

**ISSAAS INTERNATIONAL CONGRESS 2009  
NOONG NOCH BOTANICAL GARDEN AND RESORT, PATTAYA,  
CHONBURI, THAILAND, JANUARY 11-15, 2010**

***AGRICULTURE FOR BETTER LIVING AND GLOBAL ECONOMY***

**ABSTRACTS OF PAPERS - KEYNOTE ADDRESS**

**Agriculture for Better Living and Improved Global Economy  
Paiboon Ponsuwanna**

For many years, Thailand has been recognized as the leading exporter of various agricultural products, ranging from fresh ingredients to processed canned foods, in the world market. Exportation statistics from the World Trade Organization indicate that Thailand is ranked at 13th in the world, with 2.4 percent of the market share. There are over 9,000 food-processing plants and manufacturers in the country which export agricultural products worldwide including the European Union, Japan, and Australia. These products can range from rice, shrimp, chicken to tuna and many more. As one of the most important nations that export agricultural products, Thailand needs to consider well the issues of Food Safety and Food Security. At present, food safety has become the center of attention among developed nations. As such, the demand for higher levels of food safety has led to the implementation of regulatory programs that address more types of safety-related attributes. These regulatory programs are intended to improve public health by controlling the quality of the domestic food supply and the increasing flow of imported food products from countries around the world. For that reason food processing schemes namely the Traceability and Cold Chain Management should be developed and improved. While traceability refers to the capability to trace goods along distribution chain on a batch number or series number basis and improvement of supply-side management, cold chain management is a temperature-controlled supply chain with uninterrupted series of storage and distribution activities that can maintain a given temperature range. Cold Chain Management is used to help extend and ensure the shelf life of products such as fresh agricultural produce and processed foods. We all know that the demand for food is ever increasing nowadays. Therefore, it is necessary to develop production capacity to meet with the needs of the world population. Also, it is most likely that there will be over 9,000 million people in the next 20-30 years. Consequently, sufficient raw materials for food production should be readily prepared in order to avoid food shortage

**Agriculture for Better Living and Global Economy: Thailand  
Peeradet Tongumpai  
Deputy Director, The Thailand Research Fund  
E-mail: peeradet@trf.or.th**

Thailand possesses a very fertile environment with population of 63 million and growth rate is low due to a very effective birth control measure. Average life span of the Thai is around 72 years which leads towards the ageing society. Special foods for the aged are highly needed. Thailand policy is emphasized on food which may bring the country toward a world major production site and is trying to become a kitchen of the world. Nevertheless the reduction of fertile land which is suitable for agriculture and the increasing aged farmers are major concerns which may determine the success of such policy. Functional foods and herbs may play a significant impact especially for the niche market. The need for food in the near future is increasing in both quantity and quality. Food safety is a concern of many countries, thus research and development should be seriously considered. Value-added products from agricultural produce are significantly increasing through extensive research. Such examples are the extraction of beta carotene and vitamin E from palm oil, capsaicin from chili pepper, and sericin from silk which are used in the cosmetic and food industry. The value of these extracts is substantially high as compare to the primary products themselves. These products lead to a drastic increase in the utilization of the primary produce which in turn influence the price.

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**AGRICULTURE FOR BETTER LIVING AND GLOBAL ECONOMY**

**ABSTRACTS OF PAPERS—SCIENTIFIC SESSIONS**

**Novel Bioproduct of Bacterial Antagonist Amended in Growing Soil Promotes Plant Growth and Induces Plant Resistance Against Diseases of Rice**

*Supot Kasem and Sutruedee Prathuangwong*

*Department of Plant Pathology, Faculty of Agriculture, Kasetsart University,  
Bangkok 10900 Thailand*

Two-bacterial antagonist strains, *Bacillus* sp. D10 from rice rhizosphere obtained in this study and the commercial strain *Pseudomonas fluorescens* SP007s that have proven ability to suppress rice diseases in the paddy, were subjected to cross linked matrix with several inexpensive organic carriers for development of a novel bioproduct for soil improvement. These 2 strains survived in the selected best product (dry cow dung:rice bran chaff:rice husk ash dust:coir dust: decomposed plant matter with 1:1:4:4:10 by volume) at  $2 \times 10^{13}$  cfu/ml for 120-day at room temperature. Greenhouse experiments with either SP007s or D10 products amended in grown soil at ratio 1:10 by volume significantly enhanced plant growth with increased seed germination and seedling vigor including stem high, root length, fresh weight, and long leaf of rice ( $P=0.05$ ). When rice plant assays were employed with these strain products applied as single soil amendment (1:10 by volume) and combined with cell suspension by seed treatment ( $1 \times 10^4$  cfu/ml) and foliar spray ( $1 \times 10^8$  cfu/ml), the significant reduction of 2 diseases, sheath blight and leaf blight caused by *Rhizoctonia solani* and *Xanthomonas oryzae* pv. *oryzae* respectively were found in correlation with increase of defense-related enzymes including phenolic compound,  $\beta$ -1,3-glucanase, and peroxidase in rice leaves. This demonstrates that strains SP007s and D10 are in the efficient delivery system of either organic carrier or application fitness for enhance plant growth and biocontrol activity.

**Effect of Bio-factors against Potato Common Scab Disease in Vietnam**

*Dang Thi Dung<sup>1</sup>, H. Yoshida<sup>2</sup> and K. Suyama<sup>2</sup>*

*<sup>1</sup>Hanoi Agricultural University, Hanoi, Vietnam*

*<sup>2</sup>Tokyo University of Agriculture, Tokyo, Japan.*

Potato common scab is a serious disease that attack potato tuber during forming tuber stage to harvest. This disease affects not only potato production (if it occurs in early stage), but also on tuber quality. The study on potato common scab (*Streptomyces scabies*) and disease management has been reported by many researchers. However, the study on using *Trichoderma viride* and acid humic against potato common scab is still limited. This research aims to study the effect of *T. viride* and acid humic against potato scab in a field trial in Vietnam. The result shown that, *T. viride* and acid humic have good effect in controlling potato common scab on scab tuber and scab index. The experiment data in Dalat city shown that, scab tuber in control experiment was 89.2% in compare with 52.7% which tested with *T. viride* and 64.7% which tested with acid humic. And on scab index were 47.3% (in control experiment) comparing with 21.9% (tested with *T. viride*) and 24.9% (tested with acid humic) respectively) with similar results in Bacninh province. The percentage of tuber infested by common scab was 22.1% in control treatment in compare with 0% which tested with *T. viride* and 4.0% tested with acid humic. Scab severity also shown a positive result. It was 8.4% scab index in control treatment comparing with 0% and 1.1% on those tested with *T. viride* and acid humic respectively. For potato production, *T. viride* and acid humic have also good effect on treatments both in Dalat city and in Bacninh province. Potato plants tested with *T. viride* and with acid humic, gave higher production than control treatment. Thus, *T. viride* and acid humic can control potato common scab on tuber and have a direct impact on potato productivity.

**Safed Musli (*Chlorophytum borivillanum*) Tuber Emergence as Affected by**

**Exogenous Application of Humic and Gibberellic Acid**

*J J Nakasha, U R Sinniah\* and Puteh A.*

*Department of Crop Science, Faculty of Agriculture, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia E-mail: umarani@agri.upm.edu.com*

Safed musli, belonging to the liliaceae family, is an herbaceous plant which originates from India (Parmar *et al.*, 2007). Tuber germination of safed musli has been reported to be variable, requiring two to eight weeks to germinate, and this contributes to the heterogeneous growth of the crop. It is necessary to increase its germination uniformity as well as the time of germination in order to obtain an efficient production and management system. Various aspects of the crop propagation and management are currently being established under the Malaysian condition. Exogenous application of growth regulator is known to stimulate germination in order to achieve uniformity (Brocklehurst *et al.*, 1982). This study was therefore designed to assess the effects of exogenous application of gibberellic acid (GA3) and humic acid (HA) on the emergence of safed musli. The experiment was conducted at Universiti Putra Malaysia, Malaysia on 2009. Tubers were soaked for one hour in different concentrations of GA3 (10, 15 and 20 mg/L), HA (5, 10, and 15%), and distilled water (control). After one hour, tubers were sown in poly bags and replicated four times using randomized complete block design. Results showed that pretreatment is needed in order to obtain uniformity in growth, high germination percentage (GP) and better root and shoot development. Treatment with 20 mg/L GA and 15% HA were more superior to other treatments. However, in term of vigor index (VI), 20mg/L GA3 recorded the highest VI having the best shoot and root development in relation to GP. Prior to planting, safed musli tubers should be treated with exogenous GA3 at 20mg/L.

**Assessment of the Needs and Problems of Vegetable Farmers in Rizal: Basis for Policy Formulation and Design of a Functional Extension Program**

*Namerod F. Mateo, Rosalinda G. Brasos, Elvira S. Abines, Amabel P. Cruz, Alvin I. Marquez  
College of Agriculture, University of Rizal System Main Campus, Tanay, Rizal, Philippines  
E-mail: nfmateo@yahoo.com Community Empowerment*

This study was conducted to generate information on the farmers' problems associated with marketing, support services, and other issues and concerns as well as on farmer training needs in vegetable production and postharvest technology hopefully to serve as basis for the formulation and design of a functional extension program. Survey questionnaire was obtained to collect data from vegetable farmers. The municipal/city agriculturists were interviewed as in depth case to full fill more information. Problems encountered by most of the farmers associated to marketing of products including low farm gate price, no established market channels, limited access to information on supply and demand and distribution of vegetables, high competition of vegetables produced within the province and those from other provinces/regions while those attributed to support services were focused on credit, trainings, farms tools and equipment, irrigation system, poor farm to market roads, storage facilities, source of good seeds, and high cost of inputs. Polluted irrigation water, high cost of labor, and inadequate reading materials were limiting factors for successful vegetable production and non-membership to farmers' organization constraints farmers' access to government support. Significant number of the respondents expressed their need to be trained on the different aspects of vegetable production such as planting and cultivation, fertilizer usage, pest control and management and also harvest and postharvest technology. Addressing these problems and training needs through the formulation of a sensible policy and design of a functional extension program are deemed necessary to improve vegetable farmers' productivity in the province.

**The Biology and Development of the Tachinid fly *Zenillia Dolosa* (Meigen) (Diptera: Tachinidae) in Host *Mythimna Separata* (Walker)**

*Ho Thi Thu Giang<sup>1</sup> and Satoshi Nakamura<sup>2</sup>*

*<sup>1</sup> Ha noi University of Agriculture, Ha Noi, Viet Nam*

*<sup>2</sup> Japan International Research Center for Agricultural Sciences, Tsukuba 305-8686, Japan Email: httgiangnh@hua.edu.vn*

All tachinids are endo-parasitoids and important natural enemies of many lepidopteran spp. They have been used in many applied biological control programs worldwide. *Zenillia dolosa* Meigen (Diptera: Tachinidae) is an ovolarviparous parasitoid, which lays incubated microtype eggs on the food plants of many lepidopteran pest species. This fly is a widespread gregarious parasitoid occurring throughout other Asian and European countries. Life history of this parasitoid was investigated in the laboratory on the host *Mythimna separata* (Lepidoptera: Noctuidae). Total developmental time from oviposition to adult emergence decreased as temperature increased from 15 to 30°C. Fecundity was highest at 20°C (1580.6 ± 93.40 eggs per female) but was reduced at 30°C (892.7 ± 146.2 eggs per female). Parasitoids successfully developed in 4th to 6th instar host larvae; host instar at time of parasitization significantly influenced the development of the immature parasitoid which was shorter as host instar increased. Both host mortality and parasitoid puparial weight were affected by the number of parasitoid eggs ingested per host: host mortality increased and puparial weight decreased when clutch size increased from 1 to 10 eggs per host.

**Performance of Okra (*Abelmoschus esculentus* (L) Moench) in Response to Different Kinds of Organic Fertilizers**

*Namerod F Mateo, Alexander M Abrazado, Amabel P Cruz*  
*College of Agriculture, University of Rizal System, Main Campus, Tanay, Philippines*  
*E-mail: nfmateo@yahoo.com*

This study sought to determine the effects of the different kinds of organic fertilizers on the growth and yield performance of okra (*Abelmoschus esculentus* (L) Moench) variety smooth green using the recommended rate of application of 9 tons/hectare. The experiment was laid out in RCBD using six treatments: T1 = Control (no fertilizer); T2 = Inorganic Fertilizer (IF); T3 = Cow manure based organic fertilizer (CMBOF); T4 = Chicken Manure Based Organic Fertilizer (ChMBOF); T5 = Bioplus Organic Fertilizer (BPOF); T6 = Vermi Compost Organic Fertilizer (VCOF). Each plot was replicated three times. Experimentation was limited to one trial. The okra plants fertilized with organic fertilizers were smaller than those plants applied with inorganic fertilizers 47 days after planting, however, those plants applied with VCOF have comparable height with those plants fertilized with IF at the end of the experimentation. Plants with CMBOF, ChMBOF, and BPOF have the same height and comparable with the control plants. The application of organic and inorganic fertilizers has no influence on the performance of okra in terms of leaf length, stem diameter, days to first harvest, fruit length, basal fruit diameter, and number of fruits per plant. Those plants applied with different organic fertilizers produced the same weight of fruits, significantly heavier than the fruits harvested from the control and comparable with those plants applied with IF. Hence, the application of organic fertilizer could be a good alternative to inorganic fertilizer in okra production.

**Influence of Planting Hole Size on the Yield of Yam Varieties**

*Namerod F Mateo and Alexander M Abrazado*  
*College of Agriculture, University of Rizal System Main Campus, Tanay, Rizal,*  
*Philippines E-mail: nfmateo@yahoo.com*

This presentation seeks to determine the effects of different planting hole sizes on the yield performance of the different yam varieties. Data were generated through field experimentation utilizing RCBD, 3 x 3 factorial arrangements with 3 replications. Three yam varieties and three sizes of planting holes comprised the treatment combinations during the growing season in May 2005 - January 2006. The results showed that the yielding capability of the three varieties differs significantly. Ubeng-ube (Balolong) variety yielded 28.99 t/ha while Ubeng-ube (Mindoro) variety produced only 13.72 t/ha. Kinampay variety has the lowest yield with 8.06 t/ha. The high yielding ability of Ubeng-ube (Balolong) variety could be attributed to its characteristic of developing bigger and more than one tuber per plant. The size of planting hole significantly influenced the performance of the yam plants. The yield is significantly increased by 34.98% when planted in a 3.375 cu.ft. hole. A nonsignificant interaction between variety and planting hole size was observed, indicating that the varietal difference was not significantly affected by the planting hole size and that the planting hole

size effect did not differ significantly with the yam varieties tested considering yield (t/ha) and number of tuber/hill as predictors. Ubeng-ube (Balolong) variety is more profitable to produce than the other varieties tested especially when it is planted in a 3.375 cu. ft. hole.

**Germplasm Collection, Characterization and Evaluation of Chickpea (*Cicer arietinum*) Varieties under Highland and Lowland conditions under Benguet Conditions**

*F. R. Gonzales, F. G. Bawang, I. C. Gonzales, P. Gaur\* and M. Mula\**

*Benguet State University, La Trinidad, Benguet-2601*

*\*Icrisat, Patancheru, Andhra Pradesh, India*

Chickpea (*Cicer arietinum* L.) is a newly introduced crop in the Philippines particularly in the highland condition. Its' aim is to introduce, evaluate and promote varieties intended for processing. Thirty chickpea varieties from ICRISAT was collected and evaluated under highland with an elevation of 1,245 masl and lowland with an elevation of 640 masl. The different varieties were characterized and evaluated based on the IBPGR descriptors' list for chickpea. Characters evaluated were on vegetative growth such as growth habit, leaf size, leaf area, number of branches, plant canopy height and width, flower duration, biological yield, grain yield and incidence of pest and diseases. Six varieties of desi-type and kabuli type were selected based on vegetative growth, yield, seed yield and resistance to pest and diseases. Varieties selected for the highland conditions were ICCV 93952, ICCV 93954, ICCV 06102, ICCV 92311, ICCV 95334 and ICCV 07307. Varieties selected for the lowland conditions were ICCV 10, ICCV 93952, ICCV 07114, ICCV 92311, ICCV 95332 and ICCV 07307. Pest and diseases seen were; pod borer (*Helicoverpa armigera*), ascochyta blight, dry root rot, alternaria leaf blight, fusarium wilt, stunt and alfalfa mosaic virus. ICCV 93954, a desi-type variety was found promising for flour processing due to its high milling recovery of 80%. Chickpea flour was analyzed and showed higher protein, dietary fiber, iron and fat as compared to wheat flour. Chickpea cookies and puto was developed by substituting chickpea flour with wheat flour using three formulations; 1:1 ratio, 1:2 ratio and 1:3 ratio. Results showed no significant differences among the rations, however 1:2 (1 cup chickpea and 2 cups wheat flour) ration gave the highest acceptability rating of 6.84.

**Inheritance of Important Traits in Sweet Corn Single-cross Hybrid**

*Pedram Kashiani and Ghizan Saleh*

*Department of Crop Science, Faculty of Agriculture,*

*Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia*

*pedram\_kashiani@yahoo.com, ghizan@agri.upm.edu.my*

Sweet corn (*Zea mays* L. *saccharata*) is an important crop in Malaysia, and its production has continuously increased, mainly due to its high return. Single-cross Hybrid 969, an imported hybrid variety, has performed well and is widely planted throughout the country, proving it desirable as a source of inbred lines. Previous studies have generally indicated that complete dominance is important in the genetic control of yield traits in corn hybrids. Hence, many commercial single-cross hybrids which showed high inbreeding depression at early generations of inbreeding were found not suitable to be used as germplasm sources (Basra, 2002). Objectives of this study were to evaluate performance of the F1 and F2 populations of Hybrid 969, to determine inbreeding depression in the F2 population, to estimate broadsense heritability of the traits measured in the populations, and to predict gain from selection of the traits measured on the populations. Results show that the F2 population had all measurements significantly lower than the F1 population, except for days to tasseling and silking where the reverse was true. Estimates of inbreeding depression were highest for dehusked and husked fresh yield (-61.1% and - 54.7%, respectively). This has resulted from increased homozygosity of the recessive alleles responsible for the control of these characters (as a result of selfing), the effects of which were masked or partly masked by dominant alleles in the heterozygous form in the F1 population. Days to tasseling was found to be the most heritable trait, followed by dehusked and husked ear diameter (91.0%, 81.5% and 74.4%, respectively). This indicates that these traits can be improved more rapidly through selection at early generations of segregation than those with lower heritability estimates (Bonos *et al.*, 2003). Results also indicate that a substantial gain from selection of the top 20% of the population can be expected when phenotypic selection is used.

In conclusion, significant differences in performance between the F1 and F2 populations indicate high inbreeding depression after one generation of selfing in the sweet corn Hybrid 969, although there were individuals in the F2 population that showed highly desirable performance. Hence selection of these desirable segregants with the character of interest could be exploited for development of inbred lines derived from Hybrid 969.

#### **Multiplication Rate of Selected Potato Entries to Rapid Multiplication Technique**

*Kiswa, C. G. and D. K. Simongo*

*Nprcrtc-Bsu, La Trinidad, Benguet, Philippines*

*Email: dsimongo@yahoo.com.ph, ckiswa@yahoo.com*

Selected eight potato entries were evaluated to their performance in rapid multiplication technique. The entries 2.21.6.2, 380241.17 and the check variety Igorota had the most vigorous growth among the eight entries. Furthermore, the Igorota significantly gave the highest number of stem cuttings produced in three months period with 152 stem cuttings/25 mother plants. This was followed by the entries 676070 and 380241.17 with 100 and 97 stem cuttings respectively. Other entries (2.21.6.2, 5.19.2.2, 573275, Granola and Ganza) produced stem cuttings from 45 to 86 stem cuttings in three months period. Significant differences was obtained on the tuber yield of the different entries under greenhouse. The entries 5.19.2.2 and 676070 had the highest number of tubers with 30 and 27 per m<sup>2</sup> respectively. The lowest were from entries Igorota, 573275 and 2.21.6.2 with tubers ranging from 18 to 23 pieces per m<sup>2</sup>.

#### **Cassava Disease Detection by Fractal Analysis of Digital Images**

*Kittipong Powbunthorn<sup>1</sup>, Wanrat Abdullakasim<sup>1\*</sup> and Jintana Unartngam<sup>2</sup>*

*<sup>1</sup>Department of Agricultural Engineering, Kasetsart University,*

*<sup>2</sup>Department of Plant Pathology, Kasetsart University, Nakhon Pathom 73140 Thailand.*

*\*Contact details, E-mail: fengwra@ku.ac.th*

A crop monitoring system that provides early detection of plant disease is indispensable for future crop protection. Diseased plants are usually observable from visual symptoms and hence suggest the possibility of damaged plants identification using machine vision [1]. This requires a quantity which is capable of characterizing atypical appearances of the diseased plant organs. This study evaluated the validity of some fractal parameters in plant disease identification. Colored images of normal and diseased cassava leaves were captured with a digital camera at a horizontal by vertical resolution of 1600 by 1200 pixels. The original color images were grayscaled and thresholded to detect their edge outlines. These were converted to binary images prior to analysis. Fractal analyses based on box-counting algorithm were performed for individual image to estimate fractal dimensions and lacunarities using FracLac v.2.4e for ImageJ. The software functioned in placing non-overlapping grids over the image by varying the grid size from 2 to 540 pixels. The number of boxes required to cover foreground pixels as well as the number of pixels in each box were counted. Two types of fractal dimensions i.e., standard box-count dimension ( $D_{std}$ ), and minimum cover box-count dimension ( $D_{mc}$ ) were calculated. The slope corrected  $D_{std}$  and  $D_{mc}$  which eliminate the effect of plateau slope were also observed. The lacunarities considered includes prefactor lacunarity ( $\Lambda_{pf}$ ) derived both from box counts and pixel masses, average lacunarity ( $\Lambda_{avg}$ ) and binned probability density lacunarity ( $\Lambda_{bpd}$ ) obtained both from foreground masses only, and foreground plus empty boxes. The results showed that  $D_{std}$  and  $D_{mc}$  of diseased leaves images were significantly greater than those of normal leaves which were similar to sloped corrected  $D_{std}$  and  $D_{mc}$ . This indicates that the diseased regions appeared on the cassava leaves had introduced a marked complexity to the leaves profiles. The lacunarities of diseased leaves were found smaller than those of typical leaves for all cases. Nevertheless, these differences were not statistically significant except for the  $\Lambda_{avg}$  obtained from foreground plus empty boxes. This implies that alteration in spatial heterogeneity due to the diseased regions, under the present condition, was not obvious. The fractal dimensions are therefore of promising parameters to make the diseased plants identifiable.

#### **Effect of Salted Hide Moisture on Contamination of Halophilic and Halotolerant Bacteria**

*Siriporn Vihokto<sup>1</sup>, Pakapun Skunmun<sup>2</sup> and Surachai Piumkla<sup>3</sup>*

*<sup>1</sup> Central Laboratory and Green House Complex, Kasetsart University Research and*

*Development Institute at Kamphaeng Saen, Kasetsart University, Nakhonpathom, Thailand. <sup>2</sup> Buffalo and Beef Production R&D Center, Suwanvajokkasikit Animal R&D Institute (SARDI), Kasetsart University, Nakhonpathom, Thailand. <sup>3</sup> Animal Produce R&D Center, SARDI, Kasetsart University, Nakhonpathom, Thailand.*

Without any preservation, fresh hide is rapidly destroyed by microorganism. Hide salting prolongs hide quality from microorganism contamination. However, halophilic and halotolerant bacteria growing, in salty condition, can spoil the cured hide. In this condition, hide moisture content is an important factor for bacterial growth. The easiest and cheapest method to reduce hide moisture is air drying. In this experiment, the effect of salted hide moisture on halophilic and halotolerant bacteria number was studied. Salt at the amount of 25% green hide weight was used for drum salting, while that of 40% for hide salting in cement pond or traditional one. Cured hide pieces were taken for moisture determination and halophilic and halotolerant bacteria count every week for six weeks. The bacteria peaked at the first week after salting and then decreased in relation to the moisture content. The bacteria were limited at low level as moisture was about or <30 %. The results suggest that the hide moisture content can be an indicator for low halophilic and halotolerant bacteria contamination.

### **Influence of Fluidization Drying and Tempering Time on Quality of High-amylose Brown Rice**

*Donludee Jaisut<sup>1</sup>, and Somchart Soponronnarit<sup>2</sup>*

*<sup>1</sup>Department of Farm Mechanics, Kasetsart University, Bangkok 10900, Thailand.*

*<sup>2</sup>School of Energy, Environment and Materials, King Mongkut's University of Technology Thonburi, 126 Pracha u-tid Road, Bangkok 10140, Thailand.*

The main objective of this work was to study the influence of fluidization drying using air at temperature of 130 and 150 °C on various parameters of Suphanburi 1 local *Indica* rice. The moisture diffusivity of paddy was determined. Fresh paddy was dried from initial moisture contents of 22 and 25% w.b. to 18-19% w.b. It was then tempered for different periods before ventilated by the ambient temperature at the last stage. The experimental results indicated that the initial moisture content and drying temperature influenced on drying time. The longer tempering time and higher drying temperature could improve the percentage of head rice yield whilst the whiteness decreased. Starch characteristics were studied by Rapid Visco Analyser (RVA), x-ray diffraction, and differential scanning calorimetry (DSC). Pasting properties were effected by the initial moisture content and drying temperature. The pasting temperature and setback were increased when high initial moisture content paddy was dried by high temperature, but peak viscosity and final viscosity decreased. All starch thermal treated samples displayed the typical A, B, and V type x-ray diffraction pattern whereas the shade dried samples showed only A type x-ray diffraction pattern. The apparent crystallinity determined by x-ray diffraction was reduced with increasing initial moisture content and drying temperature. The degree of gelatinization was increased with the higher initial moisture content, drying temperature and tempering time.

### **Postharvest Loss Assessment of Potato Entries Grown Across Locations in the Philippine Highlands**

*Sagalla, E. J. D., R. Baldo, J. Y. Del-amen, and D. K. Simongo*  
*Benguet State University, La Trinidad, Benguet, Philippines*

*Email: ejsagalla@yahoo.com.ph, jydelamen\_2007@yahoo.com.ph and dsimongo@yahoo.com.ph*

The study assessed the postharvest losses of potato entries, determine the effect of locations on postharvest losses of potato entries, and to determine the interaction between of potato entries and location of production on postharvest loss. Based on the results, CIP 380241.17, Phil 2.21.6.2 and Phil 5.19.2.2 had the lowest yield loss from harvest to 18 weeks of storage with temperature ranging from 21-22.5 °C and relative humidity ranging from 68.75 to 91.80%. Moreover, potatoes harvested from Loo had the lowest yield loss immediately after harvesting and during storage. Both location and entry are important factors in selecting potatoes for low incidence of decay and weight loss. CIP

380241.17 and 5.19.2.2 could be stored when price is low and can be sold after hence it had less weight loss after 18 weeks of storage. Careful harvesting and appropriate method for harvesting are important considerations in decreasing postharvest loss.

**Evaluation of Selected Potato Entries Grown Across Location  
for its Chipping Quality**

*E.T. Botangen, I.C. Gonzales and D. K. Simongo  
Nprcrtc-Bsu, La Trinidad, Benguet, Philippines*

Five potato selections from the multilocational trials of the NPRCRTC and three check varieties were harvested across locations, Bonglo, Loo and Madaymen, Benguet and evaluated for chipping quality at the NPRCRTC processing laboratory in March 2007. Potato selections evaluated across locations did not show any difference in terms of dry matter content, chip recovery as well as in the sensory characteristics. However, it varies among the potato entries evaluated. Dry matter content was observed to be high in check variety Igorota, 676070, 5.19.2.2, 573275 and 2.21.6.2 with 20 – 23%. Lowest DMC was observed for Granola and Ganza with 16 – 19%. Highest chip recovery of 32 – 35% was observed for entries 5.19.2.2, 380241.17, 2.21.6.2 and Igorota. For the sensory characteristics, potato entries 380241.17, 5.19.2.2, 2.21.6.2, Ganza and Igorota has the best quality with a chip color of slight browning (1 – 2%) to no browning, slightly oily as well as acceptable to highly acceptable chips. 676070, 573275 and Granola gave an unacceptable chips because of excessive browning and oily chips.

**Meta - Analysis on Environmental Impact of Eucalyptus Plantation in Thailand**

*Wanna Tukjak, Sayam Aroonsrimorakot E-mail : jeede63@hotmail.com*

The Meta-analysis on environmental impact of eucalyptus plantation in Thailand has its purpose on the study of general features of researches studies on it and the synthesis of these researches by using meta-analysis method. Forty researches that led to the synthesis were printed and published during the year of 2532 to the year of 2551. Data collection on each research characteristic summarized on research data base and using the method of Glass, McGaw&Smith (1981) have the effect sizes value of 213. The synthetic results conclude: 1. The majority of meta-analysis in this study is in the category of organization. The most of research from the Royal Forest Department (53.7%). The largest part of the researches is in appearance of final report (46.3%) which most published in the 1987-1991 (34.1%). This research focus on the sample which were collected from the Northeast Region. The most frequently studied environmental impact is soil environmental impacts from eucalyptus plantation for plant biomass. The minor impacts are on water resources, toxicity of Eucalyptus and others plants species that plant together with eucalyptus.

**Pod Setting and Yield Response to High Temperature Stress on Soybean  
[*Glycine max* (L) Merrill]**

*M. Thuzar<sup>1</sup>, A. B. Puteh<sup>2</sup>, N. A. P. Abdullah<sup>2</sup>, M. B. Mohd. Lassim<sup>2</sup>*

*<sup>1</sup>Department of Agricultural Botany, Yezin Agricultural University, Myanmar*

*<sup>2</sup>Department of Crop Science, Faculty of Agriculture, Universiti Putra Malaysia, Malaysia  
E-mail:myinthuzarupm@gmail.com*

This research determined the effect of high temperature stress during reproductive development on pod setting, seed set, and yield of soybean. To create variations in temperatures Degree Days, plants were covered with transparent plastic sheets. Normal conditions without cover plastic cages (25°C) and single layer plastic cages (30°C) or double layer plastic cages (35°C) with transparent plastic walls were placed above the plant canopy. The results show that high temperature stress imposed during Early Flowering (EF) and EF to Pod Development (PD) decreased seed yields of all three genotypes by affecting pod formation, seed set, and dry matter accumulation. High temperature during EF and PD did not affect pod production in AGS, whereas the high temperature during EF decreased pod production by 25.58% for the Dieng genotype and 34.92% for the Willis genotype also during PD decreased pod production by 37.5% for the Dieng genotype and 63.33% for the Willis genotype but it had no effect on the AGS. The high temperature stress also affected both weight per

seed and seeds per pod. The effects of the PD high temperature stress was more pronounced compared to the EF stress. On average, the PD high temperature stress decreased weight per seed and reduced seeds per pod compared to control, whereas the EF high temperature stress had marginal effects on these three variables. The EF high temperature stress decreased seed yield per plant. Both the EF and PD high temperature (30 to 35°C) decreased the seed yield of all three genotypes. Between the three soybean genotype, the Willis genotype produced as many pods per plant and more seeds per plant than the AGS, more seeds per plant than the Dieng genotype under stressful conditions. Although the AGS genotype had a smaller individual seeds, its yield was greater than the Dieng and Willis genotype. These results suggest that the AGS genotype may have a better ability to tolerate high temperature stress than the Dieng and Willis genotype.

**The Makapuno Production Through Embryo Culture Technology:  
Ladder to Achieve Better Living of the Community**

*Florie B. Gapido, Dorothy C. Solano, Florante D. Solano,  
College of Agriculture, University of Rizal System, Philippines,  
[fbgapido@yahoo.com](mailto:fbgapido@yahoo.com), [dory\\_solano@yahoo.com](mailto:dory_solano@yahoo.com), [teantskydiksol@yahoo.com](mailto:teantskydiksol@yahoo.com)*

An enterprise that improves the quality of people's lives, addresses poverty, and empowers the marginalized sectors of the society is the makapuno nut growing and its byproduct processing through embryo culture technology. It is an innovative and fast technology with 100% nut production. which produces clean and disease-free pure Makapuno seedlings. Makapuno meat which could be used for pies, cakes, shakes, drinks, ice cream flavor and candies have soft endosperm that almost fills the nut cavity; Makapuno nut does not germinate because the meat rots easily once the nut is harvested. Embryo culture technology solves this problem. Rearing the seedlings should be in a well maintained nursery, open, level, well drained with good source of water irrigation and far from any existing sources of coconut insect pests and diseases. After 3-5 months, the plants with 4-6 splitting leaves, can be transferred to the field during the cooler months. Under optimum cultural management practices, flowering starts after 4 years. Before the dispersal of the ready to transplant Makapuno seedlings, recipients are trained on the proper care and management of growing the plants and accomplish a memorandum of agreement in this line. When the farmer- recipients started harvesting they are to payback the seedlings from the produce. The potential revenue generated from growing Makapuno the conventional way can yield only 2 to 17 % Makapuno nuts per bunch, while the technology can produce 99 to 100 %. At harvest time, people could be employed to work in the farm, process its by-products and earn income every 45 days.

**Shoot Proliferation of Banana cv. Grande Naine Through Horizontal Sectioning  
of the Shoot Tip**

*Mahdi Safarpour<sup>1</sup>, Uma Rani Sinniah<sup>1\*</sup>, Sreeramanan Subramaniam<sup>3</sup> and Maheran Abdul Aziz<sup>2</sup>  
<sup>1</sup>Department of Crop Science, <sup>2</sup>Department of Agriculture Technology,  
Faculty of Agriculture, Universiti Putra Malaysia.  
<sup>3</sup>School of Biological Sciences, Universiti Sains Malaysia  
E-mail: [umarani@agri.upm.edu.my](mailto:umarani@agri.upm.edu.my)*

Cavendish (AAA genome type) is one of the most important banana cultivar with about 47% global production (Arias et al., 2003). The edible bananas and plantains are conventionally propagated through vegetative means using sword suckers which is very slow. The *in vitro* method is used for mass production. Here, we report an improved technique for rapid multiplication for large scale micropropagation. The aim of this study was to establish an applicable protocol for shoot proliferation through horizontal sectioning of the individual shoot tip using suckers of banana cv. Grande Naine (*Musa* spp. AAA group). The excised shoot tips were cultured on MS medium supplemented for one month. After 2 months, the multiple shoots which emerged from each segment were isolated and cultured on MS medium supplemented with three different concentrations of BAP (10, 20, 30 µM) for further multiplication and determination of the best BAP concentration for shoot proliferation with monthly subculture interval. As a control the excised shoot tips were cultured on MS medium supplemented with 10, 20 and 30 µM BAP, with one month subculture interval for six month without sectioning. All experiments were arranged in CRD with three replications with 10

explants per replication per treatment. Parameters observed were the number of shoots produced per explants per subculture. The horizontal sections of cv. Grande Naine placed onto MS medium containing 10  $\mu$ M BAP resulted in high multiple shoot production. The multiple shoots obtained in this step were isolated and cultured on MS medium supplemented with 10, 20 and 30  $\mu$ M of BAP for further shoot proliferation. The mean number of proliferated shoots obtained at 10 and 30  $\mu$ M of BAP was 3.53 and 4.12 after four subcultures respectively. The number of proliferated shoots can be maximized by using horizontal sections of the individual shoot tip resulting in 49 % increase.

**The Expression of Antisense *EcLIM* Gene in *Eucalyptus camaldulensis* Dehnh.  
by *Agrobacterium tumefaciens*-Mediated-Transformation**

Subin Hinjan Sontichai Chanprame<sup>1,2</sup> and Sermsiri Chanprame<sup>1,3\*</sup>

<sup>1</sup>Center for Agricultural Biotechnology, Kasetsart University, and  
(AG-BIO/PERDO-CHE), Thailand <sup>2</sup>Department of Agronomy and

<sup>3</sup>Department of Horticulture, Faculty of Agriculture

at Kamphaeng Saen, Kasetsart University, Nakhon Phathom 73140 Thailand

<sup>4</sup>Product and Technology Development Center, SCG Paper Public Company Limited

19 Saeng-Xuto Road, Ban Pong, Ratchaburi 70110 Thailand.

E-mail: subinh@scg.or.th, agrstc@ku.ac.th and agrsrc@ku.ac.th\*

The LIM proteins which got their names from three first discovered homeodomain proteins: LIN11, ISL1 and MEC3, are transcription factors that involved in lignin biosynthesis and specifically bind to the important cis-acting element, PAL-box sequence. The NtLIM gene from tobacco has been reported to control the expression of several lignin biosynthesis genes in eucalyptus including phenylalanine ammonialyase (PAL), cinnamate-4-hydroxylase (C4H) and 4-hydroxycinnamate CoA ligase (4CL). In this research, we investigated the function of LIM gene in lignin biosynthesis in eucalyptus by antisense transformation of EcLIM gene from eucalyptus into elite eucalyptus clone. The partial EcLIM gene was cloned from *Eucalyptus camaldulensis* cDNA and the antisense orientation was constructed into a binary vector, pCAMBIA1304, under the control of CaMV35S promoter together with hygromycinresistant gene as a plant selectable marker gene. The recombinant plasmid was then transformed into *Agrobacterium tumefaciens* strain EHA105 for the genetic transformation of in vitro eucalyptus. The putative transgenic lines were selected based on their hygromycin resistance character and the existence of antisense EcLIM gene was confirmed by PCR analysis. Nine transgenic lines were transplanted in a bio-safety greenhouse. It was found that survival rate of the transgenic lines were higher than the wild type and none of visible abnormal phenotype was observed. The three-month-old transgenic lines were taller than wild type. The expression of LIM gene in transgenic eucalyptus lines were reduced more than 90 % compare to the wild type as measured by real-time PCR of xylem RNA. For further work, lignin contents and pulping characteristics will be investigated in one-year-old trees.

**Hybrid Testing of Sweet Corn and Waxy Corn using Seed Storage Proteins  
by Ultrathin-Layer Isoelectric Focusing Technique**

Prakay Manum<sup>1,2</sup>, Thammasak Thongket<sup>3</sup>, Sontichai Chanprame<sup>1,2,4</sup>  
and Sermsiri Chanprame<sup>1,2,3\*</sup>

<sup>1</sup>Center for Agricultural Biotechnology, Kasetsart University, Nakhon Pathom 73140, Thailand

<sup>2</sup>Center for Agricultural Biotechnology (AG-BIO/ PERDO-CHE), Thailand

<sup>3</sup>Department of Horticulture and <sup>4</sup>Department of Agronomy, Faculty of Agriculture at  
Kamphaeng Saen, Kasetsart University, Nakhon Phathom 73140, Thailand

E-mail: g522900004@ku.ac.th, agrstt@ku.ac.th, agrstc@ku.ac.th, agrsrc@ku.ac.th\*

The hybrid test of F-1 hybrid is very important in seed production industry especially for the cross pollination crop such as corn. To ensure farmer's satisfactory, seed companies have to intensively test their hybrid seeds. Ultrathin-layer isoelectric focusing (UTLIEF) technique is the one that was considered as reliable, convenient and low cost. Three different protein extraction solvents including water, phosphate buffer and 4M urea were tested with mature seeds of six sweet corn cultivars. The results revealed that these six sweet corn varieties could be distinguished by UTLIEF technique using any of these three solvents. However, protein bands obtained from water extraction

had clearer and sharper resolution than extract with phosphate buffer or 4M urea. Thus, water was selected as solvent for the hybrid tested in sweet corn and waxy corn. The inbred lines and their F-1 hybrids were subjected to hybridity tested using UTLIEF. Seed storage proteins were extracted with water and were separated on the pH 2-9 acrylamide gel according to their isoelectric when the electrical voltage of 2500V was applied. The results demonstrated that this technique could be successfully used for hybrid test in both sweet and waxy corns. For sweet corn, ten distinct protein bands could be used to indicate parental lines and their F-1 hybrid. For waxy corn, even only four protein bands could be observed but they were clear cut for hybridity test. In the waxy corn seed, there was a distinct band which indicated that the seed was not the F-1 hybrid seed. Thus, the UTLIEF technique not only offers the means for hybrid test but the genetic purity test also.

**Varietal Identification of Cucumber using Seed Protein Analysis by Ultrathin Layer Isoelectric Focusing Technique**

Damrongwoot Onwimol<sup>1,2</sup>, Sermisiri Chanprame<sup>1,2</sup> and Thammasak Thongket<sup>1</sup>

<sup>1</sup>Department of Horticulture, Faculty of Agriculture at Kamphaneng Saen, Kasetsart University, Nakhon Pathom, Thailand 73140 <sup>2</sup>Center for Agricultural Biotechnology (AG-BIO/PERDO-CHE) Thailand E-mail: d.onwimol@gmail.com

Genetic purity test is crucial for quality control in seed production, especially for F-1 hybrid variety. The test should be reliable, rapid, simple and affordable. Unfortunately, the most reliable DNA fingerprint test is costly while the simple grow-out test is a very time-consuming method. The ultrathin-layer isoelectric focusing (UTLIEF) test was reported as a new, rapid and relatively cheap technique to differentiate plant varieties based on the polymorphism of seed protein in rice, corn and tomato (Yan et al., 2006; Leist and Knoblauch, 2003; Wang et al., 2000). Cucumber (*Cucumis sativus* L.) is the major crop for F-1 hybrid seed production of Thailand. The applicable UTLIEF technique as the genetic purity test for cucumber seed will greatly enhance its seed quality control efficiency. The objective of this experiment was to find a suitable extraction buffer and pH gradient to be used for running the UTLIEF on the protein stored within the cucumber seed in the IEF-SYS horizontal electrophoresis system. Four buffer solutions including water, 0.005 M NaCl, phosphate buffer and 0.005 M Na<sub>2</sub> EDTA were tested in combination with two pH gradients of 2-11 and 4-5 plus 3-10 range. It was found that pH range of 2-11 on polyacrylamide gel and extracted protein by water yielded the most polymorphic and clearest bands. Positive result was found when the technique was used to identify 5 open pollinate commercial cucumber varieties. The efficiency of UTLIEF technique in hybridity test for F-1 hybrid cucumber seed needs to be tested to confirm the feasibility of using this UTLIEF technique in routine genetic purity test for cucumber seed production.

**Polymorphic Microsatellite Markers from Expressed Sequence Tags of Rubber Tree (*Hevea brasiliensis* Muell. Arg.)**

Supanath Kanjanawattanawong<sup>1</sup>, Panida Kongsawadworakul<sup>2,3</sup>, Unchera Viboonjun<sup>2,3</sup>, Sithichoke Tangphatsornruang<sup>3,4</sup>, Kanikar Teerawatanasuk<sup>5</sup>, Hervé Chrestin<sup>6</sup>, Somvong Tragoonrun<sup>4</sup> and Kanokporn Triwitayakorn<sup>1,3\*</sup>

<sup>1</sup>Institute of Molecular Bioscience, Mahidol University, Thailand,

<sup>2</sup>Department of Plant Science, Faculty of Science, Mahidol University, Thailand,

<sup>3</sup>Center for Cassava Molecular Biotechnology, Faculty of Science, Mahidol University, Thailand,

<sup>4</sup>National Center for Genetic Engineering and Biotechnology, Thailand,

<sup>5</sup>CRRC-Rubber Research Institute of Thailand, Department of Agriculture, Thailand,

<sup>6</sup>IRD (UR60) CEFE/CNRS, Montpellier, France

\*Corresponding author: mbktw@mahidol.ac.th,

Para rubber tree (*Hevea brasiliensis* Muell. Arg.) is an economically important plant in tropical areas that produces 98% of the world's natural rubber. Microsatellite marker from expressed sequence tag (EST-SSRs) become the ideal markers for constructing high-resolution genetic maps and identifying traits of interest as well as genetic analysis. In this study, polymorphic EST-SSR markers were developed from ESTs of rubber tree deposited in public databases. A total of 226 primer pairs were designed and 48 primer pairs were screened on 31 cultivated clones of *H. brasiliensis*. Of the 48 EST-

SSR loci, 18 yielded polymorphisms with two to six alleles per locus. The average unbiased and direct count heterozygosities were 0.456 and 0.516, respectively. Cross-amplification of the 48 EST-SSR loci was tested with cassava (*Manihot esculenta* Crantz) and physic nut (*Jatropha curcas*) which belong to the same Euphorbiaceae family. Five and six EST-SSRs showed polymorphic patterns in cassava and physic nut, respectively. In addition, all 226 EST-SSRs were tested with our selected parental varieties of a mapping population, RRII105 and RRIM600, resulting 24 polymorphic markers which will be applied to construct genetic linkage map of this species in the future.

**Aglibut Sweet Tamarind (The Commercialization of the Philippines 1st Sweet Tamarind Variety Registered under NSIC-BPI)**

*Norman G. De Jesus, Rogelio D. Cosio, Filomena K. Reyes,  
Zosimo M. Battad and Honorio M. Soriano, Jr.  
Pampanga Agricultural College*

The Pampanga Agricultural College-Philippines developed the 'Aglibut sweet' and is now promoting it for widespread planting not only in Central Luzon but also in other parts of the country. 'Aglibut sweet' is the first sweet tamarind registered in the Philippines. To commercialize such important commodity, it involved training of interested farmer-entrepreneurs, conduct of field days, establishment of demonstration farms, commercialization project proposal development and submission to external funding agencies, free technical consultation for walk-in buyers and previously-trained growers, credit assistance in the form of seedlings loan, technical backstopping necessary for the establishment and development of off-campus scion groves/nurseries at selected local government units and state colleges and universities. Other promotional activities for the commercial production of 'Aglibut sweet' include: production of information, education and communication materials; participation in technology commercialization forum; trade fair and exhibits; and media advertisement. As an offshoot of the above-mentioned activities, the following were realized: increased income of PAC and other partner-institutions from the sale of planting materials, fresh fruits and other food and non-food products, increased financial and logistical supports from the various government agencies to further advance sweet tamarind as a commodity-based industry, the creation of sweet tamarind research and development center which pursues continuous development and upgrading of technologies relative to sweet tamarind.

**Enhancing the Utilization of the Light Trapping Technology for Insect Pest Management of Major Crops in Selected Provinces of Region 1, Philippines**

*A.D. Solsoloy, M. Begonia J. Tolentino, A. Castillo, L. Valdez, P. L. Mones & A. Padilla  
Ilocos Norte Provincial Center Department of Agriculture, Regional Field Unit 1  
Batac, Ilocos Norte, Philippines Email address: aidasolsoloy@yahoo.com*

The light trapping technology was showcased for four major crops, namely, rice, corn, mango and vegetables at different municipalities of the four provinces of Region 1. The technology uses the ultraviolet lamp that at specific wavelength greatly attracts various insect species. With lamps installed at farmers' fields, the number of insect pests, influence on the increase in yield and the degree of chemical reduction were noted to assess its effectiveness. Generally for rice, corn and vegetables, weekly insect pest collection by the light trap was highly extensive while population of the trapped natural enemy was very minimal. Crop yield increased from 5% to 50% and a reduction in chemical spraying from 25% - 100% were noted for rice, corn and vegetable farms exposed to the light trap in comparison to farms without light traps. Mango exposed to light trap had considerable number of fruits per panicle causing a 50% increase in fruit yield. In addition, about 20-30% reduction in chemical spraying against insect pests was also observed. Excellent crop protection was augmented by weekly spraying of 0.1% calcium hypochlorite + a commercial hair shampoo which further reduced disease incidence resulting in clean and unblemished fruits. Net monetary benefit derived by partial budget analysis showed high economic returns in using the light trap. Cost effectiveness of the technology as an insect pest management tactic was highly demonstrated which warrants commercial availability of crops which are GAP (Good Agricultural Practices) -certifiable, i.e. with general safety to consumers.

**Management Practices in Potato Production of Three Potato Varieties  
by Farmers in Benguet, Philippines**

*D. K. Simongo, B. T. Gayao and D. T. Meldoz  
Nprcrtc-Bsu, La Trinidad, Benguet, Philippines*

*E-mail: dsimongo@yahoo.com.ph, btgayao@hotmail.com and d.meldoz@yahoo.com*

Farmers' management practices of growing three potato varieties; Igorota, Solibao, and Raniag were documented. Information gathered came mainly from seven case-farmer respondents selected based on their length of experience in growing the varieties and their willingness to share their knowledge and experience. Among the three varieties, Igorota (seed tuber) was kept and maintained by farmers until the sixth cropping. Solibao and Raniag were planted only once or until three cropping seasons. Solibao was less preferred in the market while Raniag was a low yielder in elevation. The yielding ability of Igorota could be maintained until the sixth cropping if seed tubers were sourced out from different farm locations and elevations every cropping season. The three varieties had higher yields during October to February planting. Igorota and Solibao had robust vegetative growth but lower tuber yield during the wet season but showed resistance to late blight; hence farmers practiced longer fungicide spraying intervals. Raniag was harvested as early as 75 to 90 days after planting, Igorota at 80-110 days, and Solibao at 90-120 days. Dehaulming one to two weeks before harvesting, curing by covering piled tubers in cement floor one month prior to transport, or spraying with a fungicide two weeks before harvesting were done to reduce bruises and feathering. Igorota was suitable for in-ground storage despite its 3-month dormancy period. The tubers of Igorota and Solibao turned green faster than Granola (farmers' variety). Cropping pattern practices dictated the need for 6-month seed tuber storage. Hence, one-level piling of the seeds in seedbed racks can be done under diffused light storage in cooler temperature to prolong the dormancy of Igorota to more than three months. The growing period was shortened when Igorota seed tubers were already shriveled.

**Effect of Potassium Humate on Electrical Conductivity and pH of Acidic Soil**

*Amjad. A, Khanif. Y. M, Aminuddin H, Radiah, O and Osumanu. H  
Department of Land Management University Putra Malaysia.*

*Department of Crop Sciences University Putra Malaysia Bintulu, Sarawak  
Email: aliamjadsh@yahoo.com*

Potassium humate (K-humate) derived from brown lignite coal organic material by alkaline extract ion; aromatic in nature, abundant in carboxylic and phenolic groups can provide favourable reactive sites for cation exchange, bind and adsorb phototoxic elements, increase pH buffering capacity, improve penetration and retention of Ca in the soil, helps root enlargement and play an important role for nutrient transport to plants. The aim of this work is to determine the effect of K-humate on electrical conductivity (EC) and pH of acidic soil. An incubation experiment was carried out for 60 days in the month of March and April 2009 on a Kangkong soil series. The soil was prepared, sieved through 2 mm sieve and 25g of soil were used in vial. The layout of experiment was completely randomized design with three replicates and six treatments. K-humate (0, 25, 50, 75 and 100 kg ha<sup>-1</sup>) and phosphorus (0 and 70 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>) in the form of triple super phosphate were applied on the surface of the soil before watering; water was applied at field capacity level. After each 15 days of incubation, soil samples were collected and analyzed for EC and pH up to 60 days. It was observed that when only P (T<sub>2</sub>) was applied maximum values were found for EC in contrast at same treatment minimum pH values were observed. Whereas the values of EC and pH both are significantly increased as dose of K-humate increases over control, among the K-humate treatments highest values were noted at T<sub>6</sub> (70 kg P<sub>2</sub>O<sub>5</sub> and 100 kg K-humate ha<sup>-1</sup>), respectively. However, no significant difference was found between T<sub>5</sub> and T<sub>6</sub>. Results indicates statistically significant increases (849-946 μS cm<sup>-1</sup> and 5.48-6.03), at T<sub>6</sub> (70 kg P<sub>2</sub>O<sub>5</sub> and 100 kg K-humate ha<sup>-1</sup>) in soil EC and pH respectively, relative to the control.

**The River Analysis Simulation Model for Paddy field in Saline soil: A case study in  
the Lower Nam Kam River Basin, Thailand**

*Sombat Chuenchooklin1/\* Phattaporn Mekpruksawong2/ Tsutomu Ichikawa3/*

*and Songvut Sangchan<sup>4/</sup>*

*1/Department of Civil Engineering, Naresuan University, Phitsanulok, 65000, Thailand*

*2/Project Planning Office, Royal Irrigation Department, Bangkok, 10300, Thailand*

*3/School of Industrial Engineering, Tokai University, Kumamoto, 862-8652, Japan*

*4/ King Mongkut's Institute of Technology Ladkrabang, Bangkok, 10520, Thailand*

*E-mail: sombatc@nu.ac.th*

A study on flood management in lower Nam Kam River Basin, a tributary of Mekong River Basin in Nakhon Phanom Province, was carried out. Although there have been some regulated structures in the upstream of the Nam Kam and the Nam Bang rivers (branch stream of Nam Kam) which managed by the Royal Irrigation Department (RID) in recent years, however, the fluctuated water level in floodplain nearby the river mouth is easily influenced by backwater from the Mekong River and cause flood in floodplain area. Unfortunately, some sources that might cause surface and ground water contamination by some saline soil spots beneath the ground level were investigated by RID. The gate regulations for the proposed reservoir in the lower Nam Kam river should be well operated with awareness of the dispersion of saline water from those sources. The present research was conducted by analyzing flood delineations using the river analysis system model (HEC-RAS) for the estimation of main hydraulic parameters of the Nam Kam River and would be applied to cases of without and with the regulated structures by proposed dam and reservoir. The results from the model fitted with the observation and recorded data of both river stages and electric conductivities (EC) of shallow wells nearby saline soil spots since 2005. This study is a part of research in sustainable conjunctive use of groundwater and surface water in saline soil with the aims for further management of operation of gates, reservoirs, and groundwater utilization to avoid salinity dispersion.

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*1/Department of Civil Engineering, Naresuan University, Phitsanulok, 65000, Thailand*

*2/Project Planning Office, Royal Irrigation Department, Bangkok, 10300, Thailand*

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**Results of Studies the Possible Correlations between SPAD Value and Total Nitrogen Contents in the Leaves of Sugarcane (*Saccharum officinarum* L.)**

*Suchanya Jaroenseng<sup>a</sup>, Audthasit Wongmaneeroj<sup>b\*</sup>, Suphachai Amkhab*

*<sup>a</sup> The Graduate school, Kasetsart University, Kamphaeng Saen Campus,*

*Nakhon Pathom 73140 <sup>b</sup> Department of Soil Science, Faculty of Agriculture at Kamphaeng Saen*

Kasetsart University, Kamphaengsaen Campus, Nakhon Pathom 73140

Plant analysis is an important tool for monitoring and evaluating the nutrient status of crops. Conventional tissue analysis is time-consuming for evaluate the nitrogen status. The objective of this study was to investigating the possible correlations between SPAD value and the total nitrogen concentration in leaves of sugarcane using the SPAD- 502 chlorophyll meter. The experiment was conducted in Kamphaeng Phet soil series (Kp: Oxyaquic (Ultic) Haplustalfs) of Sandy clay loam texture under rain-fed area at Koaleaw district in Nakorn Sawan province during May,2008 to April,2009. Treatments included five N rates of 0, 12 (chemical fertilizers application based on soil analysis as recommended by Department of Agriculture), 9\*, 18\* and 36\* kg N rai-1 (\*chemical fertilizers based on quantities of applied nitrogen and estimated uptake of 100, 50, 25%)(as urea). The experiment was a completely randomized block design with five replications. SPAD-values were taken from the middle section of the top visible dewlap blade between 2 to 8 months. Results showed nitrogen concentration in the leaves of sugarcane was correlated with SPAD values. Chlorophyll meter readings above 34 SPAD unit for sugarcane leaves were considered sufficient nitrogen concentration. SPAD readings less than 34 were considered that nitrogen was in the deficiency range. The chlorophyll meter (SPAD-502) can be used as an effective tool to predict nitrogen status of sugarcane under field condition.

### **Production of Egg Yolk Antibody Specific to *Vibrio harveyi* and Evaluation of Its Stability for Feed Additive**

<sup>1,2</sup> Kawin Punyokun, <sup>1,3</sup>\*Ratchanee Hongprayoon, <sup>4</sup>Prapansak Srisapoome,  
<sup>5</sup>Theerapol Sirinarumitr and <sup>6</sup>Suchart Sanguanphan

<sup>1</sup>Center for Agricultural Biotechnology, Kasetsart University, Kamphaeng Saen Campus,

<sup>2</sup>Center for Agricultural Biotechnology: (AG-BIO/PERDO-CHE), Thailand

<sup>3</sup>Department of Plant Pathology, Faculty of Agriculture at Kamphaeng Saen, Kasetsart University,  
Kamphaeng Saen Campus, Nakhon Pathom, Thailand

<sup>4</sup>Department of Aquaculture, Faculty of Fisheries, Kasetsart University, Bangkok, Thailand

<sup>5</sup>Department of Veterinary Pathology, Faculty of Veterinary Medicine, Kasetsart University,

<sup>6</sup>Poultry Research and Development Center, Suwanvajokkasikit Animal Research and Development  
Institute, Kasetsart University, Kamphaeng Saen Campus, Nakhon Pathom, Thailand

\* Corresponding author : agrat@ku.ac.th

*Vibrio harveyi* is a natural microflora in the marine environment which causes luminous disease in black tiger shrimp (*Penaeus monodon*). The disease leads to high mortality and large economic losses in cultured shrimp. Due to the widespread use of antibiotics to control the disease, many luminescent *Vibrios* have become resistant, thereby making antibiotic treatments ineffective. The antibiotics eventually remain in the shrimp body. Passive immunization using pathogen-specific antibodies raised in chickens has been reported to be a promising approach to control the infection. In our previous research, we preliminarily proved that chicken anti-*V. harveyi* antibody has a potential to effectively control this disease; however, the stability of the egg yolk immunoglobulin (IgY) as feed additive needed to be evaluated further, which is the objective of this study. Twelve Roman-Brown laying hens were vaccinated with glutaraldehyde killed *V. harveyi* and C-phosphate guanosine oligodeoxynucleotide (CpG-ODN). The latter was added to enhance the specific antibody production. IgY was extracted from egg yolk by water dilution method then freeze-dried. The specific antibody was determined by ELISA. The concentration of IgY was approximately 9.8 mg/ml of egg yolk with 34.2% purity and 12.2% specific IgY. The stability of IgY in various conditions involving pH, temperature, effect of proteolytic enzyme to IgY activity and storage temperature was investigated. The results indicated that IgY was quite stable at pH 6 to 8. Temperature higher than 70°C significantly affected IgY activity; however, the presence of 30% sorbitol effectively enhanced IgY stability. The behavior of IgY with pepsin and trypsin was also examined and the result showed that after 4h incubation, the activity of IgY remained at 9 and 94% for the mixtures with pepsin and trypsin, respectively. The result also showed that the best storage temperature is -20°C.

### **Role of Host Fruit Cues to the Response of *Bactrocera dorsalis* (Hendel)**

**(Diptera: Tephritidae)**

Wigunda Rattanapun<sup>1</sup>, Weerawan Amornsak<sup>2</sup>, Anthony R. Clarke<sup>3</sup> and Kawit Wanichkul<sup>4</sup>

<sup>1</sup>Faculty of Technology and Community Development, Thaksin University, Phattalung,

Thailand, 93110. E-mail: [g4781021@ku.ac.th](mailto:g4781021@ku.ac.th)

<sup>2</sup>Department of Entomology, Kasetsart University, Bangkok, Thailand, 10900

<sup>3</sup>School of Natural Resource Sciences and CRC for National Plant Biosecurity,  
Queensland University of Technology, GPO Box 2434, Brisbane, Qld 4001, Australia

<sup>4</sup>Department of Horticulture, Kasetsart University, Kamphaeng Saen Campus

*Bactrocera dorsalis* (Hendel) (Diptera: Tephritidae), a polyphagous fruit fly, has complex host response patterns. Results of previous study indicated that if female flies could touch the fruit surface, the preference also correlated with changes in fruit firmness. To further understand the role played by different host cues in female orientation, two experiments were run. These isolated host visual and olfactory cues for three ripening stages of mango *Mangifera indica* L. (Anacardiaceae) variety Namdorkmai. Results of these studies indicated that host fruit color least influenced the assessment of host quality by female flies, whereas host fruit volatiles played an important role in the determination of host quality. The influences of physical changes and chemical changes of mango ripening to female fly responses were discussed.

**Use of Essential Oils and Organic Acids as Piglet Feed Additives**

Wandee Tartrakoon <sup>a\*</sup>, Orose Rugchati <sup>a</sup>, Tinnagon Tartrakoon <sup>b</sup>

and Kunlayapat Wuthijareea

<sup>a</sup> Faculty of Agriculture Natural Resource and Environment, Naresuan University,

Phitsanulok 65000, Thailand <sup>b</sup> Faculty of Science and Agricultural Technology, Rajamangala

University of Technology Lanna Phitsanulok Campus, Phitsanulok 65000, Thailand

\*Corresponding author. E-mail address: [wandeeta@nu.ac.th](mailto:wandeeta@nu.ac.th)

Improvement of post-weaning growth rate and efficiency of feed utilization have been achieved by supplementing starter diets with feed additives. Presently, natural ingredients such as essential oils, which are found in many plants like spices and herbs, and organic acids have been used in piglet feed to improve their performance and prevent certain digestive problems, especially in the post-weaning period. The study sought to find a suitable mixture and an appropriate inclusion level in the diet of a feed additive prepared from essential oil mixes (EOM) and organic acids mixes (OAM) in post-weaning pig diet supplementation using growth performance and feed utilization as decision parameters. EOM included clove oil, mint oil, orange peel oil at the ratio of 1:1:1 by weight and OAM included fumaric acid, lactic acid and citric acid (1:1:1 by weight). The first experiment studied for 49 days on the performance and fecal characteristics of 28 days old weaned pigs consisting of 40 males and 40 females crossbred Duroc×(Large White×Landrace). The second experiment studied on the digestibility of nutrients in 40 weaned pigs grouped 4 pigs/group/diet by CRD. Diet 1 was control diet containing corn and soybean meal as the main ingredients. Diet 2 to 10 were control supplemented with 5, 10 and 20 g/kg of diet of the ratio of EOM:OAM 1:1, 1:2 and 2:1, respectively. There were significant differences in average daily gain (ADG) and feed conversion ratio of weaned pigs amongst diets. The weaned pigs fed diet 5 which contained 5 g/kg diet of each of clove oil, mint oil and orange peel oil 0.06%, respectively and each of fumaric acid, lactic acid and citric acid 0.11%, respectively, tended to be the greatest of ADG. Fecal shape and color did not differ amongst diets. The highest of digestibility coefficient of nutrients was found in diet 5. In conclusion, the mixture containing 0.06% each of clove oil, mint oil and orange peel oil, and 0.11% each of fumaric acid, lactic acid and citric acid was the suitable mixture for piglet feed additive at inclusion level 5 g/kg diet.

**Satisfaction of Rice Farmers with Living Conditions in Penang and Kelantan, Malaysia**

Rika Terano and Akimi Fujimoto

Tokyo University of Agriculture

A concept of "Quality of Life" has been a controversial issue for living standard and satisfaction level of people's life. Malaysia achieved an economic growth with the development of manufacturing

sector, and living standard was greatly improved by material affluence. While Malaysian government referred to quality of life (QOL) in relation to monetary approach, there is no mention of non-monetary perspectives of people's life. It is necessary to measure how much people are satisfied with their living standard and condition at more micro level for further policy development. Interview surveys were conducted in the two villages from 2008 to 2009 in Sebrang Prai, Penang state and Pasir Mas, Kelantan state. A total of 42 and 39 farm households were studied respectively. This paper aims (1) to define the term "quality of life" in the Malaysian context, (2) to measure quality of life in two villages, and (3) to find out determinants of well-being of paddy farmers in two villages. There are two different reactions to living condition between the more industrialized and less developed villages. In terms of objective perspective, "age" was a commonly important determinant in the both villages. However, it indicates opposite tendencies which younger people tended to have higher satisfaction in the less developed area, and elder people tended to have lower satisfaction in the industrialized area. In terms of subjective perspective, there were apparent attributes relating to employed family members and local activities in the more industrialized area, while key determinant did not come up in the less developed area. The regional characteristics had influenced main determinants of QOL especially in the more industrialized area.

#### **Land Tenure Systems and Rental Determination in a Suburban Village in Hanoi, Vietnam**

*Phan Vu Quynh Chi and Akimi Fujimoto  
Tokyo University of Agriculture*

Agricultural production in tropical countries such as Vietnam depends basically on the use of endowed fertile land resources. In Vietnam, farmlands operated formerly by communes were redistributed among their members in the 1980s under Doimoi Policy. Currently, land and related policies have direct effects on the livelihood of rural populations through influences on land tenure, farm size and fragmentation of land holdings, land use, land and credit markets. The average farm size in Red River Delta ranges from 0.2 ha to 0.3 ha per household and plots of the cultivated land are scattered over many places. This results in difficulties in farm management (e.g. mechanization, irrigation and specialization) and in the pursuit of productivity improvement, requiring intensive labor input in cultivation. This paper aims to determine and to clarify the current land tenure systems, including the pattern of land holding and the existing tenancy contracts of the farm respondents, to investigate the recent changes in land use system for agriculture production. Data were collected by a questionnaire survey, which was conducted in February 2008 in Da Ton Commune, Gia Lam District, Hanoi. It was found that operating lands in Da Ton commune were not only small in size but also fragmented. Da Ton commune had experienced drastic changes in land use patterns and recently there emerged tenancy contracts, especially in the case of fruit land. It was considered that tenancy contracts were established as a part of the broader socio-economic system in the village.

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#### **Effects of Antioxidants Supplementation Dietary on Poly Unsaturated Fatty Acids of Longissimus Dorsi Muscle of Goat**

*M. Karamia, A.R. Alimona, Y.M. Gohb, A.Q. Sazilia  
aDepartment of Animal Science, bDepartment of Veterinary Preclinical Sciences, c,  
University Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia  
E-mail: ralimon@agri.upm.edu.my*

Consumers demand high quality and convenient meat products with natural flavor and taste, and they appreciate the fresh appearance of meat. Goat meat (chevon) is leaner than mutton and beef, because it incorporates less subcutaneous and intramuscular fat. A study was conducted to investigate the effects of dietary supplementation of antioxidants on fatty acids profile of male kids meat. 32 male goat kids were used in a completely randomized design to determine the effects different dietary supplementation of antioxidants consist control (CN), 400 mg/kg Vit E (VE), 0.5 percent/kg DMI turmeric (TU) and 0.5 percent /kg DMI *Andrographis paniculata* (AP) of kids. The animals were slaughtered at end of experiment and *longissimus dorsi* (LD) was taken. The LD muscle was vacuum packed and frozen (-80oC) for fatty acids measurement. Total fatty acid from meat samples was extracted using a chloroform-methanol solvent extraction system as described by Folch et al. (1957). Result showed that the application of herbs such as TU and AP significantly increased

linoleic fatty acids and also other omega 6 fatty acids in LD muscle. However, incorporation of VA, TU and AP into the animal diet had significant effects on the muscle fatty acid composition of the important commercial muscle cut, such as LD. There was also increased n6:n3 ratio for the TU treatment compared to other treatments (CN, VE and AP). TU and AP increased PUFA: SFA in LD muscle against CN, there was a general improvement in the fatty acids profile of chevon in goats supplemented with the herbal plants antioxidant.

**Participatory Communication Approach to Preserve Existing Indigenous  
Agricultural and Natural Resource Strategies in Barangay Amganad, Banaue, Ifugao**

*D.M. Macandog<sup>1</sup>, M.S.C. Tirol<sup>2</sup>, E.R. Abucay<sup>1</sup>, E.B. Bernardo<sup>2</sup>, J.P.P. Talubo<sup>3</sup>,*

*K.G. Engay<sup>3</sup>, C.M.B. Brown<sup>1</sup> and N. Taguiling<sup>4</sup>*

*1Institute of Biological Sciences; 2Office of Public Relations and 3School of Environmental*

*Science and Management, UP Los Baños, College, Laguna;*

*4Ifugao State College of Agriculture and Forestry, Lagawe, Ifugao*

The indigenous knowledge on resource use is a key concept in the sustainability of agriculture and the environment. It is embedded in community practices, institutions, cultural values and belief systems. To preserve indigenous strategies, the community plays an important role in sharing experiences, information and in the process of creating an effective media of communication materials. The study aims to present participatory communication approach as a tool in the development of communication materials to preserve existing Indigenous Agricultural and Natural Resource Strategies (Iansrs) in Barangay Amganad, Banaue, Ifugao. Key Informant interview was conducted to solicit information on Iansrs in the study area along with actual field reconnaissance. Selected participants were invited to join the Focus Group Discussion and workshops in the development of communication materials. The output of the FGD and workshop were used in the development of prototype communication materials on two IANRS, *Muyong* and *Payew*, respectively. The community members identified the most effective forms of communication materials to preserve and popularize their community poster, story book or comics and radio plug. The community poster message was generally well understood and perceived to be intended for the Ifugao farmers and their families. For the comic story booklet, participants showed high comprehension and enjoyed the story they conceptualized during the workshops. The communication materials produced through participatory communication approach are highly understandable, acceptable and attractive to the participating community. It also fosters synergy among experts, semi-technical staffs, government workers and the community. These types of communication materials if properly disseminated could help in the preservation of IANRS.

**Socio-Economic and Environmental Contributions of Agroforestry Based Farm**

*German L Penaranda and Flordeliza R Penaranda*

*College of Agriculture, University of Rizal System, Tanay, Rizal, Philippines, 1980*

*E-mail: urs\_flor\_green@yahoo.com*

The agroforestry based technology demonstration farm was established to adopt soil and water management technologies contributing to the stable and sustainable agricultural production in the pilot marginal lands and to establish farmers' participatory techno-demonstration farms (TDF) to disseminate the developed technologies. The farm is located in hillyland agro-ecological zone in Sampaloc, Tanay, Rizal, Philippines which represents the country's extensive marginal soils known as acid upland soils. Previously, the area is dominantly grassland. The farm tested mature technologies for dissemination and adoption within the immediate environs with similar soil-related problems. After four years, this study was conducted to evaluate the agroforestry based technology demonstration farm specifically the site, farmer-cooperators and the agro-technologies adopted in terms of their impact, efficiency, relevance and sustainability. Results revealed that the adopted agrotechnologies include soil conservation (vegetation control, contour orchard, strip/alley cropping), soil fertility management (combined organic and inorganic fertilization, crop rotation/diversification, soil amendment and fertility restoration), water conservation, pest management showed positive results. The technologies' impact on the environment were: marked reduction of the volume of eroded soil, improved soil fertility, improved chemical soil property, increased organic matter and

percent base saturation, and improved pH. There was also a steady increase in vegetative cover and biodiversity. An analysis of the diversified cropland uses showed that there was an increase in land utilization. The project helped increase the net farm income from raising the different alley crops. The farm offered employment opportunities to the community. The demonstration farm was found relevant as it conforms to the thrusts and program of the national government. In general, the farmers in the community are willing to adopt the agro-technologies that were demonstrated.

**Technology Adoption of Alternative Planting Materials and Processing Varieties in the Philippine Highlands**

*D. T. Meldoz, B. T. Gayao and D. K. Simongo*

*Nprcrtc-Bsu, La Trinidad, Benguet, Philippines*

*Email: d.meldoz@yahoo.com, btgayao@hotmail.com, dsimongo@yahoo.com.ph*

This study determined the level of technology adoption of rooted cuttings, generation zero seeds and true potato seeds as an alternative to clean seed tubers of the locally developed varieties Igorota, Solibao, and Raniag. The survey was conducted in the seven potato producing municipalities of Benguet and Mountain Province: namely, Atok, Bakun, Bauko, Buguias, Mankayan, Kabayan, and Kibungan. Results showed that rooted cuttings had the highest adoption level with 38% of the farmers having tried planting at least once, followed by generation zero seeds (19%) and true potato seeds (2%). The other 44% and 19% of the farmers are aware of rooted cuttings and generation zero seeds, respectively but did not try planting principally because of lack of resources to grow seeds (clean area, cash and manpower). With respect to varieties, Igorota had a high adoption level (82%) while Solibao and Raniag had low adoption levels, 25 and 18%, respectively. High adoption level for Igorota was attributed to its high yield and tuber characteristics, which is accepted in the market. Solibao has elongated tuber shape and Raniag has low yield. Attendance to training and seminars as well as membership in organizations had higher influence in technology adoption levels than farm area and land ownership. Trainings had contributed a lot to the increased awareness and adoption of rooted cuttings and Igorota variety.

**Nature of Risks and Efficacy of Risk Adaptation Measures of Farming Communities in Selected Community-Based Watershed Management Projects in the Philippines**

*Roberto Rañola, Jr. CEM, U.P. Los Baños, Laguna, bert1866@gmail.com;*

*Michael A. Cuesta, Ateneo Social Science Research Center*

*Ateneo de Naga University, micuesta75@yahoo.com*

The growing threats facing farming communities and their vulnerability to climate-related hazards under 3 different watershed conditions in the Philippines, namely, lowland-hilly, downstream and hilly-mountainous areas are examined in this paper. Because farming communities are heavily dependent on agriculture for livelihood which is very vulnerable to extreme climatic conditions, then they are most exposed and vulnerable to risks and hazards associated with extreme weather and climate occurrences, the kind and nature which vary across different sites. The paper thus discusses the farmers' risks management strategies across varying bio-physical locations within the context of a risk, hazard and capacity framework. This is based on the analysis of data gathered through a rapid appraisal using FGDs of different watershed areas and riskmapping to determine the current issues and concerns related to farmers' risk situations. Simple statistical and regression analysis was also used to assess the current vulnerability of farming communities for each site and the factors that determine their ability to adopt specific risk mitigating measures. The efficacy of specific adaptation measures was examined in terms of its impact on the farm income per hectare, the selected impact variable. The results show that farmers are exposed to multiple hazards which include typhoons, drought and plant pests. Water shortage and lack of capital also affect farmers most severely. The effects of extreme rainfall, soil erosion, strong winds and dry spells vary by location. The farmers' responses to these hazards vary and range from development of small water systems to modifying land use. These decisions on the kinds of risk-mitigating measures to adopt are influenced by their socio-economic conditions and physical attributes of their farms. The implication of these findings is that there is a need to get a very good understanding of the conditions of these communities within the watersheds if effective strategies are to be developed to reduce their

vulnerability to extreme climatic conditions.

**Vulnerability and Resilience of Watershed Communities  
Under Conditions of Risks Associated with their Farming Systems**

*Maria Francesca O. Tan, Fe M. Rañola and Roberto F. Rañola, Jr.*

*Conservation and Development Specialists Foundation, Los Baños, Laguna, france\_315@yahoo.com*

*Forestry Development Center, CFNR, U.P. Los Baños, Laguna, fmrt1866@gmail.com*

*College of Economics and Management, U.P. Los Baños, Laguna., bert1866@gmail.com*

This paper examines the factors that help shape the vulnerability and resilience of farming communities when faced with risks associated with their farming systems in 3 different watershed conditions in the Philippines, namely, downstream, lowland-hilly and hilly-mountainous areas. Data for the study were gathered through focused group documentation and household survey. Simple statistical measures such as frequency counts, percent ratings, range and means were used in the analysis of the household survey data. The results of the analysis show that farmers are exposed to a combination of 25 different kinds of risks in a year. Majority of the risks faced by farmers are naturally occurring which are due to climate/weather variability. Majority of the farmers rated the effects or impacts of the climate/weather variability as “very high” or “high” with 72% of all respondents across sites estimating their losses from crops alone from “moderate” to “very high”. Farmers however have been able to adapt and institute measures to mitigate the impacts of these climatic events and other forms of risks, which for the most part however are ad hoc in nature and limited. The limitations of farm household assets such as human capital, physical and productive assets, social capital, financial capital and other support systems and entitlements influence the nature and degree of vulnerability. These findings highlight the need for the promotion of sustainable and resilient communities. The specific issues and recommendations are discussed in the paper.

**Alternative Agriculture for Better Living of Poor Farmers in High Land at Tambon  
Lakdan, Amphor Namnao, Phetchaboon Province.**

*Wandee Sutthinarakorn<sup>1</sup>\* Pongsri Jittanoontal Prapas Changlek<sup>2</sup> and Wet Taja<sup>2</sup>*

*<sup>1</sup>Institute of Food Research and Product Development, Kasetsart University, Thailand*

*<sup>2</sup>Agro-Ecological System Research and Development Institute, Kasetsart University, Thailand*

*E-mail: ifrws@ku.ac.th*

This research aimed to use alternative economy to solve poverty problem of farmers for better living. Alternative production practice was tested by comparing the economic output with that from monoculture. A learning process for farmers was also an aim of this research. The concept of alternative agriculture focused on crop variety in harmony with geography and ecosystem. Strawberry and indigenous vegetables, shortlived plants were chosen by farmers as alternative crops so that they could earn enough income. The planting area was 1 ngan. From 12 volunteer farmers, 3 farmers (25%) got good yield, 9 farmers were not successful because they could not leave or reduce conventional production practices. They also had to pay debts to Bank for Agriculture and Agricultural Cooperatives and from the village fund. They therefore could not take proper care of the new crop. Successful farmers earned 55,000 baht/1 ngan from strawberry. The investment cost for strawberry stocks was 6,000 baht, with fertilizer cost of 2,000 baht. They could sell the produce at local/community markets to both tourists and local people. Moreover, output from indigenous vegetables could reduced their food expense. Comparing with monoculture, the researchers found that most farmers grew maize in an average area of 31.29 rai/family. The investment cost was 5,278 baht/rai while the income was 4,800 baht/rai. After humidity reduction of the products, they earned only 3,360 baht/rai. Each family had an average production cost of 165,148.62 baht while average earning was only 108,494.40 baht. The conventional production practice utilized extensive land area while production cost was higher than income. Besides, farmers could not control marketing mechanism. Comparing with alternative agricultural practice relying on temperate plant - a more proper choice with its location, less land area was utilized, while giving higher yield, and having more marketing channels. Therefore, the government sector should strongly promote alternative agricultural practice. Although, this experiment was found successful for only 3 farmers, all 12 farmers could learn from both successful and unsuccessful experiences for correcting production

problems in their next crops.

**The Analysis of Investment Climate in Agriculture in Hanoi province, Vietnam.**

*Tran Huu Cuong, Bui Thi Nga*

*Hanoi University of Agriculture, Email: trancuong@hua.edu.vn*

Hanoi province, Vietnam has much potential for agricultural development such as a large consumer market for agricultural products, soil and water resources, natural climate, physical and social infrastructure, and so on. Hanoi is also one of provinces of the whole country where has attracted a larger number of investors. However, there is a few of investment projects in agriculture in Hanoi in recent years. This paper presents a result of the structure interview for managers of 200 samples including agricultural firms, co-operatives and farms in Hanoi province in 2008-2009. The finding shows that even these enterprises are happy with their business performances and profitability, the investment climate could be negative effects obstructing investment incentives in agriculture. The study finds out 8 key factors determining the investment climate in agriculture in Hanoi province. The constraints are ranked by the interviewees from the highest to the lowest to be land issue, provincial policies for agriculture, capital, physical infrastructure, administrative procedures, market, technology and labor issue. In which land issues and provincial agricultural policies are the most important constraints; the second group are capital, physical infrastructure, governmental administration; the third are market, technology, and labor issues.

**The Agricultural Women Groups in Thailand: The Organization for a Better Living to Support Local and Global Economy of Thai Farmers' Families**

*Oranutda Chinnasri*

*Department of Sociology and Anthropology, Faculty of Social Sciences,  
Kasetsart University Bangkok Thailand, Email: fsocodc@ku.ac.th*

Thailand is an agricultural country where many women participate in agricultural practice. This research focused on the agricultural women groups (AWGs) that have reflected a better living and local and global economy of Thai farmers' families. The paper examined the factors associated with the successes of the popular agricultural women groups, so called the National Agricultural Women Groups (NAWGs) over the past 30 years and considered how those factors have assisted the NAWGs in accommodating to the changes that have occurred in rural Thailand during that time. This study investigated the NAWGs in Thailand which had a total of 24 NAWGs throughout the country from 1982 to 2006. The study applied observation, participatory action research (PAR), archival recorded, faced to faced in-depth interview and telephoned-long interview. The respondents were the leader, committee, members, people working for the NAWGs, the DOAE's officers working with each group, a total of 176 respondents. The paper explained the importance of AWGs towards farmers' families. Obviously, the AWG was a tool for agricultural women. It helped women develop their occupations, increased family income and enhanced the quality of life of families and communities. This study showed that almost all NAWGs achieved remarkable successes but not all of them could maintain their successes. The study revealed that the internal and external participants of the NAWGs were the important elements affecting the organization empowerment, in particular role of leader.

**Thai Swine Production under Contract Farming: A Case Study of Autonomous Raisers**

*Mata N.1/, A. Aungsuratana 2/, S. Attamangkune 2/, N. Paramacom3/, and J. Watana4/*

*1/. Ph.D. Student, Faculty of Agriculture at Kamphaeng Saen, Kasetsart University,*

*Kampaeng Saen Campus, Nakhon Pathom 73140, Thailand, E-mail swkncm@ku.ac.th*

*2/. Faculty of Agriculture at Kamphaeng Saen, Kasetsart*

*University, Kamphaeng Saen Campus, Nakhon Pathom 73140, Thailand*

*3/. Faculty of Economics, Kasetsart University Bangkokhen, Bangkok 10900, Thailand*

*4/. Faculty of Education, Kasetsart University, Bangkokhen, Bangkok 10900, Thailand*

The study sought to determine the pig production structure and marketing channel of autonomous swine raisers under contract farming, the constraints and recommendations in order to formulate development model towards farmer participation. Studied samples were the nationwide selected 9

autonomous swine raisers under contract farming. Interview schedule was obtained to collect data. The study revealed that autonomous swine raisers under contract farming were practiced in fattening pigs only. There were 3 raising patterns including price guarantee, marketing guarantee, and hired contract. In case of price guarantee and marketing guarantee, the farmers invested by themselves as hired contract raising except input used including breeding, feed, and medicine. It also found that the hired contract raisings were provided by their parties. Price guarantee products sold at fixed guarantee price in advance yearly. Marketing guarantee products sold in the flexible agreement depending on their own satisfaction to the free market or sold back to the parties at market price. For hired contract, labor force rate was between 1.20 - 1.80 baht per kg of body weight increased. Major production constraints were lack of academic supporting from concerned government agencies, lower standard requirement products, and high cost respectively. In addition, most of the major marketing constraints were uncertainty price, less supporting from concerned government agencies, and also price interfered by the candidate parties respectively. Recommendations were the collaboration between concerned agencies and autonomous swine raisers in order to let sub-contract swine raising farmers' concern as they were stakeholders of the firms; governmental concerned agencies should enact farm size law in order to solve surplus products, price concerns, and illegal animal movement; and also export promotion to neighboring countries must be concerned.

**Commercial Sericulture Production in Northeastern: A Case Study of Sericulture Farmers in Huafai Village, Khon Kaen Province, Thailand**

*Sumranpath, K. 1, A. Angsuratana<sup>2</sup>, T. Autthom<sup>2</sup>, and N. Poramacom<sup>3</sup>*

*1/. PhD. Student, Faculty of Agriculture at Khampaeng Saen, Kasetsart University, Khampaeng Saen Campus, Nakhon Patom 73140, Thailand*

*2Faculty of Agriculture at Khampaeng Saen, Kasetsart University,*

*Khampaeng Saen campus, Nakhon Patom Province, 73140, Thailand*

*3/. Faculty of Agriculture, Kasetsart University, Bangkok, 10900, Thailand*

The objectives of the study were to determine the existing supply chain condition of sericulture production in Huafai village, Khon Kaen province, Northeastern, their constraints and recommendations in order to improve sericulture production towards farmer participation. In-depth interview and SWOT analysis were obtained to collect data. Studied samples were the selected stakeholders in commercial sericulture firms including sericulture farmers, middlemen, extension officers, and sericulture specialists. The finding revealed that in term of mulberry cultivation, the most popular mulberry variety was "BURIRUM60". Most of mulberry cultivated areas were irrigated towards commercial production system by furrow method. Cultivation techniques were also operated using extension officers recommendations. Major of disease and pest were root rot disease and mealy bug, respectively. There were two patterns in silkworm rearing including rearing for cocoon sale and silk yarn production. Most popular silkworm varieties were "DOKBUA" and "NANGNOI" that reared 8-12 cycles a year. Rearing period was obtained around 23-25 days. Rearing room was constructed permanently. Mulberry leaves were fed at the appropriate silkworm age. Major disease was gasserry disease. Farmer controlled disease by applied lime on silkworm regularly. Most of silk yarn product was first grade and was reeled using apparatus from The Queen Sirikit Institute of Sericulture. Fabric weaving was done towards standardization. Almost all silk yarn and fabric products were sold at the community and by middlemen, respectively. Variable cost of sericulture production was around 34,656.18 baht (US \$ 990, 1US \$ = 35 baht) yearly while income from cocoon 95 baht (US \$ 2.7) per kg., silk yarn 1,100 baht (US \$ 31.4) per kg, and silk fabric 220 baht (US \$ 6.2) per meter. SWOT analysis indicated that the strong point was farmer's experience in sericulture production and sericulture production was done through the integration between local wisdom and modernization technology. The weak point was instability of quality products and less concern for product quality. In terms of opportunity, the farmers were provided inputs, capital and knowledge from the government agencies. The threat point was the competition from low price of imitation products. The constraints were the instability of marketing channel and less bargaining power. Integrated firms should be promoted and more marketing channel should be supported.

**Financial Capability and Buying Practices of Barangay-Based Abaca Entrepreneurs**

**in the Province of Catanduanes**

*Moises L. Toyado*

*Catanduanes State Colleges, Virac, Catanduanes, Philippines, 4800*

*E-mail: mdltoyado@yahoo.com*

This study focused on the financial capability, operational profile, and abaca buying practices of 80 abaca entrepreneurs (AEs) in Catanduanes, Philippines and their relationships using descriptive statistics and regression analysis. The average capital investment of barangay-based abaca entrepreneurs was P10,167 and mostly drawn from personal funds. Private loans dominated the source of capital of the entrepreneurs. The average current operating budget of AE is P7,700 and few have a current operating budget of more than P20,000. Majority of respondents purchased more than 1,000 kilos of abaca fiber per month or a monthly average of 880 kilos. "All-in-one" and "Resiko" were most prevalent buying practice among entrepreneurs. Cash and commodity credits dominated the incentives extended by the traders to the abaca farmers as a buying practice. Cash loan extended by entrepreneurs to abaca farmers (AFs) was influenced by the *cash loan* obtained by the AEs. On the other hand, cash loan extended to AFs was also influenced by three factors, namely, current operating budget, loans acquired by entrepreneurs, and average monthly delivery of abaca fibers. Accordingly, if an entrepreneur's operating capital, loans acquired and delivered were high, chances were, AEs could most likely extend loans to abaca farmers. Moreover, abaca fiber production was typically financed by the entrepreneurs. Consequently, abaca farmers sold their products to whom they received financial support. Unfortunately, price of abaca fiber was dictated by the buyer including the mode at which the fiber will be bought and the farmer was left with no choice.

**Farmers' Perception on Durian Innovative: A Case Study of Certified Orchards Growers in Chanthaburi Province, Eastern Thailand.**

*Phenchan Thardphaiboon<sup>1</sup>, Am-On Aungsuratana<sup>2</sup>, Kawit Wanichkul<sup>3</sup>,*

*Jularat Wattana<sup>4</sup>, and Chuanpis Aroonrungsikul<sup>5</sup>*

*<sup>1</sup>Faculty of Agriculture, Kasetsart University, Kamphaeng Saen campus, Thailand.,*

*<sup>2</sup>Department of Agricultural Extension and Communication, Faculty of Agriculture, Kasetsart*

*University, Kamphaeng Saen campus, Thailand., <sup>3</sup>Faculty of Agriculture, Kasetsart University,*

*Kasetsart University, Bangkok campus, Thailand., <sup>4</sup>Department of Vocational Education, Faculty of Education,*

*Kasetsart University, Kamphaeng Saen campus, Thailand., <sup>5</sup>Central Laboratory Greenhouse Complex,*

*Kasetsart University, Kamphaeng Saen campus, Thailand., E-mail address: phenchan@gmail.com*

The objectives of the study were to determine 1) some personal background of durian growers, 2) their perception including knowledge, attitude, and practices regarding durian innovative, 3) relationship between some personal background of durian growers with their perception, and 4) constraints and recommendations in durian innovative. The research methodology was done through in-depth interviews scheduled with stakeholders and 71 durian growers whose orchards have been certified through GAP by the Department of Agriculture, the Ministry of Agriculture and Cooperatives, Thailand. Descriptive statistics were presented in percentage and arithmetic means. Inferential statistics to test the hypothesis was Pearson product moment correlation coefficient. Testing the reliability of knowledge and practices were obtained through the KR-20 and the KR-21 with the reliability at 0.78 and 0.72, respectively. The semantic differential scaling methods of two attitude innovatives were obtained by internal consistency through Cronbach's alpha with the reliability at 0.71 and 0.83. The findings revealed that average cultivated area was 36.42 rai (5.83 hectares) per household. Average of durian cultivation experience was 25 years. Average income from durian cultivation was 409,505 baht (US \$ 11,700.14, 1 US \$=35 baht) per year. Most durian fruits were sold to the dealers at the orchard. Most corrected knowledge and appropriate practices were added water application to 85% of evaporation rate from the class A evaporation pan at 10-11 weeks over fruit duration. Most agreed opinions were harvesting day estimations after full bloom including "MONTHONG" at 110 days, "CHANEE" at 100 days, and "KRADUM THONG" at 80 days. Positive factors affecting knowledge and practices on durian innovative were cultivated areas, durian cultivation experiences, number of group belonging, number of marketing channel, and durian production planning. Positive factors affecting attitude on durian innovative were durian cultivation

experiences and number of marketing channel. Most constraints were less niche market in domestic demand. Most recommendations were urgent measures in order to get rid of immature durian fruits in the market.

**A Comparative Study on Direct Marketing of Farm Products:**

**Cases in Japan, Korea, Italy and the United States**

*Shoji shinkai<sup>1</sup>, Kazumori Nishi<sup>1</sup>, Kazuhiko Hotta<sup>1</sup>, Shoichi Ito<sup>1</sup> and Seiichi Sakurai<sup>2</sup>*

*1Kyushu University, Fukuoka, Japan, 2Chiba University, Matsudo, Japan*

*Contact: shoji@agr.kyushu-u.ac.jp*

Today, the sales at farmers markets (FMs) are increasing again in some developed nations. Those “new” farmers markets are providing win-win relationship to both farmers and consumers. In addition, many farmers markets are functioning as centers of community development. However, the operation and management are quite unique from a market to another. This study aimed to comparative study on direct marketing of farm product among Japan, Korea, Italy and the US, especially focusing on objectives, operations and managements. Then, potential and problems of the farmers markets as a center of community empowerment are also discussed. In order to reveal situations of the farmers markets, interview items were obtained to market managers in Japan, Korea, Italy, and the US from 2004 to 2009. The interview items were also obtained to farmers, relevant organizations and local government. The result indicated that there were two types of farmers markets. One was farmer-driven or rural-driven farmers markets, and those were seen in Japan and Korea. The other was consumer driven or urban-driven farmers markets, and those were seen in Italy and the US. Both had the similar characteristics, and both were highly supported by consumers at this moment.

**Sustainability Assessment of Organic Vegetable Cultivation in Chiang Mai, Thailand**

*Jintana Kawasaki and Akimi Fujimoto*

*Tokyo University of Agriculture, Sakuragaoka, Setagaya-ku, Tokyo, 156-8502, Japan*

*E-mail: iamlaor@hotmail.com*

Thai farmers are interested in alternative vegetable farming such as safe use farming, natural farming, chemical pesticide free farming and organic farming. They strongly believe that alternative farming can provide economic feasibility due to the high prices of their products, while reducing the burden on the environment. Based on a questionnaire survey of 142 vegetable growers under different production systems in Chiang Mai Province in 2008, this paper aims to clarify whether or not organic farming is a feasible form of sustainable agriculture under small farm size conditions. Sustainability of organic farming is analyzed in terms of farm income, and environmental and social impact in comparison with other production systems. There was diversified farming of rice, vegetables, fruits and livestock in Mae Rim District, Chiang Mai Province. In the villages studied, average overall cost of environmental and social impacts of kale production was estimated to be 350 USD per year (one rai is equivalent to 0.16 ha; one USD is equal to 34.35 Baht at the time of study in 2008). The environmental and social impacts were the most important factor in improvement of production efficiency among four vegetable farming systems. The conventional kale production appeared to have the highest negative environmental and social impact, while the lowest was attained by organic farming. Only in the case of organic production, the average cost decreased due to the reduced negative impact, and organic growers could raise farm income per ha per year to 7,150 USD. This situation demonstrates that organic farming had the sustainable manner due to the highest profit with higher prices contributing to the highest income, and the lowest negative impacts for environmental and social sectors in comparison with other production system in Chiang Mai.

**Effect of Pineapple Juice and Papaya liquid on Physical Properties in Sweet Pork from Culling Sow Meat.**

*Wirat Sumon and Tipmon Yaigate*

*Tubkwang Research Station, Suwanvajokkasikit Animal Research and Development Institute, Kasetsart University, Kamphaengsaen Campus, Nakorn Pathom. 73140*

*Thailand. Corresponding author E-mail: [swkwrs@ku.ac.th](mailto:swkwrs@ku.ac.th).*

Sweet pork, in Thai, is called "Moo Sa-Wan" and is usually made from normal pork meat. Sows are culled for many reasons, e.g. old age, reproductive failure, poor performance etc. Meat from culling sow gives tough texture and low quality. Bromelain from pineapple juice and papain from papaya liquid are proteolytic enzyme and help protein breakdown. Both of enzymes are safe and proved by FAO. So, the aim of this study was to use pineapple juice and papaya liquid to improve quality of sweet pork which is processed from culling sow. Sirloin and rump meat were treated with pineapple juice (5, 7.5, and 10 ml.) and papaya liquid (0.8, 1.2, and 1.6 g.) and compared with control (Sirloin / rump; no pineapple juice and no papaya liquid), kept in plastic bag packaging with oxygen absorber inside for 30 days. The result found that pineapple juice and papaya liquid had pH values at 3.69 and 5.61, respectively. The rump of 1.2 g. papaya liquid's formula has lost the most weight after roast at 46.46%. The average percentage weight loss after frying sweet pork; rump of 1.2 g. and sirloin of 0.8 g. papaya liquid's formula up to 50%. The water activity value was 0.64 to 0.77. There were not significantly differences in shear value among treatments but rump fermented with papaya liquid's formula had higher shear value than sirloin. The microbiology after packaging storage from day 1 through day 30 found total plate count <10 cfu / g, yeast and mold <10cfu/g, *Escherichia coli* <3 MPN/g. There were no detected *Staphylococcus aureus*, *Clostridium perfringens* and *Salmonella* in products. It can be concluded that sweet pork fermented with pineapple juice and papaya liquid were safe and followed Community Standard Products, 296/2547.

#### **Food Security towards Self Sufficiency of Rice Production in Malaysia**

*Hassim, M.D.1, A. Aungsuratana2, C. Rojanaridpiched 3, S. Chanprame2 and N. Poramacom4,*

*1PhD. Student, Faculty of Agriculture at Khampaeng Saen Campus, Kasetsart University,*

*2 Faculty of Agriculture at Khampaeng Saen Campus, Kasetsart University,*

*3 Faculty of Agriculture, Kasetsart University, Bangkok 10900, Thailand*

*4 Faculty of Economics, Kasetsart University, Bangkok 10900, Thailand*

*Email Address: [desathai@yahoo.com](mailto:desathai@yahoo.com)*

The objectives of the study were to determine the status of rice production in Malaysia, constraints and recommendations in terms of policy, and implementation towards food security intervention program. The research methodology consisted of gathering and upgrading information concerning rice production from relevant agencies and in-depth case studies. The results revealed that food security and self sufficiency were ultimate goals of government policy in promoting agriculture as a third engine of economic growth. The national average yield of rice in Malaysia is 3.55 t/ha while that of other Asian countries is 4.30 t/ha. From the previous decades until the current time, Malaysia has been importing rice because not only is the supply insufficient, but also the rice industry in Malaysia does not have a comparative advantage due to several factors, in particular uneconomic land size, water shortage, limited labor force and high production cost. Nevertheless, the government has fully supported the rice industry with massive fiscal outlays to offset these constraints. However, rice production continues to be chronically inefficient. A limited labor force has been a serious problem in rice production in the last two decades. Only 3.3%, accounting for 12,495 of young farmers aged between 15 and 29 were still in the farms. Between 2003 and 2007, the total number of paddy cultivators was dropped 23% from 268,600 to 206,400. The increasing cost of agricultural inputs, particularly fertilizers and pesticides as a result of increased fuel prices had an impact on production and income of farmers. In order to promote self sufficiency intervention program on rice productivity, modernization of farming technology has been disseminated since early 1970's, with the double cropping rice technology fully implemented in 1988 especially in eight granaries areas. In terms of the current food security policy, the Malaysian government has identified three main strategies with a budget of more than USD 800 million for the period of 2008-2010, with the goal to increase SSL to 86% in 2010. Increased rice production through improvement and optimization of farm management including effective fertilization and input application, land leveling, pest control, and farm mechanization, have been promoted nationally. There is also a policy to encourage private sector investment in rice cultivation through commercialization and entrepreneurial approaches.

**Study on Location Movement of Rice Production and Export Possibility of High Quality Rice in Thailand**

*Saijai Thuamyung and Keishiro Itagaki  
Tokyo University of Agriculture, Japan*

Rice is one of the most significant cereal crops in the world. At this present time, rice is main staple food for thousand millions of people in Asian countries. Thailand is one of the world's biggest rice producer and the biggest exporter in term of quantity in the world. Increase of world population and per capita income has significant influence on the total amount of rice consumption, causing the sizable structural change in the demand and supply of rice. Thailand is still sustaining the world's biggest exporter of rice. However, as the international competitiveness of rice is getting higher, in order to maintain comparative advantage for rice production and export internationally, rice exporter should take good quality and taste into consideration, coping with change of demand structure. At this moment, Thailand is usually suffering from over production of rice because the growth rate of production is quite higher than the rate of consumption per capita in the recent years. Even though rice is substantially important staple crop, the increased income per capita in the recent years compelled rice consumption to decrease even in Thailand. Rice consumption per person yearly decreased from 144 kilogram in 1980 to below 104 kilogram in 2003. Rice is widely cultivated in everywhere nationwide in Thailand. Global warming has been preventing stable and efficient rice production. On the other hand, in order to meet rice quality to consumer preference and taste, farmers grow rice with good quality. However, a rice production with high quality depends on the location specific conditions by region. In particular, the northeast region is comparatively suitable for growing the high quality rice. Farmers in this region will be expected to get benefit from producing it. This study aims to clarify the location movement of rice production taking the quality into account in Thailand for last two decades, making use of government statistics and identify some main reasons not only from the various aspects of national and socioeconomic conditions and technology, but also why high quality rice (ex: Jasmine rice) should be used in relatively poorer region like Northeast. Understanding the location movement and export possibility of high quality rice will surely be helpful on considering the better way to improve the rice production management as well as the increased income and productivity for rice farmer in such unfavourable areas as the Northeast region in Thailand through deeper surveying.

**Study on Appropriate Area Ratio between Food and Energy Crops in Thailand**

*Narawadee Khamthep and Sayam Aroonsrimorakot  
Faculty of Environment and Resource Studies, Mahidol University,  
Nakhonpathom, Thailand E-mail address : pakk\_pakk\_pp@hotmail.com*

A study on the appropriate area ratio between food crops and energy crops in Thailand was conducted through the analysis of primary and secondary data. Farmers planting food and energy crops in Thailand were interviewed. Rice was considered a representative of food crops while tapioca and sugar cane were considered representatives of energy crops. Moreover, eucalyptus, a fast growing tree, was studied as a raw material for alternative energy. This study had two 2 parts: (1) deriving equation on trend of plantation of food and energy crops in Thailand during the period B.E. 2010 – 2024 using mathematical simulation model; and, (2) determining the relationship between influence factors on food and energy crops plantation in Thailand as well as farmers' responses to government policies on agriculture. These factors include product price, product volume, cost, and government policies on agriculture, among others. Information obtained were analyzed by applying a weighting score and rating score of importance obtained from interviewing with famers were done on influencing factors of decision making for 4 kinds of crop plantation. Results from the study are of two parts: (1) mathematical simulation model showed that the area for three kinds of plantation (rice, tapioca, and sugar cane) during the stated period had expanded; and, (2) the most influencing factor for decision making in tapioca, sugar cane and eucalyptus production was production price; whereas for rice, the most influencing factor was the conventional occupation which had been practiced from generation to generation. and cause of rice is a strong food for Thai population consumer.

**The Development of Private Standard: ThaiGAP vs GLOBALGAP**

*Roongnapa Korpraditskul 1/, Chuanpis Aroonrungsikul1 1/  
and Chainarong Rattanakreetakul2/*

*1/ Research and Development Institute at Kamphaeng Saen, Kasetsart University,  
Nakhon Pathom 73140 Thailand, email: rdirnk@yahoo.com, rdicha@ku.ac.th 2/ Department of Plant  
Pathology, Faculty of Agriculture Kamphaeng Saen,  
Kasetsart University, Nakhon Pathom 73140 Thailand, email: crattan99@yahoo.com*

This study demonstrated the development of private standard and trend of moving forward in next ten years. Currently ASEAN become gather for sharing common market and trade among region. The technical of production is increasing more and more in quality assurance and reliability key concerns. ThaiGAP; the private standard in Thailand, was developed from Western GAP in 2006 under the responsibility of Cluster of Western GAP members which involved from 4 key players i.e.; Kasetsart University at Kamphaengsaen Campus, Fruit and Vegetable Producers Association, Board of Trade of Thailand and Farmers. The constraint from food safety regulation in trade country resulted more awareness and should be implemented along the chain of custody. Upstream of production chains, GLOBALGAP was known as the pre-farm gate standard with pillars of food safety, environment, quality, worker and animal welfare. This standard is managed by Food Plus, the secretariat, and be used by retailers and approved certification body. Although the standard is voluntary, it is known that GLOBALGAP certification is accepted for putting on shelf. If not, supplier can select another channel of putting produce in another market. Private standard of GLOBALGAP provides equivalency scheme of practice. The scheme is divided into 2 categories, 1). General Regulation and CPCC (Full scheme) 2). Benchmarking Modified Check List (BMCL) of owner standard or CPCC. According to ThaiGAP standard, the choice of BMCL was selected. At the current status, ThaiGAP is at the process of witness in parallel to Independent Technical Review. The review and correction of practicing to make clear sentence were suggested. It is concluded that the technical process can be progressed and will be benchmarked within the process of 12 months. However, the body of management or secretariat has not yet stable and sustained. This issue must be solved under the collaboration among public, private and relevant sectors.

**Measuring the Impact of the Investment Climate on Total Factor Productivity (TFP) in Agricultural Sector: The Case of Hanoi, Vietnam**

*Tran Quang Trung, Tran Huu Cuong \**

*\* Faculty of Accounting and Business Management, Hanoi University of Agriculture*

This study measures the impact of investment climate factors on the total factor productivity (TFP) of manufacturing firms on agricultural area in Hanoi, Vietnam. Endogeneity of the production function and of the investment climate variables is addressed by using a variant of the control function approach, based on individual firm information, and by aggregating investment climate factors by various business lines. Specifically, the analysis is conducted in two steps: first, an econometric production function is estimated to produce a measure of TFP at the firm level; in the second step, variation in TFP across firms is statistically related to indicators of the investment climate as well as firm characteristics. The result yields a number of insights on the factors that underlie productivity. In a variety of business lines, indicators of poor investment climate, especially labor number and administrative clearance time, have significant negative effects on total factor productivity. Decreasing by one day in administrative clearance time could increase TFP by 1.2 - 3.3%. Indicators such as time of land rent, investment capital, land area, and stability of policies have positive effects on TFP. However, levels of effects from investment climate factors on TFP are different among business lines.

**Problems and Obstacles in Production and Marketing of Organic Fruits from Eastern Thailand**

*Supannika Kittilikitsak, Email : kittilikitsak@hotmail.com*

The objectives of this research were to study the cost, return/profits, problems and constraints to production and marketing of organic fruits as compared to fruit grown with chemicals, including marketing costs and margins of organic fruit sellers, and the factors affecting decision making to meet

consumer orders. Results revealed that the average production cost of organic fruit was 20,927.20 Baht/rai or 12.66 Baht/kg. The return was 44,998.29 Baht/rai or 14.99 Baht/kg, giving a total profit of 24,071.08 Baht/rai. For chemically grown fruit, the average production cost was 18,267.92 Baht/rai or 12.39 Baht/kg, giving a return of 25,471.19 Baht/rai or 5.03 Baht/kg. Thus the total profit was 6,969.94 Baht/rai. From the production cost survey of both types of farming, it was found that organic fruit farming entailed higher cost of production than fruit grown with chemicals. However, organic farming also had a higher return from production/rai/year, total profits/rai/year and selling price (baht)/kg of product. Middlemen selling organic fruits spend an average cost of 9.46 Bht/kg with a total marketing cost of 55.15% of the retail price. The farmers got a dividend of 44.85% with the marketing cost at 14.50%, whereas the wholesalers and retail sellers had marketing margins of 15.49 and 25.16%, respectively. Organic fruit farmers faced the problem of not being able to supply market demands due to insufficient production. Problems with distribution of organic fruit products faced by middlemen include high transportation costs especially when production was not in accordance with market needs. Farmers growing fruit using chemicals faced the problem of high cost of production factors. Chemical farmers faced distribution problems due to lack of market knowledge and marketing skills, resulting in an inability to negotiate with the middlemen who fruit buyers. On the part of the consumers, their decision-making to purchase was highly affected by the type and quality of products, price, and distribution channel factors. Cultural and social factors affected their decision making moderately while promotion had the lowest effect.

#### **Global Over-Fishing: A Perspective of Sustainable Development**

*Dr. Anucha Wittayakorn-Puripunpinyoo, School of Agricultural  
Extension, Sukhothai Thammathirat Open University, Parkkred Nontaburi, Thailand,  
E-mail address puanucha@windowslive.com*

*Dr. Arthur L. Stoecker, Department of Agricultural Economics, College of  
Agriculture and Natural Resources, Oklahoma State University, Stillwater, Oklahoma,*

Global fisheries resource is the one of the important bio-resources that belongs to people all over the world. Since the last 30 years, the global natural resources of fishery has been utilized especially the areas called Exclusive Economic Zone (EEZ), 200 nautical miles away from coast. With the reason of common properties of global fisheries resources, every one can take advantage of these fisheries resources that led to global over fishing. In this day and age, the world has faced with global over-fishing accounted for 28 % of the total fish stock. More crucially, the global fishing went beyond the maximum sustainable yield (MSY), estimated by Food and Agriculture Organization (FAO), continuously spread out all over the world. This study aims to measure the Global status of bio-resources to find out how to protect them by applying the bio-resources econometric model. The methods of econometrics were the tools that gave the meaningful results for the sources of Global over-fishing. According to the bio-natural resource econometric model, we found the increasing in the over-all price of fisheries products as well as the growth rate of global population which were the key factors that forced the world fisheries industry got involved. For reaching the sustainable utilization of the global fisheries that would lead to the sustainable development. Food and Agriculture Organization (FAO) has endeavored to encourage all nation members to reduce the global over-fishing through the policies such as the old vessel buy back program and subsidization of fisheries in order to reduce the number of fishing vessels. The countries such as Australia and New Zealand successfully implemented policies in individual transferable quotas and taxes of southern blue fin tuna and yellow blue fin tuna resulted in recovery and stability of parent stocks.

#### **The Selection of Microorganism for Degradation of Oil Spoilage**

*Jureerat Leesmidt 1., Somporn Sommayo 1, Papassara Sangtanoo 1, Lieutenant Ratchasak  
Warnpeurch 2 Lieutenant Nattapong Vongsthongsri 2, Lieutenant Child Amornmongkol 2  
and Commander Surakit Phongam 2*

*1Department of Science, Faculty of Arts and Science, Kasetsart University  
Sattahip and Phangnga Naval Base. Ministry of Defense. E-mail : jureerat.c@ku.ac.th*

Oil contaminated soil and water cause pollution to the environment. Bioremediation / biodegradation

by natural microorganisms represent of mechanisms by which oil pollutants eliminated from the environment This research investigated the efficiency of natural microorganisms for the bioremediation / biodegradation of lubricated oil. Natural microorganisms were collected from oil contaminated seawater and beach sand. Five hundred and nineteen samples were collected from sea coast gulf of Thailand including Chonburi, Rayong, Chanthaburi, Prachuapkhirikhan, Phetchaburi, Samutsakhon, and Samut songkhram. Two hundred and fifty two samples were collected from Andaman sea coast area from 2 provinces including Phangnga and Chumphon. Twenty eight samples were collected from Nakhonpathom, Suphanburi and closed areas, then bacterial isolates were isolated on Nutrient Agar by spread plate technique founding of pure strains 2,407 bacterial isolates. The efficiency of the biodegradation was investigated by natural microorganisms in qualitative and quantitative approaches. The qualitative test was operated for screening microorganisms by point inoculation on Mineral Salt Medium Agar plates, which composed of 2% (v/v) new lubricated oil and used lubricated oil. The result was found that 60 isolates degraded new lubricated oil and 811 isolates degraded used lubricated oil. These microorganisms were used to quantity test for oil degrading capability on Mineral Salt Medium. The results showed that the 1% (v/v) oil concentration for 96 hours was appropriated for microorganisms. Some species of *Bacillus* showed the highest degrading 10% (v/v) oil concentration for 96 hours. Future study, the natural microorganisms that had high ability will be used to eliminate oil contaminated soil and water in true conditions.

#### **Characterization of the Antimicrobial Substances Produced by *Bacillus* sp. B-1 Isolated from Culture Pond**

Supraanee Pungpang<sup>1,2</sup>, Nontawith Areechon<sup>3</sup>, Pongtep Wilaipun<sup>4</sup>

<sup>1</sup>Center for Agricultural Biotechnology, Kasetsart University, Kamphaeng Saen Campus, Nakhon Pathom, 73140, puy0109@hotmail.com <sup>2</sup>Center for Agricultural Biotechnology (AG-BIO/PERDO-CHE) <sup>3</sup>Department of Aquaculture, Faculty of Fisheries, Kasetsart University, Bangkok <sup>4</sup>Department of Fisheries Products, Faculty of Fisheries, Kasetsart University, Bangkok

Genus *Bacillus* produces many antimicrobial peptides of varying structures such as bacteriocins, sublancin and subtilisin. Although bacteriocins active against a varied bacteria including important pathogens such as *Listeria monocytogenes*, *Staphylococcus aureus* and *Streptococcus* sp. The aim of this study was preliminary characterization of antimicrobial substances especially biological and physical properties such as high temperature, pH, sensitivity of proteolysis enzymes and sodium chloride (NaCl). The antimicrobial activity was determined by bacteriocin activity assay by the application of the critical dilution method (agar well diffusion) described by Schillinger *et al.* (1989). *Bacillus* sp. B-1 produce antimicrobial peptides with properties of inhibition effects on *Streptococcus agalactiae* AQSA 001, *Aeromonas hydrophila* AQAS 001, *Staphylococcus aureus* ATCC 12600, *Escherichia coli* JM 109, *Listeria innocua* ATCC 33090, *Micrococcus luteus* IFO 12708, *Bacillus circulans* JCM 2504 and *B. coagulans* JCM 2257 and especially *L.innocua* ATCC 33090 which yielded the highest sensitivities of indicator strain (320 AU/ml). The cell-free neutralized supernatant of *Bacillus* sp. B-1 were stable at 100 °C during a period of 20 minutes (20 AU/ml) and maximum activity of pH 4.0, 6.0, 8.0 and 9.0 at 4 °C (320 Au/ml) and maximum activities of pH 2.0, 4.0 and 6.0 at 100 °C for 60 minutes were 80 AU/ml. The antimicrobial substances were sensitive to the proteolytic properties of  $\alpha$ -chymotrypsin, trypsin, proteinase K and protease and exhibited stable qualities at 6, 12 and 15 % sodium chloride.

#### **Janitor Fish Skin Leather: A Potential Solution to Local water's Degradation and Fish Species Deterioration?**

Julieta A. Delos Reyes, Michael Lojen C. Mendoza, and Jennifer C. Padrid

As early as 1998, the unabated proliferation of Janitor Fishes (*Pterygoplichtys pardalis* and *Pterygoplichtys disjunctivus*) in the Philippines was considered a pest outbreak already but is still unresolved until now. In the meantime, the technical possibility and financial viability of turning the Janitor Fish skin into more economically useful leather have already been proven. This study is in support of earlier studies on Janitor Fish as possible source of leather since it assessed the market potential of leather and leather products from Janitor Fish skin and therefore a possible solution to local water's degradation and fish species deterioration not only in the National Capital Region

(NCR) and Bulacan but the whole country as well. Primary data were obtained through a survey of 275 potential end-users employed in various occupations in NCR, 10 tanneries from Bulacan and 20 leather goods manufacturers. Descriptive, logit regression and SWOT analyses were employed. Results revealed the good market potential of the Janitor Fish skin leather since 60% of the 275 end-user-respondents were willing to purchase leather products from Janitor Fish skin and 70% of the tanneries utilizing cow hides and 67% of those using carabao skin were willing to shift to Janitor Fish skin leather. Similarly, 85% of the leather goods manufacturers signified their willingness to shift a proportion of their leather goods production from cow hides to Janitor Fish skin. Janitor Fish leather was also found price competitive considering the fact that its physical attributes are at par with that of the currently utilized leather materials. Foremost among the recommendations is the development of safe and proper breeding technology that will ensure not only the supply of Janitor Fish but also the safety of the local waters.

#### **Fry Quality of Promising Potato Selections Grown From Three Locations of Benguet**

*E.J.D. Sagalla, L.P. Matsal and D.K. Simongo  
Benguet State University, La Trinidad, Benguet, Philippines  
Email: ejsagalla@yahoo.com.ph, dsimongo@yahoo.com.ph*

The study aimed to identify the location that produces potato selections with the best fry quality, determine the potato entry with the best potato fry quality and determine the interaction between locations and potato entries on fry quality. The potato tubers harvested in Loo had the highest dry matter content and fry yield. In addition, the fries produced from entries harvested at Loo were liked much by the panelists. The fries produced from the tubers harvested at Bonglo and Sagpat were moderately crispy, moderately perceptible, moderately oily, slightly firm, slightly brown and were liked moderately by the panelists. PHIL 2.21.6.2 and Igorota have good fry quality based on high dry matter content and high fry yield. Both entries produced fries which were liked much by the panelists. Growing PHIL 2.21.6.2 and Igorota in Loo might result in the production of tubers with good fry quality.

#### **Multi-location Yield Trial of Potato Entries Grown Across Locations and Seasons in the Philippine Highlands**

*Simongo, D. K. and I. C. Gonzales  
Nprcrtc-Bsu, La Trinidad, Benguet, Philippines  
E-mail: dsimongo@yahoo.com.ph, inesgonzales@yahoo.com.ph*

The study was conducted to evaluate agronomic yield, late blight and Leafminer incidence of selected potato entries across locations/zones and seasons; recommend to the National Seed Industry Council (NSIC) selected entry for official variety release. Five potato entries grown and selected from preliminary yield trial were evaluated from 2006 to 2009 under different ecological zones/elevations from low mountain zone (1350 meters above sea level); mid-mountain zone (below 2000 meters above sea level) and high mountain zone (2000 and above meters above sea level ) for wet and dry season. Treatments were laid out following the Randomize Complete Block design (RCBD) with 40 tubers per replications in all locations and seasons. Entries 380241.17, 2.21.6.2, 676070 and 5.19.2.2 were best performers in terms of survival, vigor, canopy cover, and leafminer and late blight incidence. These four entries significantly out yielded the check varieties Igorota (processing type), Ganza (newly approved variety), and Granola (table type/ farmers variety). Based on the results entries 380241.17, 2.21.6.2, 676070 and 5.19.2.2 are highly recommended for potato production under low, mid and high mountain zones during wet and dry. These potato entries are recommended for the National Seed Industry for variety released.

#### **A Study of Screw Press Rice Bran Oil Extraction Related to Press Cake Characteristics**

*Supakit Sayasoonthorn\* and Sudsaisin Kaewrueng  
Department of Farm Mechanics, Faculty of Agriculture, Kasetsart University  
Bangkok, Thailand  
Pannatorn Patharasathapornkul  
Department of Agricultural Engineering, Faculty of Engineering,*

The relationships among speeds of screw press, compression distances and types of rice bran were studied for optimal condition of cold press oil extraction of rice bran. Results of the study showed that the compression distance of 1.7 and 1.3 cm at the screw speed of 8.4 rpm were the optimal condition for providing the highest yielding of 4.17 and 8.2% oil extraction for raw rice bran and parboiled rice bran, respectively. The texture and discharge pattern of the pressed cake is a reliable guide to predict the oil content in the pressed cake.

**Effect of Various Habitats in Thailand on the Abundance of *Azotobacter*  
In Rhizospheric Soils**

*Marisa Phiromtan 1, Thongchai Mala 2 and Peerasak Srinives3*

*1Agricultural Research and Development Program(International), Faculty of Agriculture  
Kamphaeng Saen, Kasetsart University, Kamphaeng Saen, Nakhon Pathom, Thailand  
73140; email: marphirom@yahoo.com 2Department of Soil Science, Faculty of Agriculture  
Kamphaeng Saen, Kasetsart University Kamphaeng Saen, Nakhon Pathom , Thailand 73140  
3Department of Agronomy, Agriculture Kamphaengsean Faculty, Kasetsart University  
Kamphaeng Saen, Nakhon Pathom , Thailand 73140*

The soil samples were collected from several locations with difference in agricultural practices, crop groups, soil moisture contents (SMC), pH and soil organic matter (SOM) contents. The number of total bacteria and *Azotobacter* in all samples were enumerated in nutrient agar and Ashby's medium, respectively. The results showed that plant groups had significant effect on the population and density of *Azotobacter* in soils. The maximum number and density of *Azotobacter* among plants was found in vegetable rhizospheric soils as much as  $4.24 \times 10^6$  cfu.g<sup>-1</sup> and 28.78 %. The SOM contents showed significant impacts on *Azotobacter* growing. The maximum amount of *Azotobacter* ( $4.06 \times 10^6$  cfu.g<sup>-1</sup>) was found in soil with 2.6 to 3.5 % SOM. The density of *Azotobacter* among various SOM was significant effect. The maximum density of *Azotobacter* (27.29 %) was found in soil with 3.6 to 4.5 % SOM. The soil pH had significant effect on the population and density of *Azotobacter*. The maximum population ( $4.48 \times 10^6$  cfu.g<sup>-1</sup>) and density of *Azotobacter* (25.58 %) was found at pH 5.1 to 5.5. The SMC contents showed significant influence on the abundance of *Azotobacter*. The highest population of *Azotobacter* ( $5.33 \times 10^6$  cfu.g<sup>-1</sup>) was found at 21 to 25 % SMC, but not effected to the density of *Azotobacter*. However, the locations and types of agricultural practices had no significant effect on the abundance and density of *Azotobacter*.

**Activity of Antagonistic Microbes against *Phytophthora palmivora*, the Causal Agent of Pod Rot Disease on Cacao**

G.N. Alit Susanta Wirya<sup>1</sup>, Ni Made Puspawati<sup>2</sup> and IG. Arda Pradipta<sup>1</sup>  
<sup>1</sup>Laboratory of Biopesticide, Faculty of Agriculture Udayana University  
<sup>2</sup>Laboratory of Plant Disease, Faculty of Agriculture Udayana University  
Jl. PB. Sudirman, Denpasar Bali, Indonesia E-mail : [alitsusanta@yahoo.com](mailto:alitsusanta@yahoo.com)

*Phytophthora palmivora*, the causal agent of pod rot disease is the most important factor limiting production of cacao (*Theobroma cacao*) in Bali area Indonesia, causing the decreases of cacao yield to 40%. Because of high disease pressure and environmental concerns, alternative measures to chemicals fungicides are needed to control *P. Palmivora*. Biological control (biocontrol) using antagonistic microbes, as agent is one of alternatives approaches for managing pod rot disease. In this work, we evaluated the ability of four antagonistic microbes namely; *Bacillus* sp., *Trichoderma* sp., *Saccharomyces* sp., *Pseudomonas fluorescens* sp., for their ability to suppress the growth of *P. palmivora* in PDA medium and soils. Infestations of antagonistic microbes *P. fluorescens* sp., *Trichoderma* sp., *Saccharomyces* sp. and *Bacillus* sp. into soils could suppress the population density of *P. palmivora* to 90.44%, 89.40%, 70.00%, 65.40% respectively and protected the cacao pod from the rottenness to 71.36% 70.85%, 63.42%, 56.40% respectively. These results indicate that there were antagonistic activities of four microbial antagonists to suppress the growth of *P. palmivora* in soil that can be used as agents to control pod rot on cacao.

**Synergistic Activity of Extracts of *Samanea saman* and *Allamanda cathartica* in Suppressing the Growth of *Fusarium oxysporum* f.sp. *capsici***

Dewa Ngurah Suprpta, Khamdan Khalimi and Ni Wayan Anik Leana  
Laboratory of Biopesticide, Faculty of Agriculture Udayana University  
Jl. PB. Sudirman, Denpasar Bali, Indonesia E-mail : [biop@dps.centrin.net.id](mailto:biop@dps.centrin.net.id)

*Fusarium oxysporum* f.sp. *capsici* is a pathogenic fungus that causes wilt disease on paprika pepper (*Capsicum annuum*). The disease can cause a significant yield losses on paprika particularly when it is grown in the green house. In order to control the disease, farmers are generally rely on the use of synthetic fungicide that containing Cu (cuprum). However, the residue of this heavy metal on the paprika fruit may influence the quality of the fruit, hence, it is necessary to find other safer agents from plants which effectively can be used to control the disease. Methanolic extracts of one hundreds plant species of various families collected from Bali Island, Indonesia were evaluated for their antifungal activity against *F. oxysporum* f.sp. *capsici* on potato dextrose agar (PDA) medium. Among these plant species, 11 plant species showed antifungal activity against *F. oxysporum* f.sp. *capsici*. The methanolic crude extracts of the leaves of two plants, i.e. *Samanea saman* and *Allamanda cathartica* showed synergistic activity in suppressing the fungal growth of *F.oxysporum* f.sp. *capsici* on PDA medium. Minimum inhibitory activity (MIC) of the extracts of *S. saman* and *A. cathartica* were 0.4% and 0.8%, respectively, while the MIC of their mixture was only 0.3% (w/v). This result indicated synergistic activity of the extracts of *S. saman* and *A. cathartica* in suppressing the growth of *F. oxysporum* f.sp. *Capsici*.

**A Botanical Insecticide Formulation for Controlling Four Species of Stored Product Insect Pests**

Dadang, Septripa, and Idham Sakti Harahap  
Department of Plant Protection, Bogor Agricultural University-Indonesia

A botanical insecticide formulation containing seed extracts of *Annona squamosa* and *Annona glabra* belonging to Annonaceae has been developed to control four species of stored product insect pests, *Callosobruchus chinensis* (Coleoptera: Bruchidae), *Oryzaephilus surinamensis* (Coleoptera: Silvanidae), *Sitophilus oryzae* (Coleoptera: Curculionidae), and *Tribolium castaneum* (Coleoptera: Tenebrionidae). Botanical insecticide formulation was applied by topical application method at the dosage of 1, 5, 10, 20, 50, and 100 µg/insect and residual effect method at the concentration of 0.01, 0.05, 0.08, 0.1, 0.2, and 0.4%. By topical application method, the botanical insecticide formulation yielded more than 80% mortality of *C. chinensis* and *O. surinamensis* at 20µg/insect, while by residual effect meth-

od, the formulation yielded 80% mortality of *C. chinensis* and *S. oryzae* at 0.1%.

**Biological Control of Coconut Hispine Beetle, *Brontispa longissima* Gestro by Using the Parasitoids, *Asecodes hispinarum* Bouček (Hymenoptera: Eulophidae)**

*Thitraporn Pundee*<sup>1</sup>, *Surachate Jamornmarn*<sup>1</sup>, *Wiboon Chongrattanameteekul*<sup>1</sup>,  
*Chalerm Sindhusake*<sup>2</sup>, *Amporn Winotai*<sup>2</sup>, and *Rut Morakote*<sup>2</sup>

<sup>1</sup> Department of Entomology, Faculty of Agriculture, Kasetsart University,  
<sup>2</sup> Plant Protection Research and Development Office, Department of Agriculture,  
Bangkok 10900, Thailand. \*corresponding author: Thitraporn Pundee, E-mail:  
*thitraporn@yahoo.com*

The coconut hispine beetle, *Brontispa longissima* Gestro (Coleoptera: Chrysomelidae) is one of the potentially most serious pests of coconut palms (Liebregts, 2006). Chemical pesticides to control this pest are economically impractical and environmentally unsafe. Therefore, biological control is considered to be the best approach to solving this pest problem. Scientists searched for effective biological control agents, and found the larval parasitoid *Asecodes hispinarum* Bouček was effective in the Pacific region (Sathiamma *et al.*, 2001; Food and Agriculture Organization, 2004). This experiment was studied in Panya Indra golf course, Bangkok, 2007 based on control coconut hispine beetle by using *A. hispinarum*. The parasitoids were observed in five months after released. The mummified larvae were collected in June, August and November. The percent of parasitization were found to be 3.48%, 8.59% and 14.05%, respectively. The severe leaf damage levels decreased in December. The results showed that the new leaves of coconut palm were fresh with less damage. The trees showed clear signs of recovery with green shoots, returning to pre-infestation levels. The biological control program of the coconut hispine beetle is excellent examples of achieving sustainable, long-term control of a very damaging invasive pest that minimizes impacts on the environment.

**The Potential of Carbon Dioxide Content on Aboveground Biomass in *Eucalyptus camaldulensis***

*Panadda Cheamwongsa*, *Sayam Aroonsrimorakot*  
Faculty of Environment and Resource Studies Mahidol University  
E-mail *evekaeve\_2526@hotmail.com*

This study assessed the potential of carbon dioxide content on aboveground biomass in *Eucalyptus camaldulensis* at the age of 1, 2, 3, 4 and 5 years old. The result indicated that *E. camaldulensis* at the age of 1, 2, 3, 4 and 5 years old could store carbon dioxide 2.962, 7.154 15.049, 22.156 and 23.667 ton/rai, respectively. Comparing to teak plantation at the age of 6 years old and para-rubber plantation at the age of 5 years old, it was found that *E. camaldulensis* at the age of more than 3 years old could better store carbon dioxide. Moreover, the study on Carbon Credit value in *E. camaldulensis* at the age of 1, 2, 3, 4 and 5 years old found that the value of it was 495.72 - 849.83, 1,197.29 - 2,052.55, 2,518.60 - 4,317.71, 3,708.03 - 6,356.78, and 3,960.91 - 6,790.30 Bath/rai, respectively.

**Land Use Change and Factors Affecting Changes in Huaynamphung Sub-watershed, Thailand**

*K. Damrongsadsiri*<sup>1</sup>, *D.M. Macandog*<sup>2</sup>  
<sup>1</sup> Graduate student, School of Environmental Science and Management; <sup>2</sup> Institute of  
Biological Sciences, University of the Philippines Los Banos

Land use change is the complete replacement, including modifications of one cover type by another land cover type. It depends on the factors that affect the decision making of land owners both bio-physical and socio-economic, respectively. The study was conducted in Huaynamphung sub-watershed in Thailand. The study aims to assess the land use change from 1988 to 2008 and determines the factors affecting the decision of the farmers in the study area. Satellite imageries of the area were interpreted to create land use maps for 1988 and 2008, respectively. Land uses were classified into 7 classes as follows: (1) natural forest; (2) paddy field; (3) field crop; (4) orchards and tree plantation; (5) grassland; (6) settlement and (7) water. Factors affecting land use change were determined through random household survey. Results showed that the area of natural forest and field crop have

changed significantly compared to other land uses. However, the land area of natural forest decreased while the land area of field crop increased. Similarly, the land areas of orchards and tree plantation, settlements and water have increased. Moreover, in terms of factors affecting land use changes, 101 respondents out of 204 respondents have changed their crop due to both biophysical and socio-economic factors. Price of productivity; management; government advocacy; and diseases, insects and pests were the most important factors affecting the decision of farmers in the study area. The land use in the study area has changed over the period of 20 years. These changes were associated with farmers' decision making and other socio-economic factors. Biophysical factors also play an important role in land use changes but were not the same degree as that of the socio-economic factors.

**Continuous Fixed Bed Biosorption of Pb (II) by Chitosan-Immobilized Biomass of Fungus *Rhizopus arrhizus***

Wanvisa Buranaboripan<sup>1</sup>, Sarote Sirisansaneeyakul<sup>2</sup>, Pramuk Parakulsuksatid<sup>2</sup>, Wirat Vanichsiratana<sup>2</sup>, Nobuo Sakairi<sup>3</sup>, Weeranuch Lang<sup>4\*</sup> <sup>1</sup>Department of Science, Faculty of Liberal Arts and Science, Kasetsart University, Nakornpathom, 73140, Thailand. <sup>2</sup>Department of Biotechnology, Faculty of Agro- Industry, Kasetsart University, Bangkok, 10900, Thailand. <sup>3</sup>Graduate School of Environmental Science, Hokkaido University, Kita-ku, Sapporo, 060-0810, Japan. <sup>4</sup>Department Founding Project of Microbiology, Faculty of Liberal Arts and Science, Kasetsart University, Nakornpathom, 73140, Thailand. \*E-mail address: faaswnp@ku.ac.th

Environmental pollution especially that contaminated with toxic heavy metals, is spreading through the world with industrial progress. This study focused on biosorption of Pb (II) by dead chitosan-immobilized *Rhizopus arrhizus* beads with continuous fixed bed condition. Zeta potentials at different pH were measured to demonstrate the surface charge of the powdered fungal biomass and plain chitosan beads. The optimum pH value for Pb (II) biosorption was found to be 5.0 at 30°C corresponding to the zeta potential of - 21.1 and +18.5 mV for the biomass and the chitosan beads, respectively. Different chemicals were used to study the effect of pretreatment of *R. arrhizus* biomass on biosorption of Pb (II). Pretreatment with detergent and alkali chemicals such as NaOH were exploited for increasing the biosorption capacity in comparison with autoclaved biomass elucidated by FT-IR spectroscopy. For continuous fixed bed biosorption experiment, asexual spores of the filamentous fungus *R. arrhizus* were used as the resting biomass as they tolerate the chitosan gelling for mycelia growth in chitosan beads. Breakthrough curves were analyzed at the flow rate of 1 mL/min and Thomas model was used to describe the experimental data. The beads with Pb (II) loaded were desorbed with 1M HNO<sub>3</sub> solution. After acid desorption and regeneration with deionized water, the beads could be reused to adsorb Pb (II) ions at a comparable capacity.

**Enhanced Insecticidal Activity of Integrated Bacterial Antagonist *Paenibacillus pabuli* SW01/4 with Basil (*Ocimum sanctum*) Extract for Chinese Kale Protection**

Jaruwat Thowthampitak<sup>1</sup> and Sutruedee Prathuangwong<sup>2</sup>  
<sup>1</sup>Department of Entomology, Faculty of Agriculture, Kasetsart University Bangkok  
<sup>2</sup>Department of Plant Pathology, Faculty of Agriculture, Kasetsart University Bangkok

Most farmers use synthetic insecticides to control Chinese kale insect pests. Excessive application of insecticides leads to the human health and environmental effect. In order to resolve this problem, bacterial antagonist and botanical extract can be used as alternative strategy of conventional insecticides. We evaluated the insecticidal activity of combined *Paenibacillus pabuli* SW01/4, a bacterial antagonist and basil leaf extract (*Ocimum sanctum*), under laboratory and greenhouse experiments. Commercial cypermethrin insecticide was used as positive control. The 30-day old kale plants were sprayed with SW01/4 suspension mixed with basil extract, compared to plants treated with either SW01/4 or plant extract alone for offered common cutworm feeding trials. Ten worms per plant arranged in CRD design were investigated under control conditions. The treatment with SW01/4 mixed with basil extract significantly provided the highest mortality of common cutworm per plant with 50% reduction that was significantly different (P=0.05) from other treatments. After feeding for 1 day, insect damage remained lower on plant treated with SW01/4 combined with basil extract than other treatments. The hypothesis of plant metabolites induced by bacterial antagonists or elicitation of

physiological changes in plants and active ingredient in plant extract that were toxic and repellent to most insect pests for support our study was discussed.

**The Bioconversion of Water Hyacinth (*Eichhornia crassipes*) to Bioethanol**

Jarupan Kuldiloke, Mohammad Naghi Eshtiaghi\*, Peeraya Peeploy,

Pakphoom Amornrattanapong

Department of Chemical Engineering, Faculty of Engineering, Mahidol University, Thailand

25/25 Puthamonthon Sai4, Salaya, Nakhorn Pathom, 73170, Thailand

\* Mohammad Naghi Eshtiaghi, egmne@mahidol.ac.th

The effect of chemical pretreatment methods such as acid and alkali treatment on conversion of lignocellulose (cellulose, hemicellulose) in water hyacinth was investigated. The highest sugar content in acid pretreated could be observed in water hyacinth treated with 3% H<sub>2</sub>SO<sub>4</sub> solution (up to 18.16% w/w). Subsequent treatment of acid or alkali pretreated sample with 0.8 w/w enzyme (mixture of cellulase and hemicellulase) resulted dynamic increase of sugar in sample (up to 32%w/w). In addition, increasing the applied enzyme concentration from 0.8 % w/w to 4% further increased the sugar content in sample (up to 55.5% w/w). Combination of acid treatment and ultrasonic vibration improved the digestion of lignocellulose substances in water hyacinth up to 61.99 %w/w. Sub-critical water (200 °C for 10 min) as a physical method and subsequent enzyme treatment (0.8% w/w) resulted up to 17 % w/w sugar in sample. Bioethanol concentration during fermentation (at 30 °C) of pretreated sample using *Saccharomyces Cerevisiae* increased with increasing the fermentation time. After 3 days fermentation up to 60 % of sugar in sample was converted in ethanol.

**Efficiency of Microorganisms Isolated from Soil for Plant Diseases Control and Plant Growth Promotion**

Jureerat Leesmidt, Somporn Sommayo and Khwanchai Nimanun

Department of Science, Faculty of Liberal Arts and Science, Kasetsart University,

Kamphaengsaen, Nakhonpathom, Thailand 73140. E-mail: jureerat.c@ku.ac.th

This research studied natural microorganism which eliminate the plant pathogens and are plant growth promoting, from soil in Nakhonpathom province, by cross streak plate method on two types of medium, PEMBA1 and GSP Agar2. There were 342 isolates of *Bacillus* sp. and 281 isolates of *Pseudomonas* sp. The antibiotic property was tested by streak plate method and 130 isolates could produce antibiotics. The antibiotic production results were classified in 5 levels. There were 41 isolates could produce in level 3-5, and they show possibilities to resist fungi that cause plant disease such as *A. flavus*, *A. niger*, *A. alternata*, *C. capsici*, *F. solani*, *L. theobromae* and the bacterial *X. campestris pv. glycine*. Stem end rot of mango and chili anthracnose disease were tested by detached fruit technique. Founding of 20 isolates could eliminated the diseases more than 50 %, and 108 isolates could control more than 50 % of chili anthracnose disease. Then, these microorganisms were used for controlling of the sudden death syndrome disease of soy bean and bacterial pustules of soy bean. Test results showed that 66 isolates and 22.66 % of 29 isolates could control the sudden death syndrome and bacterial pustule of soy bean more than 50 %, respectively. Moreover, these microorganisms were used to growth promoting of soy bean in green house, the abilities of growth promoting was compared by dry matter. In addition, Indole-3-acetic acid (IAA) was tested. Founding of 38 isolates which had abilities of antibiotic could abilities to support the growth promoting of soy bean in green house and IAA production, 29 isolates and 9 isolates were *Pseudomonas* sp. and *Bacillus* sp., respectively. These microorganisms high efficiency will be used to study and apply in agricultural in the future.

**Productivity Enhancement of Upland Farming System in Tanay, Rizal**

Penaranda, Flordeliza R., Solano, Eulenia V, Guiyab, Arnold T,

Penaranda, German L., Abines, Elvira S., Mateo, Namerod F.

College of Agriculture, University of Rizal System, Tanay, Rizal, Philippines 1980

*E-mail: urs\_flor\_green@yahoo.com*

The Productivity Enhancement of Upland Community Project was implemented within the context of improving the management and productivity of marginal hillylands of Tanay, Rizal. To improve the economic and social condition of these beneficiaries, the University introduced EPMMA technologies on soil and water conservation, soil fertility management and the URS low cost soilless vegetable farming. The project had two components: the on-farm yam and taro production and the in-campus rootcrop based cropping system. The on-farm yam and taro production adopted soil conservation measures such as contour farming and use of organic fertilizer. Two cropping of yam were done wherein 800 and 1,000 ubi sets were distributed to and planted by seven farmer cooperators during the first cropping (June 2006) and second cropping (May 2007), respectively. An approximately 2000 square meter lot was developed for taro production. Water conservation management technique was accomplished through improvement of one unit shallow well spring and the construction of a 10 m wide x 15 m long and 1 m deep small farm reservoir. For the in-campus component, a self-designed 144 square meter hydroponics greenhouse was constructed. Trial planting of lettuce, pak choy, tomato, cucumber, herb and honey dew melon were undertaken. Contour farming, use of organic fertilizer and minimum tillage were practiced in the culture and management of yam. Approximately 5,000 square meter lot was developed and planted with minimum tillage. Manpower capability was strengthened through training for AFP enlisted personnel, LGUs, and students. Moreover, the project served as destination site of educational tours and an information stop shop for farmers' inquiries on soil conservation farming and hydroponics. With the project, the effective cultivated area both on-farm and in-campus were increased by about 40%, a benefit-cost ratio of 2.34 was attained, soil and fertility structure were improved, academe/LGU/farmer-cooperators linkage was further strengthened, additional employment was generated and the adopted technologies were disseminated and gained acceptance within and outside the province of Rizal. Moreover, sustainability of the project was guaranteed with the institutionalization of the same in the operation of URS Tanay.

#### **Organic Liquid Fertilizer as Base Nutrient Solution for Growing Lettuce in Hydroponics**

*German L Penaranda*

*College of Agriculture University of Rizal System, Tanay, Rizal, Philippines 1980*

*E-mail: urs\_flor\_green@yahoo.com*

Chicken manure tea was used as an alternative liquid nutrient solution to grow leaf-type lettuce (*Lactuca sativa L.*) var. Waldmann's Green in two hydroponics systems: the aggregate culture and the nutrient film technique. Lettuce was fed with pure chicken manure tea (PCMT), fortified chicken manure tea (FCMT) and the produces was compared with lettuce grown by using inorganic nutrient solution (INS). The PCMT consists of 0.02% total nitrogen (N), 0.02% total phosphorous pentoxide (P<sub>2</sub>O<sub>5</sub>), 0.14% total dipotassium oxide (K<sub>2</sub>O), 0.02 % total calcium oxide (CaO), 0.05% total magnesium oxide (MgO), 0.03% Sodium (Na), 1.26 ppm Zinc (Zn), Trace Copper (Cu), 3.78 ppm Manganese (Mn) and 64.28 ppm Iron (Fe). The FCMT was formulated using the PCMT by adding in a 50-liter PCMT, 34.4 grams of calcium nitrate and 18.41 grams of magnesium sulfate. Adding of these salts increased the Total Dissolved Solutes (TDS) of the FCMT to 4,238 ppm and had a pH of 7.3. All nutrient solutions were maintained at a pH of 5.8 to 6.4 and TDS of 500-600 ppm during the first week, 700-750 ppm during the second week and 800-850 ppm on final week of growing lettuce. Results showed that there was no significant difference on growth performance of lettuce grown in two hydroponics systems and fed with PCMT, FCMT and INS. Lettuce grown in aggregates obtained an average economic yield of 53.1 grams, mean root weight of 20 grams and with a mean total biological yield of 66.5 grams. The organic nutrient solutions was negative of *Escherichia coli (e.coli.)*. Lettuce leaf was also negative of *e. coli*. The use of PCMT reduced the cost of production and increased the net income. The return on investment using PCMT was 39%.

#### **Effect of the Extracts of *Embelia ribes* Burm. f. (Myrsinaceae) Leaf on Broad Mite, *Polyphagotarsonemus latus* (Acari: Tarsonemidae)**

*Patchanee Vichitbandha a\*, Watcharin Srimongkolchaia and Angsumarn Chandrapatyab*  
*AScience Division, Faculty of Liberal Arts and Science, Kasetsart University,*

Kamphaeng Saen Campus, Nakhon Pathom 73140

<sup>b</sup>Department of Entomology, Kasetsart University, Bangkok 10900

Contact details: \*faaspnv@ku.ac.th: Sustainable Utilization of Bio-resources

To decrease the use of chemical acaricides, this study aimed to select natural plant extracts in controlling broad mite (*Polyphagotarsonemus latus* (Banks)) by investigating the repellent effects and toxicities of twelve *Embelia ribes* Burm. F. leaf crude extracts on *P. latus*. Both dry (d) and fresh (f) *E. ribes* leaves were extracted by two methods: moving-bed contacting method (MB) and fixed-bed contacting method (FB). In each method, leaves were sequentially extracted with 3 different solvents: methanol (M), dichloromethane (D) and hexane (H). Firstly, twenty adult gravid females of *P. latus* were fed on a mulberry leaf disc applied with each type of plant extracts (0.5% w/v in ethanol) by 2 ways: no choice and choice bioassays. The 10% ethyl alcohol was used as control treatment. The best four potential extracts that repelled *P. latus* from leaves and reduced their reproduction were: dry leaves by fixed-bed contacting method with dichloromethane (dFB/D), dry leaves by moving-bed contacting method with hexane (dMB/H), and both fresh and dry leaves by fixed-bed contacting method with hexane (fFB/H and dFB/H). *P. latus* stayed on the dFB/D, dMB/H, fFB/H and dFB/H leaf discs less than control leaf discs by 67.87, 48.58, 49.10 and 54.63%. The oviposition rates were reduced by 98.78, 88.73, 88.73 and 87.96% relative to control, respectively. Results from choice bioassay showed all twelve extracts repelled *P. latus* to the ethanol side of leaf discs within 32 hours, with one exception. The extracts from fresh leaves by moving-bed contacting method with dichloromethane (fMB/D) did not repel *P. latus* to the ethanol side in the first 8 hours. Secondly, the three best extracts from dry leaves were tested in no choice bioassay. The repellent effect on *P. latus* of dFB/H extract was higher than the dMB/H and dFB/D extracts. Therefore, the dFB/D, dFB/H and dMB/H extracts of *E. ribes* leaves could possibly be used to repel *P. latus*. However, the impact of these extracts on broad mite's natural enemies should also be of concern.

**Effect of the Extracts of *Embelia ribes* Burm. f. (Myrsinaceae) leaf on Predacious Mite *Amblyseius cinctus* Corpuz and Rimando (Acari: Phytoseiidae)**

Thidaporn Leelawana, Angsumarn Chandrapatyab and Patchanee Vichitbandha a\*

<sup>a</sup>Science Division, Faculty of Liberal Arts and Science, Kasetsart University,

Kamphaeng Saen Campus, Nakhon Pathom 73140 <sup>b</sup>Department of Entomology,

Faculty of Agriculture, Kasetsart University, Bangkok 10900 Contact details: \*faaspnv@ku.ac.th

Toxicity effects of the extracts of *Embelia ribes* leaf on gravid female and eggs of the predacious mite *Amblyseius cinctus* were studied for selecting botanical acaricides from wild plants to control *Polyphagotarsonemus latus* without adverse effects on their predator, *A. cinctus*. The selected *E. ribes* leaf crude extracts were extracted from dry *E. ribes* leaves by 3 methods: moving-bed contacting method with hexane (dMB/H), fixedbed contacting method with dichloromethane (dFB/D) and with hexane (dFB/H). Then each extraction was dissolved into three concentration levels (dMB/H and dFB/D: 0.3, 0.5 and 0.7% w/v; dFB/H: 0.2, 0.4 and 0.6% w/v) and their solvent, ethyl alcohol 10%, was 0% w/v. Each solution was sprayed on a gravid predacious female or dropped on predacious female's habitat to evaluate direct-contact toxicity effect and habitat-contact toxicity effect of each solution on female mortality, longevity and oviposition rate in the first experiment. Female predacious mites that contacted with any selected *E. ribes* leaf extracts could lived long as and produced eggs at the same rate as female that contacted with only their solvents. The higher concentration did not significantly cause the higher toxicity to female. Although different contacting methods did not cause the difference in oviposition rate of female, the higher toxicity to female longevity of the extracts occurred to sprayed female than female that lived on dropped habitats. In addition, the probit analysis of dead females during experiments suggested that dFB/D, dMB/H and dFB/H had the lowest toxicity to sprayed female, according to their LC50: 0.149, 0.467 and 0.827% w/v, respectively. In the later experiments, only dFB/H solution were sprayed on 2 stages of predacious mites; female and

egg. The female predacious mites, sprayed with dFB/H (0.6%w/v), had lower oviposition rate and shorter longevity than ethyl alcohol-treated females. While the hatching rates of the 0.4% w/v dFB/H-sprayed eggs was higher than the ethanol sprayed eggs, the eggs directly in contact with several con-

centrations of dFB/H and ethanol were not different. This inconsistent results might be due to the side-effects of ethyl alcohol 10%. Thus, we should investigate for better solvents of the dFB/H extracts. Next, the study effect of dMB/H to control *P. latus* without adverse effects on *A. cinctus* should also be concerned due to the low LC50 when predators got in contact with the extract in their habitat.

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(Universiti Putra Malaysia, Malaysia)  
Soil Science

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