

II . INTERNATIONAL ACTIVITIES

International Academic Exchange and Cooperation of the Faculty of Agriculture, Kyoto University

Collaboration with Foreign Guest Professors

Collaboration with foreign guest professors during April, 2010 and March, 2011 is shown in Table 1. The collaboration reports written by guest professors were attached at the end of this section.

International Cooperation and Overseas Activities

In recent years, international cooperation and overseas activities are actively carried out and many professors and students make research works abroad with foreign researchers. Please refer to “A-4. International cooperation and overseas activities” in each laboratory in “III. Research and educational activities” for the detail.

International student exchange program

We organized one of the subjects of liberal arts education, “International Exchange Program”, in which first or second grade students in various faculties are dispatched to a foreign country or foreign students are accepted for about 2 weeks for international experiences. This year, one of the subjects, “Changing Southeast Asia - Environment, Industry and Society” was implemented by the Faculty of Agriculture. Fourteen students were dispatched to Kasetsart University in Thailand during the period from 7th to 19th March, 2011. We accepted 12 students from the above University during the period from 11th to 22nd October, 2010. In addition, as a part of a seminar “Sustainable agriculture in Canada” of liberal arts education, 10 students, among whom 6 students participated in the overseas program only, were dispatched to Alberta University, Canada, during the period from 22nd August to 4th September, 2010.

International Exchange Section Office and its activities in 2010

The International Exchange Section Office was established in June 1985 as an office to handle wide-ranged issues related to international students and research fellows at the Graduate School and Faculty. The number of foreign students by country in 2010 is shown in Table 2.

Major activities of the Office besides its regular tasks are as follows:

a) Orientation and welcome party

On April 8th the orientation and acquaintance session was held for newly enrolled international students. Staffs of the International Exchange Section Office and an executive of the Kyoto University Cooperative gave guidance to the new comers on various aspects of the campus life. A welcome party was held thereafter at a “Camphora”, in which about 100 students and staffs participated. Dean Prof. Endo, Vice Dean Prof. Nawata, Chairman of International Exchange Committee, Prof. Kondo, and Vice President of Kyoto University, Prof. Junich Mori gave a speech to welcome the new comers.

On October 5th, the orientation was held for the international students who enrolled in October.

b) One-day study bus trip

The one-day study bus trips were held twice. We visited Shigaraki ware workshop, water supply facilities in Shiga prefecture on June 3rd. In total 39 international students, visiting

professors, and staffs participated in this trip. They studied a lot about water supply facilities in Japan. Associate Prof. Unami came with us and explained the facilities. All the participants enjoyed and communicated each other very much.

The second one-day bus trip was held on December 10th. In total 44 international students, visiting professors, and staffs participated in this trip. We visited Arida-Orange orchards, and listened to a lecture on the fruit-sorting facility at the Fruit Tree Experiment Station, Wakayama Research Center of Agriculture in Aridagawa-cho, Wakayama prefecture. Afterwards we observed the JA Arida AQ fruit-sorting facility. Prof. Kondo came with us and explained the facilities.

c) Summer study trip

A study trip for international students was held on September 7-8. In total 32 international students, visiting professors, and staffs participated in this trip. On the first day students enjoyed beautiful scenery at Ama-no-Hashidate and the Ine Boathouse; in the evening a BBQ offered a rare opportunity for participants to get to know students from many other countries. On the second day in the morning participants visited the Kyoto University Fisheries Station in Maizuru. After a lecture by Associate Professor Masuda, we had the chance to see the experimental facilities for marine bioscience. In the afternoon, the group visited Kansai Electric Power Company EL Park in Ooi.

d) Football game & Beer party

About 120 football lovers from many countries gathered in the rain for the games on June 26th. Emeritus Prof. Umeda, Dr. Kobayashi, Dr. Miyashita and football club members of Kyoto University assisted the games. Eight teams competed with enthusiasm and excitement. The Fermentation Team won the championship this year. After the game we had a beer party at Hokuto. All the participants enjoyed talking to each other.

e) International Café Meeting

The office started international café meetings, “Hokkori Café” in 2008. One M1 Student Mr. Javier Montano who belongs to Division of Natural Resource Economics offered the topic entitled, “A short description of Bolivia and its people” on November 10th. About 16 researchers, students, and staffs participated in the meeting.

f) Mini Bazaar

Mini bazaars were held on August 2-3, October 21-22, 2010, and February 17-18, 2011 at the International Exchange Section Office. Many things were offered by students and faculty of Agriculture and Science Departments. Profits in the bazaar are used for international exchange activities.

g) “Mochituki” Ceremony

One of the traditional Japanese ceremony, rice cake pounding was held in the east side of the second building of Agriculture on January 18th. We rented the Mochituki tools from the rental shop this year. About 150 participants tasted rice cakes with soup, soybean powder, and bean jam etc.

h) Japanese language class

The Japanese language class (beginner's, intermediate and advanced courses) was started in April, 1996. About 30 international students and researchers attended the class this year.

i) Pre-counseling room

We started a pre-counseling room once a week from October, 2002. The object of our

pre-counseling room is to release pressures of international students and to reduce their loneliness before they have serious problems. We were consulted about some problems for studying and Japanese daily life of foreign students.

j) Newsletter

Since 1988 the office has been publishing the newsletter biannually. This year, the 46th and 47th issues were published in September and March, respectively. About 3,000 copies each were delivered or e-mailed to all the students and staffs of the Faculty, visiting research scholars, foreign alumni residing in different countries (see Table 3), the members of the Supporters' Association for International Academic Exchange of the Faculty of Agriculture, and various Faculties, institutes, centers and other offices in the campus.

k) Newspapers, periodicals and books purchased

Two newspapers (one English and one Chinese) and 2 periodicals (one in foreign language and one in Japanese) are subscribed. We have many books for studying Japanese language, Japanese culture and sightseeing.

l) Correspondence to inquiries

The Office handled a number of inquiries for admission from different countries.

Membership of the Supporters' Association for International Academic Exchange

International Academic Exchange of the Faculty of Agriculture comprises both academic and administrative staffs of the Faculty. The membership of the Association was renewed in July of this year. There are 123 individuals in the membership list at the end of March, 2011. The activities of International Exchange Section Office are partially supported by the fund. A part of purchase of foreign newspapers and journals for the saloon is also made by this fund.

Table 1. Collaboration with Foreign Guest Professors

Name	Nationality	Affiliation	Research Title
Supamard Panichsakpatana	Thailand	Kasetsart University, Professor	Establishment of the appropriate management of soil, water resources and landuse systems in Southeast Asia
John Kenneth Schueller	America	University of Florida, Professor	Seedling production and vegetable harvesting robots
Halvor Solheim	Norway	Norwegian University, Professor	Ecological studies on fungi associated with the ambrosia beetle <i>Platypus quercivorus</i>
Roderick Alastair Drew	Australia	Griffith University, Professor	Biotechnology of fruit crops using tissue and cell culture
Malcolm Fitz-Earle	Canada	Capilano University, Emeritus Professor	Studies on Scientific English Writing
Craig Edward Wheelock	America	Karolinska Institute, Associate Professor	Structure-based approaches to designing inhibitors of lipid mediator-based metabolic processes
Yun-Hwa Peggy Hsieh	America	Florida State University, Professor	Studies on the application of antibody for food safety and food quality assessment
Werner Pleschberger	Austria	University of Natural Resources and Applied Life Sciences, Vienna, Associate Professor	Comparative Study on Risk perceptions of corporate stakeholders and response options in Japanese and Austrian ski resorts in the context of climate and socio-economic change

Table 2 Number of foreign students by country (2010)

Country	UG	MC	DC	OT	ST	Country	UG	MC	DC	OT	ST
Argentina			1		1	Lao			2		2
Bangladesh		1	3		4	Mali			1		1
Bolivia		1			1	Mozambique		1			1
Brazil		2	1		3	Myanmar			1	1	2
Cambodia			1		1	Nepal		1	2		3
China	4	31	25	6	63	Nigeria			1		1
Egypt			2		2	Philippines		1	1		2
France		1				Taiwan		1	7		8
Ghana			1		1	Thailand	1	1	5	1	7
India			3		3	U.S.A.		1	2		3
Indonesia	1	4	11		15	Vietnam			2		2
Kenya		1			1	Zimbabwe		1			1
Korea	4	5	6		12						
<u>Total</u>							<u>10</u>	<u>53</u>	<u>78</u>	<u>8</u>	<u>149</u>

Note) UG:Undergraduate, MC:Master Course, DC:Doctor Course, OT:Others, ST:Sub-total

Table 3 Number of foreign alumni by country of residence

Bangladesh	7	Iran	1	Philippines	7
Belgium	1	Japan	16	Poland	1
Brazil	7	Kenya	2	Spain	1
Bulgaria	2	Korea	49	Sri Lanka	6
Canada	1	Lao	2	South Africa	1
Chili	2	Macedonia	1	Switzerland	1
China	35	Malaysia	2	Taiwan	18
Congo	1	Mexico	5	Tanzania	4
Egypt	4	Myanmar	5	Thailand	46
France	2	Nepal	3	Turkey	3
Germany	1	Netherlands	2	U.S.A.	13
Ghana	1	New Zealand	1	Vietnam	2
India	4	Paraguay	1		
Indonesia	42	Peru	1		
<u>Total</u>					<u>304</u>

Activity Report for Visiting Associate Professorship Fall 2010

Visiting Professor

Craig Edward Wheelock

October 4, 2010~January 7, 2011

Laboratory of Bioregulation Chemistry

From October 4th 2010 to January 7th 2011, I was a visiting associate professor in the Graduate School of Agriculture at Kyoto University. My activities during this time can be divided up into 3 distinct areas: 1) primary research, 2) student interactions and 3) colleague interactions.

The primary purpose of my visit to Kyoto University was to work with the laboratory of Dr. Hisashi Miyagawa and Dr. Yoshiaki Nakagawa to further expand our work developing quantitative structure activity relationships (QSAR) models of carboxylesterase inhibitors. We have previously published a number of papers in this area and sought to expand our work by examining the interactions of carboxylesterases with potential lipid substrates. Lipid mediators have been demonstrated to be of importance in a number of different diseases ranging from cardiovascular disease to asthma. Recent studies have shown a potential for agrochemicals to influence lipid metabolism and affect cholesterol and triglyceride metabolism. In particular, organophosphate pesticides appear to have a role in this process. Organophosphates are activated by cytochrome P450 enzymes to their biologically active form (oxon) and can then inhibit carboxylesterase activity, which results in an observed inhibition of reverse cholesterol transport in macrophages. It has been hypothesized that this process could lead to the initiation of macrophage transformation into a foam cell and subsequent atherosclerotic plaque formation. Given the prevalence of cardiovascular disease and potential for exposure to organophosphates, this interesting hypothesis warrants further investigation. Unfortunately, there are few methods available for probing the diversity of lipid structural space and the structure-based activity of lipid metabolism is poorly understood. We are therefore testing the hypothesis that bioactive selective inhibitors of carboxylesterase can be used to probe lipid metabolism and potential interactions with agrochemicals. We employed existing data sets for inhibition of carboxylesterases as seed data to develop initial QSAR models. Classical QSAR studies are being performed using QREG2.05, with molecular hydrophobicity calculated using MacLogP 4.0. Three-dimensional QSAR studies are being conducted with Comparative Molecular Field Analysis (CoMFA) using the modeling software package SYBYL ver. 6.8 (Tripos Co., St. Louis, MO, USA). Final model generation will be performed using the SYBYL QSAR module. The electrostatic and steric potential energies at each lattice point will be calculated using Coulombic and Lennard-Jones potential functions, respectively and the hydrophobic effect will be evaluated using log P as the lattice-independent external descriptor. The results of the modeling studies will be employed to drive synthesis efforts to develop novel and selective inhibitors of carboxylesterases and potentially other esterases involved in lipid metabolism. It is expected that this information will source further studies in understanding the mechanisms by which a/b hydrolases hydrolyze their respective substrates. These studies are currently ongoing in collaboration with students in the laboratory of Dr. Nakagawa and are expected to result in publication of new 3D-QSAR models of carboxylesterase inhibition. Unfortunately, it was not possible to finish these studies during the short duration of my tenure at Kyoto University, but it is intended that our collaborations will continue and that these projects will be completed in the near future.

Other research-related activity involved work on a special thematic issue of the *Journal of Pesticide Science*. Dr. Nakagawa and myself were co-editors of a thematic issue examining the carboxylesterases and their interactions with agrochemicals. These activities tied in well to our ongoing research into carboxylesterase QSAR and lipid metabolism. The issue has now been published Vol. 35 (No3).

For student interactions, I discussed both scientific concepts as well as career development with a number of students in the department. In particular, we had a series of ongoing conversations regarding the development of systems biology and so-called omics-based research approaches. This research area is becoming of increased interest in the scientific community and because my research group at the Karolinska Institutet focuses on systems biology, the students had many questions. One of the key factors observed during these interactions was first and foremost an unclear understanding of what exactly a “systems-based” research approach entailed. Another important point raised during the discussions was whether the associated resource-intensive approach of omics-based science justified the results. In particular for academic institutions that do not possess the necessary instrumentation. Students also wondered if they would be required to obtain training and experience in multiple omics-based platforms for large-scale data acquisition in order to have successful research careers. We came to the joint conclusion that while systems biology looks interesting, it is not a substitute for hypothesis-driven research.

Other student-based activities included discussion sessions regarding potential career options. Of course many of the students are concerned about their employment possibilities following the completion of their studies. Of particular interest was the observation that the majority of the students did not expect to move into academic positions, in contrast to similar conversations that I have had with students in the USA and Sweden. Overall, I was left with a distinct impression that the majority of Japanese graduate students do not feel that there is a bright future in academic research and that it is therefore a smarter career choice to move to the industrial sector. I found this to be an unfortunate reflection of the current funding and mentoring climate in Japanese academic research. It is also somewhat worrying that the graduate students at such a prestigious university as Kyoto University do not feel that they have a future in academic research.

The other major area of activity during my stay at Kyoto University consisted of interacting with my peers. In particular, I had a number of discussions with the other visiting faculty from the USA, Australia, Canada and Norway. It was of particular interest to speak with my Norwegian colleague, and to discuss research practices in Norway relative to Sweden. A significant amount of time was spent discussing research ideas with Dr. Phillip Lee who has extensive experience in *in silico* approaches to dealing with chemical information. Dr. Lee has had an expansive career from industry to academics and was able to provide a number of useful insights regarding research practices in these two disparate sectors. This information was also of interest to the students in our discussions as described above. We discussed the potential for a number of future research collaborations, particularly regarding data management. Dr. Lee is currently working on the creation of a large legacy database designed to cross index chemical structure information with known toxicity information. Based upon our discussions, we are pursuing future potential collaborations along this line.

Overall, my tenure at Kyoto University was extremely stimulating and useful for increasing my understanding of the Japanese research environment. I found the students to be engaging and genuinely interested in scientific inquiry, but at the same time concerned about their

research careers. I thank Kyoto University for hosting me, and hope that I can return again someday for a longer tenure.

Activity report

Visiting Professor

Halvor Solheim

October 1st 2010 ~ January 31st 2010

Laboratory of Environmental Mycosciences

This report is a documentation of my stay as a guest professor at Kyoto University. Four months is a relatively short time period, and the time of the year did not allow much activity in field. My main contribution has been the daily activity at the lab, and planning for research to be done during 2011, and for future cooperation.

My first lecture, held already October 5th, was an unofficial one for the students and professors at the lab of Environmental Mycosciences. The title was “Vaccinating Norway spruce against blue-stain fungi and bark beetle attack “. I would introduce myself, and what we have done at my institute in the field I was supposed to participate on during my stay in Kyoto. A similar lecture entitled “Vaccination or priming of Norway spruce trees against blue-stain fungi and bark beetle attack” was held in January for new students who will start their Master studies in 2011.

One of my main activities was to participate at the weekly laboratory seminars where Master and PhD students were reporting from their research. During these seminars I was introduced to research going on at the lab. Here I learned a lot, and especially two important diseases interested me, the Japanese oak wilt disease and Pine wilt disease. Listening and participating in the discussions afterwards were also useful for me.

Japanese oak wilt is caused by an ambrosia beetle, *Platypus quercivorus*, and the associated fungus *Raffaelea quercivora*. During mass attack they can easily kill oak trees. This is comparable with my own main interest, bark beetles and associated blue-stain fungi. The second plague for Japanese forestry (and all lovers of pine trees) is the pine wilt disease caused by the pinewood nematode, *Bursaphelenchus xylophilus*. This disease, which is of North American origin, has spread to Japan (and other countries), and are doing serious problems for pine trees here. The disease has also been established in the southernmost part of Europe, in Portugal. All countries in Europe, including Norway, are now worried about the further spread, which may do serious problems for European pine trees which are susceptible, and may also have a great influence on the trade with timber and wood products between countries.

Four PhD students were defending their theses near the end of my stay. For those who were still doing fieldwork when I arrived I was out in the field learning about their work. My main contribution was, however, in reading chapters, especially by improving their English language,

but also to discuss and make suggestions. This was an informative process and very useful for me.

During my stay I held 5 lectures in a course Comparative Agricultural Studies 5 (Y05, Z07). My main intension was to focus on problems in northern conifer forests in Europe, by using my own experience from Norway. Some of the forest pathological problems are shared with the northernmost parts of Japan (Hokkaido), so by learning about these diseases the students also learned about problems in Hokkaido. The two last lectures focused on my main interests at the moment, priming of trees to increase resistance and the threat of invasive species to forestry worldwide. The lectures were covered by the common title: **Challenges for the Norwegian forestry – forest pathology**, and each lecture was entitled as follows:

Oct 15: Forestry in Norway and pathological problems -an overview.

Oct 22: Rot problem in Norwegian forestry – *Heterobasidion* the principal enemy.

Oct 29: Blue-stain fungi –are they important for bark beetle success?

Nov 5: Variation in susceptibility to fungal infection in Norway spruce – can research give more resistant trees for the future?

Nov 12: Invasive species – a threat to some European tree species.

For part of the students I asked for a report which I evaluated.

My special lecture was given December 14th with the title “Can trees be vaccinated? Experience with Norway spruce (*Picea abies*)”. In addition to Norway spruce, also the important invasive species Dutch elm disease caused by a combined attack by a bark beetle and associated blue-stain fungi was discussed.

The topic of my stay was “Ecological studies on fungi associated with the ambrosia beetle *Platypus quercivorus*”. At my institute, the Norwegian Forest and Landscape institute, we have a strong group working with tree defense and priming of trees to enhance resistance. Since the Japanese oak wilt disease is so serious it will be of great importance if we can succeed to develop methods to better combat with this disease. Priming of oak trees to resist attack by the ambrosia beetle *Platypus quercivorus*, and the associated fungus *Raffaelea quercivora* will be in focus for research in 2011.

A colleague of Professor K. Futai from Tottori University, Professor F. Yamamoto, has similar interest as ours, but his group are mainly working with anatomically changes after treatments. They have earlier been working with different conifers, like me. They have, however, recently published a paper on the oak species *Quercus serrata*, which is sensitive to Japanese oak wilt:

Moungsrimuangdee, Moriwaki, Nakayama, Nishigaki & Yamamoto 2011. Effects of injection of ethrel, methyljasmonate, and salicylates and *Raffaelea quercivora* inoculation on sapwood discoloration in *Quercus serrata*. IAWA Journal 32: 41-53.

Cooperation with the group at Tottori University will strengthen our research, and during my stay we have met several times. In early December I was visiting Tottori University.

Treatments for priming trees could be injection with plant hormones like jasmonic acid or salicylic acid, which are involved in signalling of plant defence. To understand the processes by priming, both chemical and molecular biological studies should be done. Of importance is the early detection which can be followed by study the initiation of defence related proteins. Susceptible trees are reacting more slowly than more resistant trees.

I have been visiting 3 different sites where experiments can be done. At all sites an ongoing Japanese oak wilt are in progress. Yoshidayama, near the campus, has already been arena for several studies. However, many oak trees are left and available for further studies. Brief visits have been done to two sites belonging to Kyoto University, the Experimental station Kamigamo, and the University forest Ashiu.

During my stay I have continued to work for the scientific community. I have evaluated two PhD theses from the University of Pretoria, South Africa, and I have been reviewer of three manuscripts submitted to Forest Pathology, Scandinavian Journal of Forest Research and Mycological Progress.

I want to express my greatest thanks to Kyoto University, Graduate School of Agriculture, and especially Professor Futai and his staff and students at the Laboratory of Environmental Mycoscience, for their great help and kindness.

Activity and Accomplishments Report

John K. Schueller

6 May 2010 – 5 August 2010

Kyoto University

This report documents a three-month term as a Guest Professor in the Graduate Faculty of Agriculture of Kyoto University by John K. Schueller. Three months is a relatively short time and the short time period did limit the achievements. However, significant activities and accomplishments were achieved during the term. In addition, a foundation was laid for further collaborative work.

A formal special lecture was prepared and given on 27 May on the topic of “Robotic and Precision Agriculture Research for Florida Specialty Crops”. The lecture was prepared specifically for this occasion and included references to Japan’s agricultural conditions. Research and commercial development in robotics and precision agriculture were reviewed along with the needs of specialty crops, such as fruits and vegetables. Future research trends were discussed.

An intensive lecture series on the topic “Practical Dynamic Modeling and Control” was given during May and June. The series consisted of seven lectures for Masters and Ph.D. students interested in the topic. The students learned how to use classical control theory to model dynamic components and systems in their research and how to improve system performance.

With professors Supramard Panichsalpatana and Philip Lee, I attended five meetings of the Seminar I on Agricultural Process Engineering in June and July. We listened to fourteen student presentations, verbally questioned the students about the content of their presentations, and provided written feedback to the students about the quality of their presentations and how they could improve.

The primary activity of this term was working with Masters and Ph.D. students on their research. I participated in the weekly laboratory seminar of the Agricultural Process Engineering Laboratory. In the seminars I listened to the students report on their research progress, asked questions of them, and provided information and suggestions. I also worked with some of the students before their seminar presentations in order to improve the technical content and English expression of their presentations.

I also attended the weekly meetings of the three focus groups in the area. During these meetings the students, faculty, and staff discussed the research progress and what work the students should do. I listened and learned, but also provided information and suggestions as appropriate. I regularly attended the machine vision and spectroscopy groups. I only attended a few meetings of the bioinstrumentation group as my expertise in that area is minimal. During these meetings I was particularly able to provide information on the international research in relevant areas.

Perhaps the most time was spent on about a dozen written papers for conferences and journals which were received from the Kyoto University authors from the Agricultural Process Engineering Laboratory and the Laboratory for Field Robotics. I carefully read the papers and marked them extensively. The authors then thoroughly discussed the papers with me. The discussions were far-ranging, including discussions of paper organization, relevant international literature, experiment procedure, data analysis, results and conclusions, future work, and English language expression. Although the papers written by the Kyoto University authors were invariably positive contributions to the literature as they were given to me, my extensive experience on many program committees and editorial boards allowed me to give constructive feedback and suggestions to improve quality.

Because I am from the U.S.A., I was able to give suggestions and advice to four students who went to Pittsburgh for the American Society of Agricultural and Biological Engineers meeting. I tried to help an international student who had visa problems, but there was no solution. I was able to help the first Kyoto University student who will be an exchange student with my home university (University of Florida) with various paperwork issues. I also helped a professor in the Crop Science Laboratory arrange a visit to the U.S.A. to learn about irrigation.

During my term I participated in discussions with international professors visiting Kyoto University, particularly those visiting from Sunchon University, Washington State University, and the University of Arizona. I also participated in discussions with individuals from IAM-BRAIN, OMI Weighing Machine Inc., and S-I Seiko. Through my external perspective, I was able to highlight many of the special capabilities of the Kyoto University faculty and staff and to provide information about international activities in their areas of interest.

I had productive discussions with various Kyoto University faculty and international program officers and with visitors from other Japanese universities.

During June I went to Quebec for the International Commission of Agricultural and Biosystems Engineering (CIGR) World Congress and to Pittsburgh for the American Society of Agricultural and Biological Engineers (ASABE) International Annual Meeting. At these conferences I participated in and chaired sessions and meetings. At CIGR I was elected to the Administrative Board and elected Chair of Section III (Equipment Engineering for Plant Production). At ASABE I was one of twelve members named a "Fellow". During both of these events, many of the leading agricultural engineers became aware that I was a Guest Professor at Kyoto University. I was also able to bring technical knowledge back to Kyoto. During my time in Kyoto I was also able to accompany Kyoto University graduate students on a tour of irrigation facilities in Shiga, visit the most prominent Japanese publisher of periodicals on agricultural equipment in Tokyo, and visit a green tea processing company in Shizuoka.

Most interactions with students, faculty, and visitors were concentrated in sensing of agricultural products (particularly the use of spectroscopy and machine vision) and

robotics. The interactions and exchanges of knowledge have definitely made my future research much better. I hope that the same is true for Kyoto University faculty and students.

In the future, I will be able to discuss projects and research with Kyoto University faculty and students with a better understanding of the local situation and the ongoing research. I will be able to provide feedback and advice on continuing research and research results with a much better perspective and more knowledge.

I hope to co-operate and work together whenever it makes sense. For example, we have an agreement between the agricultural faculties of Kyoto University and the University of Florida. I had good meetings with international officers from other faculties during my term. Perhaps the agreement could be extended to other faculties.

One particular area of future research co-operation is on vegetable (particularly tomato) grafting robotics. I have learned from interactions with Kyoto University personnel and visitors. We have identified some of the problems and opportunities. We have started a plan to develop a multinational engineering/horticultural team to synergistically work together to fulfill the great need to improve robotic grafting adoption through improving performance and reducing cost. With the demise of methyl bromide increasing the need for grafting, low-cost robotic solutions are necessary for high-labor-cost countries such as Japan and the USA. The team would likely include Prof. Naoshi Kondo of Kyoto University, Associate Professor Tian Subo of Shenyang Agricultural University, Prof. Chieri Kubota of the University of Arizona, Dr. Michael Bausher of the United States Department of Agriculture's Agricultural Research Service, and myself. We have all performed some preliminary work and discussed among ourselves. We need next to develop a coherent research plan and acquire the necessary support to conduct and finish the research.

I want to extend my greatest thanks and deepest appreciation to the Kyoto University faculty, staff, and students for their great help and kindness.

Report on Activities
Visiting Professor
Malcolm Fitz-Earle Ph.D.
October 1 2010 ~ March 31 2011
Laboratory of Comparative Agricultural Science

This report is dedicated to the memory of three students who I knew in the Graduate School of Agriculture, Kyoto University and who died in the 2011 Tohoku Tsunami.

Course taught: Special Lecture on Comparative Agricultural Studies 4: Scientific English Writing'

The course was taught in 14 classes from October 7 2010 until January 27 2011. The course content included lectures on writing scientific English and presentations in English. The students were provided with specially developed materials that helped them to write clearly and concisely. The students were given in class work and homework, all of which was evaluated, corrected and graded. As well, each participant in the course wrote a report on agriculture in their country and gave an oral presentation on their research topic, proposed or actual. These two components were evaluated and marked. The students had the opportunity to evaluate the course and me.

Considerable time was spent in preparation of course materials and in helping the students. Many of the students came to my office with materials for me to edit, such as drafts of papers, Power point presentations and applications for scholarships and internships. The participants in the course included undergraduates and graduates (masters and doctors); many were Japanese and some were from a wide variety of countries. A few of the participants are in the G30 program.

Seminars

I attended the following seminars most weeks from October 2010 to January 2011:

Laboratory of Comparative Agricultural Science (Professors Hirai, Akamatsu and Miyake): to listen to and comment on presentations by students Okamoto, Shirotani, Onoda and Ma, in Japanese. Also I attended the practice presentations for the masters theses of Onoda and Shirotani.

Laboratory of Agricultural Process Engineering (Professor Kondo), Graduate Seminar, weekly to listen to, and comment on, presentations by many master and doctor students, in English. Professor Lee and I were the independent commenters. We commented on the students' research, their presentation skills and their English abilities. Presenters were a mix of Japanese and foreign students.

Laboratory of Agricultural Process Engineering (Professor Kondo), Undergraduate Seminar, to listen to, and comment on, presentations by third year undergraduate students, in English. Procedure as for the Graduate Seminar. Students were entirely Japanese.

These seminars gave me the opportunity of getting to know all the students from the Laboratory of Comparative Agricultural Science and many students from the Laboratory of Agricultural Process Engineering. Some of these students then came to see me for help with their publications, presentations and other materials in English.

Lectures given

I gave the following lectures during my contract:

“Conservation of American Black Bears on the North Shore of Vancouver, Canada: Successful cooperative action amongst many stakeholders” (in English, with Japanese translation). Keynote speaker, Kumamori COP 10 International Symposium entitled “Conservation of forests for future generations of humans and bears.” Nagoya, October 16 2010.

“Do the bears in Japan have a bright future?” Presentation to the Laboratory of Comparative Agricultural Science, Kyoto University, November 4, 2010. The answer to the question is dependent on the location in Japan.

“Climate and bears in Japan.” Presentation to students and faculty in the Department of Applied Informatics, School of Policy Studies, Kwansei Gakuin University, Kobe-Sanda Campus, Sanda, Hyogo, November 30, 2010.

“Conservation of Biodiversity in Japan, Canada and Internationally.” Special lecture to the Faculty of Agriculture and the Graduate School of Agriculture, Kyoto University, February 15, 2011.

“Climate change and its impact on bears in Japan.” Presentation to the 26th Annual International Symposium on the Sea of Okhotsk and Sea Ice, Mombetsu, Hokkaido, February 22, 2011.

Paper published and paper in preparation

Fitz-Earle, Malcolm. 2011. Climate change and its impact on bears in Japan. Proceedings of the 26th Annual International Symposium on the Sea of Okhotsk and Sea Ice, pp 129 – 138.

Matsumura, K. and M. Fitz-Earle. 2011. Climate, forest conditions and their impacts on bears in Japan: application of informatics techniques (in preparation).

Research project with Professor Takeshi Miyake at Kyoto University

Analysis of temporal (2004 – 2010) and spatial (prefecture based) bear kill data, to elucidate the conservation status of black bears and brown bears in Japan.

Documents and presentations edited / reviewed for people from Kyoto University's Graduate School of Agriculture and Faculty of Agriculture,

Consultation with undergraduate student Tokunaga, regarding application for JSPS

Hope meeting 2011.

Edited application for JSPS meeting for graduate student Momin.

Edited application for IAESTE scholarship and internship for undergraduate student Tokunaga. Also assisted student in preparation for the interview. Follow up: student received scholarship and will intern in Switzerland for several months in 2011 / 2012.

Edited abstract for conference for graduate student Momin, entitled "Study on excitation and fluorescence spectrums of various citrus fruits for acquiring fluorescent images."

Edited two documents for undergraduate student Tokunaga.

Edited document for Matoh sensei on food and prayers.

Edited two chapters for Jung-Hwan Park's doctor thesis "Community structure and dynamics of algicidal bacteria in association with microalgal blooms in coastal environments."

Edited one chapter for Dayong Si's doctor thesis "Cloning and over-expression of ketopantoic acid reductase from *Stenotrophomonas maltophilia* and its application."

Edited one chapter for Yamada Yukiko's doctor thesis "Living wood fibers act as large-capacity "single use" starch storage in black locust *Robinia pseudoacacia*."

Reviewed report on thesis by 4th year student Tokunaga.

Reviewed abstract for a meeting of Japan Society of Bioscience, Biotechnology and Agrochemistry for Prof. Kita.

Reviewed and corrected presentations, by Koike (x2) , Cheng Xiao, Wang Tian (x2), Momin (x2), Diding, Mano, Yuan Ting (x2) for Agricontrol Meeting to be held at Kyoto University.

Edited Naito Hirotaka's abstract for Agricultural Science Biology meeting to be held

Kyoto University 2011.

Edited paper for Onoda san et al, “Empirical growth curve estimation using sigmoid sub-functions that adjust seasonal compensatory growth of Thoroughbred horses.”

Edited paper for Momin on detection of defects in citrus using fluorescence spectroscopy (several revisions).

Edited poster presentation for Nishimura for a meeting.

Edited application and statement of purpose for doctoral program of Cornell University for Funahashi.

Helped several students with their presentation for my class.

Edited abstract for scientific meeting for Tsubaki, entitled “Microwave-assisted conversion of marine biomass into useful chemicals.”

Momin was asked to review a paper. I read his review and suggested changes to the content and English.

Edited paper for Diding et al, entitled “A quantitative study for determination of glucose concentration using attenuated total reflectance tera hertz (ATR-Thz) spectroscopy.”

Edited paper for Momin et al, for a meeting in France in 2011, entitled “ Evaluation of the reasons why freshly-appearing citrus peel fluoresces during automatic inspection by fluorescent imaging technique.”

Edited cover letter and c.v. by Tokunaga for a company in Switzerland in respect to his internship.

Edited paper for Momin entitled “Study on excitation and fluorescence spectrums of Japanese citruses to construct machine vision systems for acquiring fluorescent images.”

Edited paper for Sakai Hiroki, formerly of the Graduate School of Agriculture, now in

the Graduate School of Biostudies, Kyoto University, entitled “Position detecting accuracy for asparagus spear harvesting by use of laser sensor.”

Documents edited, as Associate Editor of the journal Ursus (main publication of International Bear Research and Management Association)

Paper on bears and ants in Japan: Received reviews from 3 reviewers, combined reviews and submitted to authors; awaiting authors' re-write.

Paper on white-coloured brown bears of Kunashiri and Etorufu: Received reviews from 3 reviewers, combined reviews and submitted to authors; paper accepted for publication; publication Spring, 2011.

Documents edited - other

Wrote reference letters for former student for two departments at the University of Hawaii. Follow up: student was accepted.

Edited paper by Prof. K. Matsumura on climate change and its impact on supply and demand of rice, for Sustainability Science.

Meetings with Kyoto University people

I had many meetings with the following professors in the Graduate School of Agriculture, listed alphabetically: Akamatsu, Drew (Australia), Hirai, Hsieh (USA), Kondo, Lee (USA), Miyake, Pleschberger (Austria) and Solheim (Norway).

I had several meetings with Akio Takafuji, Emeritus Professor, Kyoto University, who was my host professor when I was at Kyoto University in 2007.

I had several meetings with the following professors in the Graduate School of Agriculture: Amano, Futai, Kitayama, Osakabe and Yano.

I had several meetings with a masters student, Fumio Tsukamoto regarding international aid projects, OISCA, and topics such as capacity building, human resources development and empowerment.

I had several meetings with doctor student, Risa Naito, Graduate School of Global Environmental Studies, to discuss her ecological studies on conservation of frogs in modified landscapes in Japan.

Meetings with other people

Members of the Japan Bear and Forest Society, to whom I am an advisor, and from whom I received data on bears killed in Japan from 2004 – 2010.

Professor K. Matsumura, Department of Applied Informatics, School of Policy Studies, Kwansei Gakuin University, to discuss our research project and a future paper on climate, vegetation, bears in Japan and related data bases and GIS mapping. Professor Matsumura was my host professor when I was at Kwansei Gakuin University in 2009 / 2010.

Professor Shunitz Tanaka, Graduate School of Environmental Science, Hokkaido University to discuss his research, my research and an invitation to me to participate in a future seminar to be held 2012 at Hokkaido University.

Professor Roger Hansell (University of Toronto) and Professor Biswajit Ganguly (Sao Paulo University, Brazil) visited the Graduate School of Agriculture on March 1 2011, where we discussed the Noble Institution for Environmental Peace and possible collaborations.

Symposia attended (chron.)

Kumamori COP 10 International Symposium entitled “Conservation of forests for future generations of humans and bears.” Nagoya, October 16 2010.

Japan Agricultural Systems Society, Kwansei Gakuin University, November 2010.

Agricontrol, Kyoto University, December 2010. Attended presentations by several students from Laboratory of Agricultural Process Engineering.

Lectures attended (chron.)

Yamamoto, Satoshi, doctor thesis public lecture on harvesting of ripe strawberries using robots, November 2010.

Montano, Javier, Presentation on Bolivia to the Faculty of Agriculture, sponsored by the International Office, November 2010.

Professor Drew, Griffith University, Brisbane, Australia: several lectures from his short course and his special lecture on tropical fruits to the Graduate School of Agriculture, December, 2010.

Profesor Solheim, Norway: lecture from his short course and his special lecture on vaccination of trees to the Graduate School of Agriculture, January, 2011.

Thant, Ya Min, doctor thesis public lecture on “Impact of cyclone Nargis on mangrove forests and people in the Ayerwady delta and its consequences to reforestation activity”, January 2011.

Kasim, Ma'ruf of the Faculty of Fishery and Marine Science, Haluoleo University, Indonesia. Lecture on establishment of community based marine protected areas for marine ecotourism in Eastern Indonesia, January 2011, held at Kyoto University.

Diana Bowler, JSPS Postdoctoral Fellow, Laboratory of Ecological Information, Research report, January 2011.

Professor Roger Hansell, University of Toronto and Professor Biswajit Ganguly, Sao Paulo University, Brazil, visited the Graduate School of Agriculture on March 1 2011, where they gave a seminar entitled ‘From Biological Control to Environmental Peace: the Essence of Sustainability.’

Field trips (chron.)

COP 10 Interactive fair for biodiversity, Nagoya, October 2010.

Oriental White Stork population restoration facility, Toyooka, Hyogo, October 2010.

Bear / wild boar traps, natural forest, Kutsuki, Shiga. November 2010.

Mountains near Hanase, Kyoto, November 2010.

Arida, Wakayama pref., Mikan sorting and grading facility, December 2010, sponsored by International Office, Graduate School of Agriculture.

Special research trip to Hokkaido, February 20 - 27 2011.

The primary purpose was to attend, and present a paper at, the 26th Annual International Symposium on the Sea of Okhotsk and Sea Ice, Mombetsu, Hokkaido, February 20 – 25, 2011. The symposium was excellent, and I learned much about the ecology of the Sea of Okhotsk and nearby regions. I had the opportunity to meet with several Japanese researchers in various fields, two researchers from Russia and a researcher from Korea. Since the sea ice moves around, there was no ice visible at Mombetsu so we drove to Shari and Abashiri to see, and walk on, the sea ice. En route from Mombetsu to Sapporo, we visited the excellent Asahiyama Zoo near Asahikawa, where I studied the behaviour of two very active polar bears in winter conditions, and one lethargic Hokkaido brown bear. I also studied several exotic species, including 4 species of penguins, a tiger and a lion. Also while in the Asahikawa area we visited the excellent Ainu exhibit at the Asahikawa City Museum. In Sapporo we met with Professor Shunitz Tanaka, Graduate School of Environmental Science, Hokkaido University to discuss his research, my research and an invitation to me to participate in a future seminar to be held 2012 at Hokkaido University. Finally before departing Chitose airport for Osaka, we visited the City Museum in Otaru. This trip was very worthwhile.

Special research trip to Okinawa, March 6 – 14 2011.

The primary purpose of this research trip was to study, and if possible observe, some of the endemic species of Okinawa, Ishigaki and Iriomote islands. The first and last days were travel days, so effectively I spent 3 full days on Iriomote and two days each on Okinawa and Ishigaki. I spent one day visiting the Nago area of Okinawa and a nearby small island Sosoko, and one day in Yanbaru, the northern most part of Okinawa island. Of especial interest in Yanbaru, was the Wildlife Research Centre that has been involved in protection of two endangered species: the (almost) flightless Okinawa rail (Yanbaru kuina) and the Okinawa woodpecker (Noguchi gera). When I visited the research centre ten years ago, the Okinawa rail was in very serious decline because of habitat loss, disturbance, road kill and predation by introduced mongooses and released feral cats. Great progress has been made in the last decade, and the recovery of Okinawa rails has to be considered a conservation success. The birds' habitat has been protected and the range has expanded. There has been an effective campaign to eliminate mongooses (one sign read 'Mongoose busters'), sterilize or euthanize feral cats, and enforce lower speed limits on the roads. The population of Okinawa rail is now about 1000, a ten fold increase from a decade ago. The story was not as positive for the Okinawa woodpecker that is dependent on old growth trees. The population is stable but dangerously low, because of the lack of suitable habitat. The situation is similar to that of other woodpeckers and owls from other parts of Japan. Near to the wildlife centre is a trail, through subtropical pristine forest, where I saw several Okinawa bird species and a clean river, leading to a waterfall.

Parts of Ishigaki Island and 90 % of Iriomote Island are subtropical rain forest that comprises Iriomote-Ishigaki National Park. Ishigaki Island has an airport, a perimeter road and roads that cross the island. It has been developed for tourism on the west and north, there are plantations of pineapples and sugar cane on the east and the main port is in the south. I drove around the island and stopped at several places to see the shore birds, Cinnamon bittern and Crested serpent eagle (the latter are restricted to the southern Ryuku islands). I also observed the impact of tourism and agriculture on the landscape.

The highlight of my trip to the Ryukyus was my visit to Iriomote. While en route by ferry from Ishigaki I saw some ocean birds (Shearwaters?) flying over the wave tops. Iriomote is one of the least developed islands in Japan. There is no airport, the roads do not go completely round the island and there are no roads crossing the island. Tourism and agriculture appear to be the only industries and the population is only

2800 people. As a result Iriomote is largely untouched and has been described as Japan's 'last frontier'. Once on Iriomote I went for a 3 hour hike in the north west of the island, where I saw a variety of local birds, including several Crested serpent eagles, many White-bodied waterhens, and an assortment of egrets and shore birds. On the second day I joined a group and a guide to cross the island from north to south. The trip begins with a boat ride through mangrove forests, up the Urauchigawa, where we saw many sub tropical trees in flower. The hike follows the Urauchigawa (Okinawa prefecture's longest river) through dense, slippery rainforest for about 6 hours, to the river's source. After the pass (290m) the trail then follows the other main river in Iriomote, the Nakamagawa, for about 3 hours. The forest trail goes through mature forest of oaks, *Ficus* and other tropical tree species. We saw several species of birds, an endemic frog species and the endemic Ryukyu fruit bat. Lower down on the last part of the trail we found the fresh scat (feces) of an Iriomote wild cat (endemic and also endangered, with only 100 individuals estimated). Though we didn't see the cat itself (people rarely do), we knew that it was nearby. For me this was the highlight of the entire Okinawa trip. While we were on the pass, we heard the first news of the Tohoku earthquake and tsunami, though it wasn't until later that we realized the magnitude of the disastrous events. My third day on Iriomote I rented a small scooter and drove south east to the Iriomote Wildlife Centre near Ohara. This centre has excellent displays and explanations related to Iriomote island's flora and fauna. The material on the Iriomote wild cat was especially informative in that it included material on the evolution and ecology of this rare animal. This concluded a most memorable research trip to sub-tropical Okinawa.

Other

I attended Watanabe, Mari's excellent Japanese language classes, most weeks from October 2010 – March 2011.

I attended several bonenkai in December 2010. In 2011 I attended the International Office, Graduate School of Agriculture's mochitsuki, promo filming and setsubun events.

I had a full and satisfying six months in the Graduate School of Agriculture, Kyoto University and I look forward to visiting again.

Acknowledgements

I wish to thank Professor Hirai for being my host during my stay and members of the Laboratory of Comparative Agricultural Science, Laboratory of Agricultural Process Engineering and the International Office, Graduate School of Agriculture. All these people, and many others, made me welcome. Thank you so much.

March 28 2011

Research Report
Visiting Professor
Roderick Drew
October 1, 2010~December 31, 2010
Laboratory of Pomology

Visiting Professor: Professor Roderick Drew

Period: 1st October 2010 – 31st December 2010

Laboratory: Laboratory of Pomology

Host professor: Professor Keizo Yonemori

I worked at Kyoto University as a visiting Professor for 3 months on invitation from the Faculty of Agriculture. Firstly, I would like to thank the Faculty of Agriculture at Kyoto University for the opportunity to come as a visiting Professor to Kyoto University. It has been a very rewarding experience and has led to important collaboration in both research and other mutual areas of interest. The work involved research on tissue culture of fruit crops, molecular biology of astringency in persimmon and virus resistance in papaya, the presentation of lectures on tropical fruits, and collaboration on two major horticultural congresses to be held in Japan and Australia. The visit followed a major collaborative research project between scientists in Australia and Kyoto University.

Collaboration between me and Professor Yonemori and other staff at the Laboratory for Pomology at Kyoto University before and during the visit to Kyoto University have included research on tissue culture of fruit crops. I research in vitro culture on tropical and sub-tropical fruit species and specialize on papaya. Professor Yonemori researches temperate and tropical fruit species and specialises in persimmon. Both researchers work on mango and mangosteen in addition to their research on other species. Research on in vitro culture has principles and protocols in common to temperate and tropical species. A problem that is often encountered with culture of papaya and other recalcitrant tropical fruit species is maintenance of proliferating cultures with time, and inability to subculture indefinitely. Another consequence of repeated subculture on Plant Growth Regulators is complete loss of apical dominance, resulting in short bushy shoots that are difficult to root. A multiplication technique based on subculture of nodal sections from apically dominant shoots, and rooting

of micro-cuttings derived from these axillary shoots was devised to overcome these problems. Similarly, prolonged exposure to auxins causes stunting and thickening of roots, low rooting percentages, poor shoot quality and consequent loss of plants at the acclimatization stage. The most critical factor in producing high percentages of good quality roots that are conducive to acclimatization, is optimal duration of exposure to auxin for root initiation. Auxin is essential for root initiation however it can be inhibitory to root growth. Thus the optimum duration of exposure to auxin has to be determined and this had led to successful in vitro protocols for rooting of papaya and mango, and will have application to other recalcitrant species. We discussed in detail these issues of plant tissue culture and their effects on persimmon and other tropical fruits during my stay in Kyoto University with Professor Keizo Yonemori.

During the time in Kyoto, I and Yonemori also had detailed discussions on molecular biology and control of astringency in persimmon and disease resistance in papaya. The genetic control of these two traits are similar at the molecular level. Persimmon cultivars are classified into four types depending on the nature of astringency loss in the fruits, i.e., pollination constant astringent (PCA), pollination constant non-astringent (PCNA), pollination variant astringent (PVA), and pollination variant non-astringent (PVNA) (Yonemori et al., 2000). The PCNA type is very important in breeding projects for fruit production as it loses its astringency on ripening. The allelotype of PCNA/non-PCNA is controlled by a single locus; however PCNA is a qualitative trait. In *Vasconcellea* species, that are wild relatives of papaya, resistance to papaya ringspot virus (PRSV) is controlled by a single dominant gene however susceptible plants show a large variation in severity of symptoms showing multi-genes are effecting virus susceptibility. Thus the multi gene effects and single gene control of astringency in persimmons and PRSV resistance in papaya are similar at the molecular level. Professor Yonemori and I have separately developed molecular markers for these respective traits and commenced sequencing genes that appear to control them. This mutual discussion and exchange of hypotheses and procedures to identify genes that control these traits at the molecular level have been valuable and should facilitate our research and collaboration in the future.

While in Kyoto, I gave a series of lectures on “Biotechnology, Biodiversity and Conservation of Tropical Fruit Species”. These lectures were attended by staff, graduate students and undergraduate students. Some graduate students enrolled in this subject to obtain credit as a unit of “Comparative Agricultural Studies 5”. The course of lectures gave an

overview of the importance and distribution of tropical fruits, worldwide. It covered the wide diversity of tropical fruits including the diversity of tropical fruits and their wild relatives in Australian rainforests. Lectures were given on biotechnology, including in vitro culture of major and minor tropical fruits using *Carica papaya* as a model crop. The course covered biotechnology of other major crops: banana, pineapple and mango; followed by a lecture on biotechnology and in vitro culture of minor tropical fruit species. A lecture was presented on the current world status on conservation of plant species in general and tropical fruit species in particular. This was followed by a presentation on the applications of biotechnology to conservation of tropical fruit species. Professor Drew also presented a special lecture at Kyoto University entitled “In vitro culture and biotechnology of tropical horticultural species”.

The other important collaboration, while I have been at Kyoto University is working towards the 2nd Asian Horticulture Congress and the 29th International Horticulture Congress. I, Professor Keizo Yonemori and Associate Professor Ryutaro Tao have been working together with Professor Kanahama to support and promote these two congresses. Professor Koki Kanahama is a Professor of the Graduate School of Agricultural Science, Tohoku University in Japan; and, is President of JSHS and Convener of the 2nd Asian Horticultural Congress. I am co-President of the 29th International Horticulture Congress (IHC2014). The 2nd Asian Horticulture Congress (AHC2012) will be held in Tsukuba from 27-30 March 2012; and, IHC2014 in Brisbane from 17-24 August 2014. The theme of AHC2012 is “A New Era of Horticultural Research in Asia” and will comprise scientific sessions on Fruit Trees, Vegetables, Ornamental Plants, Protected Horticulture and Environmental Control, Biotechnology and Genetics and Postharvest Physiology and Technology. The aim of this congress is to provide and exchange information about recent progress in Asian horticultural research. The theme for IHC2014 is “Horticulture – Sustaining Lives, Livelihoods and Landscapes” and will comprise sub-themes on Tropical Horticulture, Horticulture for Human Health and Wellbeing, Sustaining Landscapes, and Quality of Horticultural Products. The organising committees of both congresses are working together to ensure both congresses are outstanding events that many delegates will enjoy, and experience the fascinating cultures of the Asia/Pacific region and its world class horticulture.

In addition to the above issues, my visiting professorship to Kyoto University followed a collaborative research project on molecular markers in mango entitled “Utilization

of the mango germplasm collection for the development of new valuable strains” that was funded by Japan Society for the Promotion of Science (JSPS) between 2008 and 2009 as a bilateral research project between Japan and Australia. The project was lead by Dr. Chitose Honsho of the Laboratory of Pomology, Faculty of Agriculture, University of Miyazaki and Professor Keizo Yonemori was a collaborative researcher for this project. I was the project leader on the Australia side. A second project has been approved by JSPS and this collaboration will continue in 2011. My visit to Kyoto University has facilitated research and discussions on these collaborative projects with Professor Keizo Yonemori and Dr Chitose Honsho. I visited Dr Honsho at the University of Miyazaki from 3rd to 5th November. During the time at Miyazaki I observed and had discussions on tissue culture of mango and presented a lecture on “Biotechnology of Carica papaya”.

In conclusion, my time working as a visiting Professor at the Faculty of Agriculture in Kyoto University was very successful and rewarding. In addition, the benefits of the visit will be continued collaboration between Griffith University and Kyoto University. I wish to express my sincere gratitude to Professor Endo and other staff in the Faculty for the opportunity to come to the Kyoto University. I thank Professor Keizo Yonemori and Associate Professor Ryutaro Tao for their friendship and fruitful collaboration while I worked in the Laboratory of Pomology. I also thank Kirie Wantanabe and the staff of the International Centre of the Faculty of Agriculture for their kindness and help to facilitate my visit both before I came to Kyoto and during my stay.

A handwritten signature in cursive script, appearing to read "R. A. Drew".

Professor Roderick Drew

Professor Keizo Yonemori

Soil, water and sustainable agriculture in Southeast Asia
Visiting Professor
Supamard Panichsakpatana
April 1, 2010~September 30, 2010
Laboratory of Tropical Agriculture

It was recently estimated that about 30% of the global land surface is subject to desertification. Soil degradation has been the main problem in Southeast Asia for many decades. In Thailand, from 1961 to 1995 farmland became double in area from 20.1% to 41.3%. In contrast, forest land in the same country over the same period decreased from 50.1% to 25.6%. There are two reasons behind this phenomenon: one is deforestation due to rapid growth of the agricultural sector; the other and principal reason is that the land has become unfertile due to misuse resulting in significant soil loss.

Not only has there been physical loss but the soil has degraded in quality. Organic matter is the main source of the nitrogen supply for the plant, but today one can hardly find soil with organic matter over 2% in Thailand. This is representative of Southeast Asian soils in general, where problem soils are more than 50% of the total land area.

This situation affects yield performance of the soil. Farmers usually put less priority for input of chemical fertilizer for crop production as long as the soil can produce yield. With this practice through Southeast Asia, the land has become unfertile in less than a decade.

Looking at water and water quality, according to the UN World Water Development Report no.2, food production has greatly increased over the past 50 years. Yet 13% of the global population, around 850 million people mostly in rural areas, still do not have enough food to eat. And the world will need 55% more food by the year 2030.

Water, is the key factor for producing food. On the global scale, there is still plenty of fresh water, but still about 1.1 billion people do not have access to an adequate supply of safe drinking water. In Southeast Asia, food security depends much on the sustainability

of the water supply. Water quality is another issue. The water quality is declining in most regions. The problem is obvious in urban and peri-urban areas, where half of the world population is now living in. It is estimated that by the year 2030 the population of the urban areas will have risen nearly two-thirds and about 40 to 50% of the population in developing countries will live in towns and cities according to the report of Japan Vision 2050.

Thachin River, which is around 50 kilometers away from Bangkok, was rated the most polluted river in Thailand from the year 2000 to 2002. This was caused by the wastewater from pig farms and industrial factories. Chiang Mai is now becoming the place of the most serious conditions of municipal waste and wastewater.

As of the global warming issue, droughts and floods are now quite common in Southeast Asia. With global warming, floods and rising sea level will become common in Bangladesh, China, India, Thailand and Vietnam. This phenomenon will cause major changes in cropping systems in many countries. For example, in Thailand we expect that half of the corn belt and rice bowl areas may be changing to energy crops or high valued crops in the near future.

Some rivers may become sources of international conflict. The Mekong River, for example, besides the threat with decreased biodiversity of aquatic animals, scarcity of water in the downstream countries always occur especially during summer season. If these are the indicators of sustainability, soil and water quality in Southeast Asia are the serious major problems: they are the real factors of change affecting cropping patterns in Southeast Asia in the near future with the added factor of an energy crisis.

How about sustainable agriculture? To address this we have to discuss in this area about soil and water quality management and the recycling of wastes. The question is, do we have a real blueprint for sustainable agriculture in Southeast Asia? Thailand is fortunate to have a king who initiated some fundamental ideas and theories for real sustainability and sustainable agriculture in his country. In his royal address on 9th May 1997 and on

14th July 1998 H.M. the King mentioned, “....Soil conservation should be done simultaneously with forest conservation and rehabilitation. Soil conservation by using vetiver must be expanded widely in order to conserve and prevent the loss of top soil.... The area with productive soil in Thailand is diminishing: that is why we have to look for areas having bad soil and improve them to become productive.... Vetiver will retain water and nutrients coming from the mountain. Mountains are the source of water and plant nutrients; there is no need to bring in the nutrients from elsewhere. Land development is then easy, with the help from irrigation and forest....”

The king also initiated life-long education in school, which has three characteristics: one is ethical and moral training; second is agricultural knowledge for living; and third is the opportunity for outstanding students to continue their study to fulfill their potential. There are courses on agricultural knowledge in the schools providing basic information to Thai youngsters and technical knowledge for sustainable agriculture and lifelong education.

From his lifelong experience in every inch of land in his country, His majesty, the king, also proposed a theory that is called the Royal New Theory for overcoming the problems of risk and uncertainty in agriculture.

There are three stages in the theory. The first stage concerns self-reliance and sustainability. Sustainability is based on risk and resource management by dividing the use of the farmer's land as 30% paddy, 30% pond and 10% housing including animal raising and home gardening. The second stage is concerned more with capability building at the community scale to be independent through self-help civic programs such as rural health care, rural enterprise, education, saving fund and so on. The final stage is for the community to provide incentives for the external private sector to join and form partnerships in trading activities and logistics so that both parties can become more interdependent.

If blueprint for sustainable agriculture in Southeast Asia is discussed, the following topics should be incorporated and more detail of studies will be needed:-

- The “New Theory” of HM King of Thailand
- Urban/peri-urban agriculture with waste recycling
- Recycling of waste & wastewater for producing food and energy
- Precision agriculture
- Sustainable development of the Great Mekong Sub-region

I expect that with strong collaboration among renowned universities in Thailand and Japan, sustainability science will emerge. Maybe we will design a new theory such as urban/peri-urban agriculture with waste recycling and recycling of wastewater for producing food. Sustainability in the study areas as shown above will shed some light of hope on agriculture and become the first stage of real sustainable development in Southeast Asia.