

Master's Special Course
in
International Environmental and Agricultural Science

Graduate School of Agriculture
Tokyo University of Agriculture and Technology

MORE SENSE

Mission Oriental Research and Education giving Synergy in Endeavors toward a Sustainable Earth

Invitation to the Department of International Environmental and Agricultural Science (IEAS) of the Tokyo University of Agriculture and Technology (TUAT) in 2008.

It is our great pleasure to introduce you our Master's Special Course of the Department of International Environmental and Agricultural Science (IEAS), Graduate School of Agriculture, offered in the academic year 2008.

TUAT has pursued basic and applied sciences and technologies with focus on human-nature interface since 1877. TUAT has been evaluated, by both official and private evaluation organizations, as one of the top educational institutions in Japan based on its research and educational performances. We passed through a recent institutional reform to become a new National University Corporation in 2004, with the objective to further enhance our research and educational activities.

Currently our graduate programs are offered at the Graduate School of Agriculture (Fuchu Campus); the Graduate School of Technology (Koganei Campus); and the Graduate School of Bio-Applications & System Engineering (Koganei Campus). In total, there are 1,956 graduate students and 4,081 undergraduate students studying at TUAT (as of May 1, 2007). Two campuses are surrounded by lush greenery and yet located close to central Tokyo (30 minutes by public transportation).

In Fuchu Campus, we have five undergraduate departments (4-year) and nine master's departments (2-year) in the fields of agricultural and environmental sciences. You are invited to study at the Master's Special Course, offered by the Department of International Environmental and Agricultural Science (IEAS), with interdisciplinary academic supports from eight other master's departments, namely Biological Production Science, Studies in Sustainable and Symbiotic

Society, Applied Biochemistry Chemistry, Bioregulation and Biointeraction, Natural Resources and Ecomaterials, Environmental Science on Biosphere, Environment Conservation, and Environmental and Agricultural Engineering.

This Special Course accepts 23 international students from all over the world which consist of 8 Japanese Government's scholarship grantees and 15 privately financed applicants including external funding grantees. The school term begins in October and ends in September (while regular course begins in April and ends in March). Classes, exercises and research activities are conducted in English language. Japanese language lessons (from basic to advanced level) will be provided depending on student's needs. IEAS offers an additional opportunity of intercultural communication, with its half of the student body consisted of international students with various ethnic origins and another half of Japanese students.

Please refer to our web sites for more detailed information:

<http://www.tuat.ac.jp/english/index.html> (for TUAT), and

<http://www.tuat.ac.jp/~ieas/> (for IEAS).

**Master's Special Course offered by
the Department of International Environmental and Agricultural Science
(IEAS)**

The Integrated Program in International Environmental and Agricultural Science is a multi-disciplinary postgraduate program designed to train students and researchers to be at the forefront in the development of the limited natural resources around us while maintaining the vitality of the environment.

In recent years, intense human activities such as rapid industrialization and overexploitation of natural resources are causing severe global environmental problems. These problems include environmental pollution, global climate change, acid rainfall, desertification, degradation of tropical forests, soil erosion, water pollution, and environmental hormones.

In addition, the exponential population growth coupled with global food shortages is the most pressing issue that demands utmost attention.

To tackle these problems, a holistic approach to sustainable development is indispensable. It is essential to develop appropriate policies for maximizing food production, to improve the quality of human life, while avoiding the depletion and degradation of the limited natural resources around us, and maintaining an ecological balance.

Lately, there is an increasing global awareness for environmentally friendly methods of food production. We recognize that the success of such methods depends on the integration of concepts and technologies from diverse disciplines, and that only a multi-disciplinary approach can ensure such sustainable development.

This course aims at optimization of food production, conservation of the environment, and the restoration and purification of degraded resources. Emphasize on integrating the technical merits of the various disciplines to develop holistic methods of resource development. This will be done through

international cooperation. Ecologically, culturally, and socially effective strategies developed in these studies will then be applied to actual rural problems through technology transfer.

This course also aims at training engineers and scientists who have broader international view of “Environmental and Agricultural Science” and wider knowledge in several disciplines such as sociology, ecology, agronomy, and engineering.

Today environmental policy is an important subject to the environmental and agricultural technologies of our interest. We also focus on the policy-related studies in the fields of human, social and economic sciences with regards to the technological functions

The duration of this Master’s Special Course in International Environmental and Agricultural Science (IEAS) is 2 years.

The prerequisite for admission to Master’s course at TUAT is principally a total of 16 years of institutional education (from primary school to university) is obligated. In case those candidate who only have 14 to 15 years of academic background may be accepted after the University committee evaluated their educational and career background case by case. Academic Degree to be conferred to JDS scholarship students is mainly ‘Master of Agriculture’; also, ‘Master of Philosophy’ will be conferred to those specially authorized by the University.

Outline of IEAS

1. Field of International Environmental Rehabilitation and Conservation (The First Field)

This Field offers the following topics such as: Environmental Changes in Developing Areas, Ecosystem in Agricultural Lands, Investigation Methodology for Environmental Deterioration, Interaction between Biological and Human Activities, and Remediation and Conservation of Regional Environment.

2. Field of International Biological Production and Resource Science (The Second Field)

Education and research are performed for increasing food production and biological resources recycling by utilizing high biological production potential, in order to realize sustainable agriculture for regional and global environmental conservation.

3. Field of International Development on Rural Areas (The Third Field)

Education and research are performed for sustainable social development and community planning focused on economic, social, and population studies combined with natural environmental technology and food production technology.

Faculty Members of IEAS

Field of International Environmental Rehabilitation and Conservation

Kubo N., Prof.	Resources Conservation through Exploring Flows
Selecting new member	Regional Environmental Conservation Planning
Kohgo Y., Assoc. Prof.	Environmental Rehabilitation and Conservation
Watanabe H., Senior Asst. Prof.	Aquatic Environmental Conservation

Field of International Biological Production and Resource Science

Hamano K., Prof.	Sustainable Agricultural Technology and Insect Resource Science
Hirata Y., Assoc. Prof.	Improvement of Plant New Functions for Improvement
Kubo T., Prof.	Utilization of Biological Resources Cohesive to the Global Environments
Kimura S., Tenure Assoc. Prof.	Soil Science (Nutrient Cycling and Geographical Evaluation)
Oikawa Y., Asst. Prof.	Tropical Farming Systems and Forest Management

Field of International Development on Rural Areas

Wakabayashi K., Prof.	Population Sociology in Developing Regions
Toyoda T, Prof.	Multinational Agribusiness and Development Policy
Takeuchi I., Assoc. Prof.	International Development and Cooperation
Yamada M., Senior Asst. Prof.	Appropriate Technology Cooperation

Field of International Environmental Rehabilitation and Conservation



Professor Naritaka KUBO

Resources Conservation through Exploring Flows

Various kinds of facilities and structures have been constructed for the water resources development and flood protection. They, however, sometimes did not fully function as expected. Typical problems are eutrophication and long-term turbidity problems in man-made reservoirs. Against lake eutrophication, several ecological and engineering measures were taken, such as forest protection, aeration and selective withdrawal, but they could not have fully solved this problem. What is important is to fully understand their capabilities.

I think the best ways to realize them are exploring flows and developing flow-analyzing measures. More specifically, it is a computational method for water movement simulation problems, the most effective way is to incorporate. I think, in order to solve water resources and environment numerical technique with order engineering and ecological procedures.

< SELECTING NEW MEMBER >

Regional Environmental Conservation Planning

Conservation of mountainous, forestry and riverside flat field is fundamental protection strategy for land and water managements, and the conservation must harmonize with sustainable agricultural

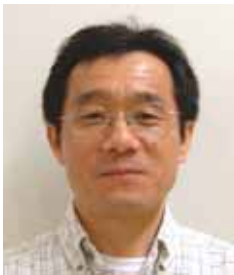
production. In this field, justification of soil erosion and water problem is quantitatively searched. Based on the results, soil and water control methodology is planned from the mountain to the sea along the river. Considering with the solution technology for soil erosion and water management, the basis of agricultural field is improved and developed, cohesive with total environments.



Associate Professor Yuji KOHGO

Environmental Rehabilitation and Conservation

We have recently many huge earthquakes and heavy rainfalls due to the global warming and active diastrophism. For examples, the magnitude of Sumatra offshore earthquake, which occurred in Dec. 2004, reached 9.3 and the tsunami due to this quake killed more than 300,000 peoples and damaged many facilities. Hurricane Katrina in Aug. 2005 gave fatal blows to New Orleans, Louisiana in USA. In Japan, the 2004 Niigata Chuetsu earthquake, which was a local earthquake with magnitude = 6.8, occurred in Oct. 2004. The quake subjected heavy damages to structures and facilities including agricultural ones. We had other earthquake named Noto peninsula earthquake this year. Slope failures and disasters of farms occur due to heavy rainfalls every year. Then, we are conducting research works to increase resistance powers of agricultural facilities and farms located mainly in Japan and South-east Asia to natural disasters on the base of environmental geotechnical engineering techniques (soil mechanics, finite element analyses, unsaturated soil behavior, elastoplastic theories). The researches are conducting under geo-environment rehabilitation and conservation.



Senior Assistant Professor Hirozumi WATANABE

The Non-point Source Pollution Control of the Pesticide

Research Topic: The Non-point Source Pollution Control of the Pesticide
Since the 1960's, adverse effects on the aquatic environment resulting from intensive agrochemical usage have been a major issue for the agricultural communities. My research activity focuses on monitoring and modeling for the pesticide fate and transport in paddy fields and in aquatic environments. Objectives of my research are to study mechanisms of pesticide fate and transport, to develop and evaluate the best management practices for controlling pesticide discharges, and to develop better tools for investigating and evaluating pesticide fate and transport for environment-friendly paddy field agriculture.

Current ongoing projects are:

1. Improvement on a system for simulating pesticide fate and transport via Internet
2. Plot scale monitoring of pesticide fate and transport in a paddy field for the evaluation of management practices for reducing the pesticide discharges.
3. Modeling and simulation of pesticide fate and transport in a paddy field using PCPF-1 model.
4. Watershed scale monitoring and modeling of pesticide fate and transport from paddy fields to aquatic ecosystem.
5. Development of a micro-paddy lysimeter system for evaluation of pesticide fate and transport in a paddy field.

For more information: <http://www.tuat.ac.jp/~pochi/>

Field of International Biological Production and Resource Science



Professor Kunikatsu HAMANO

Sustainable Agricultural Technology, and Insect Resource Science

Insect world is the most diverse in the animal kingdom. More than 1 million species of insects are distributed on the earth. Only a few insects, however, such as silkworm and honeybee are known as useful insects for production. I have studied useful functions hidden in the insect world by focusing on physiology of food habit and nutrition.

Another focus is a laboratory insect. A green caterpillar called as Sweet potato horn worm (*Agrius convolvuli*), one of the noxious insects of sweet potato, is the material. This is an insect suitable for biological experiments, which can easily grow with artificial feeds all the year round. To establish this insect as a laboratory insect such as silkworm and *Drosophila*, I investigate the physiology of this insect in detail, especially on the food habit and nutrition.

In addition, sericulture technology development and extension in developing countries is also my major concern.



Associate Professor Yutaka HIRATA

Improvement of Plant Biological New Functions for Sustainable Production

In order to solve poverty and rural development, we must improve the production technology by using breeding method in cooperation with the social science field. Plant breeding is one of the most important fields in agrobiological technology with gene technology. Especially, inquiring and induction of variations are both important processes in improvement strategy. In our lab, a new unique genetic induction method, “graft transformation” has been developed by using *in-vitro* and *in-vivo* new graftings. We have created graft hybrids (chimeras) as “Peaton” (Pimento-red pepper) and “Cabbesh” (cabbage-radish), “Cabbepa” (cabbage-rapa). Sustainable “Biotechnology” must be originated. In addition, human relationships between students and staff are very important to educate and create man powers.



Professor Takafumi KUBO

Utilization of Biological Resources Cohesive to the Global Environments

It is most reasonable to understand precisely the actual circumstances of the forest biomass, which occupies the great portion of plant biomass on the earth, and to consider continuous practical use of the forest resources in regions of the world. Then, focusing on improvement in the

self-sufficiency rate of woody plant resources in some advanced nations including Japan, and continuous reproduction and utilization of tropical forest resources, the sustainable system for using the forest resources has been studied for regional and global environmental conservations.



Tenure Associate Professor Sonoko KIMURA

Development Soil Science (Nutrient cycling and geographical evaluation)

Recently, human activity has increased the nitrogen flow in the ecosystem. Increased fossil fuel and chemical fertilizer use as well as increased area of paddy rice fields and uplands have doubled the world nitrogen cycle. Almost 70% of the increase is due to agricultural activities. Nitrogen is an essential nutrient for agricultural production and has increased crop yield, however it can cause eutrofication of rivers and underground waters and contribute to global warming due to N₂O emission and can result in acidification due to NH₃ emission. To create a sustainable society, quantification of nitrogen and carbon flow at a regional scale is important. Only by considering the balance between environmental load and food production quantitatively reflecting the site specific conditions, a concrete suggestion can be made. How should we manage the agroecosystem, especially in East-Asia with its recent fast development? With this question, I conduct field monitoring, statistical analysis, modeling and regional evaluation using GIS to search a sustainable development of world's agroecosystems.



Assistant Professor Yosei OIKAWA

Indigenous knowledge and its applications for sustainable agriculture and forestry in the tropics

Why and how have environmental degradations occurred in rural areas of the tropics? How are people facing out the problems and making efforts to solve them? In such circumstances, how do people utilize plants and lands for their better life? These questions are my starting points of agricultural fieldwork.

In order to approach the issues, I have been learning various knowledge and experiences from local people, occasionally by participating in farm works in the fields. Especially, I have recently focused on the various evolutions of such plant-human relationships as 1) mixed gardening with tree crops, 2) indigenous natural resource management without surface fire, and 3) cultivation of minor crops and plants.

After returning to the university, I explore the meaning of indigenous knowledge, experiences, technology, and views that I learned in the fields, by comparing with scientific information, such as agricultural sciences, ecological studies, and area studies. Then, I consider the problems and solutions of existing agricultural systems and forest management systems. Some farming and agroforestry technologies such as applications of bio-fertilizers and charcoal have been examined with students in our campus experimental farm and in tropical countries.

Field of International Development on Rural Areas



Professor Keiko WAKABAYASHI

Population Sociology in Developing Regions

Global population explosion is the most serious problem in the world. Especially, population explosion problem is most severe with sufficient food supply. In this next century, we must solve the many serious problems concerning food supply, poverty in developing countries, decrease of working population and productivity and so on. However, peaceful solutions must be applied and succeed for human existence cohesive with nature. We have studied population sociology in China and south Eastern Asia, and the severe negative impacts on regional communities development and environments.



Professor Takashi TOYODA

Multinational Agribusiness and Development Policies

Based on the instability of demand and supply of food in the world, the establishment of food security is a crucial global issues as the 21st century approaches. Multinational agribusiness corporations have a large impact on the world food supplies. Worldwide food system may be analyzed by the OLI paradigm for multinational corporations. This paradigm analyses the dynamics of the triadic relationships among

ownership-specific advantages (O) of firms, location-specific advantages (L) of countries and the internalizing advantages (I) of markets. The OLI paradigm clarifies the countries in the South American and Asian regions, the OLI paradigm clarifies the structure and policy issues of environmental-conservation-based resource development in the agricultural and food sectors.

The harmonization between sustainable-food trade and environmental-conservation-based development in Asian regions, and policy studies concerning international cooperation among the Japanese government, NGO, and private firms, are the most prominent recent research areas of economic development policy study.



Associate Professor Ikuo TAKEUCHI

International Development and Cooperation

Our aim is to study agricultural and rural development in developing countries and its international cooperation based on economics. First of all, we have to grasp the causes and the reasons why the necessity of sustainable development has been advocated for the recent world. Next, we have to understand the policies of its government and non-government organizations on international cooperation for the sustainable agriculture and rural development. Most of the Japanese policy makers regard highly the existence of various economic institutions, besides market economy. Therefore, we have to understand the social and cultural characteristics of each rural area's economy backgrounds thoroughly; also pliantly analyze the problems of its international development and cooperation on agricultural and rural development in earnest.



Senior Assistant Professor Masaaki YAMADA

Appropriate Technology Cooperation

Appropriate technology cooperation is crucial in facilitating Sustainable development of the developing countries and regions. For this end, the Japanese government has been providing extensive official development assistance (ODA), while non-governmental organizations (NGOs) have offered smaller-scale but long-standing grassroots support. Besides, companies and emigrants overseas, in doing their businesses for survival and prosperity, have played significant roles in technology transfer, modification and development. I have worked for NGO/ODA projects in rural development and studied immigrant agriculture in Asian/American tropics. Introduction and modification of appropriate agro-industrial technologies in those areas have improved the efficiency in utilizing limited natural resources and increased productivity. For example, Japanese immigrant agroforestry in the Brazilian Amazon has attracted world attention as a promising alternative to mass-deforestation. In my future research, I would like to compare the contributions of Chinese and Japanese immigrant farmers in tropical Asia and America.