometric characteristics of the plant cell parenchyma

It seems that geometric characteristics of plant cell parenchyma, e.g. shape of the cells and distribution of the cells, influence upon mechanical properties of parenchyma. We have given consideration to the geometric characteristics of calottes and Japanese radishes parenchyma by the images taken with the confocal laser microscope.

A-2. Publications and presentations

a) Publications

Original papers

Ryu, C. S., M. Suguri, Y. Nishiike and M. Umeda: Making Nitrogen Contents Model Using Hyperspectral Remote sensing and estimation nitrogen contents by nitrogen content model. Journal of JSAM 67(6); 47-54, 2005

Ryu, C. S., M. Iida, Y. Nishiike and M. Umeda: Influence of several doses of nitrogen fertilizer on rice taste and grain yield. Journal of JSAM 67(6); 55-61, 2005

Iida, M., Y. Yao, A. Kimura, M. Nishikori and M. Umeda: Estimation of a mass of grain inside a grain tank using an ultrasonic sensor. Journal of JSAM 68(2); 84-87, 2006

Umeda, M., M. Suguri, Y.Nishiike and T. Fukunaga: basic experiment for analyzing flight of red spider using wind tunnel built as trial. Kansai Branch report of JSAM 98; 8-9, 2005

Matsuzaki, Y., M. Iida and M. Umeda: Grain yield mapping by correcting overlaps of the swath area. Kansai Branch report of JSAM 98; 10-11, 2005

Ohnishi, K., R.masuda and M. Umeda: Development of float type autonomous robot for paddy fields. Kansai Branch report of JSAM 98; 40-41, 2005

Umeda, M., Y. Nishiike and M. Tanaka: Review of insect robot study. Kansai Branch report of JSAM 98; 44-45, 2005

Suguri, M., M. Umeda and Y. Asai: Combining images of field acquired from radio controlled helicopter. Kansai Branch report of JSAM 98; 68-69, 2005

Lin, T., M. Iida, Y. Nishiike and M. Umeda: Variable rate control system of wheat seeding and fertilizing. Kansai Branch report of JSAM 99; 74-77, 2006

Terada, C., C. S. Ryu, M. Suguri, M. Iida and M. Umeda: Investigation of rice growth and tasty elements by remote sensing. Kansai Branch report of JSAM 99; 98-101, 2006

Makino, Y., M. Umeda and C. S. Ryu: Measurement of quality and yield of tea by remote sensing. Kansai Branch report of JSAM 99; 102-105, 2006

Iida, M., Y. Yao, A. Kimura, K. Nonami, M. Nishikori and M. Umeda: Grain yield monitor for head-feeding combines. Book of Abstracts 5th ECPA; 129-131, 2005

Masuda, R., K. Ohnishi and M. Umeda: Development of float type autonomous robot for paddy fields and acquisition of obstacle avoidance behavior by using Q-learning. Book of Abstracts 5th ECPA; 191-192, 2005

Ryu, C. S., M. Suguri and M. Umeda: Estimation of the nitrogen contents and the rice properties using the remote sensing technology. Book of Abstracts 5th ECPA; 250-251, 2005

Iida, M., Y. Yao, A. Kimura and M. Umeda: Development of grain yield monitor for head-feeding combines. ASAE Paper No. 05-1136, 2005

Iida, M., Y. Yao, A. Kimura and M. Umeda: Measurement of grain yield variation using yield monitoring combine. Proc.1st ACPA; 2005

Ryu,C. S., M. Suguri and M. Umeda: Estimating the nitrogen contents and the rice quality using hyperspectral remote sensing technology. Proc. 1st ACPA; 53-57, 2005

Oido, N. and M. Iida: Measuring equipment for moisture and protein contents of single rice kernel by NIR. Proc. Joint Meeting of Environmental Engineering in Agriculture, OS3-4, 55, 2005

Masuda, R., K. Ohnishi and M. Umeda: Acquisition of obstacle avoidance behavior for float type autonomous robot by using Q-learning. Proc. Joint Meeting of Environmental Engineering in Agriculture, GS16-3, 215, 2005

Yao, Y., M. Iida, A. Kimura and M. Nishikori: Control of return flow using flow rate sensor. Proc. Joint Meeting of Environmental Engineering in Agriculture, GS30-2, 274, 2005

Ryu, C. S., M. Suguri and M. Umeda: Estimation of rice nitrogen contents using remote-sensing. Proc. Joint Meeting of Environmental Engineering in Agriculture, GS77-3, 509, 2005

Ryu, C.S., M. Suguri and M. Umeda: Application of precision agriculture for organic farming. Proc. KSAM Annual Conference, 88-92, 2006

b) Conference and seminar papers presented

International

5th ECPA, Uppsala: 3 poster presentations

ASAE 2005, 1 oral presentation

1st ACPA, Toyohashi: 2 oral presentations, 2 poster presentations

KSAM, Seoul: 1 oral presentation

Domestic

Joint Meeting of Environmental Engineering in Agriculture: 4 presentations

114th Regular Meeting of Kansai Branch of JSAM: 3 presentations

115th Regular Meeting of Kansai Branch of JSAM: 7 presentations

A-3. Off-campus activities

Membership in academic societies (roles)

Umeda, M.: JSAM (President, Councilor), JSAI (Japanese Society of Agricultural Informatics) (Director)

Iida, M.: JSAM (Councilor, Secretary of General Affairs, Member of Program Committee, Symposium Chairperson of the 10th Technofesta), Robotic Society of Japan, Japanese Society of Agricultural Informatics

Research grants

Research Grant of Japanese Science Promotion Society (JSPS): Scientific Research (B)(2) "Development of crop management in consideration of soil, crop growth and grain yield variation." (Participant: M. Iida)

Accepted Research from Ministry of Agriculture, Forestry and Fisheries: "Evaluation of effect of methane-fermentation digester application as liquid fertilizer" (Representative: Umeda. M., Participant: M. Iida, M. Suguri, R. Masuda)

Accepted Research from National Agricultural Research Organization: "Variable rate applicator for wheat seeding and fertilizing in crop rotation fields" (Representative: Iida. M.)

Industry-University Co-operation Project: "Evaluation of ECO-DAN performance" Yanmer (Representative: Umeda. M., Participant: M. Suguri), "Development of moisture content meter for single kernel for Precision Agriculture" Satake Co., Ltd. (Representative: Umeda. M.), "Control of separating and cleaning mechanism for combine" Mitsubishi Agricultural Machinery Co., Ltd. (Representative: Iida. M.)

A-4. International cooperation and overseas activities

Societies

Umeda, M.: International Commission of Agricultural Engineering (CIGR) (Board member of Section IV), Asian Conference on Precision Agriculture (ACPA) (Chairperson of Management committee), Asian Association for Agricultural Engineering (AAAE) (Vice chairperson)

Iida, M.: American Society of Agricultural and Biological engineering (ASABE)

B. Educational Activities (2005.4-2006.3)

B-1. On-campus teaching

a) Courses given

Undergraduate level: Field Robotics (Umeda), Introduction to Foreign Literature in Agricultural Machinery (Umeda), Design of Machine Elements (Umeda), Practice in Computer Aided Design (Umeda and Masuda), Vibration (Iida), Automatic Control (Iida), Applied Mathematics (Iida and others), Laboratory Course in Agricultural Machinery I (Iida, Suguri, Masuda and others), Laboratory Course in Agricultural Machinery II (Iida, Suguri, Masuda and others), Practice in Data Processing II (Iida, Masuda and others),

Seminar in Agricultural Machinery (Umeda, Iida, Suguri, Masuda and others), Science of Life Sphere (Umeda and others), Selected Technologies of Food and Agriculture (Umeda and others), Seminar in Agricultural and Environmental Engineering (Umeda, Iida, Suguri, Masuda and others)

Graduate level: Field Robotics (Advanced course) (Umeda), Advanced Seminar in Field Robotics I (Umeda and Iida), Advanced Seminar in Field Robotics II (Umeda, Iida, Suguri and Masuda), Laboratory Course of Field Robotics (Umeda, Iida, Suguri and Masuda)

B-2. Off-campus teaching and others

Part-time lecturer

Iida, M.: Faculty of Agriculture, Hokkaido University (Advanced Technology of Agricultural Robotics)

B-3. Overseas teaching

Lectures and seminars

Umeda: Lecture "Introduction to Precision Agriculture" in JICA Course of low input production system.

Students and research fellow from abroad

Doctor's program 2 (China and Korea), Master's program 2 (China and Korea)

Post-doctoral teaching assistant 3 (Korea and Jordan)

C. Other Remarks

Umeda, M.: (On-campus) Experimental Farm (Member of council), Physical Subject Section (Member), Subcommittee for Safety and Hygiene of Kyoto University (Member), Subcommittee for Safety and Hygiene of Graduate School of Agriculture of Kyoto University (Chairperson)

(Off-campus) Special committee for recycling system of bio-waste-materials of Technical committee of Japan Organics Recycling Association (Chairperson),

Iida, M.: (On-campus) Member of Space Collaboration System Committee, Member of Working Group for PFI Construction

Suguri M: (On-campus) Member of KAIS Steering Committee

Masuda R: (On-campus) Observer of Experimental Drain from the Facility of Bio-production Engineering

2.5.15 Laboratory of Agricultural Process Technology

Staff *Associate Professor: Kato, Koro, Dr. Agric. Sci.*
Assistant Professor : Nishizu, Takahisa, Dr. Agric. Sci.
Students and research fellows
Foreign research associate: (2) *Master's program: (5)*
Undergraduate : (5)

A. Research Activities (2005.4-2006.3)

A-1. Main subjects

a) Nondestructive Measurement of Internal Information of Agricultural Products and Living Bodies by Electrical physical Properties

The change of electrical properties based on growth and senescence of tissue is being studied, using a wide range of frequencies. The nondestructive inspection method of the freshness of vegetables and fish using the decrease of the resistance based on senescence of cell membranes; the study on the measurement of moisture gradient of internal grain using frequency characteristics of electrical capacitance are being studied. Image formation of the temperature distribution in living body using multi-frequency microwave computer tomography and monitoring of rice cooking process by 300kHz～3GHz impedance using reflection method are also being studied.

b) Application of Physical Properties to Quality Evaluation of Farm Products- Electrical Density Sorting of Fruits

We developed a precise measuring method of fruit volume using electrical capacitance and developed a new density sorting method. The method was put into practice to evaluate the sugar content, ripeness and hollowness for watermelons and melons at new packing houses. Recently, the electrical density sorting machines have suddenly spread in many packinghouses. As for the melon, prediction of softening using density and transmitted light and further applications of the electrical sorting method to other fruits such as citrus fruits are being studied.

c) Visualization of Component Distribution of Agricultural Products by Near-Infrared Spectroscopy

In individuals and in the individual, component distribution of the farm and marine product is not uniform. In measurement of grain moisture and nondestructive quality assessment of fruit sugar content, often the distribution becomes problem. Then, a multi wavelength near infrared spectroscopy imaging system using supersensitive monochrome chilled CCD camera and interference filter was constructed.

Transmitted light and reflected light of fruit and grain layer were photographed, and using the absorbance image, visualization on component distribution of agricultural products such as the moisture distribution of grain layer and visualization on fruit maturity are being studied. As for egg, nondestructive measurement of freshness by near-infrared transmission spectroscopy is being studied.

d) Development of Solar Desiccant System for High Quality Grain Drying

We are developing solar desiccant drying methods to realize the low cost and high quality paddy drying process using entirely natural energy. We developed a new drying system with both

solar battery ventilation and solar desiccant drying method using zeolite. The ventilating and circulating air is controlled by computer according to the air conditions of both the inside of the drying glass house and atmospheric. This system has a temporary energy storage function for a cloudy time or a night operation, and it can dry the grain by natural clean energy, keeping the grain at high quality.

e) Clarification of formative mechanism of uneven grain moisture in silo and the monitoring

Unevenness of grain moisture forms during storage, even if the silo were charged with uniform moisture grain. In order to elucidate the formative mechanism of the uneven grain moisture layer, the moisture transfer and dew condensation in grain silo caused by temperature difference and the measurement of moisture distribution in grain layers using time-domain reflectometry (TDR) and TDT are being studied.

f) Visualization and image measurement of a small amount of remaining rice bran by heating method

If a simple method to detect a small amount of residual rice bran or complete removal of bran layer is developed, it is ideal for the inspection of no rinse rice and the control of the rice mill machine. We discovered that remaining rice bran changes color and become visible easily by only heating polished rice. Polished rice is heated to about 200℃ by infrared rays, the rice bran that changes color easily than endosperm is scorched and visualized and the method of analyzing the images is being developed.The method is simple, and it is possible to view the remaining rice bran with a microscope image definitely and to know whether rice bran was completely removed or not regardless of whiteness level or variety. It can be applied to ideal control, monitoring of rice polishing process and inspection of no-rinse rice, therefore we are studying with the company.

g) Automatization for Breeding and Controlling the Cattle

In order to recognize the individual cattle and breed it, we are developing the technologies through which the individual cattle is identified with its vocalization. The voice spectra of the cattle are estimated with the maximum entropy method to characterize the vocalization in the frequency domain. The parameters involved in the estimated power spectra are utilized to identified the individual cattle through the discriminant analysis. In the present step of this research, the judgment of the cattle's physiological conditions is the target.

The black-and-white pattern on the milking cow (Holstein) is analyzed to recognize the individual animal. And the image of the face of cow is analyzed to identify the individual. The image of the iris pattern is analyzed for individual recognition of the cattle.

h) Nondestructive Quality Evaluation of Food Stuff by Ultrasound

The effects of the chemical constituents and the non-homogeneous structure of the agricultural products to their physical properties are investigated systematically in order to apply these physical properties to obtaining the internal information of the agricultural products and the foods nondestructively. Currently, the liquified foods and starch gel are used as the samples to evaluate the state of the water contained in the food and to measure the concentration of emulsion with the non-linear acoustic parameter B/A which is one of the acoustic characteristics of the material. And the influence of intercellular space or air bubbles in the agricultural products and food materials on their acoustic properties is being studied.

i) Measuring of Volume/density of Agricultural Products and Foodstuffs by Acoustic Resonance

We developed a volume/density measuring system using a Helmholtz resonator. This system enables us to measure volume/density of not only solid food or liquid food but also solid-liquid

mixture food. Further experiments will be made for applications to determine void fraction of the porous food in the future. Now we are developing a new type resonator for on-line measuring of volume, a monitoring system of cream whipping process and a fuel meter of orbit transfer vehicle in space by utilizing Helmholtz phenomena.

j) Porousness Estimation for Foodstuffs by Acoustic Resonance

Porousness is one of physical properties related to texture of foodstuff. We started to develop application of Helmholtz resonance phenomena to porousness estimation for foodstuffs. Now we investigate relations between Helmholtz resonant frequency and airflow resistance of grain layer used as a porous sample.

A-2. Publications and presentations

a) Publications

Books

Kato, K (Shared, Member of editorial staff):α.1 Evaluation and maintenance of freshness and quality, 1.1, 1.3, 1.31, 1.3.3, 1.3.4, 1.3.5, Handbook of Food Engineering (edited by Japan Society for Food Engineering), pp. 497-498, pp. 505-506, pp. 507-511, Asakura Syoten, Tokyo, 2006

Original papers

Fujiwara, T., H. Kim and Y. Ikeda: Identification of Japanese black cattle by the faces. Kansai Branch Report of JSAM 98; 58-59, 2005

Yoshioka, N., T. Nishizu and Y. Ikeda: Study on acoustic volumetric method –air temperature and air humidity compensation-. Kansai Branch Report of JSAM 98; 86-87, 2005

Kita, Y., T. Nishizu and Y. Ikeda: Brix prediction based on density in kiwifruits. Kansai Branch Report of JSAM 98; 88-89, 2005

Kinouti, Y. and K. Kato: Prediction of optimum edible period of melon by transmitted light image and near-infrared spectroscopy. Kansai Branch Report of JSAM 98; 92-93, 2005

Kimura, T., K. Kato and S. Fujitani, K. Miyamoto: Nondestructive measurement of egg freshness by near-infrared transmission spectroscopy. Kansai Branch Report of JSAM 98; 94-95, 2005

Nishizu, T., Y. Torikata, N. Yoshioka and Y. Ikeda: A study on improvement of noise-tolerance of volume measuring method with acoustic technique for agricultural products and foods. Journal of JSAM 67(3); 49-57, 2005

Nishizu, T., Y. Torikata, T. Yamashita, T. Sakamoto, Y. Futaya and A. Nakano: Determining Liquid Volume by Using Helmholtz Resonance - Measurement method based on Electrical Impedance of Loudspeaker -. JASMA 22(2); 121-127, 2005

Nakano, A., Y. Torikata, T. Yamashita and T. Nishizu: Helmholtz resonance technique for measuring liquid volume under micro-gravity conditions. Microgravity Science and Technology XVII-3; 65-70, 2005

Nakano, A., Y. Torikata, T. Yamashita, T. Sakamoto, Y. Futaya, A. Tateno and T. Nishizu: Liquid volume measurement with a closed Helmholtz resonator under micro-gravity conditions. Cryogenics 46; 126-131, 2006

b) Conference and seminar papers presented

Joint Meeting on Environmental Engineering in Agriculture 2005: 2 papers

The 6th Annual Meeting of Japan Society for Food Engineering: 1 paper

The 115th Annual Meeting of Kansai Branch of JSAM: 5 papers
Space Cryogenic Workshop 2005: 1 paper
ELGRA Biennial Symposium and General Assembly: 1 paper

A-3. Off-campus activities

Membership in academic societies (roles)

Kato, K.: The Society of Agricultural Structures, Japan (Executive director, Chairman of selection committee of institute prize); Japanese Society of Agricultural Machinery (Councilor,); Kansai Branch of Japanese Society of Agricultural Machinery (Member of Board); Japan Society for Food Engineering (Councilor, Member of executive committee of the 6 th annual meeting, Member of the editorial staff of Food Engineering handbook)

Nishizu, T.: Japanese Society of Agricultural Machinery (Member of community-based education and research committee); Japan Society for Food Engineering (Member of executive committee of the 6th annual meeting)

Research grants

Nishizu, T.: Grant 2005 by Iijima Memorial Foundation for the Promotion of Food Science and Technology, "Monitoring of bread dough rise in fermentation process" (Head)

A-4. International Cooperation and overseas activities

International meetings (roles)

Nishizu, T.: International Conference on Advanced Nondestructive Evaluation, Cheju, Korea (Invited Speaker)

Scholar from abroad

Foreign research associate: 2

B. Educational Activities (2005.4-2006.3)

B-1. On-campus teaching

a) Courses given

Undergraduate level: Introduction to Agricultural and Environmental Engineering II (kato, shared), Farm Processing Machinery (kato), Measurement Science (Kato), Laboratory Course In Agricultural Machinery I and II (Kato and Nishizu, shared), Practice in Data Processing II (Nishizu, shared), Seminar in Agricultural Machinery (Kato, and Nishizu, shared), Seminar in Agriculture and Environmental Engineering(Kato and Nishizu, shared)

Graduate level: Agricultural Process Engineering (kato), Special Seminar in Farm Processing Technology I and II (Kato), Laboratory Course in Farm Processing Technology (Kato and Nishizu, shared)

B-3. Overseas teaching

Students and research fellow from abroad

Graduate Student: (China 1)

C. Other Remarks

Kato, K.: Special committee member for intellectual property right of Oska district court and

Osaka high court, Special investigator of National Institute of Science and Technology Policy, Special committee member for evaluating upgrade business using advanced technology in Agriculture 2005, Forestry and Fisheries

Nishizu, T.: FOOMA2005 AP prize

Kato, K. and T. Nishizu: Kinki district agribusiness creation fair exhibition (Osaka international congress center)

Chair of Nuclear Science and Engineering (Research Reactor Institute)

2.5.16 Laboratory of Radiation Safety Control

Staff *Professor* *: Fukui, Masami, Dr. Eng., Dr. Agric. Sci.*
Assistant Professor : Yamasaki, Keizo, M. Eng.,
Assistant Professor : Takahashi, Tomoyuki, Dr. Eng.,
Assistant Professor : Yashima, Hiroshi, Dr. Eng.,

Students
Master's program : (2)

A. Research Activities (2005.4-2006.3)

A-1. Main subjects

a) Estimating the concentration of HTO in waters in the environment

A great amount of tritium is likely to be released from the operation of the nuclear reprocessing plant in Rokkasho, Aomori Prefecture. The discharge of tritium in the environment is concerned for the radiation exposure on the public near the facilities. For the above, the environmental impact assessment is required to make sure the safety by measuring the concentration of tritium in the environment. As a first step of an analogical research, the concentrations in moisture in air and fresh waters around the Kyoto University Research Reactor site which releases a small quantity of tritium, has been measured and compared with those in water samples that are not contaminated artificially.

b) Environmental behavior and dose assessment of radon and its progeny

Radon and its progeny are an important part of natural environmental radiation exposure. Since inhalation is a major pathway, the measurement of airborne radioactivity in geologic materials is relevant to assess the environmental radiation hazards. However, little information has been available for the radon contents in soil gas. We carried out therefore a survey of ^{222}Rn-concentrations in the air of underground as soils and several caves in parts of the western Japan. 78 samples at eight locations were analyzed with a liquid scintillation counter after trapping air of geo-sphere into toluene based-scintillation cocktail. The cumulative frequency of the concentrations showed a log-normal distribution and the average content was found to be 49 Bq/L for an arithmetic mean and 8.9 Bq/L for a median

Natural radiation exposure is one of the constraints for radiation exposure to general publics

and workers. Not only the behavior and the property of the radon and its progeny in the indoor and outdoor environment, but also the standardization of the aerosol attached radon progeny size distribution measurements in a building made of thick concrete using some low pressure cascade impactors and the generation process of radioactive aerosols by attachment between the radon progeny and standard aerosols, are now proceeding on to assess the natural radiation dose.

c) For evaluation of the effects of environmental-load substances such as radioactive ones from nucliear facilities, it is important to understand the behavior of substances in terrestrial biosphere. In 2005 FY, our main theme in this category are as follows; (1) research and development on dynamic compartment model for behavior of carbon-14 in paddy field, (2) research on relationship between environmental parameters such as distribution coefficients and physicochemical properties of cultivated soils.

d) Residual activity estimation in the nuclear and accelerator facilities

The nuclide-production cross-sections are required to estimate the radioactivities in the nuclear and accelerator facilities. In this study, the nuclide-production cross-sections induced by charged particle and neutron have been measured and residual activities have been evaluated from measured results.

e) Remediation of the water environment contaminated with refractory organic matter (ROM), endocrine disruptors, and arsenic

Application of soil percolation and phytoremediation techniques were studied to renovate the water environment contaminated with ROM and endocrine disruptors. The distribution of OM in the soil-water environment as well as the effect of plants on the behavior of OM were studied by monitoring dissolved OM by colour, dissolved organic carbon concentration and COD measurements, and sequential fractionation techniques. Analyses of endocrine disruptors using gas-chromotograph- mass specgrometry are now under way. Performance of a manganese sand processed from manganese and bismuth metals was tested to develop an inexpensive arsenic sorbent.

A-2. Publications and presentations

a) Publications

Original papers

Fukui, M.: Locating tritium sources in a research reactor building. Health Phys. 89; 303-314, 2005

Fukui, M. and S. Kimura: Oxidized tritium around a research reactor site. J. Nucl. Sci. Technol. 42; 816-824, 2005

Atarashi-Ando, M., Y. Kumakura, H. Amano and M. Fukui: Formation of organically bound deuterium at each growing stage of rice. Fusion Science and Technology 48; 771-774, 2005

Nakamaru, Y., S. Uchida, N. Ogiu, T. Takahashi, M. Terakado, K. Tomita, H. Ikeda and N. Kurosawa: Utilization of the Mapping System for the Evaluation of the Mobility of Radionuclides in Soil. Jpn. J. Soil Sci. Plant Nutr. 76; 421-426, 2005 (in Japanese).

Reports

Fukui, M.: Determinating tritium sources with a high concentration in a research reactor building. Data of co-laboration of LHD at the Nuclear Institute of Fusion Science. Sept., 2005 (CD disk in Japanese)

Fujikawa, Y., T. Hamasaki, M. Sugahara, D. Yoneda, G. Prasai, Y. Hara, T. Yamazaki, R. Imada, H. Ozaki, Y. Abe and M. Fukui: Proposal of a rapid infiltration system using granulated materials for wastewater and river water treatment — Pollutant Removal Mechanism. Proceedings of 1st International Conference on Pollution Control and Resource Reuse for a Better Tomorrow and Sustainable Economy Part 2; 82-86, 2005.

Sugahara, M., Y. Fujikawa, T. Hamasaki, G. Prasai, R. Imada, H. Ozaki, S. Sakurai and M. Fukui: Proposal of a Rapid Infiltration System for Wastewater and River Water Treatment —System Design Guide. Proceeding of 1st International Conference on Pollution Control and Resource Reuse for a Better Tomorrow and Sustainable Economy Part 2; 87-88, 2005

Hori, J., H. Yashima, T. Oishi, W. Takahashi, M. Baba and K. Nakajima: Measurement of Neutron Capture Cross Section for Natural Palladium. Proc. the 12-th Int. Symp. on Capture Gamma-Ray Spectroscopy and Related Topics, Notre Dame, Indiana, 4-9 September 2005

Takahashi, T., S. Uchida, Y. Nakamaru, M. Terakado, K. Tomita, M. Oeda and N. Kurosawa: Development of management system on environmental parameters -Development of Visualization Function of Soil Property Data-. Environmental & Sanitary Engineering Research, 19; 167-170, 2005 (in Japanese)

Yashima, H., Y. Fujikawa, K. Tonokai, M. Sugahra and M. Fukui: Sorption experiment of Mn-coated arsenic sorbent. 11th Proceedings of the Symposium on Groundwater Soil Pollutions and Their Management; 167-169, 2005 (in Japanese)

Abe, Y., Y. Fujikawa, M. Fukui, Y. Hara, H. Tatuhide, M. Sugahara, K. Nakagawa and K. Tanaka: Measurement of estrogen in animal wastes and manure by GC-MS. Environmental and Sanitary Engineering Research 19; 105-106, 2005 (in Japanese)

Sakurai, S., Y. Fujikawa, M. Fukui, T. Hamasaki, M. Sugahara, Y. Hirose and S. Harada: Growth of plants with used soil sorbents with low fertility. Environmental and Sanitary Engineering Research 19; 183-186, 2005 (in Japanese)

b) Conference and seminar papers presented

2005 autumn meeting of the Atomic Energy Society of Japan: 1 presentation

2005 annual meeting of Japan Health Physics Society: 1 presentations

2006 spring meeting of the Atomic Energy Society of Japan: 1 presentation

12th meeting about pollution of underground water and soil, and their prevention: 1 presentation

A-3. Off-campus activities

Research grants

Grant-In-Aid for Scientific Research (C) Natural attenuation system for COD reduction – Proposal of the optimal design (Fukui, Partial charge)

A-4. International cooperation and overseas activities

Editorial board of the International journal etc.

Fukui, M.: J. Contam. Hydrol. (Elsevier, Associate Editor)

B. Educational Activities (2005.4-2006.3)

B-1. On-Campus teaching

a) Course given

Undergraduate level: Behavior of Contaminant in the Environment (Fukui)

Graduate level: Environmental Radiation Protection (Fukui), Seminar in Environmental Radiation Control I, II (Fukui), Applied Environmental Radiation Technology (Fukui), Experimental Radiation Control in the Environmental (Fukui)

C. Other remarks

Safety Management

Fukui, M.: Director of Radiation Control, Member of Nuclear Safety Committee, Member of Health Physics Committee, Member of Radiation Committee for Medical Usage

Takahashi, T.: Hygiene Supervisor of Kumatori Campus

Off-campus activities

Fukui, M.: Japan Atomic Energy Agency (Scientific member for (1) Safety Research Committee, (2) Waste Management Committee and (3) Research Commission), Environmental Science Institute (Scientific Member for Environmental Impact Assessment Committee in soil system), Nuclear Waste Management Organization of Japan (NUMO: Technical Advisor), Central Research Inst. of Electric Power Industry (Member of Environmental Impact Assessment Committee for Decommission of Power Plant), National Institute of Fusion Science (Collaborating Reseacher), Osaka Prefecture (Environmental Radiation Assessment Committee)

Yamasaki, K.: National Institute of Radiological Sciences (Visiting researcher),

Takahashi, T.: Nuclear Safety Research Association (Member of committee on network for radiation emergency medicine in Osaka), Nuclear Safety Technology Center (Member of sub-group on making of teaching materials for nuclear disaster preventation), Atomic Energy Society of Japan (Member of level 3 PSA working group in standards committee), National Institute of Radiological Sciences (Visiting researcher), National Institute of Fusion Science (Collaborating researcher).

Awards

Fukui, M: Atomic Energy Society of Japan Award
(Award for Eminent Achievement in Nuclear Science and Technology)