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Chairmanship
Oral Presentation

	Room 1	**Room 2**	**Room 3**
	1st session, 10:30-12:00	1st session, 10:30-12:00	1st session, 10:30-12:00
	Rural Development (Ru)	Agricultural systems (Ag)	Environmental Management (En)
Chair	**Dr. Sinisa Berjan**	**Dr. Buntong Borarin**	**Dr. Hiromu Okazawa**
Co-chair	**Dr. Lalita Siriwattananon**	**Dr. Nina-Nocon-Shimokuchi**	**Dr. Hor Sanara**
	2nd session, 13:30-15:00	2nd session, 13:30-15:00	2nd session, 13:30-15:00
	Rural Development (Ru)	Agricultural systems (Ag)	Environmental Management (En)
Chair	**Dr. Robert J. Farquharson**	**Dr. Chuleemas Boonthai Iwai**	**Dr. Prasit Wangpakattanawong**
Co-chair	**Dr. Serge Morand**	**Dr. Noel T. Lomosbog**	**Dr. Jeeranuch Sakkhamduang**
	3rd session, 15:30-17:00	3rd session, 15:30-17:00	3rd session, 15:30-17:00
	Education for Sustainable Rural Development (Ed)	Agricultural systems (Ag)	Environmental Management (En)
Chair	**Dr. Machito Mihara**	**Dr. Peter Stamp**	**Dr. Oscar B. Zamora**
Co-chair	**Dr. Maria Cristeta N. Cuaresma**	**Dr. Shigeoki Moritani**	**Dr. Tomas D. Reyes Jr.**

	Room 4	**Room 5**
	1st session, 10:30-12:00	1st session, 10:30-12:00
	Rural Development (Ru)	Agricultural Systems (Ag)
Chair	**Dr. Marcelino T. Razalan Jr.**	**Dr. Seng Mom**
Co-chair	**Dr. Hok Lyda**	**Dr. Pen Miranda**
	2nd session, 13:30-15:00	2nd session, 13:30-15:00
	Rural Development (Ru)	Agricultural systems (Ag)
Chair	**Dr. Merites M. Buot**	**Dr. Dieter Trautz**
Co-chair	**Dr. Huon Thavrak**	**Dr. Phrueksa Lawongsa**
	3rd session, 15:30-17:00	
	Environmental Management (En)	
Chair	**Dr. Percy E. Sajise**	
Co-chair	**Dr. Neang Maline**	

Poster Presentation
Chair Prof. Dr. Regucivilla A. Pobar

Education for Sustainable Rural Development (Ed)	Rural Development (Ru)	Agricultural Systems (Ag)	Environmental Management (En)
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		Dr. Nguyen Van Thu	**Dr. Makoto Ooba**
		Dr. Pheng Vutha	**Dr. Narumol Kaewjampa**
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		Dr. Ratchata Tonwitowat	**Dr. Takahiko Kubodera**
		Dr. Rungkan Klahan	**Dr. Somporn Pleanjai**
		Dr. Sawat Pimsuwan	
		Dr. Shinobu Yamada Terauchi	
		Dr. Vo Quang Minh	
		Dr. Vo Tong Xuan	
		Dr. Yolina T. Castaneto	

Program of the 7th International Conference on Environmental and Rural Development

January 15, 2016 (Friday)

15:00-16:00	ISERD Council meeting
16:00-17:00	Steering Committee meeting
17:30-20:00	Registration and welcome dinner at Khmer Surin restaurant

January 16, 2016 (Saturday)

Part I: *Opening Program*

07:30-08:30	Registration
08:30-10:00	Announcement of program by MC/addressing delegates
	National anthem
	Welcome address and Recognition of Participants by Prof. Dr. Mom Seng
	Message from ISERD President Prof. Dr. Mario T. Tabucanon
	Introduction of Excellent paper Awards by Prof. Dr. Eiji Yamaji
	Introduction of Excellent poster Awards by Prof. Dr. Regucivilla A. Pobar
	Outcomes from ISERD Council meeting by Prof. Dr. Machito Mihara
	Remark from USAID Representative
	Remark from IDRC/SEARCA by Dr. Gil C. Saguiguit, Jr.
	Opening remark by Prof. Dr. Bunthan Ngo
	Keynote speakers by Dr. Makara Ouk

Part II: *Poster Presentation and Parallel Sessions*

10:00-10:30	Poster presentation & coffee break
10:30-12:00	Session 1 of oral presentation (6 presentations: Room 1,2,3,4,5)
12:00-13:30	Lunch
13:30-15:00	Session 2 of oral presentation (6 presentations: Room 1,2,3,4,5)
15:00-15:30	Poster presentation & coffee break
15:30-17:00	Session 3 of oral presentation (6 presentations: Room 1,2,3,4)

Part III: *Banquet & Awarding Ceremony*

January 17, 2016 (Sunday)	Excursion
7:00-16:00	

Presentation Program

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Session 3
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Co-chair Dr. Maria Cristeta N. Cuaresma

Room 4 : Rural Development and Environmental Management

Session 1
Chair Dr. Marcelino T. Razalan Jr.
Co-chair Dr. Hok Lyda

Room 5: Agricultural System

Session 1
Chair Dr. Seng Mom
Co-chair Dr. Pen Miranda

Session 3
Chair Dr. Percy E. Sajise
Co-Chair Dr. Neang Maline

Poster presentation

Chair of Poster presentation and Excellent Poster Award: **- Prof. Dr. Regucivilla A. Pobar**

Education for Sustainable Rural Development

Co-chair: **Dr. Dawroong Watcharinrat**
Dr. Katsuyuki Shimizu
Dr. Shella C. Olaguir
Dr. Vijaya Kumar Thirukkovela

Rural Development

Co-chair: **Dr. Anucha Wittayakorn Puripunpinyoo**
Dr. Aya Kaneko Ikawa
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Dr. Kumiko Kawabe
Dr. Mongkon Ta-Oun
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Dr. Krang Kroesna
Dr. Keo Sath
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Environmental Management

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Dr. Cheang Hong
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Dr. Duangrat Thongphak
Dr. Kiichiro Hayashi
Dr. Kubashi Satoru
Dr. Makoto Ooba
Dr. Narumol Kaewjampa
Dr. Ngo Thi Thanh Truc
Dr. Takahiko Kubodera
Dr. Somporn Pleanjai

ORAL PRESENTATION

A Deconstruction of a Social Environment in a Cebu City, Philippines Community Gathering

Merites M. Buot[a*], Gilda L. Uy[b]

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Abstract

In a yearly Cebu City Sinulog festival celebration, several dichotomies could be experienced, learned and relearned. The original intent of the gathering of these local people has changed through times. Although relearning again the intent of the event by looking at the tourism industry could present another view. Although economics plays a major function but another facet of social environment has experienced dualities. Commodification of the original intent can be well understood by reconstructing spirituality. Words are always value-laden therefore the importance of looking clearly at the text and the different perspectives in a post-structuralism approach was vital in successfully bringing in the truth. The study would like to explore the traditionalization/ detraditionalization of the Sinulog gathering in Cebu City. Specifically, it seeks 1) to identify patterns of dualism to generate authenticity of the tradition and its current roles, and 2) to trace the commodification of spirituality through the relationship of the church, the LGU and the community. People participate in a gathering with a mixture of reasons why. People who spent sum of money to go to an area offering commercial attractions in a form of cultural knowledge have their own stories to tell. The Church has taken a back seat role and allows the other organizers to do its roles financially and maybe intellectually. Perhaps the Church likes to maintain its sobriety in order not to tarnish itself with economics. And perhaps at this point in time, the Church has accepted the fact that commodifying spirituality cannot be stopped due to postmodernism setting in. It would be good if people coming into the city would appreciate their diverse social environment and celebrate the real meaning of it.

Keywords: economics, festival, sinulog, social environment, and spirituality

Impact Assessment of Land Use Change on Ecosystem Services and Livelihood Security of Rural Highland Communities in Lao PDR

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Abstract

It is widely recognized that land use changes are affecting provision of ecosystem services as well as people's livelihoods, especially in rural areas where people are highly dependent on local ecosystem services. This study developed an integrated methodological framework by combining a diversity of corresponding frameworks and concept, such as Driver-Pressure-State-Impact-Response (DPSIR), Ecosystem Services (ES), Sustainable Livelihood Framework (SLF) and Agro-Ecosystem Analysis (AEA). This integrated framework was used together with a combination of Participatory Rural Appraisal (PRA) method and spatio-temporal analysis. The objectives of this study were to detect land use change and identify its drivers; and to assess the impact on provisioning ES and livelihood security of rural highland communities in Saysathan district, Sayaboury province, Lao PDR. As part of the research result, land use change analysis highlighted a large decrease in forest areas during the past decade. The reduction of forest cover was associated with significant decline of provisioning ES, and the decline in provisioning ecosystem services also influenced the state of livelihood security of the local communities, especially natural capital. By taking the trajectory of forest cover change and the importance of provisioning ES into account, it is essential for stakeholders to integrate ES indicators into land use management planning as well as socio-economic development to maximize benefits from natural resources to the communities.

Keywords: land use change; ecosystem services; livelihood security; integrated methodological framework, rural highland communities; Lao PDR

Impact of Modernization on Disaster-Prone Regions as Factor of Increasing Vulnerability: Case of Ishinomaki and Kesennuma, Miyagi, Japan

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Abstract

This paper studies the relation between modernization and its adverse effect on disaster-prone regions from the sociological and historical-geographic point of view. It focuses on geophysical disasters such as earthquake and tsunami, conducting case studies in the rural areas, Ishinomaki and Kesennuma cities, Miyagi Prefecture, Japan. The both cities are historically vulnerable to earthquakes and tsunamis and excessively damaged by the Great East Japan Earthquake in 2011. The main conclusion is that modernization since the start in Japan after 1868 entailed increased risks for the Japanese society. Modern technology has certainly generated advanced disaster prevention measures based on the 'dominant paradigm' which rely on, advanced technology and science and centralized measures by the governments. However, concentration of human resources in vulnerable areas led finally to great losses after the Great Hanshin Earthquake in 1995 and the 2011 disaster in the modernized society. Against that paradigm, the 'radical paradigm' has been acknowledged as prerequisite for the disaster risk reduction, which looks at disasters from anthropological view. Thus, it emphasizes the reevaluation of indigenous knowledge and community-based adaptation. It reveals that the loss of them as one of the results of the modernization process should be put under consideration as a cause of the disasters. The overall research aim of this paper is to study whether and how the modernization made the communities in Ishinomaki and Kesennuma vulnerable to natural disasters by the time of 2011 disaster. This study is based on the qualitative method which constitutes of literature and GIS analysis.

Keywords: geophysical disaster, land-use, radical paradigm, indigenous knowledge, community-based adaptation, reflexivity of modernization

Globalization and Urbanization of Rural Areas: The Case of the City of Dasmariñas, Cavite Province, Philippines

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Abstract

The Philippine economy reached the "tiger cub" status in the middle of the 1990's after reforms in the power sector and the liberalization of several industries like banking, retail and telecommunications became the focus of the Ramos Administration. These economic reforms anchored the growth of the Philippine economy in that decade. Foreign direct investment (FDIs) increased during that period as well as investments from local conglomerates. The demand for new industrial and commercial sites for business locators paved the way for the expansion and growth of several industrial zones located most notably in the CALABARZON growth corridor which includes the provinces located south of Metro Manila namely: Cavite, Laguna, Batangas, Rizal and Quezon. This paper analyzed the changes that took place in the historic city of Dasmariñas, located in the province of Cavite. The paper presented some of the reasons behind its transformation from being a simple barrio of Imus, into what is now today as a highly urbanized city. The paper described the city's history and its numerous advantages as a business location site for many industries. This study also made use of several secondary data coming from official government websites and from selected academic papers from authors who also did several studies that are related to rural to urban transition particularly areas that used to be agricultural in setting but are now being converted into urban areas mainly due to the congestion in the core areas specifically Metro Manila.

Keywords: urbanization, globalization, agriculture, industries, transition, reforms

Biodiversity and Health in Southeast Asia: The Project BiodivHealthSEA

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Abstract

Southeast Asia is both hotspot of infectious emerging diseases of potential global pandemics and of biodiversity, particularly at threat due to dramatic changes in land use. These may explain why international organizations, developmental agencies and non-governmental conservationist organizations have specially focused on Southeast Asia (FAO-OIE, USAID, WCS, EU programs « One Health »). However, little is known on the links (mechanisms and perceptions) between biodiversity and health at local level. We have developed an integrative project BiodivHealthSEA which aimed at investigating: (i) the relationship between health and biodiversity in relation to global changes; (ii) the roles and impacts of international and national actors in promoting the "One Heath" approach; the local impacts and perceptions of the health/environment interdependence and their links to global changes; the impacts of local use schemes (local practices, access rules) in terms of health risks. We used rodents and rodent-borne diseases as proxies of biodiversity changes, environmental stress, and emerging infectious disease. We conducted studies in ecology, epidemiology, policies and social sciences at both regional and local levels. The next step is to develop a habitat-based approach that allow both data representation and based-modeling scenarios.

Keywords: Biodiversity, Health, Southeast Asia and BiodivHealthSEA Project

Assessment of Credit-Market Linkage Arrangement of Rice Farmers in Selected Town of Laguna, Philippines 2014

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Abstract

The general objective of the paper is to assess the credit-market linkage among rice farmers in selected towns of Laguna. Specifically, it identified and described the different credit-market linkages availed by rice farmers in selected towns of Laguna, Philippines. It also identified the different factors affecting the decision of the farmer to engage in the credit-market inter-linkage arrangement. Farmer respondents were divided into two groups: those who engaged in credit-market tie-up arrangement and those who availed the ordinary credit facilities. Descriptive statistics were used to describe the socio-economic characteristics and farm-related characteristics of farmer-borrowers. The study also used effective interest rate and logit regression analysis. The analysis showed that millers were the major provider of credit to rice farmers under the credit-market linkage arrangement in the study area. Some farmer respondents claimed that they were not paying any interest of the money they borrowed if they pay their loans with palay at pre-determined price. Analysis showed that the inputs suppliers usually overpriced the inputs they lent to the farmers and underpriced the rice bought from the farmers. The logit analysis showed that distance of the farm from the highway, educational attainment, household size and cost of inputs were the factors affecting the decision of the palay farmers to engage in credit-market tie-up. The results of the study showed that farmers who engaged in credit –market interlink were paying higher effective interest rate (136 %) as compared to ordinary credit arrangement (25%). In addition, most farmer respondents preferred cash loans over agricultural input loans and pay their loan with palay during harvest time.

Keywords: Credit-market inter-linkage, palay, effective interest rate, logit regression analysis

Characterization of Banana Production in Conner, Apayao

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Abstract

This paper aims to characterize banana production in Conner, Apayao in terms of types of banana cultivars preferred by farmers, describe the economic, social and ecological values of banana, and factors affecting yield performance of banana production. Primary data were collected from a total of 82 banana growers using survey questionnaires, focus group discussion, and key informant interview. Data were analyzed through the use of descriptive statistics of frequency and percentage. The results of the study revealed that there were 4 types of banana cultivars in Conner, Apayao. Farmers produced banana for cash crop purposes followed by staple food. It is usually being served as main dessert during occasions, fresh banana fruits and processed products are being exhibited during local, regional and national agro-fairs. Banana trees act as nurse tree for other agricultural crops. High incidence of pest and diseases was the main constraint in banana production. Other factors are the absence of credit services that offer low interest and lack of technical know-how on management practices of banana production.

Keywords: Banana Cultivars, Pest and Diseases, Credit Services

Diversity of Plant Growth Promoting Rhizobacteria Communities Associated with Thiamethoxam in Cassava Production Systems

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Abstract

Using of chemical pesticide always leave chemical residues on soil and may affect the population, function and diversity of soil microorganisms. Therefore, the aim of the study was to determine the effect of thiamethoxam, pesticide in the group of neonicotinoid to control insect pest, on diversity of plant growth promoting rhizobacteria (PGPR) communities in cassava production systems. Bacteria were isolated from rhizosphere of cassava grown in the field of 5 treatments, including 1**(** cassava production system without thiamethoxam and fertilizer application 2**(** cassava production system with thiamethoxam application 3**(** cassava production system with thiamethoxam and organic fertilizer application 4**(** cassava production system with thiamethoxam and chemical fertilizer application and 5) cassava production system with thiamethoxam, organic and chemical fertilizer application, and then screened for plant growth promoting traits. The genotypic diversity of isolates was determined on a basis of amplified rDNA restriction analysis (ARDRA). The findings of this study indicated that the majority of bacteria were found to belong to the genera of *Bacillus*, *Ochrobactrum*, and *Brevibacillus*. Interestingly, the application of thiamethoxam in cassava production system has no effect on PGPR diversity.

Keywords: Plant Growth Promoting Rhizobacteria (PGPR), Thiamethoxam, Cassava

Response Of Kalingag Liitan (*Cinnamomum microphyllum*) Stem Cuttings Treated With Various Levels Of Indole Butyric Acid (Iba)

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Abstract

The genus Cinnamomum commercially known as cinnamon, one of the oldest spices in the world. Cinnamon oil is widely used in the food processing, cosmetic, flavorings, and pharmaceutical industries, to treat inflammatory diseases, and antifungal diseases. In Bohol, Philippines, a unique species of genus Cinnamomum, the *Cinnamomum microphyllum* locally known as kalingag liitan was once dominates the forestland of this area. One of the major threats facing the *C. microphyllum* was the destruction of its habitat and the prevalent practice of stripping its bark for medicinal use poses a threat to its survival. Conservation of *C. microphyllum* and eventual reintroduction to its natural habitat through pure reforestation or enrichment planting can easily be carried out if proper vegetative propagation methods using appropriate rooting hormone be perfected. The effect of different levels of Indole Butyric Acid on the leaf and root performance of kalingag liitan stem cuttings were evaluated in BISU Clonal Nursery Facility, Zamora, Bilar, Bohol from January 10, 2015 to June 12, 2015. Three concentration of IBA (100ppm, 200ppm, and 300ppm) against the control (the untreated) were used in the experiment. Treatments were arranged in randomized complete block design with four replications. The result revealed that various levels of IBA were significant for all parameters studied except length of leaves. Under mist-rooting propagation, the highest number and length of leaves including number of roots of kalingag liitan stem cuttings treated with 100ppm of IBA. On the other hand, untreated cuttings of kalingag liitan had the highest length of roots and rooting percentage.

Keywords *Cinnamomum microphyllum*, Indole Butyric Acid, vegetative propagation

Improving Upland Rice Production for Sustainability of Rice Self-Sufficiency in Ratanakiri Province, Cambodia

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Abstract

Rice is the staple food and a major source of income of resource poor farmers in rural areas of Cambodia, including the Ratanakiri Province. Rice self-sufficiency is an important concern of the Government given that the population of the province is dramatically increasing while the yield trend has been declining over the last decade. The study was conducted to better understand the upland rice production systems of the area and rice consumption in Lum Choar commune, Ou Ya Dav District, Ratanakiri Province, Cambodia; and to identify yield improvement options. A total of 90 upland rice growing households were randomly selected and interviewed. Results indicated that 7.8% of the households experience insufficiency of rice. These household were notably, who possessed small farm size (less than 2 ha of rice field), with large number of household members (4-5). About 62.2% were rice-self-sufficient and 30% had rice surplus. It is noteworthy that none of those rice-insufficient families experienced hunger as they have coping mechanisms such as buying rice from the market, ask from their neighbor and/or relative. The linear multiple regression model showed that rice sufficiency of upland rice household were strongly dependent on rice yield. Traditional upland rice production practices by majority of farmers result to poor rice productivity (average yield of 1.45 t ha^{-1} which is lower compare to the 3.1 ton ha^{-1} national wide). Thus, to meet and sustain rice self-sufficient in upland rice in Ratanakiri province, several management practices need to improve including use of good seeds (high purity, germination and vigor), increasing seed rate, use improved variety, improved planting practices and improved nutrient management including fertilization. There are technologies already available that could improve productivity and sustainability of upland rice production and strategies to increase their adoption through on-farm demonstration, and strengthening extension support systems are needed.

Keywords: poor productivity, upland community, Ou Ya Dav, nutrient management, rice sufficient.

Improving Waxy Maize, the Heritage of South East Asia

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Abstract

Amylose-free (*waxy*), i.e. amylopectin maize has been a vegetable and staple food in East and South-East Asia for centuries, resulting in hundreds of landraces (LR). We hypothesized that eating preferences resulted in the additional selection for different starch properties, reflected in altered starch granule morphology or amylopectin structure. Twenty LR from Vietnam and Thailand were chosen that were used by different ethnic majorities. But no evidence was found for special starch properties within this set of *waxy* LR that would encourage future use in the food industry. However, for minority ethnic groups *waxy* LR are still the main staple food. The recessive *waxy* allele induces soft grains with favorable cooking and flavor properties. But maize protein is severely lacking in quality that makes this staple food rather unsuitable especially for small children. High quality protein maize (QPM) has been developed by the International Maize and Wheat Improvement Center (CIMMYT) two decades ago, which has 90% of the nutritive value of milk protein. We combined the recessive waxy and QPM alleles into modern high yielding lines resulting in double quality grains. In a second step this double quality was introgressed into two landraces of the Hmong minority by two backcrosses. Seeds are available now of the two improved *waxy* landraces, which possess high yield potential, high protein quality and good eating quality. Consumption of double-quality waxy maize as staple food will improve the diets of children, a good reason to produce it.

Keywords: waxy maize landraces, starch quality, quality protein maize, ethnic minorities

Comparison of Rice Plant Development with Different Transplanting Density under SRI Practices in the Lysimeter

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Abstract

A young single rice seedling is the common method in SRI practices. However, in lowland area, farmers hesitate to transplant young seedling due to the damage by flood, birds, insects etc. Most of the famers feel comfortable to transplant young rice seedling more than ones. Thus, an experiment conducted in lysimeter on the roof top of the University of Tokyo in 2015. We transplanted different seedling density of one, two, three and four in two replication applying alternative wetting and drying irrigation and compared the rice plants development. We observed rice plant height, tiller, leaves, and dry biomass and grain yields. In the vegetative phase, rice plants height were same in every transplanted density. We saw different development in the number of tiller and leaves. Moreover, dry biomass and grain yield is still in the process of data collection. The concrete finding will be presented after finishing the experiment.

Keywords: system of rice intensification, young seedling, transplanting density, plant development

Coupling of SWAT and HEC-RAS for Flood Damage and Flood Risk Analysis, Nam Phong River Basin, Thailand

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Abstract

Floods are generally considered to be the most common natural disaster worldwide. Over the past several decades, flooding has caused significant economic damage and loss of life in every corner of the globe. Flood damage analysis is considered as a very important issue in water engineering science. Meanwhile, flood risk analysis has a wide domain and depending on various factors can expect different results. Nam Phong Basin, the largest basin in the northeast of Thailand, provides important water resources for agriculture, electricity generation, aquaculture, and domestic uses, industrial and recreational purposes. In this area, flood causes severe economic and social disruptions to many households. Most of the flood protection works are carried out at the local level without preplanning and considering the problems at the river basin scale. The study was aimed to analyze flood damage and flood risk by coupling both hydrologic and hydraulic models. SWAT model was used to simulate the discharge from the catchment area, whereas HEC-RAS was used to determine flood depths and profiles. Flood damage area and flood risk were analyzed by overlying with the classified land use with different return periods. The result illustrated that the flood depth over 30 % and 20 % of the total flooded areas had water depths greater than 0.5 – 1.0 m and 1.5 – 2.0 m, respectively. The finding implied that the flood depth had been increased while the return periods increased. The biggest areas under the flood depth more than 0.5-1.0 m were paddy field varied from 18.12 km2 to 30.83 km2 and miscellaneous land varied from 2.45 km2 to 3.27 km2 for the change in return periods from 5-years to 100-year floods, respectively. The coupling of SWAT and HEC-RAS is useful in analyzing potential damages in food production and negative effects on the livelihoods in Nam Phong Watershed.

Keywords: Flood damage, flood risk, SWAT, HEC-RAS, Nam Phong River, Thailand

Effects of Survey Methods between GNSS and Direct-Leveling on Elevation Values over Long Routes in Mountainous Area

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Abstract

Water use facilities such as irrigation and drainage channels, water gate, hydraulic drop etc. are constructed to make water supply to paddy field and upland field. In a planning of irrigation project, it is necessary to obtain elevation value with accuracy and efficiency around project site. In generally, elevation values are obtained by the direct-leveling survey with specific instruments, e.g. digital or auto level, a couple of staffs and turning plates. The direct-leveling survey also needs several benchmarks, which are points of reference with high accuracy location information including latitude, longitude and elevation. There is, however, a serious problem that survey work of the direct-leveling survey must begin at several benchmarks. In the case of survey work in mountainous area, surveyors must carry out the direct-leveling survey over several very-long routes, because there are few benchmarks. On the other hand, in the GNSS surveying, elevation values can be obtained indirectly by observing carrier phase from multi positioning satellites such as GPS, GLONASS since 2011. This study started to install the new benchmark on a 920-m-high mountain, about 5km away from some known benchmarks in Karuizawa Town, Nagano Prefecture. After surveying the new benchmark by the GNSS and the direct-leveling, we compared its elevation values. Furthermore, (1) a streamlined survey process, (2) the influence on most probable value and standard deviation by the difference of using satellite, "only GPS" and "GPS and GLONASS" were investigated in the GNSS surveying. As the results, our tests found that dramatically streamlined survey process, "only GPS" can obtain an elevation value that is consistent with the value from the direct-leveling survey. Therefore, the GNSS surveying is useful to obtain accurate elevation values over long routes like very long channels.

Keywords: direct-leveling, GNSS, GPS, GLONASS

Predicting Soil Temperature Condition in Agricultural Land under Climate Change in Japan

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Abstract

Decomposition of soil organic carbon (SOC) as well as growth of crops are affected by soil physical condition such as soil moisture and soil temperature. Thus predicting soil moisture and temperature condition of arable lands under future climate change is important for both mitigation and adaptation of climate change in agriculture. In this study, we attempted to predict soil temperature condition in arbitrary arable lands in Japan. Barley fields of Toyama city, middle part of Japan facing Japan Sea were chosen as the experimental site. There, monitoring of soil temperature and measurement of soil heat properties, or soil thermal conductivity λ which is a function of soil moisture, was conducted. Considering the application to arbitrary locations, λ was also estimated with a mathematical model by using soil physical properties such as the ratio of sand: silt :clay, soil particle density and dry bulk density in soil physical database. Since soil bulk density often changes with field management such as tilling, three different dry bulk densities (1.02, 0.92, 0.82 g cm^{-3}) were employed for estimation of λ. The estimated values of λ were improved by assuming lower dry bulk density. Then, numerical simulation of soil moisture and temperature was conducted with estimated soil hydraulic properties and λ. The model well described the measured soil temperature especially when the soil condition was wet. The results indicated that it may be possible to predict future soil moisture and temperature in arbitrary arable lands by using soil physical properties database and climate model predictions especially in wet climatic regions.

Keywords: climate change, soil temperature, soil moisture, numerical simulation, soil thermal conductivity

Differences in Benthic Cover, Fish Assemblage, and Macro-Benthic Invertebrates Inside and Outside Marine Protected Area

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Abstract

Marine protected areas (MPAs) are being used increasingly to manage and protect marine resources. Most studies of MPAs have only focused on either benthic cover or fish assemblage or macro-benthic invertebrates only. In this study, the influence of MPA protection on the latter mentioned parameters in the two MPAs in Bohol (Badiang, Anda and Lumayag, Mabini) were investigated. At each MPAs, three 50 m transect lines with 10 m interval were permanently established inside and outside at 5-8 m depth. Systematic point intercept method (SPIM) was used in determining the benthic cover, fish visual census (FVC) for fish assemblage, and belt transect line with an imaginary 2 m x 5 m belt without any gap for macro-benthic invertebrates. In Badiang, the protected area had significantly higher live hard coral cover than the general use. Dead coral with algae cover were higher at the general use in both Badiang and Lumayag. Fish and macro-benthic invertebrates density inside and outside the two MPAs were not significantly different from each other but were in moderate condition. Fish species richness on the other hand significantly differs in Lumayag with a moderate condition in the protected area and poor condition in the general use. The high levels of hard coral cover and fish species richness on protected areas may be a result of a protection status or it might also have resulted from selection bias that occurred during the initial zoning.

Keywords: benthic, coral cover, fish assemblage, marine protected areas

Application of Soil and Water Assessment Tool (SWAT) Model to Predict Streamflow and Sediment Yield in Wahig-Inabanga Watershed, Bohol, Philippines

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Abstract

The study applied the Soil and Water Assessment Tool (SWAT) model -- to predict streamflow and sedimentation in Wahig-Inabanga Watershed, Bohol, Philippines. The applicability of the SWAT model was evaluated and its output was integrated to GIS to generate sedimentation hazard map. The result of the SWAT model performance evaluation on stream flows was satisfactory given prediction efficiency values: NSE = 0.6578; R2 = 0.7038; PBIAS = 14.94%; and RSR = 0.5850. Satisfactory result was also achieved in model validation with model accuracy values on NSE, R2, PBIAS and RSR of 0.41, 0.57, 25.09%, and 0.71, respectively. However, the model did not provide precise estimates of sediment yield in sub-basins and hydrological response units (HRU) with most of the land uses, especially corn, even on flat to gently rolling terrain had bloated sediment yield values. Inaccuracy issue on sediment yield prediction deferred further analysis including the sedimentation risk valuation which supposed to provide baseline information for watershed management and land use planning.

Keywords: Soil and Water Assessment Tool, SWAT, streamflow, sediment yield

Proposed the Model for Estimation of Nitrogen Load in the Agro-Forestry Watershed

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Abstract

Increasing nitrogen concentration in the river water caused by agricultural activities was reported in the Tokachi River basin, Hokkaido, Japan. The water quality conservation is required for the compatibility between the agricultural production and the environmental protection. It is important to analyze the nitrogen load in the watershed for water quality restoration. Generally, nitrogen load is estimated by the nitrogen concentration in the river water and the water discharge. However, this model needs frequent samples of the nitrogen concentrations and water discharges. In addition, many observations at multipoint have been required to figure out where and how much the nitrogen load occurs in the watershed. Here, we proposed a model to estimate the nitrogen load by land use in a watershed. The land use data such as watershed area and land use classification could be taken easily from a satellite images. Also, it is able to estimate the nitrogen load at any investigation point by using land use data for the estimation model. In the Tokachi River basin, the nitrate nitrogen concentration in the river water had a positive correlation with the proportion of agricultural land in the watershed. Further the water discharge was proportional to the watershed area. Thus, the estimation model of nitrogen load could be substituted the nitrogen concentration with the proportion of agricultural land, and the watershed discharge with watershed area. From this, there is a high possibility to estimate the nitrogen load in the watershed by the agricultural land area in the Tokachi River basin. Future subject of this model is how to correct for the variations of nitrogen concentration and river water discharge at different investigation periods.

Keywords: nitrogen load, estimation model, land use, nitrogen concentration, water discharge

The Economic Contribution of Fuel Wood to Livelihood in Snuol Commune, Kratie Province, Cambodia

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Abstract

The use of forest resources has been drawing more and more attention in many developing nations for the past few decades as forest products contribute significantly to a rural household livelihood. Cambodia is one of the countries where people extensively utilize forest resources yet the relationship between the use of forest resources and livelihood is undiscovered in a significant degree. Lack of data is particularly prominent at the house-hold level as many studies are conducted at either national or sub-national scale. In particular, this study is aimed to find the economic contribution of fuel wood in household income in Snoul Kert village, Snuol commune, Kratie province in Cambodia. Household-level surveys were conducted to 220 household during the months June to August 2015. Surveys were administered based on the survey questionnaires, and the survey questions contain the basic information such as age, educational background, and household income etc. Findings show that the mean contribution of fuel wood in household income is 48%; however, fuel wood shares 55 % of income for poor households. On the other hand, fuel wood consists of merely 32 % for richer household incomes. Therefore it can be said that the degree of reliance of fuel wood varies according to household income, and especially, farmers with lower income tend to depend more on fuel woods. Farmers in Snuol commune rely mostly on agriculture, manual labor, and the use of forest resources for their livelihood. In this regard, the findings in this study can contribute to providing information for forest resource management and policy making in a sustainable manner and support local people to appreciate the value of fuel wood. It ultimately leads to providing incentives to raising awareness for people living in a forest adjacent community to utilize forest resources sustainably in the future.

Keywords: fuel wood, livelihood, household income

Appropriate Extension Approaches in Disseminating Livestock Production Technology in Cambodia

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Abstract

Cambodia relies on agricultural extension as a means to increase production of rice and other crops, and livestock, and consequently the income of the poor farmers. Cambodia's agricultural extension system can be characterized as pluralistic. With the government's limited funds to hire extension agents for an extensive reach of the number of farmers, other institutions are taking the role as service providers using various approaches and methods for effective technology sharing especially to poor farmers. However, with the increasing population and diverse needs of farmers, combined efforts of extension service providers remains insufficient. Identifying the extension approach to use in disseminating a livestock technology is critical before employing related extension activities. The paper presents an extension work plan by a technical staff, an affiliate to a government institution on livestock production with specifically discussing the framework in identifying the appropriate extension approaches suitable to Cambodia's local situation, and basically, the framework discusses the agricultural extension approaches. Primary data was collected using a prepared questionnaire to interview a total of seven key informants from 4 extension institutions providers in Cambodia resprensting different agricultural organizations such as government, NGO and state university. Additionally, secondary data was collected from libraries of research institutes, universities, agricultural extension sectors, and online sources such as extension approaches/methods implemented in Cambodia. It was found out that the local situation tends to fit the participatory approach however in combination with other approaches. Identifying the extension approaches is part of the extension work plan to be implemented with the affiliated institution. Other parts of the plan will be outlined.

Keywords: Agricultural extension, Extension approaches, Livestock production, Technology dissemination, Participatory extension approach, Cambodia

Roles and Factors Effecting to the Rural Development Activities by University - Case in Pathum Thani Province, Thailand

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Abstract

Many rural development activities or projects have been implemented by international agencies, governmental ministries or institutions, local governments, or foundations/associations as well as private sectors. However recently, attention has been paid to the activities or projects implemented by universities as a part of the University Social Responsibility (USR). Universities covering various disciplines have been accumulating many kinds of technologies, knowledge, as well as educational materials that are directly applicable to the activities for rural development. The benefits produced through the rural development activities are not only for local people but also for university faculty staff as well as students, as the activities offer the learning opportunities on what kinds of demands exist in rural area to them. This study deals with the rural development activities on transferring the agricultural technology as an additional way to improve farmers' life quality and income, conducted in Pathum Thani Province as a part of the University Social Responsibility (USR) of Rajamangala University of Technology Thanyaburi (RMUTT). Also, roles and factors effecting to the rural development activities by university were evaluated. The perception of farmers as well as acceptability has been evaluated and an effective promoting strategy has discussed for better implementation by universities.

Keywords: RMUTT, USR, rural development, Pathum Thani

Comparison of Indigenous Knowledge and Scientific Knowledge of Land Use Selection of Ikalahan Farmers in Sta. Fe, Nueva Vizcaya, Philippines

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Abstract

This study was conducted in the Imugan watershed of Sta Fe, Nueva Vizcaya to verify the application of indigenous knowledge of Imugan farmers in land use selection. The results were further compared with the scientific knowledge on land use selection. Drawing out the indigenous knowledge was made through the use of participatory rural appraisal techniques such as focus group discussions, survey, key informant interview, transect walk and participatory mapping. Field observation was also used. On the other hand, scientific knowledge included soil profiling and characterization and soil laboratory analysis. These methods were carried out classification and land suitability rating using FAO procedure. The analysis revealed that the major criteria of indigenous knowledge of determining soil types are mainly relied on the farmers' senses supported by their ability to observe comprehensive attributes of soil resource leading to their identification of soils' best uses, management practices, as well as easiness of exchanging communication about soil resources. Scientific soil classification on the other hand, lies on classifying soils based on their genesis using soil whole properties as diagnostic features. It is both concerned with the soil morphological description of each soil sampling point and its complete physical and chemical laboratory analysis. The results of these descriptions form the basis of classifying surface and sub-surface horizons and in determining the taxonomy of the soils under survey. In the case of Ikalahan farmers, in assessing suitability of land is only one factor in land use decisions. In reality, farmers are conscious of both the physical and socio economic conditions surrounding farming but rely more on the latter in making decisions. FAO procedure is not applicable for subsistence based farmers who are not fully independent in terms of land use decision making just like the case of Ikalahan farmers. Both methods have their advantages and limitations. Hence, it is advisable to combine these two assessments, in order to improve the chances of Imugan farmers to attain high yield and sustainability of farm productivity.

Keywords: Indigenous knowledge, scientific knowledge, soil classification

Current Agricultural Condition and Constraint in Paktya Province of Afghanistan

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Abstract

Agriculture is the backbone of economy of Paktya Province with more than 80% people engaged in agriculture for their livelihoods. Despite of such a large workforce involved in this venture, the outcomes are not very satisfying. A survey was conducted to find out the possible reasons for this low outcomes and to identify the measures to improve the condition. Survey was done in accordance with a pre formed questionnaire. As per the survey it was found that majority of farmers use traditional farming methods and have very poor technical knowledge. The low productivity and fertility of soils as well as the lack of irrigation water were identified as major factors causing low agricultural production at the research area. In addition, 32.4% of responded farmers answered soil erosion happens very severely and 50.0% answered soil erosion happens severely. It means that more than 80% of farmers require the proper conservation strategies for holding soil fertility. It was considered that soil degradation caused by erosion phenomena with high intensity rainfall causes low holding capacities of nutrients and water of soils. The development of proper conservation strategies as well as farmers education in proper soil management are indispensable to achieve sustainable agriculture in Paktya Province, Afghanistan.

Keywords: Afghanistan, agriculture, conservation, soil erosion, Paktya

Interrelationships of Governance, Empowerment and Sustainability in the Ancestral Domain of the Ayangan in Nueva Vizcaya, Philippines

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Abstract

This study was undertaken to determine the impact of the issuance of Certificate of Ancestral Domain Title (CADT) on governance, empowerment and sustainability in the ancestral domain (AD) of the Ayangans. Data were gathered through the use of structured questionnaire, direct observation, key informants interview and secondary sources. Descriptive and inferential statistics were used in analyzing data gathered from selected villages in Bayombong, Solano and Villaverde, all in the province of Nueva Vizcaya. The ancestral domain is found in rolling to mountainous areas with elevations ranging from 600 – 800 meters above sea level. The area is utilized for primary and secondary forest as well as for upland cultivation. The average age of the respondents is 42.83 years, predominated by the Ayangan tribe, mostly farmers, with an average of six household members. They were mostly married, affiliated with various Christian sects, with low educational qualifications, and members of various tribal organizations. The level of executive, legislative, and judicial leadership capability of the tribal leaders correlated significantly with the level of effectiveness of the CADT as an empowerment mechanism in the ancestral domain. The sustainability of the ancestral domain significantly correlated with the beneficiaries' level of awareness of rights and responsibilities in terms of maintaining ecological balance and level of awareness of responsibilities. The level of sustainability of the ancestral domain significantly associated with the executive leadership capability of organizing, and legislative capability of the tribal leaders. The sustainability of the ancestral domain in terms of socio-economic upliftment significantly associated with the overall extent of CADT implementation. Environmental sustainability significantly correlated with the performance of the personnel assigned to the ancestral domain. The overall level of sustainability is significantly associated with the manner of implementation, and performance of personnel assigned to the ancestral domain.

Keywords: ancestral domain, Ayangans, impact, sustainability, governance

Effect of Growing Materials on Growth of *Platycerium ridley* at the Seedling Stage

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Abstract

Five planting material: Cattail fluff (*Typha latifolia*), Coconut husk chopped, Bird's nest fern root chopped (*Asplenium nidus*), Kapok tree cotton (*Ceiba pentandra* L.) and Peat moss.were test for *Platycerium ridleyi* in a CRD experiment. This experiment was conducted at The Plant Science Department nursery, Faculty of Agricultural Technology, Rajamangala University of Technology. The research start from October 2013 for germinated fern spore and experimental finished on June, 2014 and the research was completely 8 weeks. There were two sizes of *P. ridleyi*: small size (7 cm diameter) and large size (10 cm diameter). The sterile frond width, fertile frond length and fertile frond wide of the experimental plant were observed. The different among mean of determined was using LSD procedure. It was found that the small size of *P. ridleyi* (7 cm diameter) in peat moss was the best growing is that sterile frond wide average 8.38 cm and fertile frond wide average 4.56 cm, but bird's nest fern root chopped as plant material was ggrowing fertile frond length best average is 3.73 cm. The large size of *P. ridleyi* (10 cm diameter) in peat moss was growing better than other types planting material, was that the width of the sterile frond average 14.43 cm, fertile frond wide average 13.85 cm. and the length of fertile frond averaged 15.45 cm. It was no significant different between five plant material at .05

Keywords: *Platycerium ridleyi* growing material, plant growing materials, staghorn fern growing material

Vermicomposting Using Waste Papers as Substrates for African Night Crawler (*Eudrilus Eugeniae*)

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Abstract

Accumulating volumes of waste paper generated in the university is everybody's concern. As part of the implementation of Solid Waste Management Program, proper waste disposal and segregation should be done. Thus, instead of burning and throwing those waste papers, proper utilization should be undertaken. This scenario prompted the conduct of the study. A research was conducted utilizing the different waste papers as feeding materials for African night crawler (*Eudrilus eugeniae*). It is a composting worm use in the vermicomposting project of the university. The usual practice is feeding them with pre-decomposed agricultural wastes. Thus, a study was conducted to test if the different waste papers can be used as feeding materials to African night crawler. The study was conducted using Completely Randomized Design. The primary objective of the study is to a determine the effect of feeding African night crawler when fed with different types of waste paper like cartons, bond papers and newsprint) as compared with those fed by agricultural wastes. Results revealed significant differences in the change in weight of African night crawler, weight of waste paper consumed, weight of vermicompost produced, number of eggs and number of juveniles produced by the African night crawler after feeding with the different waste paper. Feeding the African night crawler with carton and bond paper resulted in significant increase in weight of African Night Crawler, number of juveniles, weight of consumed paper and weight of vermicompost produced. On the other hand, the combined agricultural wastes gave the highest number of eggs produced. Therefore, waste papers such as carton, bond paper and newsprints can be used as feeding materials for African night crawler. Biomass production of African night crawler was improved by feeding carton and bond paper over newsprint and the combined agricultural waste.

Keywords: vermicomposting, *Eudrilus eugeniae*, waste paper, substrates, feeding materials, bond paper

An Attempt to Use High Salinity Water for Irrigating a Green-Roof Garden

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Abstract

Though a green roof has been implemented mainly in city area due to the mitigation of heat island effect, it can also offer the benefit of energy saving to a building in rural area. The reuse of wastewater for irrigation may be an efficient practice for water conservation, especially in the water-scarce areas. In this study, we assessed the influence of frequent and intermittent saline irrigation on evapotranspiration (ET), dry matter yields (DM) and water-use efficiency (WUE) in crassulacean acid metabolism (CAM) plants used in the green roof program. The CAM plants Sedum kamtschaticum Fischer and Sedum oryzifolium were evaluated with turf grass, Cynodon dactylon. A sharp reduction in ET with an increase in soil salinity was found in CAM plants as compared to turf grass; however, the dry matter yield of CAM plants was higher than that of turf grass at the same amount of cumulative ET. Principle component analysis (PCA) was performed to group the treatments into fewer groups characterized by similar features. CAM plants were categorized by high DM and WUE. These features were expected to make green roof management sustainable because they have low water requirements with keeping the high-density vegetation.

Keywords: CAM plants, saline irrigation, evapotranspiration, water-use efficiency

Earthworm Communities and Activities in Rice Ecosystem under Different Soil Salinity Levels in Northeast Thailand

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Abstract
Soil salinity has become one of the major determinants of crop productivity in Northeast Thailand. This problem has affected of low soil productivity and soil ecosystem. Earthworms are most important soil organisms in soil ecosystem in maintaining soil structure and fertility. The aim of present study was to study the earthworm communities on related soil properties and rice growth under different soil salinity 2 levels 1. Low soil salinity (EC 2-4 dS/m) and 2.moderate soil salinity (EC 4-8 dS/m). Soil and earthworm cast were collected to analyze for soil chemical properties. The result showed that there was significant difference between density and size of different species of earthworms in different level of soil salinity. In rice ecosystem in moderate salt-affected area the earthworm species Drawida beddardi was the only one specie found at 95 days after rice sowing, while in low salt affected area the earthworm species, Glyphidrilus chiensis and Drawida beddardi were the most common species found at 45 days after rice sowing. Earthworms improve soil properties and the growth of rice, Oryza sativa L. (Khao Dawk Mali 105 and RD6).

Keywords: arrf dftœf fa-t aadcme fcs ce edfRcsa fdht cfR

Drought Tolerance and Nitrogen Use Efficiency of Upland Rice (*Oryza sativa* L.) Genotypes Grown Under Varying Water and Nitrogen Regimes.

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Abstract

Three screenhouse experiments were conducted at Crop Science Cluster, College of Agriculture, University of the Philippines Los Baños (UPLB) to evaluate drought tolerance and nitrogen (N) use efficiency of selected upland rice (Oryza sativa L.) genotypes grown under varying water and nitrogen regimes, based on growth and yield parameters. Results showed that sufficient soil moisture content (SMC) and high N level caused optimum growth of the genotypes. On the other, deficient water and N supply both retarded growth of rice. PSB Rc14, P42, and P38 had high number of tillers, number panicles per hill, number of spikelets per panicle, relative growth rate (RGR), water use efficiency (WUE), harvest index (HI), straw yield, grain weight, and grain yield at field capacity (FC). These genotypes also had high values in the aforementioned growth and yield parameters at 120 kg N ha^{-1} treatment. In terms of the efficiency in the use of N as indicated by agronomic efficiency of nitrogen application (AEN), recovery efficiency of nitrogen application (REN), and internal efficiency of nitrogen application, PSB Rc14, P42, and P38 still performed better than the rest of the genotypes tested. The evaluation of the combined effect of water and N application showed that PSB Rc14, P42, and P38 significantly produced high grain yields among the genotypes under SMC at FC with 120 kg N ha^{-1}which suggests that water plays a fundamental role in rice growth in combination with N.

Keywords: nitrogen use efficiency, genotypes, spikelets, agronomic efficiency, recovery efficiency and soil moisture content.

Effects of Rhizobia Inoculation at Organically Grown Soybeans (*Glycine max* (L.) Merr.)

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Abstract

Driven by an increasing demand for GMO-free soya as food or fodder, the production of organic Soybeans (*Glycine max* (L.) Merr.) increases. As a legume crop, soybeans need specific rhizobia bacteria to be supplied by biological nitrogen (N) fixation. Most soils lack the soy-specific strains (*Bradyrhizobium japonicum*), therefore bacteria material is usually added manually, especially if soy is grown on a field for the first time. We set up a field trial with 5 site-years to investigate the benefit of this inoculation procedure in two different environments (humid, Germany/semi-arid, Russia) under organic farming conditions. Overall 5 different varieties were used, at each site two individual and one joint, which was cultivated in both environments. The trial was installed in randomized complete block design with 4 replications to compare inoculation (with Bradyrhizobium japonicum strain 532C) against untreated control. Leaf chlorophyll as indicator for biologic N-fixation was determined by using a Minolta SPAD-502. To make the SPAD-meter readings of different varieties comparable, we calculated effect sizes (Hedges'd). Results showed significant differences between sites, years and varieties. At all site-years inoculation was significantly successful, as there were no nodules on untreated plants and large numbers of active nodules at the roots on all inoculated plots. The effect sizes for SPAD-values of inoculation compared to control were rising over time. Under semi-arid conditions, leaf chlorophyll content was significantly higher after inoculation at all measuring dates. In the humid environment, the effect was only significant at the latest observation (R5, beginning seed). Since soybeans will only suffer from biological N-fixation after manual inoculation, this additional effort seems to be beneficial for organic farming in both tested environments.

Keywords: Soybeans, Bradyrhizobium japonicum, organic farming, biological N-fixation, legumes, SPAD

Influence of Meteorological Variable Combinations on Reference Evapotranspiration Estimated by the FAO56 Penman-Montieth Method

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Abstract

For such a rainfall and runoff model to be used, data on potential evapotranspiration (PET) is required. The PET data is determined from the five meteorological data of air temperature, humidity, wind speed, solar radiation and or sunshine hours and by using the Penman equation. The most common equation for estimating PET, which is recommended by the FAO and is used widely in the world, is the Penman-Montieth (PM) method. The estimated PET is known to vary depending on the combination of meteorological data used in the PM equation. For example, PET can be estimated by using wind speed and air temperature data only, or by using all five meteorological data. There have been no cases that were examined regarding how combinations of the five data influence estimated PET for the Asian Monsoon region. This study used sensitivity analysis to examine how greatly the estimated PET differed depending on the different combinations of the five meteorological data. Air temperature, wind speed, solar radiation, sunshine hours and humidity were measured and recorded at ten-minute intervals for three years at a weather station in the Soma City, Fukushima Prefecture. The daily PET was estimated for the 13 combinations of the five data. Sensitivity analysis clarified that PET is strongly influenced by air temperature and solar radiation. It was clarified that the influence of wind speed on estimated PET is small. It was also clarified that PET is overestimated when the solar radiation is not included in the combination. The above results clarify that data on the solar radiation are indispensable for PET estimation that uses the PM equation.

Keywords: Hydrological model, Potential evapotranspiration, FAO, Pemman-Montieth method, Sensitivity analysis

Assessing Climate Change Vulnerability to Increase Adaptation Capacity in Rural Areas: Cases of Apple Farming in 4 Different Municipals in Gyeonggi Province, Korea

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Abstract

Climate change poses a major threat to the environment, economic and social impacts in agricultural sector in rural communities. If rural agricultural communities are to respond adequately to future climate change, they will require to develop adaptation measure and it is required to assess vulnerability in their communities. This is not an exception to Korean agricultural community. One of the most notable impacts of climate change in Korean agricultural communities is that the fruit cultivation sites are moving northward. In the past, apple cultivation was not preferred in the Gyeonggi province. However, with changing climate, some farmers in Icheon and Gapyeong in Gyeonggi province started to cultivate apple in the area. In addition, governmental support through "DMZ apple cultivation community in Paju and Yeoncheon" increased apple cultivation in Gyeonggi province in recent years. This paper is to assess climate change vulnerabilities of 4 apple cultivation communities in Gyeonggi province by developing vulnerability indices as function of climate exposure, sensitivity and adaptive capacity and using z-score normalization, the study conduct quantitative analysis with data provided by various ministries and municipal governments. In addition, open interview with climate change experts and government officer in Gyeonggi province provided significant information in analyzing the result. The main results of vulnerability assessments are founded as follow: Icheon and Gapyeong showed higher vulnerability by higher level of exposure and sensitivity to changing climate than Paju and Yeoncheon. However, adaptive capacity showed that Paju and Yeoncheon as more vulnerable than the Icheon and Gapyeong. Therefore, the study concludes that albeit the same crops cultivated in one province, local-level adaptation measures should be differentiated through assessing vulnerabilities and identifying components comprising the vulnerability in the community. Vulnerability assessment using indices should provide quantitative backgrounds for local-level governments to develop appropriate and effective agricultural community adaptation measures.

Keywords: Climate Change, Local-level adaptation, Vulnerability Assessment, Apple Farming

Soil as a Biofilter Medium for Air Pollution Control

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Abstract

Biofiltration is favored over other air pollution control technologies since it does not produce secondary pollutants and does not involve expensive maintenance and operating costs. In a biofilter for air pollution control, contaminants in the air stream are transferred into a biofilm on the bed medium and are converted by the microorganisms into carbon dioxide, water, and biomass. One fundamental factor for successful application of biofilters is the nature of the biofilter medium. In this study, soil was used as the medium for treating toluene-contaminated air in a laboratory-scale biofilter with water content control. The objective is to investigate the biofiltration performance using soil as the medium as water content was varied. Water in soil and other porous media is mainly retained by matric forces in pores. Matric potential is a measure of water availability to microorganisms which is fundamental in biofiltration for microbial activity and growth and for transport of nutrients. Reporting data in matric potential rather than water content allows comparing results obtained for a variety of soils. Results showed a maximum elimination capacity of 43.9 g m-3 h-1 at a matric potential of -10 cm H2O in treating a gas stream at an average flow rate of 21 ml/min and an average concentration of 263 ppm of toluene as contaminant. The interaction between biodegradation and mass transfer of contaminants in biofiltration was prominent in the results of this study. It showed the influence of water content on both microbial activity and diffusion which makes treatment in biofiltration possible. Fluctuations in water content impede biofiltration efficiency. Soil, with its water-holding capacity due to organic matter content and with its rich microflora, is effective as a biofilter medium for the biodegradation of the air pollutant.

Keywords: biofiltration, soil, bed medium, air pollution control, toluene

Local Community Participation in Biodiversity Monitoring and Its Implication for REDD+: A Case Study of Changkran Roy Community Forest in Cambodia

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Abstract

Reducing Emissions from Deforestation and Forest Degradation (REDD+ is a global mechanism that offers financial incentives to reduce emissions from deforestation and forest degradation in developing countries. A large part of this process depends on the participation of local communities and their role in carbon and biodiversity monitoring in order to respect the United Nations Framework Convention on Climate Change (UNFCCC) REDD+ Safeguards. While these concepts have been discussed at the international and national levels, there is still a limited number of studies that examine how local community participation could play a role in biodiversity monitoring and its implication to REDD+, especially social and environmental safeguards. As a result, it is important to explore whether community participation in biodiversity monitoring approaches has been applied in community-based forest management projects in developing countries. This paper aims to present empirical evidence on how local community members are engaging in biodiversity monitoring in Community Forestry (CF) management in Cambodia by looking at the Changkran Roy CF site in Siem Reap Province, north-west Cambodia. Based on qualitative methods conducted at Changkran Roy CF through the Asia-Pacific Community Carbon Pool and REDD+ Programme (2011-2014), this study finds that community participation in biodiversity monitoring is one of the key ways to engage and empower local community members in REDD+, since there is growing interest by NGOs and project developers in biodiversity monitoring in REDD+ and it is also perceived as an opportunity to make progress in biodiversity conservation. Community participation in biodiversity monitoring could provide a rapid and costeffective way to gather relevant information for biodiversity monitoring in REDD+. It could also build a sense of trust and ownership that local communities could have towards the implementation of REDD+. The UNFCCC text and guidance documents also recognize the importance of full and effective engagement of indigenous peoples and local communities in, and the contribution of their knowledge to, monitoring and reporting of REDD+ activities. As a result, community participation in biodiversity monitoring is one of key aspects that should be integrated in all future REDD+ activities in developing countries.

Keywords: REDD+, Biodiversity, Community Forestry, Participation, Changkran Roy, Social and Environmental Safeguards

Payment for Watershed Services (PWS): Its Potential as a Scheme for the Sustainable Management of Barobbob Watershed in Nueva Vizcaya, Philippines

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Abstract

This study employed the Contingent Valuation Method to determine the potential of putting-up a payment for watershed services scheme for Barobbob Watershed. The study assessed the willingness to pay (WTP) and willingness to accept compensation (WTAC) of resource users from upstream and downstream communities. The WTP study was conducted among 345 waters users in 19 barangays in the municipalities of Solano and Bayombong and the WTAC study among 135 individuals living within Barobbob watershed. About 63.8% (uncensored) and 58.84% (adjusted) of the respondents revealed willingness to pay for improved watershed management. The mean WTP amount, estimated through a logit model was found to be PhP39.35/month/household. Respondents WTP is influenced by bid amount, age, membership in environmental organization, experience with water-related problems, civil status of the respondent, house ownership and awareness on the concept of watershed. They were willing to pay because they want a sustainable water supply for the present and future generations. On the other hand, 82% of the respondents in the upstream community are willingness to accept compensation and participate in a payment-reward scheme. The mean WTAC amount ranged from PhP60,000.00-65,000.00 per hectare. Willingness to accept compensation is affected by bid amount, civil status, number of household members with income, proof of land ownership, current land use, farming practice, membership in environmental organization, sex, educational level and household size. The result also showed evidence of the possibility of putting-up a payment-reward scheme for Barobbob Watershed. However, the willingness percentages suggest that a significant number of resource users from both upstream and downstream communities still needs to be involve in the proposed scheme. Community education and public awareness (CEPA) campaign is necessary to enhance their understanding about the importance and values of watersheds in ensuring sustainable flow of water.

Keywords: willingness to pay, willingness to accept, payment for watershed services, watershed management, logit model

Policy Analysis for Biodiversity Conservation in Cambodia: The Protected Areas System

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Abstract

The Government of Cambodia recognizes the importance of biodiversity conservation. Following broad consultation and collaboration with stakeholders, the Government of Cambodia has created national policies and legislation to govern environmental and natural resources management over the next decade. In addition to national legal instruments, Cambodia also has obligations under international treaties and conventions relating to environmental protection and natural resources management. This paper sets out the existing national policies and legislation for environmental and natural resources management, focusing on the protected areas policy for biodiversity conservation in Cambodia. The specific objective is to analyze policy gaps in the protected areas system management and biodiversity conservation. The paper will assess national policies and legislation that are currently being implemented, as well as those that are not being implemented. The assessment is divided in three parts: 1) gathering and reviewing the content of existing policies and legislation, while highlighting significant competences related to biodiversity conservation and management; 2) analyzing and identifying gaps and opportunities of the "Protected Areas Law" and relevant legislation for natural resources management within the protected areas system; 3) reviewing the extent to which existing laws and policies comply with Cambodia's obligations under the United Nations Convention on Biological Diversity. In total, this paper will analyze 14 specific laws and 8 relevant policies. Approximately one third of these are found to have specific provisions related to biodiversity management, and most were found to be relevant to the protected areas system management. At the conclusion, this paper will present opinions and recommendations to address policy gaps and enhance the implementation of existing laws.

Keywords: Policy, Analysis, Biodiversity, Conservation, Cambodia

Going by the Flow of Community Life: An Approach to Participatory Action Research in Cambodia

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Abstract

Development practices have been drawn upon from experiences of neighboring countries and/or those from within the region. Practitioners have been bombarded with different models, given its complexities and variations, which often time not being able to digest and make use of what is best suitable for the local context. While practitioners learn and apply the mechanics of various models, they lack clarity on the process side of it. This paper shares the emerged approach of Participatory Action Research (PAR) applied by Analyzing Development Issues Centre in the Northeast of Cambodia over the past decade. The study will discuss the PAR with practical experiences from fieldwork in order to suggest for further implementation in similar areas of research or project. This study illustrates that PAR concept of "going by the flow of community life" can forge healthy relationship between practitioners and communities to arrive at mutual understanding, collectivity, and solidarity. Such approach reduces the pressure and tension of all sides while instead allows the natural flow to occur and ultimately grapple with empowerment for sustainable development. The case study of solving a prolonged boundary conflict between two indigenous communities in Ratanakiri Province and another case of community response to a potential risk of land grabbing by outsiders in Mondulkiri Province provide good examples of how PAR approach contributes to the effective problem solving in the community and taking control of their own life resulting from active engagement and mutual understanding applied by PAR researchers.

Keywords: Participatory Action Research (PAR), Empowerment, Development Practices, Sustainable Development

Agrimario: Marionette Thematic Creation Based on Education Agriculture with Vetiver as Basic Material

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Abstract

Agrimario is an innovation of marionet doll which based vetiver (Vetiveria zizanoides) ad basic material. Based of making agrimario is educational agriculture. The Goal of Agrimario is to be achieved and make Agrimario as one of the local resource product and environmentally friendly product. Processing of raw materials is done by empowering craftsmen of vetiver. The marketing method is done in two ways such as direct selling system as set up booths and onlineshop system by social media. Agrimario, became one of the selection of children to learn about agriculture with fun and interesting. Having conducted a market survey and product innovation, it turns out processed products vetiver has wide benefits, among others, to decorate the room, mosquito repellent, as well as a graduation gift souvenir. The net profit earned during the five months of production can reach 13,797,500 milion rupiah so it will give high profit so as to ensure the sustainability of processing vetiver product business.

Keywords: agrimario, vetiver, educational, agriculture, environmentally friendly, product business

Impact of ESD Related Initiatives in Banacon Island: An Initial Assessment

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Abstract

This is an initial assessment of the impact of the Professional and Skills Development Trainings - specific intervention initiatives under the Socio-Economic Education Awareness (SEEA) for Climate Change Adaptation and Disaster Risk Management, an Education for Sustainable Development (ESD) Program in Banacon Island, Getafe Bohol. It is a descriptive study that employed modified SWS questionnaires to gather data from the twenty eight respondents who graduated from the trainings. Results revealed that an overwhelming majority (97%) of the respondents were aware of the agencies that collaborate to implement the initiatives. The satisfaction level of the trainings registered an average weighted mean of 4.60 described as "very contented." Moreover, a great majority (74%) of the respondents claimed that they had concrete benefits from their specific learnings as they were able to apply them in their primary occupations while only a plurality (26%) claimed that they have yet to feel the benefits as they have not yet applied their leaning. Finally, computed data revealed that there was no significant difference in the impact of the trainings among the respondents grouped according to skills areas. Therefrom, it is concluded that the respondents have high level of awareness of the collaborating agencies of the ESD initiatives and that the trainings have positive impact on them. It is recommended that the initiatives be sustained and/or scaled up to strengthen the positive impact and further make better difference in the lives of the residents of Banacon Island.

Keywords: Disaster Risk Reduction and Management, Education for Sustainable Development, Impact Assessment, Intervention Initiatives, Banacon Island

Manual Scheduling Practices: Basis for the Development of Automated Academic Scheduling System for a State University Branch

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Abstract

The purpose of this study was to analyze, design and develop an Automated Academic Scheduling System for a State University Branch. This study specifically sought to identify the status of the present Academic Scheduling system of the University in terms of Class Schedule, Room Assignment and Faculty Loading as well as the problems encountered. The study used the descriptive method of research using the questionnaire as a main tool of data collection. For the analysis and interpretation of the data gathered, the researchers used frequencies, percentages and rank. The results of the questionnaire revealed that there were deficiencies in the existing Academic Scheduling System and that there is a need to improve such system. These results highly support the proposal for an automated academic scheduling system to improve the scheduling process.

Keywords: Automated, Class Schedule, University Disaster Risk Reduction and Management, Education for Sustainable Development, Intervention Initiatives, Banacon Island

Tractor Driving Technical Learning of Agricultural Student in Agricultural Machinery Subject

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Abstract

Ability for driving a tractor is one of objective in Agricultural Machinery subject. Student also would learn about part of tractor and their function. Learning was easier than learn how to drive a tractor. Comfortable condition was one of student need. This research compare about technical driving tractor between a lecturer and staff who able to drive tractor. There were forty five students divided into two group. First group (Group 1) teached by a staff and second group (Group 2) teached by lecturer. This research used questionnaire to know student ability in ride transportation before driving practice. After driving teaching a mount, students got questionnaire about their satisfied in tractor driving teaching. Mean, standard deviation, frequency, percent, and t-test were statistical that used in this research. The result show in mean that after a mount, the group 1 was 3.60 better in driving tractor than the second group 2 was 3.50. Male students in mean were 3.61 better than female students were 3.51. But, there were no significant difference in statistical t-test between group 1 and group 2 were 1.57 at level α 0.5 also t-test between male student and female students were 1.65 at level α 0.5. The result between male and female student also group 1 and group 2 were no different ability in driving tractor after a mount. Students ability in drive a tractor after teaching by staff and lecturer were same between group 1 and group 2 also between male students and female students.

Keywords: Driving Tractor, Tractor, Farm Tractor and Agricultural Machinery

Development of an Emergency Discharging Device and an Early Warning System for Floods at Irrigation Ponds

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Abstract

Spillways of most irrigation ponds in Japan should be repaired enough to safely pass the 200-year flood, which is the governmental design criteria. However, due to a large number of the ponds and high repairing cost, it is not realistic to repair the spillways of all irrigation ponds. Therefore, a low-cost early warning system to reduce the risk in case of floods as well as a low-cost emergency discharging device was developed to prevent or mitigate the floods. The Yutani irrigation pond in Tottori City was selected for this study. The pond stores runoff from the catchment area and has no inflow from other basins. A siphon tube with 20 cm of diameter was employed emergency discharging device for the pond and the discharge performance was evaluated. Firstly, 60-min rainfalls at return period of 10, 20, 30, 40, 50, 60 and 200 years were estimated. Then, peak runoff and its arrival time of each year 60-min rainfall and the discharges from the spillway and the siphon were estimated. The water balance of the pond was calculated using the peak runoff as an inflow element and the discharges from the spillway and the siphon as outflow elements. Results show that the pond overflows if 50-year rainfall event occurs under current condition, while it doesn't overflow with the siphon even if 60-year rainfall event occurs. Since the siphon discharge is not large enough to pass greater than 60-year flood, we developed an early warning system which informs villages near by the pond through alarm lamp and e-mail when the water level of the pond reaches to these levels. Based on results of the water balance analysis, this system provides information to judge whether villagers should be evacuated or not, and the timing of evacuation if necessary in case of heavy rainfall events.

Keywords: siphon, probability of rainfall, peak runoff, arrival time, water balance

Potential of a New Slow-Release Urea Fertilizer under On-Farm Conditions in a Semi-Arid Environment

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Abstract

Nitrogen (N) fertilizers play an important role to increase grain yield and grain quality in crop production systems. In Western Siberia, predominantly used N-fertilizers for cereal production are urea and ammonium-nitrate ('Selitra'). Due to semi-arid climate, only one fertilizer application is common, simultaneously with sowing and directly into the seed furrow.The new kind of slow-release fertilizer is a modified urea with silicate coating and urease inhibitor and was developed at the State Agrarian University of the Northern Transural. The coated urea has the potential to improve nitrogen use efficiency and minimize N-losses via ammonia volatilization or nitrate leaching. Furthermore, steady N-availability from slow-release fertilizers could improve the grain yield and protein content. In a field trial, the comparative performance of the new fertilizer type was tested with spring wheat near the city of Ishim in Tyumen region (Western Siberia, Russian Federation) on 3.4 ha under on-farm conditions. 4 levels of the slow-release urea (25/50/75/100%) were compared to 100% of conventional urea, 100% of Selitra and an unfertilized control in randomized complete block design with 4 replications. Plant development, soil nitrogen content (analysed by Merck RQflex) and leaf chlorophyll content (measured by Minolta SPAD 502) as well as yield and post-harvest parameters were analysed. Results showed significant differences in soil nitrate availability but no differences in ammonium content. Differences between N-levels dispersed during heading, afterwards only plots with Selitra fertilization showed significant higher nitrate values. Leaf chlorophyll content as indicator for plant nitrogen supply showed significant differences from beginning stem elongation on. Up to the end of flowering, only the two lowest N-levels (25/50%) and the unfertilized control showed significant lower SPAD values than the 100% plots. Yield results will be included in the final statistics after completion of laboratory analyses.

Keywords: slow-release fertilizer, silicate coating, urease inhibitor, nitrogen use efficiency, spring wheat, Western Siberia

Organic and Chemical Fertilizer Applications Affected Fresh Yield and Quality of Aromatic Vegetable Soybean "CM 84-2"

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Abstract

The experiment of organic and chemical fertilizer applications affected fresh yield and quality of aromatic vegetable soybean cultivar Chiang Mai 84-2 was conducted at Faculty of Agricultural Technology; RMUTT, during dry season (Dec 2012 to Feb 2013) and late rainy season (Jul-Sep 2013) by RCB design 3 and 4 replications respectively with 4 treatments: cow manure 2 t/rai, the set of chemical fertilizer recommended for fresh corn (basal application with 50 kg/rai of 16-16-16 and side dress with 25 kg/rai of 46-0-0 at 25, 45 days after planting), the modified set from Department of Agriculture (basal application with 20 kg/rai of 18-46-0+10 kg/rai of 0-0-60 and 1st side dress at 25 days after planting with 25 kg/rai of 13-13-21, 2nd side dress with 25 kg/rai of 46-0-0 at 45 days after planting) and the set of private company recommended for vegetable soybean (basal application with 50 kg/rai of 16-16-16 at 15 days after planting, 1st side dress at 30 days after planting with 50 kg/rai of 13-13-21, 2nd side dress with 50 kg/rai of 46-0-0 at 50 days after planting). The results revealed that the vegetable soybean responded to all fertilizer applications in late rainy season better than dry season, approximately 38 % increasing in fresh pod yield. In dry season, the recommended set of chemical fertilizer for fresh corn gave superior yield components (32.5 pod/pl and 79.7 g/pl) leading to give higher fresh pod yield (8.25 t/ha) but not statistically different from other chemical fertilizer recommended sets. However, in late rainy season, it was the modified set from DOA that provided the highest, 47 pod/pl with 128.5 g/pl and 12.69 t/ha in fresh pod yield including 9.06 t/ha of plant fresh yield. Regarding to the fresh seed qualities analysis, the aromatic fresh vegetable soybean seed which applied with the recommended set of chemical fertilizer for fresh corn had contented greater reducing sugar (735.60 ug/ml/g fw) while the higher protein content was obtained from the one that applied with cow manure (50.30 mg/g sample).

Keywords: aromatic vegetable soybean, fertilizer applications, fresh pod yield.

Soil Amendments for Maize Cultivation by Crop Rotations in Upland Cropping Systems of Southeast Cambodia

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Abstract

Prey Veng and Svay Rieng provinces in Southeast Cambodia, continuous mono-cropping in upland areas, particularly with cassava, have led to a progressive decline in soil fertility. There is an urgent need to identify alternative agricultural production options capable of economically improving both the soils and production, while the same time improving incomes of rural households which are almost 100% dependent on agriculture. A study was made of the importance of crop rotations on the growth and yield of maize in upland cropping systems of Cambodia. Maize (MZ) was grown continuously and in two-year rotations with cassava (CS), soybean (SB), mungbean (MB) and peanut (PN). Six different rotations T1 (SB-MZ-MB-MZ), T2 (PN-MZ-SB-MZ), T3 (MB-MZ-PN-MZ), T4 (CS-CS-CS-MZ), T5 (CS-MB-PN-MZ) and T6 (CS-SB-PN-MZ)) were designed and studied in the upland cropping systems in the provinces of Prey Veng and Svay Rieng in southeastern Cambodia. Mono-cropping with maize (T0) was used as the control treatment in the study. The study was undertaken in the period 2013 to 2015. The field experiments revealed an increase in crop yields in the order of T1 > T2 > T3 > T5 > T6. There was no significant difference in crop yield between T4 and the control (T0) treatment. The analysis of soils data revealed that there were no significant differences in soil nitrogen and phosphate levels pre-treatment and post–treatment in each of the rotations (paired samples t test, $p > 0.05$). However, post-treatment potassium levels were significantly lower than the pre-treatment levels in all cropping rotations ($p < 0.05$) except T0. The results of the study suggest that the maize-legume rotation is the most promising crop rotation for yield improvement in the upland cropping systems in southeast Cambodia.

Keywords: Maize, Crop rotation, Upland Cropping System, Cambodia

Efficiency of the Entomopathogenic Fungus *Nomuraea Rileyi* for the Management of Vegetable Pest *Spodoptera Litura* (Lepidoptera: Noctuidae)

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Abstract

The effect of eight different culture media and temperature on sporulation, spore germination and mycelial growth of the entomopathogenic fungus, *Nomuraea rileyi* were studied *in vitro*. This work demonstrated that the mungbean agar (MU) medium was suitable for the growth of all the tested fungi and the growth of *N. rileyi*. on MU medium was significantly higher when compared to PDA. The fungus favored relatively moderate temperature (30–35oC) for sporulation and mycelial growth. Pathogenicity of eight *N. rileyi* isolates against *Spodoptera litura* studied by exposing 1st, 2nd and 3rd instars to topical application of a spore concentrations of $6x10^7$, $6x10^8$ and $6x10^9$ conidia/ml. All eight isolates of *N. rileyi* were active against all instars of *S. litura*, resulting in 2.5 to 92.5% mortality at 7 days. However, there were statistically no significant differences among the isolates with respect to the pathogenicity levels. The virulence of the most promising isolate 1 and isolate 6 with the concentration $6x10^9$ spores/ml was observed. Maximum mortality (92.5%) was observed after 7 days from inoculation of 1st instar of cutworm with 10^9 conidia/ml. This variation in lethal concentrations could be due to isolates genetic variation in virulence, and spore germination, in addition to other factors such as efficacy in laboratory bioassays.

Keywords: *Nomuraea rileyi*, *Spodoptera litura*, Entomopathogenic Fungi, Biological control

Comparative Performance of Living Barriers on Some Field Insect Pests of Cruciferous Vegetables (*Brassica spp.*)

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Abstract

Brassica crop is one of the important and favorite vegetables in Cambodia, but this crop is very sensitive to insect pests from seedling to harvesting stage. The aim of this study was to identify the performance of living barriers on the occurrence and population dynamic of insect pest. The studies were carried out during the dry season in 2014 and 2015, in crop station of Royal University of Agriculture. The two trials design used were a 4x4 Randomised Complete Block Design (RCBD) in 2014 and a 5x4 RCBD in 2015. Lemongrass, spring onion, sweet basil and non-barrier were used as treatments in 2014 while sweet basil, holy basil, yellow sticky trap and plastic barrier were integrated with control in 2015. Insect samples were counted and collected by manual collection. The results showed that in the dry season of 2014, six pest species were identified representing four families and two insect orders while in the dry season of 2015, only five pest species were identified. Two new species were found in 2015 while three species from 2014 has disappeared. Evidently, sweet basil, holy basil, spring onion and plastic barrier repelled cabbage flea beetle while spring onion seems to deter diamondback moth and webworm moth. Lemon grass and yellow sticky trap were not effective in this study. The damage yield component showed that there is no significant different between living barriers and non-barrier.

Keywords: Living barrier, brassica, spring onion, sweet basil, holy basil, yellow sticky trap

Effects of Wood Vinegar and Wild Spikenard Extract on Growth and Seed Germination of F1 Hybrid Cucumber

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Abstract

This study was undertaken to observe the effects of wood vinegar and wild spikenard (*Hyptis suaveolens* (Linn.) Poit) extract on growth and seed germination of F1 Hybrid cucumber. The research was done during January – March, 2014 in Agricultural Faculty Rajamangala University of Technology. Experimental design was Complete Randomized Design (CRD) with 9 treatments as follows: water (as control), wood vinegar and wild spikenard extract at concentration 0.25 0.33 0.5 and 1 % respectively. Two experiments were done namlich growth rate measurement and germination rate measurement. The result of first experiment: Growth rate determination revealed that wood vinegar at concentration 0.33% showed the highest stimulant on growth of cucumber plants with statistic different from others. From germination rate experiment: Wood vinegar at 0.5% and wild spikenard extract at 0.33% were enhanced germination rate of cucumber seeds but wild spikenard extract at 0.25% was inhibited the percentage of seed germination.

Keywords: wood vinegar, wild spikenard, growth, F1 hybrid cucumber

Socio-Economic Evaluation of Ecosystem Services Using Travel Cost Method in Urban Green Space and Land Use Analysis in Nagoya, Japan

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Abstract

In recent years, as the area of urban green spaces has generally been increasing and also their values are beginning to be reviewed in Japan. In particular, easily accessible and routinely available urban green spaces, where many people receive the benefit of ecosystem services such as cultural services that include recreation and relaxation functions, have great values for people. However, since there is the possibility of destruction of urban parks and green spaces by urban development, the more the importance of economic evaluation of their ecosystem services has become increase. Thus, for the purpose of assessing the recreation function of small- to medium-scale urban green spaces routinely used by many people (principal parks in residential areas), this study tried to evaluate their total economic values using the travel cost method and the each economic value of their ecosystem services. To expanding the results from the TCM, conservation rank of ecosystem in urban area were suggested by an ecosystem conservation software. Potential supply of ecosystem services were estimated from categorized proxy variables (provision, support, regulation, and culture) and were weighted by the TCM results. Importance and critical ecosystems were shown in geographical maps. It was suggested that continuousness of ecosystem was also important from the context of wild life conservation. This assessment can be applied to any city of which social and natural statistics are not well-managed.

Keywords: ecosystem service, urban green space, travel cost method, Geographical Information System (GIS)

Factors Affecting Householders' Acceptance to Adopt Reduce, Reuse and Recycle - 3Rs Program in Domestic Waste Management in Mekong Delta, Vietnam

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Abstract

Reduce, reuse and recycle (3Rs) is one of the key elements contributing to the success of launching the integrated solid waste management recommended by the United Nations of Environmental Program. However, it has not been launched broadly in the Mekong Delta (MD), Vietnam. This paper summarizes how domestic solid waste generated and managed at household level, experience respondents' knowledge, awareness and their acceptance participating 3Rs program if it is introduced in the MD. The data in the paper is based on the survey of 360 urban and suburban household respondents in the MD. The results show that 78% respondents sell recycle waste and listed activities meaning reducing, reusing and recycling domestic solid waste. More than 70% respondents support this program when it is launched. The results of the logit model reveal the significant difference in factors affecting urban and suburban respondents' acceptance this program. Age, gender and educational attainment of respondents, household income, respondents' knowledge and practice on reduce, reuse and recycle their solid domestic waste are factors affecting household acceptance involving in 3Rs program. They also propose how to organize successfully 3Rs program, namely the collaboration between household and local community in organizing this program, upgrading households' awareness on environmental protection and the support in propaganda of local authorities and social media.

Keywords: domestic solid waste, 3Rs, reduce, reuse, recycle, Mekong Delta

Mechanism toward Resilience Building in the Face of Climate Change: A Question for Cambodian Rural Communities

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Abstract

The article discusses the current climatic situations in Cambodia and existing mechanisms of the country to address climate change (CC), and the level of rural communities being able to adapt to CC. Reviews of various CC related documents indicate that structures and mechanisms at national level to deal with CC are adequate but limited at community level. An emerging barrier to resilience building of community and the country is limited fiscal decentralization as the current financial sources for CC resilience building are solely dependent on external fund for decades while this source of funds is declining. Additionally, informational, technical and managerial inputs are still strongly required for local communities in order to ensure that least consequences of any occurred climatic hazards can be obtained. Involving private sector would therefore be a good option for local communities in the future always provided that private investors had the skills be able to manage rural infrastructures, for example irrigation systems, effectively.

Keywords: Rural Development, Climate Change Mechanism, Environment

Distribution of Stromboids Species in Mantatao Island Calape, Bohol: Its Implication to Conservation Measures

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Abstract

Sea snails from family strombidae are commonly known as true conchs, it is the taxonomic family of medium to very large size sea snails in the super family stromboidea. This study was conducted to determine the abundance of sea snails from family strombidae in Mantatao Island, Calape, Bohol. Descriptive study was used in determining its abundance. Transect line method was used in gathering the data with two by two (2x2) meter quadrant with a five (5) point scale in determining the abundance of stromboids species. Field guide and recording materials were used for the gathering and identification of data. There are nine (9) species gathered. The following stromboids species are Conch shell *Stombus erythrinus* which got the highest numbers of individuals and the most abundant population but got the lowest when it comes total weight while Milleped spider conch *Lambis millepeda,* got the lowest numbers of individuals but got the highest weight. There is no significant difference of the data gathered between sampling sites both has same degree of relative abundance, although sizes and weight differs but not enough to justify the significance. Distribution and abundance of stromboids in the islands still observed but with the different gleaning practices used this will led later to the nearly depleted stock.

Keywords: sea snails, quadrant sampsling, stromboids

Influence of Water Hardness on Ecotoxicology of Copper on Aquatic Biota: Implication for the Revision of Water Quality Standardization in Lao PDR

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Abstract

The ecotoxicology of copper on freshwater organisms were studied using field-collected water from two local sites (site 1 Pakxan District and site 2 Vientiane Capital City) along Lower Mekong Basin in Lao PDR. The study compared the effects of hardness as CaCO3 for site 1 of 20±2.83 and site 2 of 108±0.00 mg/L (water in rainy season), site 1 of 105±3.35 and site 2 was 140±4.00 mg/L (water in dry season). The acute toxicity of organisms responses to copper at the different water hardnesses of Mekong River water gave that showed higher water hardness can reduce the toxic effect of copper. The result of LC50 with 95% confidence interval in water hardnesses as CaCO3 for site 1 of 20±2.83 mg/L, site 2 of 108±0.00 (in rainy season) and site 1 of 105±3.35 mg/L, site 2 of 140±4.00 mg/L (dry season) were site 1 of 0.038 mg/L, site 2 of 0.106 mg/L (rainy season) and site 1 of 0.092 mg/L, site 2 of 0.155 mg/L (dry season) for (L. rohita). Moreover, (M. Macrocopa) LC50 was site 1 of 0.004 mg/L, site 2 of 0.012 mg/L (rainy season) and site 1 of 0.01mg/L, site 2 of 0.023 mg/L (dry season), respectively. It was concluded that the effects of copper to organisms was dependent on the water hardness level due to increasing water hardness reduce the toxic effect of copper upon aquatic organisms.

Keywords: water hardness, aquatic biota, copper

Influence of Dissolved Organic Carbon on Ecotoxicology of Copper on Aquatic Biota: Implication for the Revision of Water Quality Standardization in Cambodia

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Abstract

The Mekong River is one of the world's greatest river systems and sustains human life and ecosystems. The livelihoods of 60 million people who live along the Lower Mekong Basin (LMB) rely on both the economic resource and the ecological health of the river. In this study, US EPA method was used for the acute toxicity with different water dissolved organic carbon (DOC) of Mekong River in Cambodia on chironomus javanus (C. javanus) and fish Nile tilapia (Oreochromis niloticus) to modify the effecting of DOC on copper toxicity. Both (C. javanus) and Nile tilapia were significantly less sensitive to copper in water high DOC (5.74 mg/L DOC), compared to water low DOC (1.12 mg/L DOC) exposures. The effect of DOC, as humic acid source on the acute toxicity of copper (Cu) to (C. javanus) and fish Nile tilapia also was investigated. The mortalities for both species increase with increasing copper, but LC50 value decreased as more toxic on Nile tilapia and (C. javunus). This gave an order of toxicity of copper in water with low DOC > water with high DOC at the end point of LC50. DOC might provide protection against Cu toxicity in the freshwater in term of completive between copper form and DOC. The result of the LC50 with 95% confidence limit obtained at 48hr in tap water on Moina macrocopa, (C. javanus), Grass Carp and Nile tilapia were 12µg/L, 16399µg/L, 118µg/L and 1383 µg/L, respectively. This gave an order of toxicity of copper in tap water with Moina macrocopa > Grass Carp (Ctenopharyngodon idella) > Nile tilapia (Oreochromis niloticus)> Chironomus javanus (C. javanus). Also, it could be noted that Moina was the most sensitive followed by Grass Carp, Nile tilapia, and (C. javanus) to copper. Present study indicated that water chemistry parameters can influence on copper toxicity to tropical freshwaters biota. Exposures in this series of laboratory experiment will provides a worst-case scenario and useful for determine the risk assessment of copper on Mekong tropical freshwater animals.

Keywords: copper, water quality, aquatic biota

Economic Analysis of Small-Scale Pumping Machines Operated in Rice Production in Chum Kiri District, Kampot, Cambodia

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Abstract

Water scarcity has become abnormally serious across the year, so timely irrigation aid is strongly required for healthy crop growth. For this reason, the paper aims to identify the role the water pump plays in rice productivity and to analyze its break-even point. The study was performed during the January-June period of 2015, randomly selecting 80 pump owners from one farming commune in Chum Kiri District, Kampot Province, Cambodia. The data were collected using household interviews, in-depth interviews and a group discussion and then analyzed utilizing descriptive statistics and the break-even formula to investigate repair costs, annual pumping hours and standard farm size. The result shows that water pumps were highly in operation during the dry season to maintain the crop-water balance and were annually operated from 340 to 380 hours. The engine capacity of the pumps, frequently purchased, ranged from 5 to 8 horsepower. Typically, the pumps lasted five full-operational years and depreciated 25 dollars on annual basis. Japanese-brand pumps were bestselling, still farmers were subject to excessive spending on annual repairs because of less care and little maintenance knowledge. Although water pumps were widely utilized across the studied area, each household only cultivated farmland of 1.20 hectares on average, whereas the break-even land was calculated as at least 6 hectares of cultivated land, so that the pumps were operated fully, economically and effectively. In conclusion, though operated on small land, water pumps has made a contribution toward improved crop production. However, they remained minimally useful in case of scarce water sources. Therefore, irrigation sources should also be considered and constructed, so crop production might double or diversify with the presence of pumping machines.

Keywords: Dry season, operational hours, farmland, break-even point

The Cassava Marketing in Pailin Province, Cambodia, 2014

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Abstract

This study was conducted at the farm and intermediary market levels to examine the efficiency of cassava marketing system in Pailin province, Cambodia, especially aimed to (1) describe the socio-economic characteristics of market participants; (2) analyze the marketing channels of cassava; (3) evaluate marketing costs and margins of the different players in the marketing system; (4) determine the efficiency of cassava marketing; and (4) recommend improvements in the cassava marketing system. A total of 120 cassava farmers and 20 traders were randomly selected for the study. The analysis included the tracing method, marketing margin, mark-up, price share and Shepherd's Index. Results reveal that majority of the cassava (73.28%) was exported to Thailand. Farmers, local collectors and wholesalers were the major marketing agents involved in delivering cassava from the farm to local processing firms and Thai importers. Cassava price was determined by the buyers and was based on the prevailing marketing price and quality. Marketing channel for cassava is short having only two intermediaries, the local collectors and wholesalers with the latter earning more profit and incurring the least marketing cost. Farmers claimed a higher share to end-user's price (45.11%) followed by local collectors (29.60%) and wholesalers (19.65%). Among marketing channels, channel III obtain the highest margin while channel V is considered most efficient channel for having the highest marketing efficiency index of 3.85. It also distributes the highest volume of cassava compared to other channels. Marketing cost has a negative effect to the profit of cassava marketing agents. In order to improve the marketing efficiency of cassava in Pailin province marketing cost at farm and intermediaries level should be minimized. Policy directions like the establishment of an effective market information system, promotion of local processing firms, establishment of required post-harvest facilities, and improvement of road infrastructure are suggested.

Keywords: marketing efficiency, marketing cost, marketing margin

Economic Opportunities for Off-Season Chilli and Tomato Production and Marketing in Kampot Province, Cambodia

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Abstract

The economic possibilities for off-season Chilli and Tomato production and marketing are important for lowland rice farmers in Cambodia. There are both constraints and opportunities to improve farm income and supply a growing domestic market. Focus group discussions were conducted with 15-20 growers in three villages of Kampot Province. Vegetable economic prospect analysis, including risk assessment, was developed to compare normal farming systems (dry season vegetable production) with a new system (off-season vegetable production). These farmers in Koun Sat Commune have an annual income of US$1,137 per family, with many sources of non-rice and non-crop income. On average they plant 0.05 ha of vegetables on a 0.5 ha farm. Vegetable yields in experimental plots are very high, but these need to be translated into yields achieved on farms. The economic return (measured by gross margin) is not substantially appealing unless high on-farm yields can be achieved. The use of improved technologies, including improved seeds and production methods, can improve domestic vegetable production and farm income. But more action is needed to enable translation of yields obtainable in experiments to yields achieved on farms. Further study of specific vegetable production methods in the wet season – including greenhouse vegetable production and use of rain shelters, is warranted to prevent vegetables becoming wet in this new production system.

Keywords: Vegetable, off-season, economic prospect, Cambodia

Are There Potential Economic Benefits from Adoption of New Rice Varieties in the Ayeyarwady Delta of Myanmar?

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Abstract

Rice is important for semi-subsistence smallholders in the Ayeyarwady Delta Region of Myanmar. High-Yielding Varieties (HYVs) of rice have been developed by the International Rice Research Institute (IRRI) with the semi-dwarf high water- and nutrient-use efficiency genes that were successful in the Green Revolution, requiring added fertilizer and water inputs to achieve full yield expression. Increased rice production through adoption of HYVs is a pathway that IRRI believes can provide improved livelihoods for families. HYV rice adoption has been quite successful in the dry season, but adoption in the monsoon season is low. There is a large potential gap between yields achieved on farms and what is biophysically possible. This research aimed to understand whether the adoption of monsoon HYVs is economically viable for these farmers. Gross Margin rice budgets of traditional and HYVs were developed to enable an economic comparison of a new technology with the existing rice system. These budgets account for expected income and variable costs of production for a hectare of land. We assume that since semi-subsistence farmers are selling at least some of their crop, a basic accounting for costs and benefits is important. We found that in two villages under elevated and low-lying conditions the economic returns were never higher for the Sin Thwe Latt HYV compared to the traditional fragrant Paw San variety. The HYV crop yield achieved by farmers is an important factor in the comparisons. But examination of farmer diaries and evaluation of crop variable costs suggested that fertilizer inputs are well below the amounts required to achieve the yields indicated to be possible. Although there were problems with the ability of interviewers to reach farmers and obtain full data on crop input use, these results indicate that more focus can be turned to the farm fertilizer use decision.

Keywords: Potential economic benefits, adoption, Myanmar

Assessing the Economic Benefits from the Adoption of New Rice Varieties in the Ayeyarwady Delta of Myanmar

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Abstract

The Ayeyarwady Delta region of Myanmar has a large rural population, many affected by poverty associated with semi-subsistent smallholder farms. Rice is strongly connected with farms in this region. There is a large rice yield gap in the cropping systems of Myanmar, between yields achieved on farms and what is biophysically possible. Improving rice production though the uptake of High-Yielding Varieties (HYVs) is a pathway that the International Rice Research Institute (IRRI) believes can provide improved livelihoods to farming families. HYV adoption has been quite successful during the dry season due to the breeding of photoperiod insensitive varieties. The adoption of HYVs in the Monsoon season is low. This research aimed to gain an understanding as to whether the adoption of HYVs was economically viable. Newer HYVs containing the same semi-dwarf high water and nutrient use efficiency genes that were successful in the Green Revolution have been bred through IRRI. These require the added inputs to achieve the yield benefits. However, the traditional low-input cropping patterns in the monsoon season appear to be continuing. Fertiliser inputs were well below the required amounts for achieving the potential yields that are possible in this area. A problem with the inability for interviewers to reach farmers to obtain data and lack of farmers growing HYVs has caused any conclusions to only be speculative. The research question was established by gaining an understanding of the farming systems and crop varieties to test scenarios under the guidance of the overarching IRRI research project. The data that was received from IRRI was analysed using GM comparisons of the HYV Sin Thwe Latt and the traditional fragrant variety Paw San in the monsoon season and Thee Htut Yin in the dry season. This created discussion about the risk management of the two seasonal cropping systems.

Keywords: High-yielding rice varieties, economic improvement, Ayeyarwady Delta

Supply Chain Management of Organic Rice in Northern Thailand

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Abstract

The present study has the objective to perform an analysis on supply chain management of organic rice sector in Northern Thailand. The supply chain and linkages under study start from the downstream portion comprising groups of organic rice growers operating as social enterprises, to millers, and wholesalers. The needed information was surveyed and collected using questionnaire. Methodologically, the Supply Chain Operations Reference: SCOR Model was applied for analyzing the value chain of various activities. In order to find the activities that add extra cost while not adding value to the whole business. It was found from this study that most activities are in the category of necessary but non - value added (NNVA) and they occurred largely, about 80-90 % of all activities, in the "Plan" and "Make" processes. The most time consuming process was "Source" as millers, farmers, and large scale retailers on the average spent 8,646.90, 481.75, and 436.81 hours/crop season, respectively. For millers, it was necessary and unavoidable to involve lengthy time for inventory activity and millers have to procure and stock rice grain after the harvest for processing into milled rice upon buyers' order and to meet year-round rice demand. For farmers, most time was spent for the procurement of inputs and waiting until application in rice growing season. Meanwhile, large scale wholesalers took long time for inventory of milled rice to ensure adequate supply for the order fulfillment cycle time. On the part of small scale wholesalers, some Value added (VA) activities were practiced such as repackaging into the sizes preferred by customers, using attractive and new package designs, and expediting the internal working process to cut down the time used in the supply chain. The non -value added (NVA) activity of miller was related to the inspection of rice grain quality which was not up to the standard. From time to time, the procured paddy had high moisture content and repeated sun-drying process becomes necessary to reduce grain moisture to standard level.

Keywords: Organic rice, Social enterprise, Supply Chain, Value Chain

Carbon Dioxide Evolution as an Index of N Mineralization Rates of Organic Substrates

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Abstract

Mineralization of nutrients from organic materials is vital for optimum plant growth and development. Various methods have been used to evaluate the mineralization rate of different organic substrates. Of these, carbon dioxide evolution is a reliable method to estimate mineralization rate. Four different substrates: dry chicken manure, *Azolla*, coconut coir dust (CCD), and *Gliricidia sepium* leaves and the combination of these organic materials with a nutrients source (Simple Nutrient Addition Program [SNAP] solution) on their rates of mineralization was determined. The results were significantly different in the amounts of CO_2 evolved from the substrates. CO_2 evolution from the substrates was stimulated by SNAP. Among all treatments, *G. sepium* with SNAP yielded the highest amount while coconut coir dust gave the lowest. Nitrogen mineralized to about fifty percent (50%) during the first week in all treatments. By the end of eight weeks period, *G. sepium* with SNAP produced the highest amount of mineralized nitrogen (9.40 mg kg^{-1} soil) while CCD had lowest N mineralized (8.03 mg kg^{-1}) compared to other treatments with organic materials and SNAP. Using soil organic materials such as *Gliricidia sepium* leaves would quickly provide the soil with more mineralized nutrients which are available for plant growth and development.

Keywords: mineralization, CO_2 evolution, organic substrates, *Gliricidia sepium*

Agronomic Performance and Weed Infestation in Bitter Gourd (*Momordica charantia* Linn.) with Mulches under Open Field and Protected Cultivation Systems

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Abstract

The study evaluated the influence of mulching materials on agronomic performance and weed infestation in bitter gourd grown under open field and protected cultivation systems. Organic mulches: rice straws, rice hulls, Gliricidia sepium Linn. leaves, Chromolaena odorata Linn. leaves and in-organic plastic mulches in silver-black, green, red and blue colors with control treatments were tested in two experimental set ups with randomized complete block design. Findings revealed both cultivation systems showed no significant influence on crop's growth, yield and weed infestation. However, different mulches Gliricidia significantly encouraged node development on vines bearing first male flower under protected cultivation. Silver-black, red and blue plastic enhanced 5-6 days earliness in first female flower emergence than unmulched crops in open field. Silver-black, green plastic and control significantly encouraged node production at first male flower emergence. Silver-black plastic significantly reduced the weight of non-marketable fruits by 47%, green plastic 41%, blue plastic 59% increasing crop's yield by 40%, 35% and 56% respectively in open field only. Rice hull, rice straw and Gliricidia significantly reduced weed herbage in open field, while rice straw, Gliricidia and Chromolaena mulches effectively lessen herbage under protected cultivation. Both mulches significantly influenced water consumptive rate of weeds infesting bitter gourd. Compared to the control, rice straws reduced rate by 8% and 12%, rice hull 5% and 15%, Gliricidia 4% and 32% and Chromolaena 8% and 24% in open field at first and second month of crop growth respectively. Weeds under silver-black, green, blue and red plastic had significantly lower water consumption rate at first month with 4, 4, 5 and 11% lower than control plots respectively. Therefore, organic mulches improve agronomic performance of bitter gourd while reducing weed infestation in both cultivation systems implying that locally-available materials can replace chemical inputs and are useful in organic bitter gourd production.

Keywords: Agronomic Performance, Cultivation Systems, Organic Mulches, In-organic Mulches, Weed Infestation, Water Consumptive Rate

Utilization of Corncob as Feedstuff on Growth Performance, Feed Utilization and Carcass Composition of Nile Tilapia (*Oreochromis niloticus*)

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Abstract

The utilization of corncob as feedstuff was investigated to examine the corncob containing feed trial in the fingerling Nile tilapia *Oreochromis niloticus* (L.). The initial weight of Nile tilapia fingerlings ranged from 14.66 – 16.66 g/fish. The experiment was divided into four groups by the levels of corncob were 0%, 5%, 10% and 15% and conducted for 120 days. At the end of experiment, the results showed that the growth performance and feed utilization each groups were not significant different (P>0.05). In addition the carcass composition and chemical composition of edible flesh have no difference (P>0.05). Moreover, the water quality of fish fed with feed contained corncob at different levels were in range of water quality standard. The study indicated that the diets containing corncob available to 15% by no negative effect on growth, feed utilization, carcass composition edible flesh quality and water quality. On the other hand, it's cost - effectiveness.

Keywords: Nile tilapia, corncob, feed, growth

Improving Diet Quality, Nutrient Digestibilty and Growth Performance of Cattle by Supplementing Water Hyacinth (*Eichhornia crassipes*) to Rice Straw

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Abstract

Four local male cattle with average live weight of 290 kg were arranged in a Latin-square design with four treatments, which included fresh water hyacinth replacing rice straw at levels of 0, 25, 50 and 75% in the diets (DM basis) corresponding to the WH0, WH25, W50 and WH75 treatments. The aim of this study was to find out the optimum level of fresh water hyacinth in cattle diet based on nutrient digestibility, rumen parameters, nitrogen retention and daily weight gain. The multi-nutrient cake containing 323 g CP/kgDM was supplemented in all the diets to adjust the daily CP intake to 210 g/100 kg BW. Daily DM, OM, NDF and ME intakes were significantly different ($P<0.05$) among the diets and they gradually reduced from the WH0 to WH75. While rumen pH, N-NH_3 and VFAs concentration were not significantly different ($P>0.05$) among the treatments. The daily nitrogen retention and weight gain was 0.482, 0.502, 0.510 and 0.480 g/kg$W^{0.75}$ and 250, 334, 448 and 403 g for the WH25, WH50, WH75 and WH100 treatments, respectively. The results indicated that feeding the fresh water hyacinth to replace rice straw up to 75% in local cattle diet could improve nutrient digestibility and growth performance. The optimum level of WH replacement to rice straw in the diet was 50%.

Keywords: intake, growth rate, nitrogen retention, nutrient digestion, rumen parameters

Effect of Levels of Dietary Crude Protein on Nutrient Intakes, Growth and Economic Return of Guinea Fowls in the Mekong Delta of Vietnam

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Abstract

A feeding trial was carried out to investigate the feed intake, growth performance and economic analysis of Guinea fowls fed concentrate-based diets including maize, broken rice, rice bran, fish meal and soybean meal. One hundred and fifty of guinea fowls originally come from Hungary were arranged in a completely randomized design with 5 treatments and 3 replications. The treatments were the crude protein levels of the diet at 14, 16, 18, 20 and 22% (CP14, CP16, CP18, CP20 and CP22). The experimental period lasted 9 weeks. The results of the experiment indicated that CP intake improved gradually with increasing the crude protein level in the diets ($P<0.05$), while the other nutrient intakes were not significantly different ($P>0.05$) among the diets. The daily weight gain was significantly different ($P<0.05$) among the diets with the highest for the diet CP20 (19.4g) and the lowest for the diet CP14 (16.1 g). Similarly the feed conversion ratio was significantly ($P<0.05$) improved when crude protein level of diet increasing up to 20% and they were 3.43, 3.10, 3.07, 2.90 and 3.10 for the CP14, 16, 18, 20 and 22 diets. The economic analysis of the study indicated that the profit was improved when increasing CP level up to 20% and they were 43.5, 47.6, 48.1, 53.8 and 46.3 thousand VND per bird. It was concluded that the nutrient intakes, growth performance and economic return gradually improved with dietary crude protein increasing from 14 to 20%.

Keywords: Chicken, growth, dietary protein, income, nutrient utilization

A Response of Dietary Nutrient Utilization, Growth Rate and Economic Return of Rabbits Supplemented Coconut Cake in Mekong Delta of Vietnam

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Abstract

A study was conducted at the experimental farm and laboratory of Can Tho University to evaluate feed utilization, nutrient digestibility and growth performance of Crossbred rabbits. Sixty crossbred rabbits at 8 weeks of age were allotted in a completely randomized design with 5 treatments that were 5 supplement levels of 10, 20, 30, 40 and 50g coconut cake (COC) per rabbit per day corresponding to the COC10, COC20, COC30, COC40 and COC50 treatments, respectively. Three replications and 4 rabbits (balanced sex) per experimental unit were used. The results show that the DM intake was significantly higher for the rabbits supplemented 30g COC ($P>0.05$). The intakes of CP, EE and ME were higher for the animals fed 30, 40 and 50 g COC ($P<0.05$).The digestibility coefficients of DM, OM, CP, EE and NDF were significantly higher in the 30COC treatment ($P<0.05$). Nitrogen intake and nitrogen retention increased corresponding with increasing COC supplementation in the diets ($P<0.05$). The daily weight gain was significantly higher for rabbits given 30g COC per animal per day ($P<0.05$). The final live weight, the carcasses, thigh meat and lean meat weights were significantly higher for rabbits fed 30g and 40g COC per day ($P<0.05$). In conclusion that the Crossbred rabbits supplemented coconut cake in the diets had significant increase of the OM, CP, EE and ME intakes. At the supplementation level of 30g COC per animal per day had higher growth rate, meat production and better profit.

Keywords: Crossbred rabbit, coconut cake, nutrient digestibility, growth rate, carcass weight

Evaluation of Eri-culture to the Empowerment of Women and Community Development in Kampong Cham Province, Cambodia

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Abstract

Betrayal was often occurred in POL POT regime in the family or in the community for surviving oneself, so that trusts among villagers were totally destroyed in this regime. It is said that 1.5 or 2 million people died from execution, forced hardships, or starvation during the Khmer Rouge regime under POL POT from 1975 to 1979. After Pol Pot regime, people returned to their homelands, and re-start their living. However, one village is formed by villagers who were for POL POT and were against POL POT, and the living in the village was not like before. It is quite often said that forming group is very difficult in Cambodia due to the historical reason when implementing projects in the rural areas. Only 15 years has passed since the remaining Khmer Rouge surrendered in 1999. Cambodia experienced the crucial history in the past decades that makes the community development as well as capacity building of people and community so difficult in this country. Survivors of Khmer Rouge have been waiting for trails and it is still going on in Cambodia. Also in Khmer society, women status put lower than men, and they are expected to be modest and humble all time. Recently, women's social advancement has encouraged however, women are still treated low, particularly in rural areas. With these social environment and conventional ways of thinking, how eri-culture contributes to the empowerment of women and community development should be discussed. Accordingly, this paper aims to identify how eri-culture including spinning, dyeing, weaving and marketing contributes to community development in the research site in Kampong Cham Province. Particularly, it is focused on the effects of eri-culture on the job opportunities for female and the communication in rural communities.

Keywords: eri-culture, community development, empowerment of women, capacity building, weaving, dying, spinning, POL POT, Khmer regime

Impacts of Flash Flood on Farmers' Livelihoods in Upland Areas: A Case Study of Rice Production in Nathen Village, Kasi District, Vientiane Province, Lao PDR

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Abstract

Laos is located in the tropical monsoon climate and is geographically divided into two land zones, upland and lowland. Upland area lies approximately in the Northern half of the country, and lowland lies in the Southern half of the country. Most of upland provinces are vulnerable to tropical depression and typhoon originating in the Pacific Ocean or the South China Sea. Majority of upland areas are occupied by small and poor farm holders where each household held about 0.9 ha. Schiller et al (2006) found that in the upland area low temperature is normal which can catch heavy rain causing flash flood and affecting rice productivity. Therefore, this paper aims at fulfilling two main objectives, 1) to study the impacts of flash flood on the farmers' livelihood, particularly rice production and 2) to identify the coping strategies of the farmers against the flash flood. The research includes both primary and secondary data. A questionnaire and in-dept interview survey were performed in this study. Nathen village, Kasi district, Vientiane province, Lao PDR was selected as the location for this case study. Forty households affected by flash-flood were interviewed using questionnaire. Fifteen farmers and Five key informants, government official, chief of the village, NGOs leader, were in-depth interviewed using subtopic. Furthermore, two focus group discussions were conducted with 10 respondents, included the head of the village, a committee to prevent and control disasters of the village, an NGO staff, a local government official, the head of youth union, the head of women union, and four villagers.The findings indicated that out of the 40 households interviewed, 97.5% experienced severe flash floods caused by heavy rain which result from a powerful water flow from the Lik river. This type of flood badly affected their agricultural production areas, rice production, crop production, livestock, household assets, health care, and other facilities. Therefore, the households prioritized coping strategies for survival throughout the years such as, settlement changing, occupational readjustment, and crop diversification.

Key words: flash-flood, farmers' livelihoods, upland, strategic, Lao PDR

Assessing Impacts of Enhanced and Decreased Surface Temperature Situations on Yield and Essential Amino Acids for Children of Two Thai Soybean Cultivars

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Abstract

This study is aimed at assessing the impact of enhanced and decreased surface air temperature on yield and two types of essential amino acid for children: histidine and arginine, of two Thai soybean (*Glycine max* (L.) Merrill) cultivars: CM60 and SJ5. This study was carried out in a field experiment in 2013 to 2014 at the Naresuan University, Phitsanulok, Thailand. Two cultivars of soybean were planted and covered with open top chamber (OTC) since seedling through maturing stage. Open-top chamber with electrical system were set to control three different temperature situations: 25.5±1.3°C (low temperature /LT treatment), 37±3.4°C (high temperature /HT treatment) and 35±1.9 °C (ambient temperature / CT-treatment). We observed in total number of seed per plant; the results indicated that yield loss obviously occurred by statistical significance in both two cultivars. The reduction ranges from 71% to 77% were found in CM60 and SJ5 under high temperature and low temperature, respectively. However, the contrast results were found in essential amino acid; the both of low temperature and high temperature situations induced the increase in amino acid content. The significance increase in histidine by 5% was shown in only SJ5 cultivar under low temperature situation. In addition, both low temperature and high temperature situations also induced the increase in arginine amino acid by approximately 6%. Although, the great increase by 35% was shown in SJ5 under high temperature situation. To summarize, the enhanced or decreased surface air temperature situations in growing season could cause yield loss but induced the increases in essential amino acids for children: histidine and arginine, in two cultivars of Thai soybean.

Keywords: enhanced temperature, decreased temperature, yield, essential amino acid, open top chamber, Thai soybean

Prevalence and Determinants of Household Food Security in Resettled Areas in Sekong Province, Lao PDR

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Abstract

Relocating isolated villagers from upland to lowland areas is an important rural development strategy to eradicate poverty and food insecurity in Laos. However, previous research found several social and livelihood problems after resettlement, including poverty and food insecurity. This study investigated the level of food insecurity after resettlement and identified factors influencing household food security. We conducted a survey in Tok Ong Keo village of Lamam district, Sekong province, and surveyed 60 households through a structured questionnaire. We employed the U.S. Household Food Security/Hunger Survey Module (U.S. FSSM) to measure the severity of food insecurity. We also applied a logistic regression model and marginal effect to examine the factors influencing household food security. The results show that about 55% and 34% of the respondents experienced rice shortages for about 1–3 months and more than 3 months, respectively. Consequently, 62% were categorized as "food insecure with moderate hunger" and about 12% were "food insecure with severe hunger", implying that most adults in the study areas frequently experienced the physical sensation of hunger. The education level of household head, household size and livestock ownership had a positively influence on food security, while household size was negatively associated with food security. In order to escape from food insecurity in the new resettled villages, policymakers should focus on non-formal education for uneducated and unskilled household heads. In addition, they should provide knowledge of how to increase livestock production and prevent livestock diseases in the study areas.

Keywords: food security, determinants, resettlement, upland areas, Sekong province, Laos.

Acceptability of Enhanced Puso as a Complete Meal

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Abstract

Asians are rice eaters. From the Asian countries, Philippines consumed more rice in their meals. It was also observed that Filipinos sometimes prepared their rice in the form of puso or sometimes called "hanging rice" being wrapped in woven coconut leaves in different shapes and cooked by submerging them in boiling water, when cooked, they were hang and were observed to last longer than ordinary way of cooking rice and they were convenient to eat whether at home or outdoor. In this study, the researchers ventured to add protein food in ordinary puso and studied the acceptability of the 3 treatments from Treatment0 or T0 – ordinary puso as the control; T1 – Puso with Meat Ball, T2 – Puso with Chicken Asado and T3 – Puso with Beef Guisado. This study aims to determine the acceptability of the 4 treatments in terms of Appearance, Odor, Color, Texture, Taste and Overall Liking. It also aims to identify the ingredients, tools, utensils, equipment and the procedure in preparing it. It further compares the shelf life of ordinary puso and the enhanced one with the end view of promoting for its utilization as complete meal of the people in the community. This study is experimental utilizing parallel group design and employing 4-Point Hedonic Scale with 50 panelists rating the products.The result shows that T3 or Puso with Beef Guisado ranked first in taste and odor, it was followed by Puso with Chicken Asado and last Puso with Meat Balls. The odor of the Beef Guisado was very evident in the Puso. The result also shows that the 3 treatments of the enhanced Puso were acceptable being convenient to be eaten anywhere even without plates, spoons and forks at home or outdoor like outings and picnic.

Keywords: enhanced puso, complete meal, hedonic scale, acceptability

Access to Financial Resources in Rural Areas of Bosnia, Montenegro and Serbia

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Abstract

Lack of financial resources is one of the main indicators used for poverty assessment. One of the most important problems faced by farmers and rural entrepreneurs in Bosnia, Montenegro and Serbia (BMS) is the lack of and/or difficult access to financial resources. The paper aims at providing insights into rural finance and access to credit in rural areas of BMS. It is based on a literature review and an exploratory face-to-face questionnaire survey - dealing with households' livelihoods diversification - performed with 108 households in south-eastern Bosnia (winter 2012), 106 households in northern Montenegro (autumn 2013) and 104 households in western Serbia (spring 2013). Households were randomly selected from address-based municipal register records. Many of surveyed rural households never started procedure for getting a credit in Bosnia (29.6%), Montenegro (almost 50%) and Serbia (around 60%) mainly for the lack of collaterals. In Bosnia and Serbia, majority of interviewees used credits for personal needs while in Montenegro loans were used mainly for buying machines and equipment (26.4%). Loans were taken also for construction and maintenance of buildings, buying inputs (fertilizers, seeds, etc.), non-farm investments and jobs, construction of fish ponds, irrigation systems' procurement, and buying animals and seedlings. However, range of financial services available to rural people are relatively costly and/or rigid. Moreover, there is connection between human and financial assets of rural households. In fact, as financial management skills of borrowers are considered by lending institutions when analysing loan requests, educated rural people have likely more chance to get loans. All in all, improving rural financial market in BMS has enormous potential for economic growth, poverty reduction and rural economy diversification. Well-developed and inclusive financial systems are associated with more rapid rural development. Therefore, public action is needed to make easier access to credits from formal and semiformal financial sectors.

Keywords: Rural finance, loan access, Bosnia, Montenegro, Serbia.

Variation in Storage Temperatures for Foot and Mouth Vaccine in Cambodia

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Abstract

An investigation was conducted on thirty vaccine cold storages in veterinary drug stores in three study areas in Cambodia to assess current vaccine cold storage management and vaccine handling practices. Electronic data loggers were used to record the temperature in each cold storage facility every thirty minutes for a period of thirty days. The study results revealed that most of the vaccines stored in the refrigerators at both private stores and government offices were often exposed to temperatures which were colder or hotter than the manufacturers' recommendations and their potency may have been reduced. Most of the refrigerators were also used to store items other than vaccines, such as food and drink, leading to frequent door opening. Vaccines were often stored in the bottom drawers and door shelves, which is the warmest location in a refrigerator. None of the refrigerators were equipped with a maximum and minimum thermometer. Daily temperature recording was not practiced in any veterinary drug stores. One way analysis of variance revealed that there was not significant effect of province, government/private status or interaction between these two for mean or median temperatures or percentage of time spent in different temperature categories ($P>0.05$), while there was significant effect of province, and interaction between province and government/private status for the standard deviation of temperature, and the number of temperature episodes in different categories ($P<0.05$). Better storage conditions to avoid loss of vaccine potency could be achieved simply and cheaply by providing corrective training for wholesalers/retailers and relevant government staff. Maintenance of vaccine potency is likely to improve the success of vaccination programs in Cambodia. This critical but neglected issue requires improved practices and ongoing monitoring. The new high-tech and low cost data logging method used in Cambodia in this study provides a practical means to monitor and evaluate the vaccine cold storage function. This method can be used on a regular basis to monitor the functioning of vaccine cold storage. The study highlights the need for improvement and solutions to avoid ongoing future exposures of vaccines to freezing, too cold and too hot temperature, particularly in hot tropical countries like Cambodia.

Keywords: Data logger, veterinary drug store, refrigerator, vaccine, Cambodia

Development of Starter Culture Using Isolated Microorganisms from Medombae (Starter Culture)

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Abstract

Medombae, a dried starter culture for rice wine processing, plays a major role in the wine's active fermentation. The main objective of this study was to develop an instant starter culture for rice wine processing, by (1) applying the developed starter culture consisting of the useful microorganisms (Mucor spp, R. oryzae, S. cerevisiae, C. tropicalis, and Saccharomycopsis spp in actual rice wine fermentation; (2) evaluating the saccharifiying ability and alcohol production of the instant strains; (3) developing a starter culture and determining its storage stability; and (4) characterizing the traditionally fermented rice wine products from pigmented and non-pigmented rice through physicochemical analysis. The Duncan's New Multiple Range Test (DNMRT) was used to determine the differences among samples. The high saccharification rate and good liquefaction of saccharified rice was established using the developed starter culture. Results showed that *medombae* either formulated individually or in mixed cultures have longer shelf-life maintaining its microbial content of 10^7 CFU g^{-1} for one month upon storage at 4-8^oC at .moisture content of 11-13%. The developed starter cultures were utilized in the production of traditional rice wine using low-amylose rice at 1% rating based on the weight of milled rice. The yeast count of fermented mash were 10^6-10^7 CFU ml^{-1} during fermentation while acid-producing bacterial count gradually increased to 10^4-10^6 CFU ml^{-1}. Rice wine produced using mixed starter and waxy non-pigmented rice has high alcohol percent compared to rice wine using individual starter culture and waxy pigmented rice.

Keywords: Medombae (starter culture), microorganisms, rice wine

Identification of Microbiological Hazards and Histamine Producing Bacteria in Fermented Fishes Produced in Cambodia

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Abstract

Foodborne outbreaks are commonly reported in Cambodia, but the scientific report of food safety status has not been well documented. Fermented fishes are popular and well liked by Cambodian people for their daily diet. However, some outbreaks of foodborne diseases associated with fermented products, due to improper conditions during processing that causes contamination of pathogenic bacteria or poisoning substances produced by bacteria. The main objective of this study was (1) to clarify the possibility of fecal contamination or other pathogenic bacteria into fermented fish products sold in Phnom Penh' markets, (2) to determine the level of histamine fish poisoning in those fermented fishes, and (3) to identify the main histamine producing bacteria. The experiment was conducted in National Food Research Institute (NFRI, NARO) Japan. Fermented fishes of 60 samples were purchased randomly from 5 wet markets in Cambodia from March 2014 to July 2014, sent to Japan interval 3 days and kept 5^{o}C less than 2 weeks for analysis. The standard methods for microbiological analysis were used. The contamination rate of *E. coli* (2%), *Cronobacter sakazakii* (2%), Coliform bacteria (43%), Opportunistic Non-Entrobacteriaceae (22%), *Vibrio* spp. (8%), *Enterococcus* spp. (50%), *Aerococcus* spp. (3%), *Staphylococcus* spp. (45%), *Listeria* spp. (17%) and *Bacillus cereus* (87%) were found in tested samples. Twelve samples (20%) of fermented fishes exceeded the Food Standards Code (FSC) maximum permitted level (200 ppm) for histamine. *Enterobacter aerogenes* was identified as potential histamine producing bacteria in fermented fishes. The study showed that the pHs of most fermented fish products were not low enough to inhibit the growth of unwanted bacteria. In addition, the quality of the raw material and good hygiene practices in food facility should be required to improve current food safety in Cambodia.

Keywords: Hazardous bacteria, Histamine, Histamine producing bacteria, Fermented fishes, Cambodia

Investigation on Vibration Characteristics of Hand Tractors Using Mems Sensor

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Abstract

Agriculture employs almost 80% of Cambodian rural labor forces. It is considered to strongly support Cambodian people in ensuring food security. It constitutes a main source of income. It is the main driver of poverty reduction, and it has a 29% contribution to the GDP. The enhancement of agricultural production through agricultural tools, the use of agricultural mechanization has gradually increased, virtually over the last decade. It is evident that agricultural mechanization not only facilitated timely completion of operations but also increased production, labor savings, energy efficiency, productivity, and profitability. With high degree of hand tractor use, providing a safe and comfortable working environment to operators became an important consideration, specifically vibration that is a main cause of early fatigues. In this study, therefore, translational acceleration and rotational angular velocity at various locations of hand-tractor at stationary mode were measured. Root-Mean-Squares (R.M.S) and Power-Spectrum-Density (PSD) were used to investigate vibration magnitude and dominant frequency and effective measurements were finally suggested. Results showed that the largest vibration acceleration appeared at handgrip in vertical axis of about 14.76m/s^2 followed by gearbox below, engine top and chassis, respectively. A main source of vibration, engine top, predominant vibration occurred at longitudinal axis of about 8.85m/s^2. The same huge vibration magnitude in longitudinal axis was also observed at engine top of rotational angular velocity. Within 50Hz frequencies, predominant acceleration occurred in longitudinal axis at about 10Hz frequencies at first peak and about 18Hz frequencies at next peak at engine top. Whereas, at handgrip predominant acceleration appeared hugely in vertical axis at 10Hz frequencies, and at the same frequency was found in pitch axis of rotational angular velocity. At stationary mode, vibration magnitudes were higher than health risk limitation standard; therefore, an effective intervention development should be promptly developed to prevent operators from early fatigues.

Keywords: agricultural tools, vibration magnitude of translational acceleration and rotational angular velocity, PSD, future development

Combination of MODIS Images and Aquacrop Model for Rice Yield Prediction in the Mekong Delta

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Abstract

Vietnam's economy mainly depends on the growth of agricultural production. In addition to forecasting yields to consolidate information for the assurance of food security, monitoring and mapping of rice an effective and timely manner is also extremely important. The method involves combining MODIS remote sensing data with model AQUACROP to: (i) the size, distribution area of rice cultivation status quo (ii) projected yield of paddy and (iii) simulate yield response to irrigation management differ in different lands area of Soc Trang Province. MODIS (named MOD13Q1, MOD13A1 250m resolution, 8 days repeat) in Soc Trang province collected from 12/2012 to 4/2014 date used to determine the distribution of the current status and yield mapping rice. With 9 of the survey recorded the current situation and collect samples at harvest. To check the results interpreted by comparing data recorded from 12/2012 to 4/2014 month. Results interpretation suggests may use MODIS satellite image of low resolution multi-time low determine size, distribution and status quo cultivation area of rice yield mapping at the regional level, the report for the average statistical data and field data verification. Also through test results and compare them to see the results interpreted with high accuracy in both area and yields.

Keywords: Aquacrop, rice yields, MODIS, remote sensing

Adaptation Strategies to Changing Environment by an Organic Farm in the Philippines: Case on Costales Nature Farm

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Abstract

In the Philippines, there was a renewed interest in organic farming (OF) in the early 80s. With the increasing awareness of consumers for alternative lifestyle and the recent enactment of the Organic Agricultural Act of 2010, more and more farmers are expected to shift to OF. However, shifting to OF and maintaining an organic farm are not easy tasks due to various issues such as lack of knowledge on suitable production technologies, unstable supply, lack of markets, intensive labor input, and difficulty in controlling weeds, pests and diseases. Despite these issues, some organic farms were able to sustain operations. This study aims to determine the farm business strategies that enabled Costales Nature farm (CNF) to stay in business and grow given the changing business environment, which is not limited to climate changes but also includes challenges in the economic, technological, socio-cultural and demographic conditions. The case study approach done through in-depth interviews with the company owners and multiple site visits and observation was mainly used. Moreover, evaluation of the opportunities and threats in the business environment was done to determine the match of strategies implemented by CNF. Potential OF investors may find this study useful in determining best practices in the OF business. Farm visits and key informant interviews revealed that CNF was able to adapt innovative production, marketing, financing and community relationship strategies, which are key ingredients in business survival and growth. Positioned as an agritourism farm, it was able to deal with the pressures of the external environment by integrating farm operations, crafting strategies to increase and sustain production through ecological means, adapting keen market sensing strategies, increasing financing through joint ventures and strengthening community relationships by involving them in the various financing and operations activities.

Keywords organic farming, investment strategies, extension services, Philippines

Soil Types and Geographical Forms of the Degraded Uplands of Bohol, Philippines

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Abstract

The main objective of this study was to identify the soil types and geographical forms in the degraded uplands of Bohol. This was accomplished by gathering secondary data from concerned institutions and from previous research results. Bohol is geographically located between 123°40' and 124°40' East longitude and extends from 9°30' to 10°15' North latitude, in the central portion of Visayas. It is generally flat and plain with only few mountainous areas at the northeastern portion suitable for massive cultivation of agricultural products. The slopes of these mountainous areas have good potential for commercial/urban and even industrial site development because of their natural drainage capacity. Some of these mountainous areas, particularly those preserved from degradation, can serve as habitat for interesting flora and fauna as well as natural land forms that travelers look for, such as the landform for which Bohol has been noted, the Chocolate Hills. (Bohol Provincial Agriculture Profile, 2011). The existing general land use data of Bohol has 13 categories. The top three categories in terms of area are the agricultural land, timberland and infra utilities. Agricultural land constitutes about 66.54% of the province total land area while timberland is only 24.6%. Approximately 167,160 hectares or 40.6% of the total provincial land area have slope gradients of 0-8%, largely covering the central of northern areas which comprise the prime agricultural zone utilized for irrigated and rainfed palay and corn production. The areas with 8-18% slopes accounted for 29% which is mostly planted with coconut, corn and subsistence crops and open/idle and eroded land areas. The rolling to mountain areas with slopes of 18% and above cover about 123,930 hectares or 30% of Bohol land area. Areas with slopes of 18% and above have been disturbed and exploited particularly for subsistence farming. (Bohol Postharvest Dev. Plan, 2009-2018). Soil Map shows areas of different soil classification categorized as follows: Annam Clay, Baluarte Clay Loam, Bantog Clay, Bataan Clay Loam, Batuan Clay, Batuan-Faraon Complex, Beach Sand, Bolinao Clay, Calape Clay Loam, Candijay Clay, Faraon Clay, Hydrosol, Inabanga Clay, Lugo Clay, Mandaue Clay, Mountain Soil Undifferentiate, Rough Stony Land, Sevilla Clay, Ubay Clay, Ubay Clay Loam and, Ubay Sandy Loam. The most extensive soil type is Ubay clay which occurs from the central (Carmen and Sierra Bullones) to the north and northeastern (San Miguel to Alicia) and northwestern areas of Bohol . Faraon clay predominates at the southern municipalities of Lila, Dimiao, Valencia and Garcia Hernandez.

Keywords: soil types, degraded uplands, rainfed palay, subsistence farming

Current Situation and Problem of Participatory Irrigation Management on Dry Land Agriculture in Turpan, China

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Abstract

Stable supply of irrigation water is essential to ensure agricultural productivity in arid region. To efficiently use the limited water resources, upgrading of hard infrastructures like reducing leakage from channels and installing drip irrigation, and soft infrastructures like introducing irrigation management involving local farmers are being pursued. In this study, the rationality of participatory irrigation management (PIM) in Turpan, Xingian, China was reviewed. Turpan depends its irrigation water on streams, pumped groundwater and Karez (Qanat). PIM mainly manages irrigation water supplied from the streams. Between 2013 and 2015, interviews with Turpan City's water management agency (WMA) branch office; PIM and local farmers were conducted to collect information on water management. In conclusions, the founding of this PIM organization resulted in the following benefits. (i) Reduction of governing agency's burden: PIM is now in charge of the works that have been directly done by the cell of WMA branch office before the foundation. (ii) Prevention of illegal behavior: PIM staff is elected by the local farmers so mutual surveillance works. (iii) Smoother implementation of water management: Before the foundation, there were conflicts between the local farmers and staff coming from another region, who was unaware of the local situation. After the foundation, local farmers became in charge of the water management, thus smooth communication became possible. (iv) Enhanced interest on water conservation: Because farmers are now directly managing their water distribution and maintaining their infrastructures, they became more concerned with conserving water. In contrast, for disadvantages, during seasons with risk of droughts, water management requires 24 hrs operations and there are many housekeeping thus labor shortage became an issue. This issue occurred because the main source of finance is water fee and this fee is determined by the governmental agency. Due to this, PIM could not secure enough budgets so they could not hire more staff.

Keywords: agricultural water use, participatory irrigation management, arid area

Biodiversity Assessment of Prey Lang Kratie, Kampong Thom, Stung Treng and Preah Vihear Provinces

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Abstract

Conservation International, in cooperation with the Forestry Administration of Cambodia, undertook biodiversity surveys of Prey Lang between June 2014 and February 2015. The objectives of the survey were to determine the biodiversity values and conservation priorities within Prey Lang, identify threats, and produce recommendations for the alleviation of these threats. The survey covered vegetation, mammals (including a specific study of bats), birds, amphibians and reptiles. The survey teams recorded evidence of the presence of species, using camera trapping, mist netting, harp traps, direct observation and captures. Sign surveys and interviews were also undertaken. The field surveys aimed to build on existing research undertaken in the area, and the results sections present the aggregation of both primary and secondary data. Biologically, the fauna of Prey Lang should be considered favorably diverse and to date 55 species under the IUCN Red List of Threatened Species have been confirmed. The landscape supports nationally and regionally important populations of several globally threatened animals. The possible presence of several species in Prey Lang that, if confirmed, would further elevate the conservation importance of the landscape. These include the Hairy-nosed Otter Lutra sumatrana (IUCN-EN), Siamese Crocodile, Crocodylus siamensis (IUCN-CR) and the Giant Ibis Thaumat ibis gigantea (IUCN-CR). Taking into consideration the rapid nature of most of the surveys conducted, as well as the large areas still un-surveyed, it is very likely that further species will be added to this list by any further research, as well as the overall biodiversity knowledge of Prey Lang.

Keywords: Biodiversity, Landscape

Environmental Rehabilitation, Connectivity and Globalization: A Study of Rural Development of a Community in Cambodia-Thai Borderland

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Abstract

This paper aims to explore the nature of driving forces that lead the successful development of a rural community located in the landmine-infected area of Cambodia-Thai borderland. Disorderly burying of landmine in battlefields results in a serious environmental problem and produces the fundamental difficulty for rural development of post-war societies. A landmine in a soil is an invisible and enduring weapon for decades. Once it became to be forgotten in forests, it targets ordinary people, especially the poor who has no other means of livelihoods except for cultivating crops in fields or collecting goods in forests. The Cambodia-Thai borderland was undoubtedly the case, because a number of landmines had used in the area during the civil wars in the 1980s and the 1990s. It was the last half of the 1990s that the international assistance of environmental rehabilitation of clearing landmines started in the area after a group of people begun to settle down there. However, the borderland changed to be one of the successful areas of development in the country today. This is because its location contributed to the expansion of agricultural activities as well as the introduction of rural investments from outside. The paper focuses on the case of Ta Saen commune, Kamrieng district, Battambang province where a Japanese expert of landmine clearance, Mr. Takayama Ryoji, has been working for demining and rural development for years. It, based on the short-term fieldworks, will examine the development process of the community from a battlefield to a successful place of rural development with the special reference to not only local agriculture but also the role of outsiders. In conclusion, the paper will illustrate the significance of cross-border connectivity in an era of globalization for analyzing and planning rural development in Cambodia and other countries in Southeast Asia.

Keywords: landmine, borderland, cash crop, investment, connectivity, globalization

Spatial Analysis of Ecosystem Disservice by Disamenity of Mosquito – Case in Nagoya City, Japan

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Abstract

The nature provides a lot of benefits to human society, what we call ecosystem service (ESs). These include carbon absorption, water regulation, food and timber supply, water cycling, etc. However, the nature also provides some negative benefits to human society, namely, ecosystem disservices (EDSs). Among EDSs, in this paper mosquito was focused. Mosquito supplied the EDSs, such as, the risk of disease, the disamenity of mosquito bites. The purpose of this study is to understand main factors of the EDSs by mosquito in Nagoya City. In this study, a three step approach was employed to assess the disamenity of mosquito in urban area. First, the collection of mosquito by CDC miniature traps with 1kg of dry ice was conducted in the east part of Nagoya City, Japan. In total 13 traps were set in secondary forests, residential areas and edge of forests for five nights from July to September, 2013. Then many factors including land use types were studied by statistical and GIS analyses. Second, a questionnaire survey to Nagoya citizen (1400 samples) was conducted to ask the disamenity of mosquito on September to October 2013 by an internet based questionnaire survey. Also statistical and GIS analyses were done for this questionnaire survey. Third, the results for both the mosquito traps and the mosquito questionnaire survey were compared.

Keywords: ecosystem service, ecosystem disservice, spatial analysis, mosquito, biodiversity

Marine Biodiversity Conservation Practices and Utilization of Resources in Coastal Villages of Bohol

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Abstract

The focal purpose of the study was to assess marine biodiversity conservation, practices and utilization of resources in the selected coastal villages at one town of Bohol. Four (4) objectives emanated from this purpose: (a) What are the marine biodiversity practices among the fisherfolks, both gleaning, shallow and deep-water fishing and utilization of coastal resources? (b) What is the extent of implementation of the local government marine biodiversity conservation polices as perceived by the local government unit, fishwardens and fisherfolks? (c) What are the local government's marine biodiversity policies for marine protected areas in utilization of marine resources? and (d) Are there significant differences in the extent of implementation of the local government biodiversity conservation among respondents? The study was descriptive in nature with emphasis on the survey and evaluation of marine biodiversity practices including the marine protected areas stipulated based on municipal ordinance, observed gathered data and personal interview from the 167 respondents themselves. Results revealed that the gleaning and shallow water/marine biodiversity utilization such as harvest of sea urchins, seaweeds where gleaning is done two or three times a week. However, there are times wherein harvest of see cucumber is done inside the marine sanctuary. This practice was not treated and responded properly to authorities particularly the local official and fishwardens in the village. Deep, shallow water fishing and coastal utilization were not practiced by the fisherfolks. Drive-in nets with scaring devices and hook and they always practiced lines. However, some fishermen applied some illegal fishing techniques (e.g 'sagiwsiw', dynamite, spray compressors, etc.) which had no permit and sometimes within the marine sanctuary and buffer zone. Nevertheless, the use of very fine nets to harvest clown of fish and 'kuyog' was also practiced. To add, sand extraction and dumping of waste and the cutting of mangrove were also practiced. It was also revealed that local officials were partially implemented the marine biodiversity conservation program while the fisherfolks opined that the said program was only implemented as the need arises and or as observed by them, there was no strict and proper implementation of the government policies. Like, problem on waste disposal was made known when the respondents said that there was no implementation of the appropriate dumping site for proper disposal of waste. It is understood that there is no proper waste disposal management of the locale of the study. Based on the interview, it was disclosed that the respondents (local officials in the village) lack funds for the maintenance and for regular underwater survey of marine species to further protect and conserve the marine resources. Thus funding-sourcing activities and financial system are necessary to support this need. Moreso, it was found out that difference in the extent of implementation of the conservation program was significantly differed according to the sectors of respondents. Majority of the fisherfolks in the town practiced the legal means of utilizing the marine resources while illegal practices were done by outsiders and some residents themselves therein, which would lead to marine biodiversity-ecological depletion if these unacceptable practices are not properly regulated by the local government.

Keywords: marine biodiversity, marine environmental conservation, marine environmental practices & resources, municipal ordinance on marine protected areas

POSTER PRESENTATION

Institutional Innovation for Agricultural Production Systems in Kenya: A Case of Smallholder Tea Subsector

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Abstract

The smallholder tea sub-sector which is part of the larger Kenyan tea industry has enjoyed considerable success since its inception in the early 1960s. The planted area under the smallholder system, expanded from 2,522 hectares in 1962 to over 100,000 hectares in 2012; while annual production rose from 1.3 million kgs of green leaf to over 1 billion kgs of green leaf over the same period. The sub-sector is reported to be among the most successful smallholder scheme in the world. It supports over 3 million families directly, making it one of the leading sources of livelihood in the Kenya. According to the industry statistics, the sub-sector currently owns 65 processing factories that serve over 600,000 registered growers, and produces about 60% of total industry production. Evidence from the study suggests that, the success of the sub-sector may be explained by the sector's innovative institutional arrangements and support systems which have been associated with enhanced farmers earnings. In particular, the participatory governance framework put in place post 2000, innovative approaches to the provision of advisory services and information sharing systems have provided an incentive for smallholder farmers to produce high quality teas that directly translated into better earnings. The findings show that the presence of innovative and efficient systems that reduce costs and enhance farmers earnings are critical success factors for any smallholder agricultural value chain. The paper reflects on the viability for scalability and transferability of the subsector's institutional structures and systems into the other agricultural value chains.

Keywords: Livelihood, institutional arrangements, Innovations, value chains and scalability

Remote Sensing Training for the Bachelor Students of the Faculty of Land Management and Land Administration, Cambodia

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Abstract

Cambodia has experienced changes in land use and land cover (LULCC). Thus, Cambodia needs the remote sensing scholar to challenge with land change issues. The Faculty of Land Management and Land Administration offers a course in remote sensing to challenge the issue. The department accepted the student's proposal for a study tour to improve their understanding. GIZ Land Rights Programme supported this activity, which aims at training the students to evaluate LULCC related livelihood transformation under collective ownership. Concretely, the study tour needs the student to understand image analysis, to understand land use pattern, and to know about livelihood transformation. The study tour took place between 26-29 August 2015 in La In Village, Toen Commune, Koun Mom District, Ratanakiri Province, Cambodia. In 2011, the Tom Poun villagers, indigenous people received the collective title. There were 49 students divided into five groups. One group responded to conduct the interviews with villagers using structured questionnaire. Four groups met to collect training samples using randomized sampling method and GPS devices. After the tour, the student has to write a technical report. For remote sensing, the student used Normalize Different Vegetation Index and GRASS GIS application for images analysis. The student used three Landsat 8 images, which was acquired in 2006, 2011, and 2015, to access landscape dynamic. For livelihood analysis, the student used Kruskal-Wallis Test and created the livelihood pentagon. The data analysis separated into two periods: 2006-2011 and 2011-2015. As a result, the student understands land change science and its data requirement.

Keywords: Education, Student, Remote Sensing, Common property, Livelihood Transformation

UP Open University's Environmental and Agricultural Electronic Resources: Usage, Constraints and Potentials

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Abstract

The UP Open University, as an institution offering open and distance e-learning needs to be able to provide faculty and student support services that are cognizant with its delivery mode. Provision of online library services is one of the support services urgently needed by its faculty and students. In 2011, the University of the Philippines has implemented its online services to the faculty and students of its Constituent Units. The UP Open University faculty and students, including its Organic Agriculture and Master of Environment and Natural Resources Management (MENRM) students, were given access to online resources. This study will examine the UP Open University's agriculture and environmental online resources that are available online and can be easily accessed and used. This study specifically aims to: 1) determine the extent of usage of the UP Open University's environmental online resources; 2) critically examine the challenges and constraints in the use of online resources; and 3) explore potentials of the UP Open University's agriculture and environmental online resources.

Keywords: Agriculture, Environment and Natural Resources, Online Resources, Open and Distance e-Learning

Basic Office Application Software Skills of the Elementary Schools Teachers in the Municipality of Balilihan Bohol, Philippines

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Abstract

The purpose of this study was to assess the level of Basic Office application Software skills of elementary teachers in the Municipality of Balilihan, Bohol, Philippines. This study also served as baseline for a proposed computer skills training program. The study employed the descriptive survey method with the aid of a modified questionnaire as data gathering tool. The respondents of this study were eighty (80) elementary teachers. For the analysis and interpretation of the data gathered, the researchers used frequencies, percentages and rank. In general, the respondents had limited ability on all the aspects of computer operation as evident by the general mean of 2.26. Although the respondents showed sufficient ability in general computer operation and word processing; however, their skills level in spreadsheets, and presentations software were limited. The study suggests that the computer skills of the elementary teachers are inadequate, thus the respondents are recommended to undergo basic office application software skills training program to enhance their computer competencies.

Keyword: Computer, Computer skills, Elementary Schools teacher, Office application, Software

Environmental Knowledge and Awareness among School Children: A Case Study of NGC Eco-Clubs

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Abstract

Environmental Awareness is a concept which gives an idea about process of environmental pollution and its consequences. It is the ability to understand the problems of environment through the relevant experiences and the assistance extended to the society and it's individual to solve these environmental problems. Education as an instrument of social change. Environmental education is the process to promote the awareness and understanding of the environment, its relationship with man and his activities. The present paper focuses on the study of the environmental awareness among secondary school children through Andhra Pradesh National Green Corps units. APNGC is an Eco-Club Programme aims to evolve an effective method in the schools of the country to make the community to participate in the protection and conservation of environmental resources. NGC targets the students who can receive and can reach the environmental awareness message to the community through various projects and activities. This study was conducted at Warangal district of Andhra Pradesh, India. Both qualitative and quantitative approaches were used to gather and to collect the data, interview schedule and focused group discussion were used to interact and collect the data from the district officials, NGC teachers, students of Eco- Clubs. The objectives of the paper are to study the environmental knowledge and awareness among the school students in relation to gender, age and caste. It was observed that majority of the sample students are boys and belongs to backward class community. The investigation reveals that the gender, family and income, management of the school and locality of the school have influenced on environmental awareness of the children. Students age, caste, parent's education, parents occupation have influenced on students environmental knowledge and awareness. Finding on teacher's opinions reveals that inadequate funds, lack of proper institutional arrangements, insufficient resource materials are the main constraints for effective implementation of NGC Eco-Club. NGC activities are promoting environmental knowledge and awareness among the school children.

Keywords: National Green Corps (NGC), Eco-Clubs, Environmental Knowledge, Environmental Education and Environmental awareness

Text-based Person Trip Visualization for Assessing Time-series Trip Behavior in Myanmar

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Abstract

Person trip is one of the important parameters to capture socio-economic changes even in rural areas. Traditional methodologies to analyze person trip largely depend on text-based questionnaire surveys. However, integrating text-based data to quantitative measurements and visualizing such trips data in time-series can be a helpful measurement tool to assess socio-economic changes of local people. The objectives of this paper are to: (a) visualize text-based person trip data and validate them by applying GPS loggers and (b) assess changes of trip behavior in 2005, 2010 and 2015 with respect to sex and age group. Totally 345 individual respondents were stratified-randomly selected for assessing one-day trip by questionnaire and GPS surveys. Conversion of text-based non-spatial information such as trip distance, direction and duration into spatial information was conducted by using GIS. Data processing was done for detecting stay points and outputs were manually assessed. Results showed that differences in the number of trip, total trip distance and total trip duration are 25.1%, 34.9% and 38.0% respectively. Average increases of males' trip distance between 2005/2010 and 2010/2015 show 2.6 and 1.9 times, while that of females shows 1.4 and 2.5 times. Especially, female age groups ranging 21-30 and 31-40 years old show 3.7 times' high increase between 2010/2015 mainly due to engagements to non-agricultural occupations which have been generated by a foreign investment near the study villages. The study concluded that visualization of text-based person trip data contributes to trace past trip behaviors and the visualized trip data can be integrated to current quantitative measurements utilized by mobile phones and GPS devises. Furthermore, changes of trip behavior in time-series can be an important parameter to assess dynamic impacts of socio-economic changes at individual levels.

Keywords: Person trip, GPS-Logger, Trip visualization, Myanmar, Rural development, Foreign investment

Knowledge and Innovation Systems Evolution in EU Agricultural Sector

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Abstract

This evolution of selected Agricultural Knowledge and Innovation Systems (AKIS) in EU countries is presented under the first priority of 20014-20 EU RD policy and the light of their transformation and change. Innovation is generated through information exchange among rural development actors acting as individual entities. Therefore, innovation is perceived as an output of social and politico-administrative processes rather as the outcome of research conducted at public and/or private institutions. Examples of Agricultural Information Systems evolution of Portugal and the Netherlands and Greece are presented as examples of the diverse experience n EU. A primary data research analysis of AKIS in the case of Greece, using Quantitative Network Analysis methodology, reveals their structure, role and relations (formal and informal) under the current EU Rural Development policy framework. As a result a deeper understanding among the actors involved in AKIS and their role in the information and innovation flow was also depicted.

The Efficiency Measurement of the Store Co-operatives Operation in Higher Educational Institutions of Thailand

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Abstract

The research objectives were 1) to study the business operation outputs of Store Co-operatives in higher educational institutions under the concepts of Data Envelopment Analysis Model (DEA Model) and 2) to measure business operation efficiency of Store Co-operatives in higher educational institutions utilized DEA Model. The population was Store Co-operatives in higher educational institutions. Sample was applied by purposive sampling technique which composed of 9-Stores Co-operatives in higher educational institutions following the large scale of business operation criteria settled by the Department of Co-operatives auditing. Secondary Data was applied as the tool of data collection---this collected from the Financial Information Data Base of the Department of the department of Co-operatives auditing in the period of time of 2011, 2012, and 2013 accounting year. DEA Model was applied as the tool for data analysis which demonstrated the Non-parametric estimation. The input variables were comprised of 4 variables which were 1) Co-operatives assets 2) Co-operatives debts 3) Co-operatives expenditure and 4) Co-operatives operational capitals while the total Co-operative revenue was set as an output. Efficiency measurements were measured in 5 aspects which were 1) the entire operation 2) academic 3) Increasing Return to Scale (IRS) 4) Constant Return to Scale (CRS) and 5) Decreasing Return to Scale (DRS) The research found that the operational outputs of all 9 store Co-operatives in higher educational institutions while below scores of 3 years under the assumption of CRS and VRS from input oriented in the period of time of 2011,2012, and 2013 under the concepts of Data Envelopment Analysis Model (DEA Model). For the 5efficiency aspects measurement of store Co-operatives---measured from 9 stores Co-operatives of sample. There were 2 out of 9 stores Co-operatives in higher educational institutions acquired the high level of efficiency score. It is Chiang Mai University Store Co-operative Ltd. and Kasetsart Store Co-operative Ltd.

Keywords: Operational Efficiency, Store Co- operatives Ltd., Higher Educational Institutions

Extension and Advisory Services in Senegal

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Abstract

Agriculture sector plays an important socio-economic role in Senegal. It accounts for 10% of GDP and employs over two thirds of population. Nevertheless, agriculture is undermined by low productivity and other inefficiency elements. Therefore, Senegal has undertaken a series of reforms; some of them regarding agricultural extension and rural advisory services. This review paper aims at providing an overview on the historical evolution and governance of extension and advisory services in Senegal. Till the Structural Adjustment Programs in the 1980s agricultural extension in Senegal was an exclusive prerogative of the government. In 1985, the National Agricultural Extension Program (NAEP) began as part of the country's new agricultural policy. NAEP utilized three organizational approaches to deliver information to farmers: rural mobilization, commodity-oriented extension, and the Ministry of Agriculture's government extension service. In 1990, the World Bank's supported National Extension Services Project (PNVA) began, which placed the institutional structure for extension delivery under the Extension Management Unit. The poor performance of Senegal's agriculture led to the creation of the National Agricultural and Rural Advisory Services Agency (ANCAR). ANCAR represents a pluralistic system where public and private sectors as well as NGOs and producer organizations partner in the delivery of advisory services. It operates in 144 rural communities, where 105 agricultural and rural advisors provide assistance and support to producers' and their organizations. The involvement of the private sector has been enhanced through the National Council for Rural Cooperation (CNCR). Producer organizations are actively involved and provide a vital contribution to the design, implementation and evaluation of extension programs. Nowadays, besides public extension institutions, actors providing advisory services in Senegal include public research and education institutions, semi-autonomous government extension organizations, farmer-based organizations, NGOs and other donors, and private sector firms.

Keywords: Extension and advisory services, Agriculture, Rural development, Senegal

Employability Status of Agricultural Graduates, 2009-2013

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Abstract

The study aimed to gather information on job holding of graduates in order to bring the result to develop a new curriculum which is more appropriate for career purposes. The specific objectives are (1) establish what kind of employment graduates from RUA are receiving and what sectors offer the most promising job opportunities for future graduates students; (2) measure the competencies acquired by graduates from RUA and assess whether they sufficient for the tasks that they are currently performing at work, as well as which courses are the most or least suitable for their careers. The study used Yamane's equation with margin error 3%, then stratified by faculty from academic year 2009, 2010, 2011, 2012, 2013 was randomly selected and interviewed by phone and where possible, in person in August 2014 using a structured set of questionnaires. The total 481 graduates were able to obtain the full information for the study. The most promising job opportunity for RUA students are industrial sector (41.16%) followed by public sector (30.98%) and NGOs (15.38%). The main areas of graduate's responsibilities are management (31.18%), administration/ office (28.41%), agricultural technician/extension (13.16%), research (12.70%), marketing (9.24%), own business (8.31%), teaching (5.08%), microfinance (3%) and 13.86% were in other areas. Among employment sectors, run owning business attained the highest income (747$), followed by NGOs (408$), industry (361$) and the least were public sector (184$). There were no significant different among salary of graduates from different majors (average salary were 335.94$). However, there is significant different among genders and degree holders. Male could earn average income (359$) more than female (271$) and the MSc/PhD holders (496%) attained higher income than BSc holders (316$). Each major skills provided by RUA allow students to compete in labour market, however RUA still lack of some suggested facilities made by graduates including updated teaching materials both major and minor courses, practical skills in class and outside class, foreign languages skills, computer skills and particularly updated facilities in the classroom.

Keywords: RUA, Employability, Agricultural Graduates

The Analyses of Efficiency and Factors Affecting Efficiency of Agricultural Cooperatives in Lower Northern Thailand

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Abstract

The research objectives were to (1) analyze the efficiency of agricultural cooperatives in the lower northern part of Thailand utilized by the Data Environment Analysis Model (DEA Model) and (2) study the factors affecting the efficiency and operational development of agricultural cooperatives in the lower-northern area of Thailand.The research population comprised of agricultural cooperatives which identified as the general agricultural cooperatives. The study area covered 9 provinces in the lower northern part of Thailand which were 1) KamphaengPhet Province, 2) Tak Province, Nakhon Sawan Province, Phichit Province, Phitsanulok Province, Phetchabun Province, Sukhothai Province, Uttaradit Province, and UthaiThani Province, comprising of 196 cooperatives. For the data collection methodology, The secondary data were collected from Financial Information Data Base of the Department of Cooperative Auditing, Ministry of Agriculture and Cooperatives. The data were analyzed by using Data Environment Analysis Model and Ordered Probit Model.The major findings were (1) the entire efficiency index of agricultural cooperatives in the lower-northern area of Thailand expressed at the medium score index of efficiency. The return to scale of agricultural cooperative operations in the lower-northern area of Thailand lighted on the Constant Return to Scale (CRS), Diminishing Return to Scale (DRS), as well as Increasing Return to Scale (IRS) of 15.31, 49.49, and 35.20, respectively. (2) Factors affecting the efficiency and operational development of agricultural cooperatives in the lower-northern area of Thailand expressed by value of total assets and value of credit business. According to the research results, it was suggested that the cooperative operations should be reached the maximum point of efficiency and should be necessary for cooperatives to make the operation cost management, the resources of co-operative operations which comprised of the entire co-operative assets. Moreover; the cooperatives should pay the crucial role on credit business management. In sum, the major Agricultural Co-operatives in the Lower Northern part of Thailand had been their own business operation without efficiency---meaning that they still need the assists from the Royal Thai Government in terms of their supervisors.

Keywords: Efficiency Analysis, Factors Affecting Efficiency, Agricultural Co-operatives

The Development Guideline for Farmer's Organization by Quality Organization Standards: Case of Thailand

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Abstract

The purposes of research were to (1) study circumstance of farmers' organizations in Nonthaburi Province (2) evaluate farmers' organizations by agricultural extension agents according to quality organization standards (3) determine the difference among farmers' organizations and (4) analyze extension and development guidelines for farmers' organizations. Population comprised 10 farmers' organizations and 116 agricultural extension agents. The study used mixed method. The evaluation form and structured observation was used for quantitative and qualitative data collection. Quantitative data was analyzed by descriptive statistics and ANOVA while qualitative data was analyzed by contents analysis. Findings were (1) Farmers' organizations used integrated farming with agricultural products as geographical indicator of Nonthaburi Province. Leaders of farmers' organizations possessed local wisdom, modern knowledge and expertise in both coordination and organization administration. Organizations' administration was run by members' participation, some organizations were managed by family members. Most of labor was household and hired labor. Customers were retail customers, central markets, department stores, and export. Organizations lacked of learning system to generate innovation. Key success factors included good governance, determination, hard work, patience, love in their career, and experience. (2) Most of agricultural extension agents who evaluated organizations were female with 35.95 years old and work experience was 10.25 years. Most of organizations were evaluated as high standard such as outcome, work-based performance, strategic planning, customer-focus, and staff-focus. (3) 10 farmers' organizations were statistical significant difference at 5 factors namely strategic planning, customers-centered, measurement, analysis, knowledge management, work-based performance and outcome. (4) Extension and development guidelines were strategic planning should be to ensure products throughout the year, survey satisfaction and dissatisfaction of customers regularly, share knowledge to create innovation for both products and production process, ensure participation of the new generation in farming activity, and develop marketing and upgrade to products' standards.

Keywords: Agricultural Extension, Quality Organization, Thailand

Evaluation of Local Participation in Program on Mangrove Reforestation in Tsunami Affected Area in Southern Thailand

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Abstract

Tsunami disaster occurred in 2004 proved the conservation effects of mangrove trees in Southern Thailand. However, many mangrove trees were damaged by Tsunami waves. The program on rehabilitation of damaged mangrove through reforestation with local people (RDM program) was conducted by Japanese international cooperative organization for 10 years from 2006 to 2015 in Ranong and Phang Nga Provinces, Thailand. This study dealt with the evaluation of the project on the basis of participatory level with analyzing questionnaire survey results as well as compared with other studies which discussed about the local participation level for reforestation projects. Other studies reported that participatory level of programs on promoting environmental rehabilitation and conservation had tendency of starting from Level 1, passive participation, or Level 2, participation in information giving, and it increased gradually. On the other hand, based on the results of questionnaire and attitude of local participants, participatory level of RDM program from first year could be evaluated as Level 6, interactive participation, as local people participated in mangrove reforestation with forming local network for rehabilitating damaged mangrove. Through the evaluation of local participation, it was concluded that the crisis awareness and the deep local perception led to the high local participation, and directly it connected to local adaptability of mangrove rehabilitation and conservation activities. Mangrove rehabilitation and conservation were not only related to Tsunami disaster prevention but also related to local deep understanding of natural resources in the areas.

Keywords: participatory level, local participation, Tsunami, mangrove reforestation, Southern Thailand

Properties of Japanese NGOs Working for Sustainable Development A Case Study of Their Contribution in Asian Countries

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Abstract

Organizational base of Japanese NGOs (JNGOs) including finances, human resources, etc… is not strong. However, JNGOs have made efforts to sustainable development in Asian countries in cooperation with fund partners and local partners. Actual situation such as project operating countries, project operating fields, project budget sources, project sizes, etc. of JNGOs were evaluated by using questionnaire results conducted by JNGOs council group in 2015. In addition, characteristics of the project formation were evaluated with the perspectives of the local group cooperation. In particular, according to the results of a questionnaire given to 300 JNGOs for international cooperation by the JNGOs council group (with 36 valid responses including "Institute of Environmental Rehabilitation and Conservation" received) in 2015, most of JNGOs conducted programs in Southeast Asia among Asian countries, especially 50% and 40% of JNGOs had experience of conducting programs in Cambodia and in Philippines respectively. "Education (24%)" was 1st, "Rural development (22%)" was 2nd, and "Sanitation (18%)" and "Income increasing (18%)" were 3rd in the activity fields of JNGOs in Asia. Almost All JNGOs (97%) set up the common target and shared the problem consciousness with local partners. These results indicate that JNGOs of various scale have cooperated with a local partner and had endeavored for international cooperation in Southeast Asia. Furthermore, the contribution of JNGOs working for sustainable development was evaluated through a case study of the project on rural development for sustainable development in Cambodia.

Keywords: Japanese NGOs, Japanese NGOs' properties, sustainable development, Asia

Community Empowerment through Fisheries Lens: Case Studies of CFi in Kratie and Stung Treng

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Abstract:
This paper examines the implication of community empowerment through the case study of community fisheries in the Mekong Basin of Cambodia. Community empowerment has emerged in Cambodia from the early 2000s aiming to give administrative and decision-making power the local community. Unlike the conventional studies that mainly focus on power and administrative aspects when studying community empowerment, this study adopts different approach taking into account the resource generation to sustain CFi. This study argues that community empowerment does work when there is no source of self-generated resource to sustain their CFi. To conduct this study, there researchers applied both quantitative and qualitative to collect data from six classified villages along the Mekong River basin in Kratie and Stung Treng. Questionnaire survey, Focus Group Discussion, in-dept interview, and semi-structured interview methods were used during fieldwork data collection. The study illustrates how this fisheries lens empowers the local community through capacity building, self-dependent, and community development cooperation. The study also traces the effects of empowerment through fisheries lens to gender participation, resource awareness, and poverty reduction. The primary findings show that almost all community fisheries along the Mekong basin failed to operate and could not prevent illegal fishing within their community fisheries boundary. One of the main reasons of the failure is the lack of self-finance scheme to sustain the activity of community fisheries such as patrolling and community education. The researchers concluded that successful community empowerment through fisheries lens needed secured source of revenue to support their activities.

Keywords: Community empowerment, community fisheries, capacity building, cooperation, participation, and poverty.

Assessment the Performances of Farmer Water User Communities in Irrigation Management and Development Based Participatory Approach

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Abstract

Since the large-scale physical of irrigation scheme has found out to be a major obstacle in effective and efficiency management and development of irrigation system, two Farmer Water User Communities (FWUCs), Krouch Saeuch and Along Svay FWUCs, were established to manage the secondary and tertiary schemes of Damnak Ampil irrigation system by 2010. This research aims to accesses the performances of these two FWUCs, and to seek the most pressing issues those prohibit the performances of these FWUCs within their five year management. The performances of FWUCs were assessed based on five criteria: organizational management, level of participation of water users, operation and maintenance, financial management, and communication. The results showed that the performance of Krouch Saeuch FWUC is average and Along Svay FWUC is poor. The overall challenges of these FWUCs are lack of water in catchment, lack of irrigation infrastructure, weak governance and management, lack of participation of water users, low outcome from irrigation scheme, and low external supports.

Keywords: Farmer Water User Community, participatory approach, performance, challenge

Effectiveness of Systematic Land Registration's Procedure under Order 01 for Strengthening Land Tenure Security in Cambodia

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Abstract
In 2011, the conflicts on economic land concession (ELCs) hardened and became more violent than before. Hence, Order 01 on "measures for strengthening and increasing effective management of economic land concession" was established on 07 May, 2012. The aim of this study was to evaluate the effectiveness of the land registration's procedure under Order 01 and to assess the challenges and opportunities for improving land registration. A qualitative approach, incorporating observations and semi-structured interviews with 96 local families and 23 key informants, was applied in this study. Secondary data were collected from Cambodian ministry of land and land administration sub-sector program (LASSP). The result of study showed that land conflicts were reduced and solved, measures for preventing land conflicts were taken, illegal land occupations were regularized and 361,734 titles were provided to the people. The process was fast. Local people are satisfied and are confident on its implementation. Moreover, the local people's livelihoods are improved as well as the public awareness of systematic land registration (SLR) is spread throughout the country. However, the weaknesses of its implementation are: technical problem, lack of information and quality control, poor governance, state land decreased and it impacted on educational institutions and on the environment, wildlife and indigenous culture. its opportunities were found that the investment on land will be more active from now due to the investors' confidences and trust on land titles. Its challenge was identified that financial support of technical assistances was pulled out from LASSP. In conclusion, its implementation is very useful for the landless people, and the poor. Quality control should be included into the process and land occupants should be seriously identified. SLR should be sped up to register in hot-issue sites.

Keywords: Order 01, Systematic Land Registration, Effectiveness, Challenges, Opportunities

Rural Development Approaches: from Green Revolution to Food Sovereignty

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Abstract

Since the middle of the last century, several perspectives have addressed rural development from different viewpoints, and the technocratic matters have prevailed on them. Social topics have had a secondary role in these discussions. International financial institutions and prestigious research groups have positioned their ideas on the basis of these perspectives; however, none of them had taken into consideration the voices of the rural inhabitants. Nevertheless, a new perspective that covers the political concerns of the peasantry has been strengthening in the recent years. Four general approaches grouped all these perspectives. Initially, the technocratic approach based on productive matters. Secondly, the sociological focused on social issues. Among them, the socio-technocratic approach, analyses productive problems in a social context, and finally the political one focused on the rights. This paper aims to put forward food sovereignty as the perspective of the political approach to rural development. Food sovereignty gathers the thoughts of many stakeholders involved in rural matters, who rarely had been heard in both academic and political discussion. It addressed tenets that bring to the debate concerns shared by many people worldwide. These concerns are focused on the likelihood to improve the standard of life and to accomplish the rights for all the rural inhabitants. Despite food sovereignty integrates important topics such as recognition from the society of the importance of the peasantry, a clear proposal about how to incorporate the consumers in their postulates is a task to improve the perspective.

Keywords: Rural Development Approaches, Food Sovereignty, Economistic tendencyc

Farmer Opportunities and Behavioral Challenges towards the Policy Promotion of *Vernicia montana* Biodiesel in Luangbrabang Province, North of Lao PDR: Case Adopted Small-Scale Farming

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Abstract

Interest in non-food renewable energy crops has been increasing especially with in Lao PDR, and has been promoted as biodiesel due to its characteristics of growing in both fertile and eroded land under extreme climate conditions. The objective of this study was to investigate farmers' information regarding marketing challenges and opportunities through exploitation of the benefits provided to small-scale production. Data was collected through household surveys from 156 smallholders and interviews were conducted with the key informant interviews from selected rural farms that participated in Vernicia montana cultivation. Descriptive statistics such as mean and percentage were some of the methods used to analyze data. The results of the study showed many factors challenging farmers such as farm location is too far from the selling point and limited market/not enough purchasers to highlight two of the many problems affecting farmers. Quantitative results showed that farmers who adopted Stone Jatropha net incomes were higher than those farmers in the non-adopters category. Also, expenditure was low as there were no initial costs to farmers as the seed crop was given freely from commercial bio-diesel companies. This was a major deciding factor persuading farmers to adopt Vernicia montana biodiesel.

Keywords: *Vernicia montana*, challenges, small-scale, promotion, incomes and expenditure

Rural Land Use Planning in Climate Change Context in Kbal Teuk Commune, Teuk Phos District, Kompong Chnang Province

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Abstract

The study on rural land use planning in climate change context in Kompong Chnang Province is focused on the situation of rural land-based livelihoods, the impacts of draught on local people and the adaptation of drought through commune land use planning. To reach the objectives of the study, 88 households were selected to be interview about their conception on drought and their livelihoods, and Focus group discussion was also done in each villages. The key informants were interviewed on their conception and policy related to land use and climate in study area. The result of the study indicate that 98.8% of local people doing farm, especially growing rice, but their rice field and other crop were destroyed by drought almost every year because their farm depends mostly on the rain .Health care service, infrastructure is not yet meet the need of local people. Fresh water is also a main problem in Kbal Teuk Commune. In 2014, Kbal Teuk Commune land use planning was created base on the discussion on challenges and strengths of the the area. The plan is focus on health, water, social and physical infrastructure, agricultural system management and natural and protected area management. Some of plans were already done, and some are in the process.

Keywords: rural**,** land use planning, drought, climate change, Kompong Chnang

Co-operatives Development through Financial Investment: A Case Study of Phichit Teacher Saving Co-operatives Ltd. Phichit Province, Thailand

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Abstract

The objectives of this study were to study the Co-operatives members' opinions on Automatic Teller Machine (ATM) of Phichit Teacher Saving Co-operatives Ltd. and to study the financial feasibility of ATM settlement of Phichit Teacher Saving Co-operatives Ltd. The study population of the 1st session was the ordinary members of Phichit Teacher Saving Co-operatives Ltd. on 28 February 2015 accounted for 8,083 members. The sample size was 384 samples applied quota a sampling technique following the jurisdiction territory classified by districts which were 12 districts totally. Due to the quota sampling technique, samples were selected from an individual district of 32 members steamed from 12 districts. Therefore, there were 384 samples collected as a sample size. Data were collected by questionnaire. For the data analysis of the 1st session, the Co-operatives opinions, descriptive statistics was applied as the data analysis tool-Percentage, Arithmetic Mean, as well as Standard Deviation. For the 2nd session, financial feasibility study, quantitative data were collected from quotation price list of ATM Merchandized Company along with Phichit Teacher Saving Co-operatives yearly report of the year from 2005 to 2014. Quantitative data were analyzed as financial feasibility analysis which was the Net Present Value (NPV), Benefit-Cost Ratio (B/C Ratio), Internal Rate of Return (IRR) and the Pay Back Period (PB). The study findings indicated that for the 1st session, the Co-operatives Ltd. members paid the significant contribution to financial activities through the ATM with the highest level. Also, the channel of business activities of counter service still had the credibility with the high level. The Co-operatives Ltd. members exhibited their own opinions to obtain their own ATM with the high level. For the 2nd session, financial feasibility study, the study found that NPV of 902,812.42 Thai Baht, B/C Ratio of 16.18, IRR of 33 percent, and PB of 14 months. According to the study results, all of financial indexes met the requirement of financial feasibility criteria. This exhibited that the ATM investment of Phichit Teacher Co-operatives Ltd. be worthy for investment led to Co-operatives development eventually.

Keywords: Co-operatives Development, Financial Investment, Phichit Teacher Saving Co-operatives Ltd.

Rural Development Governance in Bangladesh: A Review of the Role of NGOs

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Abstract

It has been assumed that there are some underlying issues in the governance framework of rural development efforts in Bangladesh. Critical understanding of such issues would help to find the probable solution so that the entire system of rural development in Bangladesh provides fruits of success to the real stakeholders. That is why this paper tries to analyze the role of NGOs, a major player within the rural development governance framework in Bangladesh. The paper attempts to discuss the rural development in Bangladesh since independence and how it has been governed particularly through the involvement of NGOs. Both government agencies and NGOs have some significant issues in establishing good governance in the process of rural development in Bangladesh. Thus, it is needed for both of them to collaborate with each other so that they can really overcome each other's loopholes. The research on collaboration needs some serious consideration as future strategies to resolve the governance issues in rural development.

Keywords: Development, Rural Governance, NGOs in Bangladesh, Poverty.

Economic Assessment of Upland Farming by Smallholder Farmers: Case Study in Ouheng Village, Phnom Kravanh, Pursat

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Abstract

Despite small plots of farmland and labor scarcity, farmers still consider farming an important income source, harnessing the soil devotedly. Yet agriculture varies greatly from floodplain to mountainous areas, and many studies has been done in lowland agriculture, so understanding both upland cultivation and economic activities may contribute toward improved upland use. Thus, this paper aims to explore upland farming characteristics and economically assess the farming systems, selecting a case study in Ouheng Village, Phnom Kravanh, Pursat Province, where upland farming is common. Starting from June to September 2015, the study was carried out by categorizing 30 people into a major farming system based on analyses of agro-ecological mapping and farmers' interest. Key informants, group discussion, transect walk, village mapping, and in-depth interviews were employed. The findings show that the farming system is diversified and operated on small scale, comprising a mixture of rainy season rice, cassava, home-garden vegetables, and poultry and cattle raising. The agricultural labor per household amounts to three persons, while land size averages 1.5 ha. The interconnection among the subsystems is loosely related because feed and fertilizer is mainly derived from commercial companies, making farmers invest largely in inputs. Despite its popularity, rice ranks second representing 38.91% of the overall income, surpassed by cassava accounting for 53.16%. Home-garden vegetables and animal production combined produce marginal income, about 10% of the annual earnings. Despite yearly 1,000-dollar earnings, farming households have to spend 45% back. Both per-capital revenue and land economic returns are quite low, 219 and 146 dollars, respectively. In conclusion, this upland farming system is still on subsistence basis, suggesting that the living standard still lies low. Therefore, on-site technical assistance, infrastructure construction and marketing should be locally promoted, so as to improve the existing farming system for betterment of rural livelihood.

Keywords: Farming system, Ouheng village, agro-ecological conditions, economic assessment

Nexus between Internal Value Chain Finance and Cocoa Production in Southwestern Nigeria: Impetus to Agricultural Productivity and Sustainability

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Abstract

In view of the fact that securing loan for agriculture in financial institutions has become difficult as a result of the inability of small holder farmers to provide collateral securities, the Internal Value Chain Finance (IVCF) which takes place within the value chain is increasingly becoming the major source of finance in cocoa production. The study was carried out in Southwestern part of Nigeria. The objectives of the study included: description of the socio-economics characteristics of the cocoa farmers and IVCF; identification of the sources of IVCF; examination of the conditions that impact on the borrower and lender; and appraisal of the prospects and challenges of IVCF. Data were collected from 120 cocoa farmers through interview schedule. Data analysis was carried out using frequency counts, percentage, mean, standard deviation and probit regression model. Contrary to popular opinions that farmers main source of finance were from other farmers, cooperatives and commercial banks, the major source of financing cocoa production is IVCF sources such as cocoa merchants or input supplier which provide credit to known producers and lead firm funds advances to market intermediaries. Furthermore, cocoa farmers claimed that the credit granted to farmers is flexible in terms of ease of repayment; interest free, accessibility and timeliness. The main prospect of the IVCF is that cocoa farmers have access to loan which led to increase in production and sustainable income. The problems include lack of transparency on the part of farmers, cocoa merchants and input suppliers and high risks related to uncontrollable factors such as global price fluctuations and natural disasters. There is need for extension agency and policymakers to train the farmers on the procedures of obtaining loans from lenders and provide reliable information on IVCF functioning, success factors and results. Lenders should also assess the credit-worthiness of the specific borrowers before giving out loans.

Keywords: Finance, Cocoa farmers, accessibility nexus, productivity, sustainability, value chain

Supply Chain of Snapping Shrimps *(Alpheus sp.)* in Selected Barangays of Calape, Bohol, Philippines: Basis for its Conservation Measures

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Abstract

Supply chain of snapping shrimps is needed to synchronize the demand from point of origin up to consumption. This study was conducted to monitor the consumers on the prevailing price and availability of snapping shrimps in the locality. Descriptive survey method was used during the two (2) month survey with the aid of guided questionnaires. An average of 100 respondents was interviewed during focused group discussion. Actual observation and documentation were made to validate the results. Among of the target barangays majority of the gatherers came from Abucayan Norte got the highest total volume catch per day which is 25.6 kg but the prevailing price from the gatherers and vendors depends on the volume of catch as well as the demand for consumption. Although, price fluctuation was observed but Abucayan Norte still possessed the lowest price gathered compared to the two (2) barangays and most of them used baits such as ghost crab tied with fiber. However, the volume of preference in some households and restaurants owners was affected by high price of the supply. Some of the reasons added for price fluctuation were the seasons of molting, environmental problems and peoples unlawful disposition of substance that may poisons and caused toxicity for some aquatic organisms living in mangrove areas.

Keywords: supply chain, snapping shrimps, price fluctuation, prevailing price

Impact of Smallholder Agricultural Cooperatives on Market Participation of Vegetable Farmers in Cambodia: A Case Study of Svay Rieng Agro-Products Cooperative

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Abstract

Agricultural cooperatives play a crucial role in improving vegetable market participation of farmers in Cambodia. Because the country imports a huge amount of vegetables from Vietnam as well as from Thailand, the vegetable sector in Cambodia has both quantitative and qualitative problems. Whether domestically grown or imported, most vegetables are still chemical-usage vegetables. This study shows the impacts of Svay Rieng Agro-Products Cooperative (SAC) on market participation of farmer-members in the area. Quantitative approaches were used to conduct a survey of 44 SAC members and 20 non-SAC members in Svay Rieng province. A market participation index was used to measure the level of respondent market participation. The 64 sampled farmers represented four levels of market participation of vegetable farmers: Level One 4-16 scores, 35.9 percent; Level Two 12-32 scores, 32.8 percent; Level Three 24-36 scores, 17.2 percent; and Level Four 32-52 scores, 14.1 percent. T-test analysis showed that vegetable market participation of SAC members is higher than that of non-members. Logit model revealed that the fit of the data is statistically significant at 5 percent level while the concordant R^2 is 0.22. Vegetables are a primary source of household income, which is positively related to the probability of selling vegetables to SAC. Tobit model was used to determine factors affecting market participation levels of SAC members. An R^2 of 0.22 and a 1 percent level of significance were obtained. The study revealed five factors as critical variables affecting effective market participation: 1) education level of household head; 2) receiving market information; 3) amount of vegetable production, 4) distance to main market; and 5) extent of supplying vegetables to SAC.

Keywords: agricultural cooperative, market participation, Cambodia

Cost and Benefit Analysis of Cattle Production in Forage-based- Feeding in Pursat Province, Cambodia

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Abstract

A growing population in Cambodia is leading to increasing demand for beef. However, a production system dominated by small-scale producers if finding it difficult to meet this demand as productivity is still limited and growing slowly. One potential limitation is continued use of traditional management approaches, especially feeding methods. A study was conducted to analyze the economics of cattle production with and without forages using cost benefit analysis. This study took place in 2 villages in Pursat town, such as Roleab and Chamroeun Phal village with 20 forage-planting and 20 non-forage-planting farmers. The results indicate that the majority of farmers depend on rice and livestock production. The majority of farmers raised their cattle mainly for draught purposes. The introduction of forage did not lead to any significant different in labor use between forage-planting and non-forage-planting farmers. However, using forage contributed positively on household income. Farmers who utilized forage for feeding their livestock could earn around 540 USD per year from selling calves of 5 cows, (Net Present Value over 5 years of 175 USD). In contrast, at the same number of calves reared using a traditional rice straw based diet, returned about 150 USD per year (with a negative Net Present Value). In conclusion, although there are positive economic returns from introducing forage-based-feeding, certain conditions should be taken into account including land availability for forage plot, sufficient water for irrigating during dry season, and the purpose of cattle production.

Keywords: Cost Benefit Analysis, Cattle Production, Forage-based-Feeding

Assessment of Agricultural Support to the Smallholder Producer of Lejweleputswa District, Free State Province, South Africa

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Abstract

The main objective of the study was to assess whether the support received under the CASP leads to the increased production to the smallholder producers on Lejweleputswa District Free State Province of South Africa. A probability sampling method that involves simple random technique was used to select the desired sample of 120 smallholder respondents. Data were collected using sets of pre-tested questionnaire through face to face interview, telephone interview and self administered questionnaire. A descriptive statistics was used to assess the nature of the support received by the smallholder producers and a correlation analysis was used to measure the strength of the relationship between the agricultural support and the selected variables were (IG= Income Generated, FIV= Farm Infrastructure Value, FAR= Financial Assistance Received, MA= Market Access, AT= Agricultural Training, LSH= Land Size in Hectares, NE= Number of Enterprises, GP= Gender Producer, LE= Level of Education, AAP= Average Age of Producers). The study have discovered that there was a lesser significant relationship between the agricultural support and the selected variables. Since the 1950s government and donors have spent large amounts money on agricultural credit programmes supporting farmers (Coffey, 1998). To date, it is more than a decade since DAFF (Department of Agriculture Forestry and Fisheries) initiated the national agricultural support programme. In 2003, the African Union (AU) together with the New Partnership for Africa Development (NEPAD) created an agricultural initiative called the Comprehensive Africa Agricultural Development Programme (CAADP) with the goal of pursuing economic growth through agriculture-led development. One of the aims of the CAADP is to reduce poverty and hunger on the continent and achieve the Millennium Development Goal (MDG). This aim has lead to the birth of CASP in 2004 by the South African Government to eradicate hunger and extreme poverty. The provincial Department are the custodians to implement the programme not just as to make the production infrastructure available but as the strategy to meet the MDG goal 1 ‘eradicate extreme poverty and hunger ’and indirectly supporting goal 3 ‘promote gender equality and empowerment of women’ by encouraging women to penetrate in food production as it is currently male dominated and 4 ‘reduce child mortality’ by increasing food production and access to healthy food by all (Bashir and Gonzalo, 2008).

Keywords: Smallholder producer, CASP, Land Reform, Post settlement support, Impact

Use of Indigenous Biotechnology among Rural Dwellers in the Forest Zone of Osun State, Nigeria: Implications for Sustainable Agricultural Development

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Abstract

Several traditional practices in our community revolved round Indigenous Biotechnology and these are deeply embedded in local culture. The study was designed to assess the utilization of Indigenous Biotechnology among rural dwellers in the forest zone of Osun State. It specifically identified some indigenous biotechnologies used in crop and animal production, identified the various sources of the IB, identified the reasons for utilizing the IB and identified the problems that are associated with utilization of IB in crop and animal production. One hundred and twenty five people in 10 rural communities and mostly males were randomly selected and interviewed across the four LGAs that constituted the zone. The study revealed that over 65% of the respondents know much about (IB). Result further showed that). Commonest IB used in crop and animal production include: bush fallow, trash burning, bed and heap making, control of pest infestation through the intensive mixed cropping system, wood ash from Iroko tree (*Chlorophora excelsa (welw*) benth to control small worms that attack plantain and yam, the use of Brucea antidysenteria (Gallnut) n and warbugia for treating abdominal ulcers, weak joints and diarrhoea in farm animals. incorporated with weathered poultry manure, extracts of ocimum. Others include application with lotion from black local soap and dusting with wood ash from Iroko tree (*Chlorophora excelsa (welw*) benth, to control insects. Findings from the study further revealed that age , education level ,functional contact with extension agents had a significant relationship with the use of IB Most farmers were of the opinion that IB were cheaper economically advantageous and ecologically favorable. Scientist and development workers should inventoried and harmonized indigenous knowledge with modern science to evolve a diversified technology base.

Keywords: Biotechnology, sustainable agricultural development, forest zone

Acceptability of Seafood Cupcake

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Abstract

Cupcakes are tiny cakes in muffin pans lined with paper cups. They are the favorite foods for young and old as their meal accompanied by protein food and also as snacks item because these are convenient to eat since these are in paper cups. The researchers got the idea of adding seafood to the cupcake and subject the products to panelist for its acceptability in terms of overall liking, odor, taste, texture and appearance. This study aims to determine the acceptability of seafood cupcake; identify the ingredients, tools, utensils and the methods involved in preparing this cupcake; discover its shelf life; and promote its use in the community. This is an experimental research using the 4-point Hedonic scale in rating the product. The products were tasted by the 60 panelists in three sessions; first immediately after baking while hot or at 10:00 in the morning, second at 4:00 in the afternoon when the products were already cold and the third at 8:00 in the morning of the following way when they were already one day old. The results show that Seafood cupcakes got the highest rating in all sensory attributes while hot, second high ratings were given by the panelists when the cupcake was cold, the lowest rating was given to the cupcake when it was already one day old. Among the sensory attributes, odor got the lowest because the odor of squid was so dominant followed by texture; the texture was so coarse. The panelists rated the seafood cupcake to be very acceptable. It can be concluded that Seafood Cupcake is acceptable and can be considered as a complete heavy meal. It contained additional protein ingredients like flaked fish, chopped shrimps and chopped squid being added into the basic cupcake recipe. It can be promoted for use in the countryside community because it is easy to prepare and the ingredients are available in the local community.

Keywords: seafood, cupcake, convenient, protein, food, hedonic scale

Assessment of Farmers' Food Insecurity and Coping Strategies in Rubber Farming, Oudomxay Province, Lao PDR

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Abstract

Rubber plantation is challenges in food security, recovering of shifting cultivation and poverty reduction in Northern of Lao PDR. The objective to assess impact of cropping system changes on food insecurity in rubber plantation at household level. The research methodology was employed the participatory rural approach (PRA) methods to assess in this study. Firstly, focus group discussion to find out the location of farm, district socio mapping, key indicators of food insecurity, and the number of farmers for three farm types: Upland rice farm (URF) with other crop; Upland rice with rubber plantation (RP); and Rubber plantation (RP). Sixty households were selected in each farm type with the total 180 households. Resulting found that agricultural land declined over 65% of the total land use in Namo and Xay district. Land use found that has RP areas 35%, URF 30% and 32% for maize and job's tear. Whereas, the potential of food crop production have been declined due to introducing RP. The food security has been facing problems as shown in proportion of food sharing: 1) Rice production found in URF 58.4% and URRP 41.6%; 2) Vegetables were grown URF 69.2% and URRP 30.8%. 3) Non-timber forest products (NTFPs) were shared roughly above 30% in each farm types. 4) Livestock was raised in two farm types (URF 88.4% and URRP 11.6%). RP found food sharing only in NTFPs. Thus, the upland rice farming with subsistence agriculture farming has greatly coping strategies such as multiple alternatively to produce other crops, which provides good sources of income for purchase or buy food to meet their food for household consumption needs. In addition, the land management has greatly role for food availability and food access in the region. It was concluded that changing traditional upland rice subsistence farming to rubber farming which has changed in crop production pattern and agricultural areas, declining opportunity to grow food crop and high risk of future cultivation.

Keywords: coping strategy, food security, rubber, upland rice

The Impact of Spent Wash Liquor on Soil Resources in Sugar Cane Area-base

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Abstract

The research and impact of spent wash Liquor on soil resources in sugar cane area-base were investigated. The survey and deep interview with 39 farmers were conducted. They used spent wash Liquor continuous 1 to 5 years. The results showed that apply spent wash Liquor continuous 1 to 3 years gave higher trend to increase sugarcane yield (15.29, 17.75 and 18.18 tons/rai , respectively) while applied spent wash Liquor continuous 4 to 5 years gave lower trend to sugarcane yield(15.60 and 13.33 tons/rai). Soil pH after harvest sugarcane, they used spent wash continuous 1 to 5 years were moderate acid soil(pH), 6.11, 5.15, 6.07, 6.10 and 6.36 , respectively) while soil electrical conductivity (EC) after application 1 to 5 years gave higher trend to increase EC(0.070, 0.072, 0.074, 0.95 and 0.197 mS/cm, respectively).

Keywords: Impact, Soil Resources, Spent wash Liquor, Sugar Cane

Rights over the Protected Lands: Granting Community Usufruct Rights to Secure Land Use and Forest Conservation, a Case Study of Phu Kao-Phu Phan Kham National Park, Thailand

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Abstract

Man and forest are perceived unable to go along under a protected area (i.e., national park) management scheme. Therefore, settlements are usually removed when designating national parks in Thailand. However, many communities were established before the park designation so removing those leads to conflicts between people and park officers. In many cases, including Phu Kao–Phu Phan Kham National Park (PKPP), Northeast Thailand, the Department of National Parks, Wildlife and Plant Conservation (DNP) solves this problem by granting those communities usufruct rights over the settlement lands where communities continue to live in the protected areas. But villagers need to obey rules and regulations, including control over agricultural activities e.g., permitted land boundaries and crop types to be planted. With socioeconomic and demographic dynamics, community obedience is in doubt. This study looked at a case study at PKPP where three communities have lived in the Park over 30 years before the Park was designated. Obviously, the communities grow much larger than before with over 528 households in 2014. Key agricultural activities are cash crop plantations, including cassava (83.15% of total farmlands), rice (12.55%), and sugarcanes (2.71%). But a new type of plantation i.e., para rubbers, which indeed is prohibited, was observed in the area with approximately 31.16 ha (1.59% of total farmlands). Although the majority of villagers (75.83%) obtain usufruct rights, they do not have ownership over their land. Without regular patrol and effective enforcement of rules and regulations, agricultural extension beyond the permitted boundaries is expected. The case of PKPP might be one among many other cases in Thailand showing that a model of granting usufruct rights to communities may be able to help reducing conflicts between the Parks and communities but fails to tackle land encroachment issues.

Keywords: usufruct rights, land use, protected areas, Phu Kao-Phu Phan Kham National park, Thailand

Food Diversity and Security from Shifting Cultivation Systems of Three Ethnic Groups: A Case Study from XiengKhaung Province, Northern Lao PDR

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Abstract

This qualitative research using formal key informant group discussions and household semi-structured interview was carried out to evaluate food diversity and security of shifting cultivation at NamChat village, XiengKhaung province in northern Lao PDR, where the village includes three ethnic groups; Khmu, Hmong and Lao Loum. The study found that rice is the main staple food crop for three ethnic groups. However, Hmong and Khmu representing approximately 30% of total households in this village produced insufficient rice for household consumption. Food was sourced from various kinds of cultivation crops and domestic livestock, as well as wild plants, wildlife aquatic animals and insects. The three ethnic groups were differently in consumption quantities of food sources and crops or animal species, depending on specific ethnic groups. The three ethnic groups earned household income from both of domestic crops and animals, as well as non-timber forest product and wildlife. Lao Loum received annual gross income greater than Hmong and Khmu in the present study.

Keywords: Shifting cultivation, Non-timber forest products, XiengKhoung Province, Security, Food diversity, Ethnic groups

Effects of *E. coli* on Rural Livelihoods in Kampong Cham Province, Cambodia

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Abstract

E. coli pollution is sometimes critical cause for human health, especially from livestock dung. In Kampong Cham Province, Cambodia, there are many smallholder farmers with cattle breeding. In this study, pollution of *E. coli* in vegetables for self-consumption and drinking water from wells were detected, in addition to conduct questionnaire survey for farmers' life style and health conditions in Kampong Cham Province. The results of the survey indicated that there was no *E. coli* detected in drinking water from the wells. But some *E. coli* was detected in compost and soils in farmlands. Furthermore in the vegetables for selling in the local market, *E. coli* was detected as well. Also, the results of questionnaire survey indicated that farmers tend to make compost from livestock dung, and casting before planting crops and some after planting. Accordingly in this study, suitable management of farmlands is discussed for eliminating the effects of *E. coli* on rural livelihoods in Kampong Cham Province, Cambodia.

Keywords: *E.Coli*, compost, rural livelihood, Cambodia

Livelihood Impacts of Forage Feeding in Smallholder Cattle Production Systems in Cambodia

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Abstract

Smallholder cattle production is common in Cambodia, with most rural families owning less than 10 head of cattle for the purpose of draught power, asset storage and/or as an income source from trade. Growing demand for beef in Cambodia and the wider Mekong region continues to present opportunities for smallholders to increase income from farm activities, particularly by improving cattle nutrition through the feeding of quality forages. Recent research has shown that farmers who establish forage plots and practice forage feeding experience increased income and time savings compared to the traditional practice of feeding rice straw and/or collected or grazed native grasses. Smallholder cattle owners involved in the 'Best practice health and husbandry of cattle Cambodia (BPHH)' (AH/2005/086) project conducted in Cambodia between 2007 and 2013 who grew forages were able to increase their income greatly and save over 2 hours per day compared to farmers who did not grow forages. Further research however is warranted to investigate the costs of forage plot establishment in order to determine the overall benefit of forage feeding compared to traditional practices. A survey of 31 smallholder cattle owners who had developed forage plots as part of the BPHH project was conducted in three rural provinces in Cambodia; Kandal, Takeo and Kampong Cham. Farmers were asked to report the cost of inputs to forage plot establishment such as land preparation, fencing, manure, fertilizer and forage seed. A financial analysis was then conducted to determine the cost and benefit of forage feeding compared to traditional feeding practices. Preliminary results indicate that forage feeding is a profitable activity for smallholder cattle farmers when incorporated into their existing systems and therefore should be recommended to smallholder cattle owners to improve their livelihoods.

Keywords: cattle feeding practices, forage feeding, livelihoods

Change in the Effectiveness of Stung Chinit Irrigation System within a Social Economic and Climate Change Context in Santuk District, Kampong Thom

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Abstract

The irrigation system is one of the most important mechanisms for preventing or minimizing crop failure, doubling planting seasons, and increasing crop yields, if properly designed, built, operated and maintained, as well as climate-proofed. It is projected that the climate change – flood, drought, and temperature – will adversely affect the reliability of the irrigation system and its services. This research was conducted focusing on the following objectives: 1) to compare of farmers' livelihood before and after constructing irrigation infrastructure; 2) to identify the potentials and constraints of the system considering both management factors and climate change risks. A survey using questionnaires and focus group discussions, in-depth interviews with key information and observation were also carried out. The findings illustrate that the community-structural management is well-prepared, but there are several challenges such as poor regulation, insufficient budget for repairing the broken earthen canals caused by cattle, crabs and mice, heavy rain and flooding, heavy-storage transportation on or through the canals. However, after completing the infrastructure, each household farmland increased 0.04 ha and 0.12 ha in Kvaek and Banteay Yumreach, respectively, while Prey Plo farmland remained stable. Moreover, 73.90% of farmers in Kvaek, 88.20% in Prey Plo, 45.50% in Banteay Yumreach could access enough water for irrigation. Annual rice yields also increased 0.67 t/ha, 0.37 t/ha, and 0.24 t/ha, respectively. Households' average net-income also increased from 2.44 to 3.14 million riel per household, whereas, the effectiveness decreased from 0.50 riel to 0.89 riel among three villages. In conclusion, after construction, rice yield, land size and seasonal growing are increased and most of the farmers could access enough water for irrigation, so farmers' livelihood is improved according to the consisting properties. However, there are many income sources which could generate farmers' livelihood such as small business, construction and factory workers, taxi-driver and so on.

Keywords: Stung Chinit, irrigation system, Effectiveness, Economic, Climate change

The Impact of Vegetable Contract Farming on Small Household Income in Svay Rieng Province, Cambodia

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Abstract

Vegetable production in Svay Chrum commune is the most important activity for cash income generation. This commune is where Svay Rieng Agro-products Cooperative (SAC) is found and is active contracting farmers. A survey was conducted to analyze the household economic status, source of income and expenses outside of cucumber production. This research also explored the benefits which farmers who participated gained in term of income generation, access to agricultural input and market access. The data was collected by interviewing 94 households (SAC members = 57 household and Non-SAC members 37 households) by using structured questionnaires, interviewing key informants and four groups of farmers were involved in focus group discussion. The study showed that most of SAC members were male, older and more educated than Non-SAC member. The majority of their income sources are derived from non-farm income and livestock income. The vegetable contract farming arrangements have been operated through both verbal and written agreements. There were significant differences in the mean gross incomes between SAC and Non-SAC members. In term of market access, there was no difference between SAC and Non-SAC members, but in term of agriculture input access and techniques SAC members had higher participation than Non-SAC members because they participated in training and shared their experience about cucumber production with each other during field demonstrations. There are also some challenges such as high cost of production, pest prevention and price fluctuation depending on the market. By presenting the results of this study, it is hoped to contribute to the development of contract farming not only in the study site or Svay Rieng Province, but also in the other areas with similar opportunities to develop vegetable contract farming and to share the benefits and generate income for small households that live in rural area.

Keywords: vegetable production, contract farming, impact, household economy

Music for Sustainable Development

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Abstract

Music is the language of the soul. In the Philippines, all activities from religious services to merriment purposes, music is always part of it. Loboc, Bohol is considered as the music capital of this island province, many music groups were organized in this municipality. This study aims to discover the origin of music culture of Loboc. It further identifies the different music groups organized and their effects the lives of the people and the tourism industry of the municipality. This also discovers the problems encountered by the keyplayers; with a hope to propose steps on how to sustain the culture. The findings show that there were six music groups established which were active in raising funds for livelihood of each member, scholarship and allowance of student members and helped in increasing income of the municipality through the booming tourism industry. Loboc Children Choir for example, being known for winning three times in international choir competition gave their members opportunity to travel abroad and sent the members to college. This choir staged concerts abroad to raise funds to help for the rehabilitation of Loboc church which was totally damaged by 7.2 magnitude earthquake in 2013. The result also shows that the music culture holistically developed the members' personality. The identified problems were the lack of funds for the purchase and maintenance of the instruments, and the aging teachers of "solfegio" or the Loboc School of Music as well as the leaders of different music groups. To solve this problem, it is recommended that since the music culture boomed the tourism industry of the municipality, officials of the local government unit should look for sponsors of these groups and allocate budget for the purchase and maintenance of instruments; the groups themselves should also set aside a certain amount from their income for the maintenance. New breed of leaders for each group should be trained to be ready to replace the aging leaders.

Keywords: music, music culture, holistic, sustainable

Organic Farming: Can This Ecologically Sound Practice Become as Popular as the Mainstream Agriculture?

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Abstract

In Thailand, organic farming is an alternative for mainstream agriculture because it is more ecologically sound. In addition, it is also promoted as a new production line for safe and healthy food. However, its popularity is way behind the mainstream agriculture. This study reviewed relevant literature to identify its pros and cons, and also interviewed a group of people at Ban Dongbak, Ban Chaimongkon and Ban Wangmon, Nong Bua Lampu province and Ban Nongsim Noi, Mahasarakham province who turned themselves to organic farmers. Ecologically sound, low money input but labor intensive, specifically time consuming and slow returns make organic farming less popular among mainstream farmers who expect big and fast money returns. Organic farmers expressed that cost reduction, especially on chemical fertilizers and long term benefits accrued are primary reasons making them try organic farming. Furthermore, organic farming may not be as popular as mainstream agriculture, but it offers an option that helps increase efficiency in use of land and improve year-round production of food and of useful and salable products. Subsequently, it helps improve quality of life, "a slow but simple way of life", in which household labor and resources are used all year-round with increase in total production to eat or to sell.

Keywords: organic farming, mainstream agriculture, ecologically sound, cost reduction, Thailand

Soil Amendments for Peanut Cultivation by Intercropping in Upland Cropping Systems of Southeast Cambodia

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Abstract

The challenges of farmers in improving upland farming systems in Cambodia were identified, in which soil fertility was one of the main challenges in agricultural production systems in Cambodia. Previous studies revealed that upland areas are widespread throughout Cambodia, thus there was a considerable scope in developing upland crops and cropping technologies in Cambodia. Important upland crops in Cambodia are maize, rubber, soybean, mungbean, cassava, sesame, peanut and sugarcane. Inter-cropping is one of the options available for more sustainable agricultural production systems. The aim of the study was to examine the growth and yield of peanut in intercropping cultivation in the upland cropping systems of Cambodia. Seven intercropping treatments were studied: T1 (cassava + mungbean + fertilizer rotation with fallowing); T2 (cassava + peanut + fertilizer rotation with fallowing); T3 (cassava + fertilizer rotation with fallowing); T4 (cassava + no fertilizer); T5 (mungbean + fertilizer rotation with cassava + mungbean + no fertilizer); T6 (peanut + fertilizer rotation with cassava + peanut + no fertilizer) and T7 (stylo + fertilizer rotation with cassava + no fertilizer) were designed and conducted in the fields of farmers in Prey Veng and Svay Rieng provinces. Field data indicated that peanut yield increased in the order of: T2 > T7 > T1 > T6 > T5 > T3 > T4. Analysis revealed there were significant differences in peanut yield among all seven treatments, with the yield of T4 being significantly lower than that of T2 and T7. The mean of the peanut yields were greater than 2.1t/h for all treatments. The total N, K and phosphate of the pre-treatment analysis did not significantly differ from those of the post-treatment analysis. This study suggests that intercropping cultivation could provide a sustainable harvestable yield of peanut in the upland cropping system in Cambodia.

Keywords: Peanut, intercropping, upland cropping system, Cambodia.

Evaluation of Different Rhizobial Strains on Growth and Grain Yield Improvement of Paddy (*Oryza sativa* L.) in Sri Lanka

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Abstract

Rhizobium is endophyte in paddy roots and promotes their growth and yield has been proven experimentally. The ability of *Rhizobium* to colonize roots and act as plant growth promoting rhizobacteria in paddy involves mechanisms that producing phytohormones, siderophores and phenolic substances but independent of root nodulation and biological nitrogen fixation. Increasing the use of *Rhizobium* as a biofertilizer in paddy would be an important technology in sustainable paddy cultivation in Sri Lanka. Therefore, the present study was conducted to assess the specificity of different *Rhizobium* strains to promote growth and yield towards paddy cultivar. Therefore, a pot trail was conducted to assess the potential of rhizobial strains isolated from the root nodules of eight legumes (i.e. *Glycine max, Mimosa pudica*, *Vigna radiata*, *Phosophocarpus tetragonolobus*, *Vigna unguiculata*, *Vigna unguiculata* subspp. *sesquipedalis*, *Clitoria ternatea* and *Sesbania grandiflora*) for improving the growth and yield of three paddy cultivars ("Bg 300", "Kaluheenati" and "Suwandel"). Seedlings of paddy cultivars were transplanted in pots after inoculation with test strains of *Rhizobium.* Mixture of crushed *Gliricidia* leaves and cow dung were applied and good quality water was used for irrigation. Most of the parameters of all three paddy cultivars i.e. relative growth rate, leaf area index, number of leaves, number of tillers, dry weight of hundred grains improved maximally by the strain isolated from *Sesbania grandiflora* over un-inoculated control. Among three paddy cultivars, rhizobial strain isolated from *Sesbania grandiflora* caused maximum increase of growth and yield in "Suwandel" cultivar. Furthermore, improved paddy variety "Bg 300" also positively responds to the specific rhizobial strains isolated from *Glycine max*. It is concluded that most of the tested rhizobial strains have the potential to enhance the growth and yield of three paddy cultivars. Moreover, further work is needed to explore the effectiveness of these strains under field conditions.

Keywords: *Rhizobium*, endophytes, biofertilizer, paddy cultivar, growth, yield

Effect of Bio-extracts on Growth and Quality of Red Oak and Green Oak Lettuces

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Abstract

Study on effect of bio-extracts on growth and quality of red oak and green oak lettuces. The experimental design was RCBD (Randomized Complete Block Design) with 3 treatments and 4 replications include chemical fertilizer (16-16-16), bio-extract of fish meal and bio-extract of soybean meal. The result of this study showed that the vegetative yield of red oak lettuces similar to chemical fertilizer with difference statistically significant when treated with bio-extract of fish meal and soybean meal. There were no statistically difference on the vegetative yield of green oak lettuces. Both of Bio-extract of fish meal and soybean meal could increase the color of leaves in red oak and green oak lettuces than chemical fertilizer.

Keywords: bio-extract, red oak lettuces, green oak lettuces

Influence of Spent Wash Liquor on Plants Growth and Soil Property

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Abstract

The aim of this study was to investigate the Influence of spent wash liquor on plants growth and soil property. An experimental design was laid out under Completely Randomized Design (CRD) with 3 replications to investigate the effect of spend wash liquor on the growth of six different kinds of economic plants (tomato, rice, corn, sugar cane, Napier grass and eucalyptus) and some changes of soil properties after applying various rates of spent wash liquor (0, 25, 50,75 and 100 %) under field capacity. The results found that the spent wash liquor had less effect on sugar cane, Napier grass and Eucalyptus and followed with rice and tomato. But have affected on corn. However, Spent wash liquor at 75^% concentration could reduce the plant growth in all plants except for sugar cane. The 50 % concentration of spent wash liquor was recommended for land application, which could increase soil fertility. It was also found that application of spent wash liquor significantly increased both pH value and electrical conductivity (EC) in soil in all treatments.

Keywords: Plants Growth, Spent wash Liquor, Soil pH, Soil EC

Influence of Spent Wash Liquor on Soil Property under the Different Of Soil Texture

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Abstract

An experimental design was laid out under Completely Randomized Design (CRD) with 3 replications to investigate some changes of soil properties after applying various rates of spent wash liquor on course texture soil and fine texture soil. The treatments were c)1rainfall water with no spent wash liquor,c)2cspent wash liquor c5.7tons/rai,c)3cspent wash liquor c17tons/rais,c)4cspent wash liquor c22.7tons/rais,c)7cspent wash liquor c33tons/rais,c)6cspent wash liquor c63tons/rais,cand c)5spent wash liquor c03tons/rais. After applying for a period of times, It was found that the accumulation of clay in subsoil (15-30 cm) was higher than that in topsoil (0-15 cm) for both course texture and fine texture soils. Application of spent wash liquid significantly improved both pH value and electrical conductivity (EC) of both course texture and fine texture soils. However, this effect was clearly shown in topsoil in that pH and EC were higher than that in subsoil. Regarding soil fertility, this research study revealed that spent wash liquid significantly improved the availability of primary and secondary nutrients (N, P, K, and Ca, Mg), particularly in topsoil of both course texture and fine texture soils.

Keywords: Soil Property, Spent wash Liquor, Heavy soil, light soil

Impacts of Pyroligneous Acid to Growth and Yield of Soybeans (*Glycine max*)

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Abstract

In the Philippines, there is at present a Soybean Roadmap which has two major components, namely: Organic Soybean Production and Organic Soybean Utilization , Processing and Marketing. This research project compliments the Philippine National Soybean Program by developing appropriate organic technologies especially on its external inputs like fertilizer. The main objective of this research was to find out the impacts of pyroligneous acid on the growth and yield of soybeans. Philippine Seed Board Soya 6 (PSB SY6) or commonly called Tiwala 8, which is an approved variety for use in the country was planted in field condition of the university research area in 2 x 2 meter plots . This was replicated four (4) times using randomized complete block design (RCBD). Coconut shell vinegar (pyroligneous acid) was used in this study. There were three levels of of pyroligneous acid being tested: 10%, 20%. and 30% which represented Treatment 1, Treatment 2 and Treatment 3, respectively. Treatment 4 served as the control. Statistical analysis revealed that all treatments did not affect the growth of the soybean plants. However, it was noted that there was a significant effect on the yield.

Keywords: pyroligneous acid, soybean road map, external inputs,

The Comparison of Liquid Bio-slurry and Rice Husk Biochar Application on Dai Neang Chili Pepper's Yield at RUA (*Capsicum annum* L)

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Abstract

Dai Neang chili pepper (*Capsicum annum* L) is a supplementary food for Asian people, especially in Thailand and Lao PDR. In Cambodia, the pepper is mostly grown in areas around Tonle Sap Lake and other provinces such as Prey Veng, Kandal, Kampong Cham and Kampong Thom. However, farmers keep using conventional methods which do not get high production yield. Liquid bio-slurry and rice husk Biochar which obtained from biodigester and rice crop production residues, could be applied to improve the soil fertility. The key objectives of this study were (1) to analyze the fertility compositions (nitrogen (N), phosphorous (P) and potassium (K)) contents in the liquid bio-slurry and rice husk Biochar fertilizer and (2) to investigate the effects of liquid bio-slurry and rice husk biochar on yield of Dai Neang chili pepper. In the research, different proportions of combination of liquid bio-slurry and rice husk Biochar were applied on Dai Neang chili pepper in a total quantity of 1.4kg/m^2. The chili peppers were planted from May 20, 2015, containing 6 treatments, 4 replicates and 24 plots with 2 square meters of area. The spaces between each plant and row were 50 centimeters. Total production yield, plant height, plants diameter, roots length, number of branches, leaves area, fruit length, fruit weight, good fruits and damaged fruits were collected as the primary data. As the results, the percentages of N-P-K compositions in the liquid bio-slurry and in the Biochar were 0.52%-1.22%-0.30% and 0.78%-0.73%-3.00%, respectively. The treatment using liquid bio-slurry 25% and rice husk Biochar 75% obtained high yield and more number of branches compared with other proportions of applied fertilizers and the control (T0). In conclusion, liquid bio-slurry, a waste of biogas and rice husk Biochar could improve the soil fertility and production yield of Dai Neang chili pepper.

Keywords: liquid bio-slurry, rice husk Biochar, Dai Neang chili pepper and fertilizer

Studies on Reducing Cadmium Uptake in Rice Plants by Soil Dressing and Mixing Tillage

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Abstract

Though soil dressing is one of the most effective methods for reducing Cadmium (Cd) uptake in rice plants of Cd contaminated paddy fields, it needs large amount of soil and thus often requires a high cost and heavy environmental loads. In this study, we investigated any possibility of minimizing the thickness of soil dressing by applying mixing tillage. 15 cm-thick contaminated soil and overlying 12.5 cm-thick soil dressing (the conventional thickness of soil dressing being 20-30 cm in Japan) were used to form the usual stratified paddy field of the three layers (plow, plowsole, and subsoil). Cd concentration of the contaminated soil was adjusted to approximately 2.0, 1.0 and 0.5 mg(Cd) kg^{-1} by mixing tillage. Then rice plants were grown under ponding condition during the cultivation and the experiments of each treatment were conducted under two different water flow system, open and closed system. As a result, Cd concentration in brown rice with water flow in an open system was 0.07 mg kg^{-1}, 0.05 mg kg^{-1}, and 0.17 mg kg^{-1} when Cd concentration of soil was 0.5, 1.0 and 2.0 mg(Cd) kg^{-1}, respectively. Cd concentration in brown rice of 2.0 mg(Cd) kg^{-1} soil was 10 % significantly higher than those of other treatments. There were no significant difference among the three treatments with water flow in a closed system. These results indicated that it was effective to dilute soil Cd concentration to 1.0 mg(Cd) kg^{-1} for reducing Cd uptake of rice plants. We conclude that mixing tillage may have a potential to minimize the thickness of soil dressing to half of the conventional thickness, 20-30 cm, under ponding condition during the cultivation.

Keywords: Cadmium, rice, water flow system, mixing tillage, soil dressing

Causes and Effects of Cassava Witches' Broom on Cassava Production in Cambodia

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Abstract

Damage to cassava crops in Cambodia by pests and diseases are posing significant concerns, due to the impact on yield and starch quality. Among the most important diseases is Cassava Witches' Broom (CWB), a phytoplasma - microscopic pathogenic disease that has only recently been identified in Cambodia which is increasing in severity and for which there are limited control or management options. A survey on the incidence, causes and effects of CWB was undertaken in 2014 with 150 cassava growers in the three provinces of Kampong Cham, Prey Veng and SvayRieng, and a further 30 who participated in a focus group discussion. The main objectives of the survey were to get an understanding of the current level of damage caused by CWB on cassava production, the causes of the diseases, and the control measures taken by the respondents in relation to the disease. CWB is perceived by cassava growers as potentially the most serious disease in their cassava crops, potentially causing a more than 50% drop in tuber yield (from an average of about 19.5 t/ha in a normal year, to 8.5 t/ha in a year of CWB infection and damage). The perception of farmer respondents, four reasons are given for the incidence and damage of CWB. These include, poor soil fertility (28.70%), drought (28%), the side effects of pesticide use (20%), and the quality of planting materials/varieties planted (18%). Even though, these are reasons provided by cassava farmers, they still do not have the capacity to control the disease, despite the following initiatives: pesticide application (55%), change to CWB resistant varieties (15%); and the application of more fertilizer (13%). Farmers reported that pesticide application is not an effective strategy to control CWB, and recommended that improved agricultural extension services could help them get access to CWB resistant varieties.

Keywords: Cassava Witches Broom, Cause, Effect, Cassava Production, Poor Soil Fertility

Can Organic Farming be an Alternative to Improve Well-Being of Smallholder Farmers in Disadvantaged Areas? A Case Study of Tanzania

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Abstract

The research from which this paper is based was done to assess the contribution of organic farming to improve well-being of smallholder farmers through crop productivity, profit and food security among smallholder farmers in Morogoro Region, Tanzania. The specific objectives were to: examine how farmers implement farming practices and sell their products; compare productivity, profit and food security between conventional/traditional farmers and organic farmers; determine factors affecting productivity, profit and food security; and determine challenges of organic farming. The results showed significant differences of profit and food security between organic and conventional/traditional farmers. Food security was analysed using food consumption score and dietary energy and showed significantly better results among organic farmers. The factors which influenced productivity significantly were sex of a household head, number of people in a household, constant markets and livestock keeping. Years of practising organic farming showed significant association with profit, and livestock keeping and age of a household head had significant impacts on food security. It was revealed that there were challenges of land preparation, markets, getting premium price, and contamination with other farms. In conclusion, organic farming has a potential to improve well-being of smallholder farmers in disadvantaged areas, especially from the aspects of profit and food security. Therefore, it is recommended that more emphasis should be put on promotion of organic farming by agricultural stakeholders.

Keywords: Organic farming, smallholder farmers, alternative development, sustainable agriculture

Farmers' Soil Conservation Practices of Maize Production, Paklay District, Sayabouly Province, Lao PDR

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Abstract

Soil degradation is a big problem in hill slope of Lao PDR. Maize is main crop and intensively grows in slope area. Thereby, maize yield was lower than 3.8 ton/ha that also impacted to environment. Soil Conservation Practice (SCP) is important alternative methodology for conservation soil in slope land. The objective of this study was to examine farmer soil conservation practices of maize production in Paklay district, Sayabouly province. The sample was done by participatory rapid appraisal (PRA) methods and data was collected though focus group discussion and semi-structured interview from three villages (Village1: Ban Palay 46 households, Village2: Ban Boumlao-Phakeo 90 households and V3: Village3 Ban Senphon 25 households within total of 161 households). Key informant interview was implemented through staff of District Agriculture and Forestry Office (DAFO) and village headman. The result showed that farmers adopted SCP practice V1 89.1%, V2 83.3% and V3 88%, respectively. SCP showed increasing in the soil fertility, improves maize yield and preventing soil erosion in hill slope. Majority of maize farmers who adopted SCP were applied legume rotation method. The legume (i.e. groundnut, red bean, mungbean and black bean) was intercrop two weeks before harvesting maize. Crops residue was used for mulching soil (conserved soil moisture and soil nutrition). Furthermore, famers' knowledge needs to be trained in SCP systems such as chemical used, crop residual, intercropping, mulching, tillage, and chemical soil contamination by staff of DAFO.

Keywords: maize, soil conservation practice, crop rotation, legume intercrop

Rice Farming Practice and Input Use of Farmers in Ratanakiri Province

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Abstract

Almost all rice farming in Cambodia are produced by small-holder farmers. The rice production is cultivated in an extensive way for household consumption purposes. Inputs availability is a major challenge for farmers associated with poor management practices which limits rice productivity. This study was conducted to find out the currently practices and input use for rice farming activities of small-holder farmers. One hundred and six farmers cultivating rice in Ouyaday, Lumphat and Koun Mom districts in Ratanakiri Province were randomly selected for an interview in 2015. On average the land size of rice field 2.11 ha per household. Mono-culture was a main practiced by farmers around 81%. More than 78% of farmers in Kuon Mom and Lumphat had prepared their soil before cultivating rice, but about 21% of farmers in Ouyaday did not do it. Some farmers preferred to practiced direct-seeding method; however, few of them practiced broadcasting or planting method in Ouyaday. No irrigation was practiced in the targets. Over than 90% of rice variety of farmers was their own variety while around 14%, 7% and 2% shared from their neighbors, provided by NGOs and bought from sellers. Hand-weeding method (64%) was the most popular for farmers in targets while very few farmers used a pesticide/insecticide for their rice cultivation. Only 39% of farmers used fertilizer as cattle manure while only 15% used as chemical fertilizers and 46% used both of them. 1.78 tones/yr/ha of cattle manure and 0.045 tones/yr/ha were applied for rice cultivation in targets. In conclusion, in terms of input use and management practices, rice production by small-holder farmers was very low. Farmers still cultivate their rice in traditional way with lack of knowledge of new interventions. New interventions of rice farming practices for upland zone and soil management systems should be recommended to farmers in order to improve rice production.

Keywords: Rice farming, Broadcasting, Direct-seeding, Small-holder farmer, Ratanakiri Province

Hydroponic Endive Lettuce in Drip System: Macronutrients Effect on Growth and Development

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Abstract

The aim of this study was to determine the effects of three different concentrations of plant macronutrients on growth and development of Endive lettuce cultured in drip system of hydroponics. The experiment was carried out in a net house in the Research and Development Center, University of Battambang. Three different nutrient concentrations were determined as 3 treatments (Low: T1, Medium: T2 and High: T3) for the experiment. Endive lettuce was grown in drip system of hydroponics feeding by the three nutrient concentrations for 25 days. Leaves number and length, fresh- and dry-weight of shoot or root per plant in T2 were significantly greater than other treatments, indicated that that low or high concentration of macro-nutrients affecting significantly on growth and development enhancement of Endive lettuce.

Keywords: Hydroponics, plant nutrients, lettuce, and vegetable.

Effects of Thai Biochar on Earthworm and Soil Microbial Activities under Korat and Roi-et Soil Series.

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Abstract

Biochar is carbonaceous material obtained by pyrolysis of biomass feed stock. It is applied to soils that improve fertility and mitigate greenhouse gas emission. Two types of Thai biochar (Eucalyptus and mix hard wood) have been used for improve soil fertility in Thailand. However, the information on these biochar on soil ecosystem is still limited. Therefore, the aim of this study was to investigate the effects of Thai biochar on earthworm (*Eisenia foetida)* and soil microbial activities under Korat and Roi-et soil series. Earthworm avoidance test and soil respiration was conducted by using two different common and biochar (eucalyptus and mix hard wood) at concentration 100 g/kg soil and 200 g/kg soil under two different types of Thai soil series (Korat and Roi-et soil series). The results showed that both types of biochar enhanced soil microbial activities especially in Korat soil series. But, both types of biochar have affected on earthworm avoidance activity in both soil types. Therefore, more study on the impact of biochar on earthworm needs to be investigation.

Keywords: biochar, soil types, soil biota

The Effect of Biochar on Earthworm (*Eudrillus eugeniae* and *Eisenia foetida)* Under Yasotorn and Korat Soil Series

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Abstract

Biochar has a great potential for enhancing soil fertility and carbon sequestration while enabling beneficial waste disposition. The biochar application has been wide spread . Therefore, the effect of biochar on soil biochar is needed to investigator. The aim of this study was to study the effect of different types of biochar (Wood Japan, Sewage Sludge Biochar, Black Carboon China, BamBoo Biochar and Rice Husk Biochar) on Earthworm (Eudrillus eugeniae and Eisenia foetida) under Yasotorn and Korat soil series. Avoidance activities of eartworm were conducted following OECD(1984) on different concentration or each biochar (0, 1, 10 and 20 g/kg). The results found that the effect of biochar were different between type of biochar and type of earthworm. However, no significant difference of avoidance activities was found between each type of biochar. However, we found that avoidance activities of earthworm were less under Korat soil series. For the effect of biochar on the growth of earthworm after 28 days biochar application, no significant difference between each type of biochar when compared with control.

Keywords: Biochar, Earthworm, Impact

Effects of Blanching Temperature on Quality of Black Paper (*Piper Nigrum*)

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Abstract

Kampot pepper is a world-famous pepper due to its spiciness, pungency, and attractiveness. Blanching is required to protect the black pepper from smell and taste losses. The key objectives of the study were (1) to determine proper blanching temperatures on quality of the black pepper and (2) to detect the effects of sun and solar house drying. In this research, Kamchay black pepper varieties, planted in the Kampot Pepper Promotion Association in Kampong Trach district, Kampot province, Cambodia was selected to study in the March-June duration of 2015. The variations of fruit weight were recorded, and the sensory test method was performed with 12 people to identify the level of satisfaction, color, smell, taste, texture, and general appearance of the black pepper, as well as consumers' preference to purchase this pepper product. The result shows that the humidity rates were recorded under 12 percent after drying and 35 percent ahead of blanching. The post-dried weight losses did not differ between the sun heat and the solar dryer. In terms of the sensory test, T4 (pepper blanching at a temperature of 100 ^{0}C in the sun drying) and T8 (pepper blanching at a temperature of 100 ^{0}C in the solar dryer) had the satisfactory black pepper color, were preferred with the smell, favorable flavor, texture of the black pepper. Moreover, the general biological properties were good in T8. Among the people involved in the sensory evaluation, 41.76% of them are willing to purchase this product for consumption. Thus, it can be concluded that the method of pepper blanching at a temperature of 100 ^{0}C in the solar dryer was the optimum condition due to the minimum weight losses and the high marks of different properties throughout sensor evaluation.

Keywords: black pepper, blanching temperature, weight loss, sensory test, and solar drying

Extraction of Chitosan from Shrimp Shells by using Chemicals Reagents

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Abstract

Chitosan is a linear polysaccharide composed of randomly distributed β-(1-4) linked D-glucosamine (deacetylated unit) and N-acetyl-D-glucosamine (acetylated unit). It is made by treating shrimp and other crustacean shells with the alkali sodium hydroxide. To achieve deacetylation of shrimp shell waste by high concentration of sodium hydroxide (40%, 50% and 60%). Chitin and chitosan manufacture processing were carried out with Sodium hydroxide, hydro-chloride acid and Sodium hypochlorite solution. Chitosan yield were 25.23% (in T1) and 20.63% (in T3). Maximum viscosity of T2 was the high value by 3.20 (log of mpa/s), but degree of deacetylation was 83.24%. Chitosan of T2 and T3 nitrogen content were 7.29% and 7.34%, but relative ash content in T1 was high value was 1.25%. The optimal condition in 50% NaOH treatment Viscosity was 3.20 log mpa/s Degree of deacetylation 83.24 and solubility 96.27%.

Keywords: Shrimp Shells, Deproteinzation, Demineration, Decolorization, Deacetylation

A Preliminary Survey of Insect Species on Mustard (*Brassica Juncea*) in Insecticides Sprayed Fields in Kandal Province

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Abstract

More than two hundred insect species were recorded as pests on green mustard worldwide and only eighty-three species were reported from Asia. However, there is relatively little information of pest occurrence and their population on green mustard in Cambodia. The main aims of this study were to report the occurrence of insect pests and their natural enemies and to observe pesticides uses. Ten mustard farms were selected randomly in two villages of Toeuk Vil Commune, Sa Ang district, Kandal province, namely Oung Pang and Wat Kandal village. Insect samples were collected by manual collection and sweeping net which ten mustard in each farm were scouted directly for larval or pupal stage while other ten mustards in the same farm were swept. Insects were collected weekly for six times in late dry season, between January and Mach, 2015. As a result, sixty arthropod species have been identified from green mustard which thirty-one species are pests and twenty-nine species are natural enemies. Thirty-one pest species were identified representing twenty families and six insect orders while twenty-nine beneficial insects were identified representing at least seventeen families and nine orders. Among thirty-one pest species, only two species were abundance, namely Cabbage flea beetle (*Phyllotreta striolata*) and Diamondback moth (*Plutella xylostella*). Sixty-three pesticides were used intensively in the studied areas which forty-six are insecticides.

Keywords: *Phyllotreta striolata, Plutella xylostella,* insect pest, beneficial insects, green mustard, pesticides, Sa Ang district, Kandal province

Evaluation of Entomopathogenic Fungi for Controlling Solanum Fruit Fly *Bactrocera latifrons* (Hendel) (Diptera: Tephritidae)

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Abstract

The pathogenicity of forty isolates of entomopathogenic fungi against pupariating larvae of the Solanum fruit fly, *Bactrocera latifrons* (Hendel) (Diptera: Tephritidae) was evaluated in the laboratory. All pupariating larvae treated with fungi pupated normally but infection established in puparia and emerging adults. All fungus isolates were able to pathogenic in both pupae and adults. However, mortality varied considerably among the genera with *Beauveria* being more pathogenic to *B. latifrons* than *Metarhizium* and *Isaria.* Variation of the pathogenicity within fungal species showed *Beauveria bassiana* and *Isaria fumosoroseus* causing 90 to 100% mortality and significantly reducing fecundity. Whereas *Metarhizium anisopliae* also showed reliable pest control effects, *Metarhizium flavoviride*, *and Isaria tenuipes* were only moderately pathogenic to *B. latifrons*. It is apparent that *Beauveria bassiana* would be a good candidate fungal biopesticide for biological control of the *Bactrocera latifrons***.**

Keywords: entomopathogenic fungi, *Bactrocera latifrons*, fruit fly

Assessment of the Factors Affecting the Efficiency of Yellow Corn Production in Selected Provinces in the Philippines

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Abstract
The paper examined empirically the technical efficiency of yellow corn production in selected provinces of the Philippines using cross section data from 154 corn farmers. Moreover, the paper aimed to determine the level of input utilization, profitability of yellow corn and determine the factors affecting corn productivity and technical efficiency. Stochastic Frontier Production Function Model was used to estimate farm level technical efficiency using Maximum Likelihood Estimation (MLE) Method. The paper also used cost and return analysis to determine the profitability of corn production in the study areas. The results of the analysis showed that on the average, yellow corn farmers were applying 50.9 kilogram of seeds, 124 kilogram of nitrogen, 27 kilogram of Phosphorous, 5 kilogram of Potassium and PhP 1,688 worth of pesticides in one production season. The results also showed that the average technical efficiency of yellow corn production was 67.6 percent. Seeds, nitrogen and phosphorous fertilizers and pesticides were significant factors influencing the productivity of yellow corn in the study areas. Factors such as level of education of the farmers, years of farmers' experienced in yellow corn production and trainings and seminars attended on yellow corn production attended by the farmers showed positive effects on the farm-level technical efficiency of yellow corn farms.

Keywords: Yellow corn, stochastic production function, technical efficiency

Determining C Factor of Universal Soil Loss Equation (USLE) Based on Remote Sensing

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Abstract

Soil erosion is a serious environment problem which causes the degradation of soil and water environment. Thus, soil conservation is necessary for the areas where accelerated erosion happens. At early stage of soil conservation, certain strategies should be implemented based on predicted soil erosion rate of the areas. Soil erosion rate used to be calculated using erosion models, such as Universal Soil Loss Equation (USLE}, Revised Universal Soil Loss Equation (RUSLE}, Water Erosion Prediction Project (WEPP), etc. However, the most common model is either Universal Soil Loss Equation (USLE) or Revised Universal Soil Loss Equation (RUSLE}, as they are easy in handling for users. Attention has been paid to Cropping Management C factor ofUSLE or RUSLE, since it is challenging to determine C factor. The factor depends on the type of crop and the growing stage, however growing conditions would change locally and harvesting time are unpredictable. Also, vegetation could be changed unpredictably due to weather or farming conditions. It means USLE or RUSLE model is difficult to apply in the field where vegetation is unpredictable. Remote sensing is usually applied to predict vegetation based on analysis of reflectance spectra of vegetation. Moreover, remote sensing has an advantage of detecting vegetation immediately without temporal and spatial restrictions. Therefore in this study, remote sensing is used to determine C factor of USLE or RUSLE model. For clarification, the experiment on identifying the relationship between C factor and reflectance spectra of given conditions at certain wavelength was carried out. Furthermore, the accuracy of applying remote sensing to predict soil erosion rate was discussed through an erosion model experiment.

Keywords: soil erosion, soil conservation, USLE, C factor, remote sensing, reflectance spectra

Characteristics of Transformation of Traditional Upland Farming System in Cambodia: A Case Study of Snuol Commune, Kratie Province

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Abstract

In Cambodia the amounts of applying agricultural chemicals such as chemical fertilizer and pesticide are rapidly increasing in recently years. Although it contributed to increase the agricultural productivity, the amounts of applying agricultural chemicals caused environmental disruptions such as soil and water quality degradation, and decrease in land productivity in long term. Based on the above mentioned backgrounds, the main objective of this study is to compare the characteristics between the local farmers who conduct traditional upland farming without chemical fertilizer and the local farmers who depend on chemical fertilizer. At first, the approach was to clarify the characteristics of the local farmers who depend on chemical fertilizer through evaluating a factor input by the estimated production function based on the Biological and Chemical Technology Method. In addition, the technical efficiency is evaluated by the estimated stochastic frontier production function. The results of the analysis are summarized as follows. 1) According to the results of Multiple Correspondence Analysis, it was clear that the preference divisions of the local farmers who depend on chemical fertilizer were "Gender", "Age", "Family number", "Duration of residence", "Irrigation facility" and "Multiple cropping", as important characteristics for the classification. 2) The results from the Biological and Chemical Technology Method indicated that chemical fertilizer were applied intensively in the farmlands of low soil fertility. Therefore, it was considered that the contribution of the current capital such as chemical fertilizer was not effectively conducted. 3) In the research site, the estimated value of technical efficiency showed the existence of technical inefficiency in upland farming system.

Keywords: Traditional farming system, chemical fertilizer, biological and chemical technology, production function

Combination Effects of Fertilizers and *Trichoderma harzianum* on Cambodian Rice Varieties

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Abstract

Trichoderma harzianum is a fungus that is also used as fungicide. It is highly effective for controlling plant diseases, soil fertility improvement to enhance plant growth and increase yield, e.g. rice or corn yield can be increased by ca. 20%. We aim to identify the effects ofc*T. harzianum* on growth and yield of Cambodian rice varieties (*Oryza sativa* L.). The experiment with randomised-completed block design was conducted with four replications for 20 different treatments in plots of 3m × 4m. Soil of the experimental plot was classified as Brown Hydromorphics or Toul Samroung soils. In each plot, 14 days old rice seedlings were directly transplanted 2 seedlings per hill, and 20 cm × 20 cm plant spacing. Four rice varieties, i.e. Senkraob, Senpidao, IR-66 and Cholsa were selected to treat with different fertilizer rates at 100, 75, 50, 25 and 0% of recommonded rate (i.e. N: 100 kg/ha, P_2O_5: 50 kg/ha, K_2O: 0 kg/ha) and suplemented with *T. harzianum* of 2 kg/ha. Urea and DAP (diammonium phosphate) were applied to soil at three stages, i.e. transplanting date, 15 days after transplanting, and panicle initiation, and *T. harzianum* was applied to soil at transplanting date. We found the combination of fertilizers and *T. harzianum* application effect significantly on rice growth (i.e. plant height, tiller numbers) and grain yield for different rice varieties. The findings suggested that increased grain yield was due to *T. harzianum* application. The results indicate that *T. harzianum* application may substitute by 25% of the fertilizers applied for Cambodian rice varieties under dry season condition.

Keywords: Cholsa, Fertilizer, IR-66, Senkraob, Senpidao, *Trichoderma harzianum*

Yield and Water Footprint of Field Corn Response on Various Water Depletion and Fertilizer Rates

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Abstract

Field corn)*Zea may L.*) is one of crucial economic plants grown in Thailand. It ranks fourth among cultivation areas following rubber tree, rice and cassava in Thailand. Thailand has an export amount 0.59 million tons and then made income of 134 million dollars. Furthermore, that found rapid requirement of field corn production for livings stock and ethanol production which have to import amount 0.03 million tons in 2014. The objective of this study was investigated to appropriate irrigation and fertilizer application to enhance for field corn production. Experiment design was split plots with three replications. Treatments consisted of three main plots c)140 % Allowable Depletion Content (ADC, High frequency irrigation), 263c)% ADC)Medium frequency(and 303c)% ADCc)Low frequency(association with four sub plots 1c)Control, 2c)78-63-63 kgcha^{1-} (N-P_2O_5-K_2O, base on soil analyzed(,c)339-31-31ckgcha^{1-})half of base on soil analyzed(cand c)4178-63c3-kg ha^{-1})conventional practice(. The result found 40 % ADCcirrigation to increase corn height, pods weight husked, pods length, pods amount, water use efficiency and irrigation water use efficiency were not significant including this method proved to reduce green, blue and total water footprint were significant to significantly. Past of fertilizer usages occurred 78-63-63 kg ha^{-1} to promote corn height, pods weight husked, pods amount, water use efficiency and irrigation use efficiency were significantly whereas that resulted to decrease green, blue and total water footprint were significantly. Conclusion, A 40 % ADCcirrigation combination with 78-63-63ckg ha^{-1} fertilizer application yielded of highest corn height, pods weight husked, pods length, pods amount, water use efficiency and irrigation water use efficiency were not significantcwhile the water footprint amount demonstrated to decrease green, blue and total water footprint amount compared with another treatments were not significant to significantly. c

Keywords: field corn, water footprint, fertilizer application, water and yield relationship

Variation in Grain Morphology of Upland Rice Varieties from Luangprabang, Province Lao PDR

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Abstract

This study evaluated variation in grain morphological characteristics of upland rice varieties from Luangprabang province, Lao PDR. The samples were collected from three districts, (PX) Ponxay, (PO) Pak-Ou, and (XNg) Xieng Ngeun, two villages each. Grain morphological characteristics were measured in grain size (length, width, and thickness), weight and pericarp color, and grain. The samples of 60 varieties were collected which was separated into 26, 10, and 24 samples from PX, PO, and XNg, respectively and among this samples, 42 and 18 samples were glutinous and non-glutinous endosperm types, respectively. Pericarp color was found 51 samples in non-pigmented, 4 in red and 5 in black colors. There was variation of grain size among 60 samples. Grain length, width and thickness were ranging from 8.6-11.6, 2.6-4.2 and 1.9-2.4 mm, respectively. By using the ratio between grain length/width, most samples (58 varieties) were distinguished to be in large grain type and the others in slender type. One hundred grain weight was also varied from 2.0-4.0 g among brown rice of 60 samples. The grain weight was varied with grain length, width and thickness in multiple regressions of $y = 0.39$ (grain length) + 0.53 (grain width) + 1.42 (grain thickness) – 5.52 at $R^2 = 0.89$ ($p < 0.05$). This study demonstrated the variation in grain morphological characteristics of upland rice varieties from Luangprabang province, Lao PDR. This basic information would be useful for the selection traits of rice varieties in the further breeding program.

Keywords: Luangprabang, rice varieties, rice grain morphological characteristics, color, weight, village

Vermicomposting Quality as Influenced by Different Species of Earthworm

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Abstract
Improvement of soil through vermicomposting has become popular in organic farming. The aim of this study was to investigate vermicomposting quality as influenced by three different species of earthworm (Eudrillus eugeniae, Eisenia foetida and Pheretima sp.) The results found that the quality of vermicomposting were different between earthworm species. The germination effects of vermicomposting from three species of earthworm were found highest in vermicomposting from Earthworm (Eisenia foetida). Soil microbial activity was found highest in vermicomposting from Earthworm (Eudrillus eugeniae). The chemical quality of vermicomposting from three different species of earthworm (Eudrillus eugeniae, Eisenia foetida and Pheretima sp.) were followed; Organic matter were 2.66, 2.68 and 2.52 %, respectively, Moisture were 44.49, 20.59 and 11.63 %, respectively; pH were 7.16, 6.84 and 6.08, respectively; EC were 0.12, 0.87 and 0.17 dS/m, respectively.

Keywords: vermicomposting, earthworm, quality

Weed Suppressive Potential of Mungbean Varieties as Determined by Agar Bioassay

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Abstract

There has been increasing attention in organic agriculture due to the global concerns about the environment and human health due to excessive use of herbicides. As a consequence, several scientists worldwide have attempted to exploit allelopathy in weed management. To date, limited research has been focused on the weed suppressive potential of mungbean through allelopathic interference. This study was carried out in the laboratory using agar bioassay to: a) determine the planting density of mungbean that will significantly influence the seedling growth of barnyardgrass; and b) investigate the weed-suppressive potential of mungbean varieties on different sowing times of barnyardgrass. The results showed that the roots of barnyardgrass were significantly reduced by the presence of mungbean root exudates. The degree of inhibition varied from 1-3 seedlings to 5-25 seedlings of mungbean. In general, as planting density of mungbean increased, the degree of inhibition was also increased. The alIelopathic activity of mungbean was very pronounced in roots of barnyardgrass compared to other growth parameters i.e. shoot length, oven-dry weight and fresh weight when directly in contact with the mungbean root exudates.The same patterns of barnyardgrass response to the mungbean root exudates were notable regardless of mungbean variety and sowing time of barnyardgrass. The results suggest that mungbean varieties have a greater advantage over barnyardgrass due to allelochemicals released during early developmental stages. In addition, mungbean varieties can be a useful tool in integrated weed management to reduce herbicide inputs in crop production.

Keywords: Mungbean varieties; Allelopathy, Allelopathic interference; Allelochemicals; Agar bioassay; Root exudates

A Preliminary Survey of Insect Species on Cauliflower (*Brassica Oleracea Var. Botrytis*) in Insecticides Sprayed Fields in Kandal Province

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Abstract

Overload of insecticide applications in crop production have imbalanced the natural biodiversity, especially population of beneficial insects while it has positive impact on insect pests, in the angle of pest population and their pesticide resistance. The main objectives of this study were to identify the occurrence pests and their natural enemies and to observe conventional pesticide uses. In this study, insect surveillance was done in twelve randomly selected cauliflower fields in Dey Eth commune, Kien Svay district, Kandal province. Insect samples were collected by manual collection and sweeping net which ten cauliflowers in each farm were scouted directly for larval or pupal stage while other ten cauliflowers in the same farm were swept (five sweeps per cauliflower). Insects were collected weekly for eight times in late dry season, between January and Mach, 2015. The results showed that fifty-five arthropod species were identified which twenty-nine species were insect pests and twenty-six species were beneficial insects. Twenty-nine pest species were identified representing eighteen families and six insect orders while twenty-six beneficial insects were identified representing twenty-one families and seven insect orders. Among twenty-nine pest species, only two species were abundance, namely Cabbage flea beetle (*Phyllotreta striolata*) and Diamondback moth (*Plutella xylostella*). Thirty-three active ingredients of insecticides in seven various groups were used intensively in the target area. Among them, Macrocyclic lactone was a popular active ingredient insecticide.

Keywords: *Phyllotreta striolata, Plutella xylostella,* insect pest, beneficial insects, cauliflower, insecticides, Kien Svay district, Kandal province

Dispersal of Brown Plant-Hopper on Rainy Season Rice Under Climate Change Conditions in Snamprah Commune, Bakan District, Pursat Province

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Abstract

This research aims to find out about brown plant-hopper (BPH) present impact variability on the rainy season rice due to the changing in temperature and rain-fall patterns in the study area and to research for the measures to mitigate BPH practiced by farmers in their rainy season paddy rice farming. The study was conducted in four villages; Cheung Phleung, Kaoh Krasang, Bak Pring and Sdok Svay. The data collection is done by using questionnaires to interview with 80 farmers and 7 relevant local authorities. The rain-fall pattern and temperature data in this study was identified only in rainy season (May - November). The findings show that, the rain-fall of 1,377.8 mm caused higher BPH infestation than other rain-fall patterns during the study period (2009-2014). There were 49 farmers whose fields were damaged by BPH when rain-fall increased to 1,377.8 mm. In other hand, when rain-fall fell down to 1127.2 mm, the amount of farmers whose fields were infested by BPH also decreased to 47. Moreover, BPH infestation also changed when temperature changes from year to year. The most of famers use insecticide to control BPH in their field rather than using natural and mechanical methods. The percentages of farmers who used insecticide are about 83.9%, natural methods are about 20%, and mechanical methods approximately 17.50%. Neem tree is a common natural insecticide substance use to control BPH. They can use Neem's leafs and bark to soak in water and spread into the field as natural insecticide. In mechanical methods, farmers prefer to use net rather than using engine oil and allow ducks to eat BPH in rice fields.

Keywords: brown planthopper, climate change, infest, rain-fall, temperature, oryza sativa

Actinomyces Produces a Multi-antibiotic Complex Acts as a Potential Biocontrol Agent to *Ascosphaera apis*

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Abstract

Chalkbrood is one of a fungal disease of honey bee (*Apis mellifera*) brood caused by the heterothallic fungus *Ascosphaera apis* **.**It causes the death and mummification of sealed brood and seriously weakens the colony, affecting well-being of honey bees. There is no effective chemical agent effective for use against chalkbrood fungus. Management practices and biological control are currently available which may reduce the effects of chalkbrood. Five isolates of antagonistic actinomyces as NSP1, NSP2, NSP3, NSP4, NSP5 were successfully isolated from soil and evaluated the capacity of this species to inhibit *Ascosphaera apis* in vitro by dual culture technique. The assays showed that NSP5, NSP6, NSP4, NSP3 และ NSP1 give the percentage of growth inhibition with 68.20, 67.18, 66.15, 64.10 and 63.59 respectively compare to the negative control. These finding is the first critical evidence identifying actinomyces from soil as a biocontrol agent for chalkbrood disease, *Ascosphaera apis*.

Keywords: *Ascosphaera apis*, Actinomyces, biological control, honey bee

Breaking Seed Dormancy of *N. Victoria amazonica* Sowerby

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Abstract
Victoria amazonica (Nymphaeaceae) is aquatic plant. Reproduce from seed that used during 50-60 days from flowering to broken pod until it was germinated. The research aims to provide the method was exiting seed germination and percentage of rate germination. IT was grown in the same period. Seeds were collected in 3 months of the plant between 3 stages 20 , 25 and 30 days. The plan of experiment is Completely Randomized Design (CRD) to include 6 methods as 1. control 2.Nicking 3.Soaked substance Gibberellic acid (GA) 0.05 % for hour 4. Soaked substance GA 0.05% for hour 5.Nicking and Soaked substance (GA) 0.05% for hour 6. Nicking and Soaked substance (GA) 0.1% for hourc.The result concluded that the germination depend on the time of broken pod and nicking with soaked substance GA. That the highest of percentage of rate germination that it was broken pod 30 days of nicking and soaked substance GA 0.1% for hour about 56.5 after to cultivate 35 days.

Keywords: aquatic plant, germication, *N. Victoria amazonica* Sowerby

Alternative *in Vivo* Pig Loops Model for Toxicity Study: Deoxynivalenol and Nivalenol Show Synergism on Jejunal Enterocytes

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Abstract

Food and feed safety pose an issue due to mycotoxins, secondary fungal metabolites and usually found as mixtures in cereals products. The aim of this work was to analyze the effects of two main mycotoxins, alone or associated, deoxynivalenol (DON) and nivalenol (NIV), on the intestinal pig mucosa either after a single exposure *in vivo*, or after repeated exposure of animals. The animals received a natural contaminated feed, with DON (2.89 $mg.kg^{-1}$ feed) or with DON+NIV (3.50 $mg.kg^{-1}$ /0.72 $mg.kg^{-1}$ feed) for 28 days. The loops model was developed to assess an acute single exposure of DON and NIV individually and in combination (1:1) at 1, 3 and 10 µM for 24h. Histological investigations, including morphometry, proliferation and apoptosis assessments were conducted. Both experiments were concordant for the total-cell proliferation decrease at the villus tips after DON or DON+NIV at 10 µM acutely after 24h, or repeatedly after 28 days, of 30-35% and of 20-25%, respectively in loops and in animals. In loops model, apoptotic enterocytes at villus tips increased dose-dependently by either DON, NIV alone or in combination. The combination in loops at 10 µM showed higher effects on proliferation and apoptosis than DON alone. The interaction analysis showed synergism between DON and NIV for villus enterocyte apoptosis. It is concluded that proliferative enterocyte and total-cell proliferation at the villus tips were sensitive to DON and DON+NIV in both models. Intestinal loops, in the context of 3Rs, represent a model allowing to investigate the digestive effects of mycotoxins and of food contaminants, and can contribute to improve our knowledge on plausible interactions of contaminants present simultaneously at the intestinal level.

Keywords: Apoptosis, *Fusarium* fungi, intestine mucosa, morphometry, surgical model

Influence of Pig Breeds on Growth Performance and Immunity in Pre-Weaning Period

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Abstract

A study was conducted to find out the influence of pig breeds on growth performance and immunity in pre-weaning period. A total of 297 piglets from 105 Thai native (TN), Meishan (MS), Large white x Landrace(LW+LR) sows were located in the experiment. Piglets were weighted daily week until weaning at 21 days of age and calculated average daily gain (ADG). After farrowing, piglets collected blood sample on 12, 24 hr. For IgG measurement used ELISA technic. In pre-weaning period, body weights of all treatments were increased. The body weight of Thai native piglets were lowest compared to the Meishan and Large White+Landrace at all studied ages. The growth performance, piglets of LW+LR were significant ($p<0.01$) higher at birth date and seven days (1.43±0.20 and 2.67±0.20, respectively) compared to piglets of TN (0.65±0.15 and 1.12±0.15, respectively) and MS (1.07±0.02 and 1.97±0.37, respectively), but piglets of MS were non-significant ($p<0.01$) with LW+LR at fourteen and twenty-one days of ages. Average daily gain(ADG) of MS and LW+LR were significant ($p<0.01$) higher all lactation period.Howeverthe piglets of MS were highest ADGat fourteen days. The present results indicate thatbreed was affected to growth performance and ADG. Moreover, this study showed that low birth weight of piglet was obtained low growth performance and ADG.The IgG concentration will be in further result.

Keywords: piglet, breed, immunity, body weight

Challenge and Prevalence of Fasciolosis in Cattle after Flood, Ou Tapong Commune, Bakan District, Pursat

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Abstract

Poor nutrition and the Fasciolosis have significant decreasing cattle productivity. Cattle production is also affected by flood, one of the well-known climate changes. The presence of permanent water bodies in these inundated areas may be provided favorable environment for Lymnaea snail, the intermediate host of F. gigantica. Therefore, the study aims to identify challenge in cattle production and the risk factors of F. gigantica infection in cattle after flood in OuTapong, Bakan, Pursat, from December 2014 to June 2015. 88 households as cattle owner were interviewed find possible and associate risks related to husbandry practice. Age, sex, health status were determined for individually. The total 171 fecal samples from flood area and none flood area. Fecal samples examined using a Modified Balivat Fasciola egg counting technique to find presence fasciola egg. There are significantly ($P<0.001$) between prevalence of Fasciolosis in flooded area (25%) and none floodrd area (1.6%) in flood area. It is noted that higher infection rate was recorded in female (19.7%) and male (2.9%).The prevalence of fasciolosis in older animal ≥3 years (23.2%) and young cattle <3 years old (7.9%) was observed significant ($P<0.01$).The body condition is highly significant difference ($P<0.001$) of prevalence F.gigantica among emaciated, thin, medium and fat body condition of cattle. Cattle was fed by cut and carry water grass from inundated area (natural lake) have significant association (OR=0.61) with prevalence of fasciolosis in cattle through logistic regression model. Following focus group discussions, main problems encounter in cattle raising cause to flood including pen flooding, lack of feed and susceptible to disease. However, only 27% prepared feed before flood season and others do as habitation in local. Therefore, flood may be a factor to contribute to fasciolosis cattle infection. Traditional adaptation in cattle raising of famer seem to be neglected to improve cattle production.

Keywords: Fasciola gigantica, cattle, Prevalence, flood, Pursat province, Cambodia

Effect of Water Hyacinth (*eichhornia crassipes) Supplement in Diet on* Growth Performance, Carcass Values and Economic Return of *Guinea fowls*

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Abstract

One hundred and twenty Guinea fowls at five weeks of age were used in an experiment to evaluate effects of different supplementation levels of fresh water hyacinth in basal concentrate diets on the growth performance, carcass values and economic returns. The experiment was a completely randomized design with 5 treatments and three replications. The treatments were the different supplementation levels of fresh water hyacinth at 0, 1.5, 3.0, 4.5 and 6.0% levels of body weight (WH0, WH1.5, WH3.0, WH4.5 and WH6.0 treatments, respectively) and the experiment was finished at 14 weeks of age. The concentrate used for feeding birds contained 20.0 %CP, 6.35% CF and 2.850 Kcal/kg ME. The results showed that the daily DM intakes were significantly ($P<0.01$) different among the treatments and they were 57.3, 57.6, 59.0, 58.5 and 58.4 g for the WH0, WH1.5, WH3.0, WH4.5 and WH6.0, respectively. Similarly the daily CF intake were significantly different ($P<0.05$) among the treatments and they were 3.64, 4.02, 4.44, 4.74 and 4.99 g for the WH0, WH1.5, WH3.0, WH4.5 and WH6.0, respectively. The daily CP and ME intakes were significantly different ($P<0.05$) among the treatments with the highest values for the WH3.0 treatment. The highest value of daily weight gain was for the WH3.0 treatment (17.7 g) and significantly higher than the lowest one of the WH0 (16.9 g), while FCR value was not significantly different ($P>0.05$) in different treatments. The weights of carcass and breast meat of the WH3.0 was significantly higher than the WH0 treatment ($P<0.05$). The economic analysis showed that the profit got from the experiment was improved in the WH supplementation diets. The conclusion was that Guinea fowls fed concentrate basal diets with 6.35 %CF and supplemented by fresh water hyacinth from 3% to 6% body live weight could increase daily weight gain and economic returns.

Keywords: green fodders, supplement, chicken, meat, performance, benefit**.**

A Study of Ensiled Water Hyacinth (*Eichhornia Crassipes*) in Sheep Diets on Feed Intake, Digestibility and Rumen Parameters

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Abstract

This study aimed to evaluate effects of replacement of ensilaged water hyacinth (*Eichhornia crassipes*) to Para grass (*Brachiaria mutica*) in the diets (DM basis) on feed intake, rumen parameters, nutrient digestibility and nitrogen retention of growing sheep. Four growing sheep (19.8±0.43kg) were allocated in a 4x4 Latin square design with 4 treatments including Para grass (EWH0), replacement of 15% Para grass by ensilaged water hyacinth (EWH15), replacement of 30% Para grass by ensilaged water hyacinth (EWH30), replacement of 45% Para grass by ensilaged water hyacinth (EWH45). There was a supplementation of coconut meal, soybean cake and urea to adjust the CP content of diets being 17% (DM). Each experimental period was 14 days including 7 days for adaptation and 7 days for sample collecting. The results were that there was no significant different ($P>0.05$) in DM intakes among the treatment, however the significantly ($P<0.05$) lower NDF intakes of EWH30 and EWH45 treatments compared to the EWH0 and EWH15 ones. The rumen parameters, nutrient digestibility and nitrogen retention were not significantly different ($P>0.05$) among the treatments. The conclusion was that EWH could be used to feed growing sheep without adverse effects on rumen parameters, and the replacement level of 30% EWH to Para grass in diet gave a better result.

Keywords: lamb, water hyacinth, supplements, diets, Para grass, replacement

A Study of Sweet Potato Tuber in Rabbit Diets On Feed and Nutrient Utilization, Meat Production and Profit in the Mekong Delta of Vietnam

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Abstract

Sixty crossbred rabbits (Californian x local) at 45 days of age (703 ± 51 g/rabbit) were arranged in one experiment of complete randomized design with 5 treatments and 3 replications. Four rabbits balancing in sex were used for one experimental unit. The treatments were the supplementation levels of sweet potato tubers of 0, 10, 20, 30 and 40 gDM/rabbit/day corresponding to SPT0, SPT10, SPT20, SPT30 and SPT40 treatments, respectively. The fresh sweet potato tubers were prepared by washing and cut into small slides for feeding. The feeds used for the experiment were Para grass (*Brachiaria mutica*), water spinach leaves, soya waste and oil-extracted soybean meal, in which the Para grass was fed *ad libitum*. The experimental results indicated that supplementing SPT at levels of 30 and 40 gDM in diets significantly ($P<0.05$) increased for the daily dry matter (DM), organic matter (OM) and metabolizable energy (ME) intakes. However no significant ($P>0.05$) intakes of CP, EE, NDF and ADF were found in different treatments. The daily weight gains (WG) were significantly different ($P<0.05$) among the treatments and were 17.8, 19.5, 21.6, 21.9 and 21.9 g/rabbit for the SPT0, SPT10, SPT20, SPT30 and SPT40 treatments, respectively. Similarly, the carcass weight values were significantly different ($P<0.05$) among the treatments with highest value for the SPT30 treatment. The economic analysis showed that the profits were higher for the SPT20, SPT30 treatments and they were 22,054 and 21,404 VND/kgWG, respectively. It was concluded that the SPT supplementation to crossbred rabbit diets should be recommended being from 20 to 40 gDM/rabbit/day to improve the growth performance, profit and sustainable production.

Keywords: rodents, energy supplements, growth, economic return

Acceptability to the Services of Hemorrhagic Septicemia Vaccination Program in Pursat Province

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Abstract

In Kralanh and Tuol Kruos villages, there were only 30% cattle raising households, respectively, and their cattle were susceptible to annual Hemorrhagic septicemia (HS) outbreak. Consequently, this study was to (1) survey the prevalence of the disease and, (2) evaluate HS-related knowledge, attitude and practices (KAP) of local farmers. The households chosen for interview were not involved in Beef4Market project, and stratified into two groups: households who accepted vaccination (Vaccination) and households who did not accept vaccination (Non-vaccination). In 2014, 27.5% non-vaccination households likely experienced cattle HS disease in their areas while only 7.5% of vaccination households did. Two-third of them (72.5% and 67.5% of Vaccination and Non-vaccination household respectively) were aware of HS disease. The 93.1% of vaccination household knew of how to prevent cattle from HS by vaccinating their cattle, only 33.3% of Non-vaccination households were aware of it. Almost all Vaccination households have known of what a vaccine is, but 67.5% of Non-vaccination household have this knowledge. Several reasons that induced farmers to vaccinate their cattle were observed including prevention of HS outbreak (80%), following neighbors (30%), and free-charged vaccines (22.5%). The Non-vaccination farmers did not vaccinate their cattle because of lack of information (35%), difficulty to bring cattle to get vaccinated (17.5%), no HS outbreak, no trust on vaccines, and concern to pay money (12.5%, respectively). The practices of vaccination procedure are rated to be low, only 30% and 25% of Vaccination and Non-vaccination households separated new stock of cattle. The result also showed that 55% of Vaccination households have ever joined in the training, but only 17.5% for Non-vaccination farmers used to join. Vaccination households are more knowledgeable than Non-vaccination ones. More importantly, sustainable training program should be given to households in Cambodia to improve their knowledge, attitudes and practices to vaccination program.

Keywords: vaccinations, Knowledge, Attitude, Practices (KAP), Hemorrhagic Septicemia (HS)

Nutrient Intake and Digestibility of Cross-Bred Cattle Fed Rice Straw-Mulato II Supplemented with Rice Bran, Gliricidia and Rumen Cake

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Abstract

An *In vivo* experiment was conducted to evaluate nutrient intake and digestibility, and nitrogen-retention of cattle fed rice straw (RS) and Mulato II (MII) as basal diet, and Rumen Cake (RC), Gliricidia (GL), or rice bran (RB) supplemented to RS+MII proportion. Four fistulated (native × Haryana) cross-bred steers (initial BW of 220±30 kg) were divided into 1 of 4 treatment diets (T1=50%RS + 50%MII; T2=50%RS+45%MII+5%RC; T3=50%RS + 30%MII + 20%GL; and T4=50%RS + 30%MII + 20%RB) using Latin Square Design (4 diets × 4 periods) with 17 days (10-day adaption and 7-day total collection period) each. Feed intake, faecal, and urine collected during total collection period were analyzed for dry matter (DM), organic matter (OM), crude protein (CP), and crude fiber (CF). The results show that DM intake of cattle in T2 and T3 (27.27 and 23.43g/kgBW/day, respectively) were insignificant ($p>0.05$), but highest ($p<0.05$) and the least was in T4 (20.22g/kgBW/day). OM intake (23.99, 20.84, 18.92, and 17.76g/kgBW/day for T2, T3, T1, and T4, respectively) was significant ($p<0.05$). CP intake in T2 (2.72g/kgBW/day) was ($p<0.05$) higher than in T1 and T4 (1.96 and 1.79g/kgBW/day, respectively), but insignificant ($p>0.05$) with T3 (2.38g/kgBW/day) being similar with T1 ($p>0.05$). CF intake was insignificant ($p>0.05$). DM and CF digestibilities (71.14 and 75.63%, respectively) of T2 were highest ($p<0.05$), and the least was in T4 (50.82 and 55.5%, respectively). OM digestibility in T1, T2 and T3 (74.06, 74.04, and 71.16%, respectively) were not different (p>0.05) but were higher ($p<0.05$) than T4 (55.76%). Nitrogen digestibility was indifferent among treatments ($p>0.05$) while N-retention was significant ($p<0.05$). N-retention was highest in T2 (83.72g/day) and others were the same (48-65g/day). Therefore, 5% rumen cake was first optimum to be supplemented to Mulato II with Rice Straw, following supplementation of 20% Gliciridia for feeding cattle with improved nutrient digestibility.

Keywords: Rumen Cake, Gliricidia, Rice Bran, N-retention, *in vivo*

In Sacco Degradability of Different Grades of Rice Bran of Cross-breed Cattle Fed Rice Straw and Mulato II as Basal Diet

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Abstract

In Sacco study was conducted to determine dry matter (DM) and organic matter (OM) degradabilities of 3 different rice bran grades (1, 2, and 3) in cattle fed a basal diet (50 rice straw:50Mulata II) 2.5% body weight. Each of 5g rice bran were packed in 2 separately Nylon bags for incubating in ventral rumen of 2 fistula Haryana cross-bred steers. Bags contained 1-graded, 2-graded, and 3-graded rice bran were incubated in ventral rumen of each steer at time: 0, 3, 6, 9, 12, 18, 24, 36, 48, and 72 hour. Degradability was calculated by equation $P = a + b\ (1\text{-}e^{-ct})$ and effective degradability (ED) was calculated using a theoretical rumen out flow rate of K=0.02/hour. Result showed that 1-graded rice bran was in higher Crude Protein (13.25% CP) higher than 2-graded and 3-graded rice brans (8.80 and 4.83% CP, respectively). Crude Fiber (CF) of 1-graded rice bran (5.82%) was lower than that of 2-graded and 3-graded (26.50 and30.95%, respectively). DM and OM Degradability (DMD and OMD, respectively) of each rice bran increased as the incubation time increased. DMD of 1-graded rice bran increased from 21.90% at 0 hour to 66.27% at 72hour which was higher than that of 2-graded (18.61 to 63.72%) and 3-graded rice bran (16.14 to 33.43%). Additionally, ODM of 1-graded rice bran was higher from 0 to 72 hour (21.21 to 73.16%) than that of 2-graded (18.81 to 69.36%) and 3-graded rice bran (16.17 to 36.40%) Like, 1-graded rice bran had higher ED0.02 (75.88%) than 2-graded and 3-graded rice bran (68.28 and 55.41%, respectively). Thus, 1-graded rice bran was optimum to be used for feeding ruminant animal such cattle based of highest degradability of DM and OM with CP and ED0.02.

Keywords: *In Sacco*, DM degradability, OM degradability, rice bran grades.

Change in Nutrient Contents of Milk from Holstein-Friesian x Sahiwal Cows (*Bos taurus* X *Bos indicus*) in Early and Mid-stage of Lactation

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Abstract:
Milk is secreted from the mammary gland of mammals and is a unique source of food containing colostrum, lactose, fat, protein, vitamins, minerals, amino and fatty acids that can be used for human consumption. Dairy industries are trying to produce high quality milk to attain optimal income and better public health. A study was conducted at the dairy farm of the Animal and Dairy Sciences Cluster of the University of Philippines Los Baños. The study aimed to (1) determine the effect of early and mid-lactation periods on crude fat, and protein content of milk; (2) determine the effect of early and mid-lactation periods on protein profile of milk using Sodium Dodecyl Sulfate - Polyacrylamide Gel Electrophoresis (SDS-PAGE); and (3) determine the changes in body condition score of the cows at early and mid-lactation periods. The nutrient content of milk in early and mid-stage of lactation was determined by collection of daily feed consumption and milk yield from eight Holstein-Friesian x Sahiwal cows every 28 days from 14 days post calving to 210 days of lactation. The amount of roughage grazed daily by the cows was estimated using the Quadrat method. Milk samples were collected during the same period to estimate milk fat and protein contents as well as the protein profile. The results revealed that cows reached peak milk production at 6 to 10 weeks postpartum, but started to decrease until the end of mid-stage of lactation (30 weeks postpartum). Fat concentration fluctuated by 3.25%, 2.77%, and 2.89% at the early stage of lactation, at 6-10 weeks, and by the end of mid-stage, respectively. Protein concentration (3.38±0.18%) was more stable than fat (3.13±0.56%). Body condition score (4.20±0.33%) did not considerably change through the early to mid-stage of lactation. The results of the study suggests that lactation stages affect milk yield, milk nutrients and body condition score (BCS). This information could be beneficial to dairy farmers in similar settings and climate.

Keywords: dairy cow, Holstein-Friesian, milk nutrient content, body condition score (BCS)

Bioremediation of Heavy Metal Contamination by Vermitechnology with Organic Material

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Abstract
Heavy metal contamination has been in concern about their toxicity and their accumulation in the environmental and food chain. There are several technologies for reducing the toxicity of heavy metals. Vermicomposting technology is becoming popular in management the domestic and industrial wastes and also one of alternative method to reduce toxicity. The aims of this study were to investigate the possibility of employing two organic materials (cassava peel and eucalyptus bark) in vermicomposting using by two different kinds of earthworm species (Eudrillus eugeniae and Eisenia foetida) to reduce copper contamination. The result found that after 28 days, earthworm (Eudrillus eugeniae and Eisenia foetida) could survive in eucalyptus bark more than in the cassava peels. The earthworm, Eisenia foetida when cultured in the presence of natural organic adsorbents of copper tended to avoid heavy metals less than Eudrillus eugeniae. Also found that the number of cocoon after the trial, which used organic eucalyptus bark were produced more than in cassava peel and earthworm species Eisenia foetida produced cocoon more than Eudrillus eugeniae. Study of vermicompost quality and the form of copper in vermicomposting process found that vermicompost using cassava peel had pH 5.70 to 7.50 and EC 0.90-1.54 mS/cm and vermicompost using eucalyptus bark had pH 6.20 to 6.90 and EC 1.44-1.68 mS/cm and the nitrogen, phosphorus and potassium found higher in vermicompost using cassava peel than in the vermicompost using eucalyptus bark. And the result of total copper in vermicompost, vermicast and body tissue of earthworm, accumulation of copper was found within vermicompost and vermicast. Especially, eucalyptus bark could absorb copper more than cassava peel. While Eisenia foetida species of earthworm accumulated copper more than Eudrillus eugeniae. It could be concluded that vermitechnology with organic material could be used as bioremediation for metal contamination.

Keywords: Earthworm, bioremediation, Heavy metal

Impact of Forage Fodder Bank on Cattle Production and Market System of Smallholder Households in Prey Chhor District, Kampong Cham Province

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Abstract

Smallholder cattle production is constrained by severe feed shortage, which limits the participation of farmers in cattle market. The research question of this study was 'Is forage fodder bank a solution for farmer to increase production and market involvement?' Data was collected using structured questionnaires two times at end of rainy season (November 2015) and of dry season (May 2015). 45 households (HHs) were randomly selected for this study, including 15 HHs adopted farmers (who involved in Beef4Market project), 15 HHs non-adopted farmers (but they exposed to the project) and 15 HHs non-exposed farmers (whose farms located outside the targeted areas). Average family member were 5.47, 5.7 and 5.2 for adopted, exposed and non-exposed famers, respectively. Farm size was significantly different, 2.18, 1.20 and 0.97 hectares for adopted, exposed and non-exposed, respectively. Adopted farmers were keeping on average 6.30 heads of cattle, followed by exposed 5.63 and non-exposed 5.93. On average, adopted farmers saved 2 hours on cattle feeding and management in each season compared to other two groups ($P<0.01$). More farmers in adopted group vaccinated to prevent their cattle from HS and FMD. The body condition score of cattle in adopted group was 2.47 in rainy reason and 2.20 in dry season, which was higher than other groups by 0.5 score. In conclusion, forage adoption has improved cattle bio-security interventions by farmers, BCS and save time and labor for finding feeds.

Keywords: Forages, Body Condition Score, Bio-security

Simplification of the Colorimetric Method to Detect Methanol Contamination in the Cambodian Local Rice Liquor

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Abstract

Methanol, an alcohol, is known to be hazardous for human consumption. Methanol contamination in traditional rice liquor caused many deaths in local areas in Cambodia. Contamination happened in every steps of liquor manufacturing, distribution, and consumption. To avoid this problem, monitoring the quality of alcohol is important. However, only a few government institutes in the capital can detect the methanol contamination at an institutional level by colorimetric methods. To detect methanol contamination easily at the local level, a simplified method is urgently required. We tested the original colorimetric methods to determine the influence of the amount of chemical solutions, the time and the alcohol percentage to the color change. Further we checked the shelf life of the chemical solutions. The results showed that methanol was detectable at one-tenth of original volume after treatment 2-5 hours, and the alcohol percentage was not influence of the color changes. In addition, we tested 21 liquor samples collected from markets in Phnom Penh and 6 provinces with the simplified method, resulting that methanol was not detected from all samples.

Keywords: local liquor, methanol, simplified methods

Biochar and Compost with *Bradyrhizobium* Improve Growth and Yield of Soybean (*Glycine max* L.) in Tropical Soil

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Abstract

The microbial consortium in the soil is critical to improve soil quality in agricultural fields. Organic residue recycling is becoming an increasingly important aspect of environmentally sound sustainable agriculture. Interactions of biochar and compost with soil microorganisms are complex and facilitate the growth and activity of plant growth promoting rhizobacteria (PGPR), hence improve the growth and yield of crops in tropical soil. Therefore, pot experiment was conducted at the greenhouse in Mihintale, Sri Lanka, with the objective of finding the effectiveness of biochar and compost with *Bradyrhizobium* sp. in improving soybean (*Glycine max* L.) growth, nodulation and yield. Control and the other nine treatments were comprised as wood biochar (15% by weight), compost (15% by weight), synthetic chemical fertilizer (0.01 kg m^{-2} urea, 0.01 kg m^{-2} P_2O_5 and 0.008 kg m^{-2} K_2O), *Bradyrhizobium* sp. (10^8 CFU/ml) and different combinations of above amendments and *Bradyrhizobium* sp. inoculum together. The experiment was arranged in a completely randomized block design with ten replicates. Wood biochar amendment with *Bradyrhizobium* sp. inoculation significantly ($p<0.05$) enhanced certain plant growth parameters. Concurrently, biochar, compost and *Bradyrhizobium* sp. together significantly increased ($p<0.05$) soybean yield. Soil bacterial population was significantly ($p< 0.05$) high in the treatment of both organic amendments and *Bradyrhizobium* sp. together, while *Bradyrhizobium* sp. population was high with biochar. It is concluded that the soybean growth and yield in tropical soil enhanced by the application of organic amendments and *Bradyrhizobium* sp. together.

Keywords: *Glycine max*, biochar, compost, *Bradyrhizobium* sp., growth, yield

Total Phenolic Content of *Nelumbo nucifera* Extract

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Abstract
Nelumbo nucifera Gaertn. (Lotus) is an aquatic plant distributed throughout tropical regions. It is reported to have diuretic, hypoglycemic and antioxidant activity. Lotus was long been used by Thai traditional doctors for treatment heart disease and diabetic patients. There are many researches referring that the antioxidant activity herb is always have good benefit for chronic disease patients because of inhibiting the oxidation reaction. The objectives of this study was to investigate the total phenolic content of ethanolic extract from ten parts of *Nelumbo nucifera* (petal, pollen, seed, embryo, torus, leaf, young leaf, petal stalk, bud and root). The plant materials was macerated with 95% ethanol, filtered and concentrated to dryness under pressure by evaporator then keep in -20 °C. Percentage yield of plant extract was calculated. The total phenolic content of was determined using the Folin-Ciocalteau's reagent, absorbance was measured at 760 nm. A standard curve was prepared using gallic acid with a concentration range. The results was expressed as mg gallic acid equivalents (GAE)/g of samples. The percentage yield of ethanolic extract from petal demonstrated highest yields fallow with pollen and young leaf by 12.54, 9.88 and 8.08 % respectively. The ethanolic extract of petal also showed the highest total phenolic content by 145.82±1.c36mg GAE/g following by petal stalk and torus (953.8±3.87c andc 87.79±1.07c mg GAE/g respectively). The *Nelumbo nucifera* petal extract exhibited highest total phenolic content. Therefore, the worthy part of this plant was petal which the previous study also showed highest antioxidant activity by DPPH radical scavenging assay. (EC_{50}1c5.95±0.89cμg/ml). The further study should be continue to isolation the bioactivity compounds and develop to be diabetic drug, health products or promote consumption in daily food.

Keywords: Total phenolic content, Antioxidant activity, *Nelumbo nucifera*, Lotus, Diabetes mellitus

Opportunities and Constraints in Smallholder Cattle Farming along the River Bank in Saang District, Kandal Province, Cambodia

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Abstract

This study was to identify opportunities and constraints of smallholder cattle farming in Saang district. Primary data using a structured questionnaire focused on cattle population, feed and feeding, and disease, was from 90 households (HHs) in 2 villages of 2 communes. Results showed that 100%HHs raised cattle and crop farmers. Average total of 288 cattle during last 3 years included 114 male and 174 female. Of all, 18.5 and 19.3% were was ≤2-year-male and female, respectively; 10.3 % male and 23.3% female were 3-5years; and ≥5-year cattle was 10.9% male and 18.1% female. Cattle of 41, 33, and 26% HHs were inheritance, bought, and shared with others, respectively. 79% HHs raised cattle for breeding/calving, 22.2% as draught animals, and 47.8% for selling. Cattle of all HHs was based on natural grass supplemented with crop by-products. 100% HHs fed corn stem to cattle as fresh (98.9%) and dry (1.1%) at amount of >10kg/day (92.2%) and <10kg/day (7.8%). Corn stem was residue of HH crop (50%), bought from others (23%) with 1000 riels/kg, and given by others (18.9%). 38.9% HHs also fed ground bean stem as fresh (22.2%) and dry (16.7%) being residue of HH farm (22.2%), bought (6.7%) with 1200 riels/kg, and given by others (16.7%); and 13.3, 11.1, and 7.8% fed it to cattle 1-5, >10 and 5-10kg/day, respectively. 75.6% HHs raised cattle in pen only with completely cut feeding, but others tethered cattle at field only (7.8%) or for half of day (16.7%). 70% HHs experienced cattle disease outbreak - 28% and 43% having cattle died of and overcome from diseases, respectively. In conclusion, integrated farming of crops and cattle would benefit to cattle raising with available local feeds especially during rainy season, but diseases were risk for this farming.

Keywords: Smallholder cattle farming, Opportunities, Constraints, Saang district, Cambodia

Efficiency of Two Small Rice Mills OTAKE and SATAKE on Milled Rice Quality

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Abstract
Rice is the main source diet in Central Asia. Increasing the quality and quantity of rice to the job after harvesting, milling is an important stage. Since the quality of small rice mills in provinces produce milled rice does not meet the international standard relating to the percentage of head rice and broken rice, the milled rice could not exported with a standard price. Therefore, an appropriate small rice mill is necessary to improve the quality of rice in Cambodia for internally export. The key objectives this study was to identify the influence of role gaps and appropriate fan speeds for a better milled rice quality and its whiteness. In the research, two rice species (Jasmine rice and Fragrant rice) were milled by SATAKE and OTAKE rice mill machines at different role's gap (0.6mm, 0.7mm and 0.8mm) and fan's round speed (4620rpm, 3970rpm and 3320rpm). There were 3 replications for each treatment. The moisture content of the rice was 14%. Physical properties, percentage of lose, percentage of cracked rice, and capacity of peeling for millstone peel data were collected and analyze statically using SPSS version 16.0. The results showed that the role gap of SATAKE (0.7mm) was the optimum condition for the best quality of Jasmine rice (good in physical property with 78.80% of de-husked, 94.64% of head rice and 7.00% of crack), and fan speed peeling of OTAKE (3970 rpm) was the optimum condition for Jasmine rice (good in physical property for de-husked, head rice and crack accounted for 94.27%, 83.90% and 5.44%, respectively In conclusion, the appropriate of role gap and fan speed of the rice mill machines are really important to improve the quality of milled rice to meet the required international standard for internationally export, reduce the number of loss and the percentage of crack.

Keywords: rice mill, role gap, fan speed, jasmine rice, fragrant rice, cracked rice, and capacity of peeling millestone

Efficiency of Two-row Chinese Rice Transplanter Experimented on RUA Campus

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Abstrat

As agricultural labor has shifted to urban industry, rice production is now experiencing labor shortages, making transplanting deeply unpopular. Despite producing higher yields, transplanting has dramatically been replaced by direct seeding. Therefore, this research paper aims to introduce the rice transplanter, modeled TMRT 2, and to determine its working performance and efficiency by conducting an on-station experiment, starting from June to August, 2015, at the Royal University of Agriculture (RUA), Cambodia. The experiment was partitioned into 9 treatments, each sized 2 m x 7m, and two main factors—plant age and water level—were studied and analyzed selecting 12 days, 18 days, and 25 days in age; and 2 cm, 5 cm, and 10 cm as water level. The findings indicate that in the treatment *(25 days + 2 cm)*, the hills contained a density of 4-5 plants and suffered low damage during planting operation. Though transplanted at various water depths, old rice seedlings tend to stand upright, averaging 65^0 to 75^0, whereas slow transplanting speed might greatly reduce seedling losses to 1-2 plants per hill. Additionally, hill-to-hill spacing varied from 21 to 23 cm when the rice seedlings aged 18 and 25 days were mechanically transplanted. However, transplanting of younger seedlings produced many missing hills that ranged from 3 to 7 hills in the 2 m x 7 m plot, and this might substantially decrease the future yields. Planting depths varied from 4 to 5 cm when transplanting of seedlings aged 18 and 25 days was performed at a water level of 2 cm. It might be concluded that rice seedlings, aged 18 and 25 days, should be transplanted at 2-cm water level, in combination with slow enough operational speed, while transplanting of 12-day seedlings at varied water depths produced greater damage and losses.

Keywords: Rice transplanter, water level, root growth, hill spacing, operational speed

The Adaptation Strategies of Beekeepers to Climate Change in Nigeria: Impetus to Beekeeping Sustainability

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Abstract

The study assessed the adaptation strategies adapted by beekeepers to reduce the adverse effect of climate change. The specific objectives include examine effects of climate change on the bees and honey production; socio-economic effects on beekeepers livelihood; and knowledge level of the adaptation strategies used. One hundred and eighty two respondents were interviewed through the use of structured interview schedule. Data analysis was carried out using frequency counts, percentage, mean, standard deviation and correlation. The results of the study showed mean age of the farmer was 42±12 years. Majority were literate and information sourced from fellow farmers was most common and reliable. Few of the beekeepers got training regarding climate change adaptation methods from extension agents. The effect of climate change as indicated by farmers include reduction in yield, income and increase in cost of production The results also showed that the occurrences of strong heat, rainfall fluctuation, and prolonged drought negatively affected bees production and honey yield. The beekeepers were moderately knowledgeable in the use of the adaptation strategies such as, supplying their bees with additional feed, hive-shading with shelters and not harvest honey during drought. However, they have inadequate knowledge in tree plantation, stone bund, and trench and hive areas closure. Positive and significant correlation exists between adaptation strategies use by beekeepers, income, and training attended and knowledge level. Conclusively, beekeepers were moderately knowledgeable in the various adaptation strategies while some have inadequate knowledge about some. In view of this, there is urgent need to strengthen the capacity of beekeepers through training, workshops and demonstrations on improved methods of adaptation to climate change. If the farmers are well trained in climate change adaptation strategies it will reduce the effect on beekeeping and which will in turn lead to honey and allied product sustainability.

Keywords: Adaptation, climate change, knowledge, livelihood, strategies, training

Effects of Purified Kraft Lignin as a Natural Binder on Fiberboard Made from Rice Straw Thermomechanical Pulp

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Abstract

Rice is grown in many parts of the world and used as a main source of diet, especially in Asia. Besides the cereal, its residues have been used to feed animals, cover crops and produce mushroom. A huge quantity of the biomass, however, was wasted in the field or burnt, while it is possible to obtain more added value as source of fibers for fiberboard manufacturing. Recently, the market demand of medium density fiberboard (MDF) and high density fiberboard (HDF) are increasing following the world population growth. Commercially, the fiberboards are made with urea- or phenol-formaldehyde synthetic resins as binder agents. The resins have negative effects on human health and environment since formaldehyde is a non-biodegradable material. On the other hand, lignin can be obtained from black liquor, a waste of paper and pulp factory. In this study rice straw was used to make thermomechanical pulp (TMP) and purified Kraft lignin was used as a green adhesive. The key objectives were (1) to identify the optimum preparation conditions (temperature and time) of rice straw TMP and (2) to study the effect of different lignin additions on mechanical properties of fully biodegradable fiberboards. The fiberboards were made in wet process, using hot press thermoformer. Physical and mechanical properties of the fiberboards were analyzed following European standards. As the results, rice straw TMP cooked at 160°C during 30 minutes obtained the optimum condition with high production yield and high mechanical properties. Purified Kraft lignin in powder form at 13wt/wt% showed the highest mechanical properties of the binderless fiberboard (56MPa) compared with other proportions and with 0wt/wt% (40MPa) of added lignin and higher than the commercial fiberboard (42MPa). In conclusion, purified Kraft lignin improved the mechanical and physical properties of fiberboards made from rice straw TMP, substituting synthetic resins in such panel production.

Keywords: rice straw, TMP, MDF, HDF, natural binder and Kraft lignin

Systems Analysis and Modelling of Pollution Loading for Management of Calumpang River in Batangas City, Philippines

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Abstract

In the Province of Batangas, Philippines, the Batangas City government is considering the whole stretch of Calumpang River for its proposed ecotourism project. However, water quality of this river falls under the Philippine Department of Environment and Natural Resource (DENR) classification as Class D and is currently facing management issues. For this river to qualify for ecotourism purposes, water has to be restored to Class B Recreational Water Class I. Using systems analysis, this study analyzes the factors and the processes that lead to its current polluted state. This study aims to generate information that will aid policymakers in crafting water quality management options for the restoration of Calumpang River. Conceptual framework of the river system, anchored on the basic characteristics of an ecotourism area, was developed and used for quantification and numerical linking of the river, people, land uses and management practices. Analytical Hierarchy Process (AHP) and Geographic Information System (GIS) were used in determining who should be responsible and accountable in the restoration and management of this water resource. Results showed that agricultural activities are the major contributor in the degradation of water quality in Calumpang River, specifically, animal production. Furthermore, the study also recommended a governing body should be established, composition of which is based on the physico-chemical and socio-economic characteristics and pollution loading of the municipality or city. Based on the computed weights, the cities of Batangas and Lipa, which both have the weight 0.24, suggest the highest accountability, followed by Rosario (0.15), Ibaan (0.14), and San Jose (0.10). A follow-up study should be done to determine how much financial contribution should be imposed to the respective municipalities for its restoration and management based on their pollution loading.

Keywords: Systems Analysis, Calumpang, Watershed, Swine, Water Degradation

Spatial Assessment of Ecosystem Services by New City Development-Case in Nay Pyi Taw, Myanmar

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Abstract

Ecosystems provide a lot of services not only for human well-being but also for the environment. Land use and Land cover change caused by development activities have been increasing rapidly and these were recognized as one of the main factors for a key human-induced effect on ecosystems. During these decades, ecosystem services have been deteriorated and destroyed due to land use change especially urban development at the global scale, especially in developing countries. For example, in Myanmar, new capital city was developed on the previously rural area in 2006. So that big land use changes were conducted and a lot of ecosystem services were destroyed. To compare the loss of ecosystem services between before and after the development, in this study spatial analysis of ecosystem services were conducted in Nay Pyi Taw, Myanmar as a case study. The spatial analysis was done to understand the distribution pattern of ecosystem services by using unit values of ecosystem services. For the spatial analysis, two satellite images, namely, ALOS in 2010 and Landsat 7 in 1999 were used in order to do land classification. And the existing unit values of ecosystem services were collected by literature survey and by estimation using simple methods. Then conservation prioritization was estimated to identify priority areas for conservation of ecosystem service provisions using the results of spatial analysis by the ZONATION software (Moilanen, et.al. 2012). As a result, based on the comparison study, the changes of ecosystem service provisions due to land use changes were estimated and compared, and also the changes of priority areas were calculated.

Keywords: ecosystem services, land use change, spatial analysis, conservation prioritization

Determinants of Adoption of Sustainable Land Management Practices among Farmers in Nigeria: Osun State Experience

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Abstract

Environmental issues has been a global concern for decades with different strategies been used to overcome the menace. This study identified and categorized the specific Sustainable Land Management (SLM) practices introduced to beneficiaries of FADAMA III in Nigeria; determined the level of adoption and the factors influencing the adoption with a view to improving their level of adoption. Multistage and proportionate sampling techniques were used to select 256 farmers from eight Local Government Areas (LGAs). Quantitative and key informant data were collected from the farmers. Data were analysed with frequency, percentage, mean and standard deviation while Chi- square and correlation were used to isolate crucial factors influencing adoption of the SLM practices. Results revealed that 36 SLM practices were introduced to the farmers which were categorized as crop management- related, livestock management related, forest management, water conservation- related, alternative and off-farm SLM practices. Farmers with high level of adoption were more (33.9%) than those with low level (43.7%). Household size, size of some cash crops and attitude were significantly correlated with level of adoption at 95% level of confidence. Seven factors: farming experience, economic, educational, accessibility to inputs, personal and family characteristics, and soil fertility status were identified to influence adoption of SLM practices. The study concluded that the level of adoption of SLM practices was still low in Nigeria.

Keywords: Adoption, Sustainable Land Management, Farmers

Characteristics of the River Water Quality under Base Flow Condition in The Tokachi River Basin, Japan

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Abstract

The Tokachi River basin has an important role as a food base of Japan. It is one of the significant challenges that achieve a good balance between a food production and water quality conservation for the sustainable agriculture in this basin. Here, we carried out the river water monitoring in the Tokachi River basin and evaluated the river water quality under base flow condition. 37 sampling points in the main stream and the tributaries were monitored in late June, late August or early September, and late October 2007 to 2011. Five year mean values and standard deviation of pH, BOD, SS and EC were evaluated. The water quality of the Tokachi River showed variations at each investigation period. However, there were no change trends of seasons or years. The mean pH values of the Tokachi River basin were the range of 7.1-7.5. The river water quality was neutrality and stable in each sampling point. The mean BOD showed comparatively low values in the Tokachi River basin (0.9-1.8 mg/L), however the BOD values increased gradually with the main stream flow. The mean SS values were less than 25 mg/L at all sampling points. Also, the SS values tended to increase basically with the main stream flow. The mean EC values increased from upstream to downstream of the main stream (6.8-12.4 mg/L). In addition, the EC values in 13 of 20 sampling points of the tributaries were higher than the main stream values (5.0-22.2 mg/L). There were significant correlations between the EC values and the proportion of the agricultural land or forest land. From these results, it was considered that the dissolved matter in the river water increased with a high proportion of agricultural land in the Tokachi River basin.

Keywords: river water quality, base flow condition, the Tokachi River basin.

Environmental Sensitiveness of Urban Citizens in Serbia: Case of New Belgrade Municipality

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Abstract

Humans are an integral part of urban systems and their attitudes, behaviours as well as activities have implications in terms of urban environmental sustainability. Therefore, it is crucial to have a good knowledge about environmental problems and their impacts on social and ecological systems to ensure sustainable environmental management in cities. The future of urban ecology depends on understanding the ways in which humans affect environment in dynamic and transformative cities and urban settlements. The present paper aims at getting insights into citizens' attitude towards environment in New Belgrade municipality (NBM) in northern Serbia. It also analyses relations between environment-related attitude and socio-demographic variables. The work is based on secondary data from an extensive review and primary data collected by an online questionnaire survey on attitude towards environment and urban ecology carried out in December 2014 with 275 citizens of NBM. As for the main environmental problems at municipality level, most of respondents focused on waste management and highlighted lack of waste bins on the streets, illegal landfills and small number of recycling containers, which exist just in certain municipality parts. More than 65% of respondents stated their personal high attention to and care of the environment while over 90% of the interviewees consider that their fellow citizens need better environmental education (*e.g.* trainings, workshops, involvement in environmental campaigns and initiatives, etc.). Results show also that more than a half of respondents (52.4%) would cultivate the city's urban gardens provided that the municipality put at their disposal unused land area. All in all, the exploratory survey findings show the willingness of the majority of NBM's inhabitants to adopt more environmentally-friendly lifestyles. This willingness should be fostered by appropriate awareness raising initiatives and an enabling institutional and political environment in order to contribute to the development of an environmentally sustainable city.

Keywords: urban ecology, citizen attitude, environment, Northern Serbia

Self-Sustaining Waste Management by Using 3R Method in Way Kalam Village as the Part to Gain Status of Pilot Tourism Village

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Abstract

This research aims to analyze the progress of self-sustaining waste management conducted by Way Kalam village, South of Lampung region, Lampung province, Indonesia. The waste management is conducted in order to prepare Way Kalam village becomes the pilot tourism village in South of Lampung region. The standard which is employed in this research is 3R (Reduce, Reuse, Resycle). This research is conducted by having a collaboration between the researcher as the member of Komunitas Putera Krakatau or in English it is translated as Sons of Krakatoa Community (henceforth called as KPK), Kelompok Sadar Wisata (Pokdarwis) of Way Kalam village (in English it is translated as Tourism Awareness Group of Way Kalam village) and the village officers in Way Kalam village. The finding in this research confirms that in reduce, Way Kalam village has been progressing by the fact that they have been able to reduce the volume of village's garbage at 20% from the normal volume, for the reuse the progress is still undergoing, the method which is used is to reuse the garbage is by reuse the garbage as the plant's pot and it reduces at 2% from normal volume, and the last is recycle, it is also still undergoing, the method to resycle the garbage is to make the garbage to be a tourism souvenir.

Keywords: 3R (Reduce, Reuse, Resycle), Pilot Tourism Village, Self- sustaining waste management, Way Kalam village

Soil Loss Mitigation by Applying Animal Waste Slurry

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Abstract

The application of excreta wastes is beneficial for soil conservation, especially in degraded soils and soils being susceptible to erosion. Oaxaca State, Mexico, is the main state by numbers of goats (Around 952,000 goats), which represents 10.9% of the national production. In this study animal dung was used as a resource for protecting soils against erosion. The objective of this study is to measure the effectivity of slurry for mitigating soil loss in leptosol from Mixteca Region. For this purpose, a raindrop model and a slope model were used. Raindrop model consisted in stainless steel cores of 1.0 cm long with inside diameter at 1.1 cm. Soil was placed inside at a dry density of 1.0 ±0.1 g/cm^3. Fifty drops of artificial rain were dripped into the soil inside the core and soil loss was measured. On the other hand, slope model consisted of a plot of 91cm x 3.15 cm x 1.4 cm, with a triangular section. Soil was filled in with the same dry density of raindrop model and 1.2 cm^3/s of deionized water was supplied during one hour on a 12° slope. Discharge was collected every ten minutes and soil loss was measured. As a treatment for both models, animal waste slurry was used. Horse dung was collected in the Horsemanship Club of Tokyo University of Agriculture and passed through a sieve at 212 μm in order to obtain slurry. 3 treatments were set up; the first was control, the second was cattle slurry incorporated with soil, and the third was crust formed with animal waste slurry. The dried mass ratio of soil-slurry was 66:1. Soil losses were compared among these 3 treatments. Raindrop experiment results showed that the addition of slurry decreased significantly soil loss rate from 6.4% to 1.3% in slurry incorporated cores and 0.2% in formed bio-crust cores. The same tendency was observed in the slope model experiment, where the application of slurry reduced significantly the soil losses from 558.6 g/m^2 to around 60 g/m^2 in both plots where slurry was added. Therefore it can be concluded that the application of animal waste slurry was effective to reduce significantly soil losses by protecting the soil against kinetic energy of raindrops, as well as against shearing force of runoff on a 12 degrees slope in leptosol soil of Mixteca Region.

Keywords: slurry, soil erosion, horse dung, leptosol, Mixteca Region

Situation Analysis and Need Assessment for Tra Hat Climate-Smart Village, Bac Lieu Province, Vietnam

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Abstract

The program on Climate Change, Agriculture and Food Security (CCAFS) established the first six climate-smart villages (CSV) in Southeast Asia in 2014. Among six CSVs, Tra Hat CSV locates in Bac Lieu Province, Mekong Delta, South of Vietnam. Climate-smart agriculture interventions are implemented in CSV to improve farmers' income and resilience to climate risks and boost their ability to adapt to climate change. This paper presents common problems that are usually encountered at CSV. The data in the paper is based on the results of the situation analysis and need assessment study that related to climate change and food security at Tra Hat CSV in 2014. Rice is main production at Tra Hat CSV that intakes fresh water source from Quan Lo Phung Hiep canal system that connected to the Mekong River. Its agriculture has got risks from saline intrusion under impact of sea water level rise and lacks of fresh water during the dry season. Abnormal weather has been also reported recently. There is no hunger in Tra Hat CSV. Food sources depend much on the main rice production in the village, ornament garden and small-scale aquaculture around households. Diet is an annual problem in hardest months from November to January. Other problems are needed to address for Tra Hat CSV, such as improving productivity and market access of main sources of household livelihood such as rice production, piggery, chicken and duck raising. Weather and pest - disease forecast systems should be improved at Tra Hat CSV for protection from climate risks of rice production as the main livelihood of household. Raising awareness and keeping the good environmental sanitation and protection from production and domestic activities are also important in the village and should be conducted at community level.

Keywords: situation analysis, need assessment, climate change, food security, climate-smart village, Tra Hat

Effects of Adding Coffee Residues on Eliminating *E.coli* and Lowering Ammonia Gas Concentration in Cow Dung

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Abstract

The disposal of cow dung causes environmental and hygienic problems to human body. The pathogenic bacteria known as *E. coli* or coliform bacteria may survive in cow dung and affect human health. Based on previous studies, coffee residues have advantage in eliminating *E. coli* and removing bad smell. However, the efficiency of field application of this technique is still unevaluated. Thus, the objective of this study is to evaluate the effects of adding coffee residues on eliminating *E.coli* and deodorizing environment during composting cow dung in both field and laboratory levels. The field survey at the farm located in Hachioji of Tokyo, where local farmers handle cow dung with adding coffee residues, was carried out for evaluating the changes in the amounts of *E.coli* in cow dung and compost. The amounts of *E.coli* in cow dung and compost sampled from the farm were evaluated with a dilution plate method. Additionally in the laboratory, the effects of adding coffee residues on ammonia gas concentration were observed. According to the field survey and the laboratory experiments, it was indicated that adding coffee residues was effective for eliminating *E.coli* in cow dung as well as removing bad smell with lowering ammonia gas concentration. Thus, it was concluded that adding coffee residues to cow dung is an effective strategy for promoting sustainable agriculture.

Keywords: coffee, *E.coli*, coliform bacteria, ammonia gas, nitrogen, temperature

Fish Assemblage on Coral Nursery Unit

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Abstract

Since 2012 the Department of Science and Technology-Philippine Council for Agriculture and Natural Resources Research and Development (DOST-PCAARD) funded different universities in the Philippines for a coral reef restoration project. As part of this project, coral nursery units (CNUs) have been deployed to improved supply of high quality coral nubbins ready for transplantation and reduced dependence of coral fragments from wild coral populations. Changes in the reef fish assemblage were visually observed few months after these CNUs have been deployed. Intrigued by this, this present work were conducted to assess whether fishes are attracted or and produced on CNUs. Six CNUs were deployed with a 30 m distance with each other. Fishes were counted and identified using fixed point technique. Fish density, species richness, diversity, and evenness were compared before and four months after CNUs have been deployed. Evidences of both production and attraction of reef fishes were evident. Production is evidenced by the abundance of *Apogon sealei* and *Apogon monospilus*. The high concentrations of tertiary consumer with a 66% frequency of occurrence *Archamia melasma*, were not observed before, is the main evidence for attraction by CNUs. Our results indicate that CNUs can become a useful management and restoration tool that could help in improving the local fishing yields.

Keywords: coral, coral nursery unit, fish assemblage, restoration, management

The Impacts of Drought on Fisherman's Livelihoods in Stung Chinit Catchment, Kampong Thom Province

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Abstract

Drought has contributed to decline fish stock and catch. Fish decreasing is likely to influence Fishermen's livelihood. Thus, the study aims at to assess the impacts of drought on fisheries, fish decrease on fisher's livelihoods include challenge and adaptive capacity of fishers. It was conducted from March to August, 2015, in six villages of three communes, located along Stung Chinit, Kampong Thom province. Ninety households were interviewed and three focus group discussions. Results illustrate that, fishermen observed that drought becomes more frequency recently. Drought was contributed to impact on fisheries in several conditions, reducing water level of lake. Furthermore, drought reduced stream flow, water body of river and floodplain. Moreover, it caused fish lost habitat and inhibited fish immigration. It's a main factor have been contributed to reduce fish catch rate. The comparison of fish catch rate in 2014 and last 10 year was found that in Tnort Chhom commune was decreased 10.7 to 5.4kg/person/day, follow by 6.4 to 3.8kg/person/day and 3.9 to 2.7kg/person/day, in Kampong Thmor and Sochit commune. This case brings fishers lost their job, got low income, and spend more money on daily food. However, most fishers didn't change fishing gear and place because they had no skill to use other gears or machine canoe to fishing in further place and had no enough money to increase size or number of fishing gear. Since, fisheries resources was decreased annually, fishermen think that their fishing job will be abandoned and they will change to do alternative jobs such as farm work, immigrating, animal raising, construction worker in future. Overall, drought is likely a factor contributing to reduce fish catch rate. Fish catch decreasing may be affects fishers' livelihoods as generate income reduction and fish consumption.

Keywords: Drought, Fishermen's Livelihood, Fisheries, Stung Chinit, Kampong Thom

The Impact of *Mimosa pigra* on Local Livelihood in Stung Sen Core Area, Tonle Sap Biosphere Reserve

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Abstract

The Stung Sen Core Area is situated at the southeastern end of Tonle Sap Lake, and comprises an area of 6,355 ha. It was created under the Royal Decree on the establishment of the Tonle Sap Biosphere Reserve (TSBR), dated 10 April 2001, and aims to protect unique evergreen riverine forests and associated vegetation assemblages. Stung Sen is the buffer zone of the three core zones within the TSBR, and provides the most important inland wetland in Southeast Asia, both for biodiversity conservation and for livelihoods based on harvesting of aquatic resources and agricultural farming in surrounding the areas. This core area has been interrupted by an invasive alien species named Mimosa Pigra, which has had significant physical and economic impacts on the natural habitat, local community livelihoods, animals and plants, human health, jobs and the ecosystem. This study discusses the negative impacts of the invasive Mimosa Pigra on local livelihoods. It uses economic analysis to calculate the cost of its impacts and the cost for recovery, and then provides recommendation on how these impacts can be mitigated. The distribution of Mimosa Pigra in core areas has been mapped, and only those areas which have a high-density of Mimosa Pigra are identified for economic analysis in this study. Face to face interviews were carried out with local authorities, rangers, community members, and famers within the Stung Sen Core Area. The data analysis is focused on impacts on farming land, fishing yield, income generation, and natural habitat distraction. This paper uses the results of a pilot site experiment on methods of removing Mimosa Pigra to explore the best option for mitigating the spread of Mimosa Pigra, and removing existing Mimosa Pigra in the Stung Sen core area.

Keywords Mimosa Pigra, Impact, Local Livelihood, Stung Sen Core Area, Cambodia

Current Uses of Rice Husk and Demand to Use Rice Husk Briquette of Rice Farmers in the Mekong Delta, Vietnam

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Abstract

Rice husk is the outermost layer of the paddy grain separated from the rice grains during the milling process. With about five million tons of rice husk annually generated in the Mekong Delta (MD), Vietnam, it becomes one of the most important renewable resources from rice production. The introduction and convenience of fuels for household cooking and new product of rice husk briquette have made much change in rice husk uses in the last ten years in the MD. A survey of 400 hundred rice farmers in Can Tho, An Giang, Dong Thap and Tien Giang of the Mekong Delta was conducted in 2015 to summarize the rice husk uses by rice farmers and their demand to use rice husk briquette. The rice farmers consume only 12% of the total quantity of rice husk generated for energy purposes (96%) and mulching fruit trees and ornamental plants (4%). 71% of rice farmers know about rice husk briquette. However, only 8% of the rice farmer are using rice husk briquette and consume 1.7% of rice husk quantity generated for rice husk briquette. Only about 20% of the rice famers accept to use rice husk briquette when it was introduced to them. The logit model shows that factors affecting rice farmers to use rice husk briquette are number of rice crops cultivated per year, cost of gas for household cooking, rice farmers' acceptance of using rice husk briquette when 25% gas price increase and community's acceptance to use rice husk briquette. Besides, to promote rice farmers using rice husk briquette in the MD, more information related to its price, where to buy, its benefits and local renewable energy source should be introduced widely to the public and more research focusing on burning efficiency, cost effectiveness and convenience of using it.

Keywords: rice husk, rice husk briquette, Mekong Delta

Changing of Rice Cropping Season under Climate Change in the Mekong Delta

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Abstract

Mekong Delta is the largest granary which has high food production and aquaculture in Vietnam. But Mekong Delta is suffered the most impact of climate change. These effects are not small to affect the production, food security of region. Therefore, assessing the level of vulnerability to rice production under the impact of climate change needs to do to determine the vulnerability area of flooding, saltwater intrusion in the Mekong Delta. Based on Southern Irrigation Planning Institute`s the scenarios of sea level rise and the scenarios of saline intrusion and GIS technology to evaluate the vulnerability area on the current of the agricultural land use. Results showed that: the affected areas by flooding (come flooding, over flooding), by salinity were shown on the map with the different levels of each climate change scenario. In particular, the affected rice area from sea-level rise scenarios in 2030, 2050 added climate change factors was more affected than the present scenario (HT). These results are very important basic for managers, farmers who have the appropriate adjustments and timely responses in rice cultivation to deal with climate change in Mekong Delta.

Keywords: Mekong Delta; rice production; climate change; flooding; saline intrusion

Application of Salt Tolerant and Halophyte Vegetables in Agro-forestry Systems for Rehabilitating Salt Affected Soils

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Abstract

One of the agro-forestry systems found in the salt affected areas of Khon Kaen province, Thailand is tree plantations associated with animal husbandry. Using space between trees of Eucalyptus and Acacia in plantation, salt tolerant and halophyte vegetables including Chinese kale (*Brassica oleracea var. alboglabra*), tomato (*Solanum lycopersicum*) and purslane (*Portulaca oleracea*) were grown for 20 days during rainy and dry seasons. For comparison, salt tolerant and halophyte vegetables were grown in adjacent bare areas as well. The results of growing vegetables in rainy season showed a significant difference at 99% in crop yield and survival rate. The highest yields and survival rates were found in both the plantation areas of Eucalyptus and Acacia. The survival rates of Chinese kale, tomato and purslane grown in the Eucalyptus plantation area were 87.5%, 100.0% and 95.8%, respectively. In the bare area adjacent to Eucalyptus, only purslane could survive at 33.3%. The yields of Chinese kale, tomato and purslane grown in the Eucalyptus plantation area were 441.3 g/10 m^2, 954.2 g/10 m^2 and 1998.8 g/10 m^2, respectively. In addition, the values of $EC_{1:5}$, sodium and calcium concentrations of soils in vegetable fields were measured before growing, 10 days and 20 days after growing. Moreover, sodium concentrations of vegetables were measured as well. According to the results, it was evaluated that the amounts of sodium absorbed by vegetables were negligible compared to sodium amounts transported by vertical soil water movement. So, it was hard to rehabilitate salt affected soils with cultivating salt tolerant and halophyte vegetables. However, it may be concluded that agro-forestry system that combined fast growing trees with salt tolerant or halophyte vegetables can be introduced to local people in the research area to promote reforestation as well as being source of their additional income.

Keywords: salt affected areas, agro-forestry, salt tolerant, halophyte vegetables

Setting up Landmarks for Community Development in Senri New Town of Osaka with Local Eco-Material Bamboo

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Abstract

Senri New Town of Osaka was the first case of big residential developments in Japan. Before the residential development, the area located in undulating hills was covered with bamboo forest. As Osaka Prefecture didn't have enough numbers of houses in 1950s, the Japanese government had implemented the residential development at Senri Hills. Though the construction of Senri New Town, residential area, public area, or commercial area were set up separately based on the zooning of each town function. Although there are so called Town Hall in the area, the networking among residents could not be matured. Though the interview survey to residents in Senri New Town, it was considered that public area, commercial area or City Hall did not work to deepen the networking among residents, although each town function has been providing certain services to residents. In addition, people who have different background gathered to Senri New Town from all over Japan. That is one of the reasons why community development was not achieved. Almost 50 years has been passed since Senri New Town has been developed. In this study, some architectural designs with local eco-material; bamboo are proposed for setting up landmarks to deepen the networks among residents.

Keywords: Senri New Town, residential development, Senri Hills, networking, community, local eco-material

Leveraging on the Potentials of Solar Energy for Agricultural Activities in Nigeria

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Abstract

Sufficient and readily available energy is a key to driving the agricultural development of any nation and one of the major challenges facing sustainable food security in Nigeria is the issue of energy scarcity in our agricultural sector. Agriculture is the mainstay of the economy of Nigeria and the most readily available and widely utilizable energy source in the rural areas where farming is the main means of livelihood are the renewable energy types, particularly solar energy. This is because Nigeria is blessed with abundant amount of sunshine. In line with one of the recent and just adopted Sustainable Development Goals (SDGs) which highlights the provision of affordable and clean energy for all, this paper attempts to focus on the potential of this long neglected and less harnessed energy source in order to make up for the current deficit in energy supply especially in the agricultural sector thus maximizing the great benefits it has to offer for the achievement of the much desired agricultural and all round rural development in the country.

Keywords: Agricultural Activities, Nigeria, Potentials, Solar Energy.

Comparison the Water Footprint of Cassava and Sugarcane in Northeast, Thailand

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Abstract

The water footprint (WF) is an indicator of water use consists of the direct and indirect water use throughout the life cycle of crop produce and it varies on different climate and agricultural production system. This study aims to assess the water use of cassava and sugarcane cultivation in northeastern, Thailand using WF concept which is a tool for sustainable water analysis and management. The results of this study show the average the WF of cassava (345 m3/ton) is more than that sugarcane (157 m3/ton). At the provincial level, the WF of cassava is the most highest in Amnat Charoen (378 m3/ton; green WF 44 m3/ton, blue WF 233 m3/ton and grey WF 101 m3/ton), while Buri Ram has the lowest WF (313 m3/ton; green WF 38 m3/ton, blue WF 181 m3/ton and grey WF 94 m3/ton). For sugarcane, Amnat Charoen show the highest of WF of 167 m3/ton, which consists of green WF 20 m3/ton, blue WF 84 m3/ton and grey WF 63 m3/ton. Meanwhile, the lowest WF was 133 m3/ton in Bueng Kan (green WF 16 m3/ton, blue WF 64 m3/ton and grey WF 54 m3/ton). As a result, the different location, crop, agricultural production systems and yields have an effect on WF. Therefore, not only developing the efficiency water system to water resources sustainable but also increased crop productivity and soil fertility are certainly important for decrease the amount of water used in this region.

Keywords: Water footprint, cassava, sugarcane, water resource, northeast Thailand

Biodiversity of Aquatic Insects in the Organic and Conventional Rice Fields in Khon Kaen Thailand

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Abstract

The water quality has significant effects toward the diversity and distribution of aquatic insect. The use of fertilizer and pesticides may cause the water quality and affect to diversity of aquatic insect. Aquatic insect in rice fields was surveyed to compare the different of biodiversity during May to August 2015 between organic and conventional rice fields in Khon Kaen province. The physico-chemical parameters of water quality were also analyzed. Three replicates of sampling by aquatic D-net were used at sampling sites. During the study period aquatic insect was represented by 17 species belonging to 16 families of 5 orders. The order hemiptera was the highest in abundance groups in the fields (5 families) followed by Odonata (3 families), Diptera (3 families), Coleoptera (2 families), and Ephemeroptera was the lowest in abundance (1 families). The richness of insects in the organic site was found higher than the conventional site. The species diversity index (H') was 0.427 in organic site and conventional site was 0.401. It is concluded that organic rice field would help to sustain biodiversity in ecosystem.

Keywords: Aquatic insect, Paddy ecosystem, Biodiversity

Greenhouse Gas Emissions of Organic Car Wax Processing from Rice Bran Oil

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Abstract

An analysis of greenhouse gases (GHG) emission of organic car wax processing from rice bran oil is experimented. During life cycle of car wax product, GHG during rice cultivation, rice milling, refinery of rice bran oil, and car wax formulation and transportation were examined. The functional unit (FU) of 100 grams car wax product was used. Emission of greenhouse gases from rice cultivation based on conventional cultivation (with chemical fertilizer) was compared with rice cultivation with organic fertilizer. The results showed that life cycle greenhouse gas emissions, expressed in g CO_2 equivalents, are highest for rice cultivation based on conventional cultivation with c21c-23kgCO-$_2$eq/FU. Whereas GHG emission of rice cultivation with organic fertilzer was found to be c22c-21kgCO-$_2$eq/FU, respectively. Influence of rice cultivation with organic fertilizer and chemical fertilizer on emission of GHG will be discussed comparatively. Furthermore the major share of the GHG was found by rice cultivation (>98%) in both systems. Whereas energy consumption in rice milling, refinery of rice bran oil, and car wax formulation and transportation were found as minor share. As suggestion, new cultivation technology should be employed and recommended to decrease of global warming potential of car wax production.

Keywords: LCA, Car Wax, Rice Oil Brand, fertilizer

Ecotoxicology of Leachate from Sewage Sludge, Spent Wash Liquor and Wastewater from Cassava Industry on Nile tilapia and Water Fern

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Abstract

The environmental concern of using wastewater or waste from the community and industrial for agricultural land application has been raised. Especially, the impact of leachate on aquatic environment. Therefore, the objective of this study was to study ecological toxicology of sewage sludge leachate, spent wash liquor and wastewater from cassava industry (influent, effluent, wastewater for agriculture and bio-gas sludge leachate) on aquatic biota. The chemical property of wastewater was studied and heavy metal content of the wastewater were analysed. The study examined the acute toxicity of different types of wastewater on nile tilapia (*Oreochromis niloticus*) and water fern (*Azolla microphylla*). The results showed that the acute toxicity of sewage sludge leachate, spent wash liquor and wastewater from cassava industry (influent, effluent, wastewater for agriculture and bio-gas sludge leachate) on nile tilapia as LC_{50} values at 96 hours were 1,937.16, 3.39, 10.20, 15.73, 59.87, 16.71 %, respectively. The study of the effects of sewage sludge, spent wash liquor and wastewater from on the growth of water fern, *Azolla microphylla* after 1 week were found that the spent wash liquor at concentration 5 % and wastewater from cassava industry (bio-gas sludge leachate) at concentration 25 % had impacted on the growth of *Azolla microphylla* by reducing the wet weight significantly difference from the control group ($p<0.05$). The wastewater from cassava industry, influent and the treated wastewater for agricultural use were not significantly difference from the control group ($p>0.05$). The leachate from sewage sludge from concentration 25 % was affected to the growth of freshwater plant, *Azolla microphylla* by increasing the wet weight significantly difference from the control group ($p<0.05$).

Keywords: ecotoxicology, wastewater, aquatic biota

The Study on the Impact of Drought on Household Economy in Kbal Tuek Commune, Tuek Phos District, Kampong Chhnang Province

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Abstract

In the context of climate change, drought has occurred more frequently and severely. This study was conducted in four villages in Kbal Tuek commune, Tuek Phos district, Kampong Chhnang province order to (i) understand the socio-economics (ii) study on the characteristics and the impact of drought on household economy (iii) determine suitable adaptive measures to drought in the targeted area. Data was collected by Key Informant interview, Group Focus Discussion, and Household Interview. Then quantitative data was analyzed by Frequency, Crosstabs, Multiple-response, and One-way ANOVA. The study found that at least 75 per cent of household involved in rice production depending heavily on rainfall for household income. In 2014 rainfall in study site was 779 mm and 1,217 mm in Srea Ta Chey and Krang Ta Mom weather station respectively, which was lower than those in the last ten years. People faced drought in early and middle of rainy season but household in the four villages faced different duration of drought. With non-significant farming land size, rice yield in household faced shorter duration of drought was 1,668.48 kg and income per hector was 155.33 ten thousand riel which higher than those in longer drought-duration faced villages in which rice yield was between 845.46 kg and 943.24 kg and income per hector was between 76.13 and 90.08 ten thousand riel. Because of income from raising animals, agricultural income in the four villages was non-significantly different. So drought really has impacts on rice production but household still obtain income from other sources like cutting sugarcane, cutting trees and other non-agricultural activities to meet their household expanse. In order to reduce the impact of drought on household economy in the targeted area, water infrastructure should be rehabilitated and agricultural diversification should be encouraged.

Keywords: impact, drought, household economy

Small Scale Charcoal Producers Transforming Forest Space

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Abstract

This paper is an ethnographic study that examines the dynamics that revolves around charcoal production and how the charcoal producer's transforms their ecological space. A few studies conducted on charcoal production provided that this economic activity is not destructive to the forested environment. They argued that charcoal producer's utilized left-over lumber from trees and therefore do not put pressure on the forest itself. However, this paper exposed the dynamics of charcoal production as deleterious to the ecological forest. This study anchored on the theory of ecocide to explain the cultural adaptation of charcoal producers and the transformation of their forest areas. The research captured different scenarios of charcoal farming activities. It showed the realities of the charcoal producer's life as they struggle to survive in a challenging environment. The finding showed that the respondent's livelihood could not provide adequate sustenance to their family and they had to resort to charcoal production. Charcoal production was preferred because it does not involved monetary capital. Charcoal production as practice by the farmers put a lot of pressures to the forest but they could not disengage from this activity because of environmental constraints marginalizing their primary livelihood.

International Society of Environmental and Rural Development

Philosophy of ISERD:

Recently, in developing countries, subsistence agriculture is being converted to export-oriented mono-culture, and the amounts of agricultural chemicals applied to the farmland are increasing every year. The applied chemicals in farmland cause serious environmental problems downstream such as eutrophication, unusual growth of aquatic plants, decrease in dissolved oxygen and accumulation of bottom mud in water resources. Also, there seem to be many cases in which people apply agricultural chemicals without understanding its impact to health and food safety. Therefore, it is necessary to promote and enhance understanding of sustainable rural development among local stakeholders including farmers.

Sustainable rural development aims to meet human needs while preserving the natural environment. As it should cover not only social and economic development but also natural environment conservation, no single organization can achieve sufficiently the aspirations of sustainable rural development. Collaboration among international, governmental and non-governmental organizations, together with the academe and scientific sector, is indispensable.

The knowledge and intelligence accumulated in universities and research institutions are also expected to make the programs facilitated by the international, governmental and non-governmental organizations more adequately implemented and meaningful to societal development. However, these cases especially those implemented locally have been scattered without having been summarized well or recorded in annals academic or scientific societies.

So, the International Society of Environmental and Rural Development founded in 2010, aims to discuss and develop suitable and effective processes or strategies on sustainable rural development focusing on agricultural and environmental aspects in developing countries. The ultimate goals of the society are to contribute to sustainable rural development through social and economic development in harmony with the natural environment, and to support the potential or capacity building of local institutions and stakeholders in the rural area with academic background.

Purposes of ISERD:

The primary purposes of ISERD are to contribute to sustainable rural development through social and economic development in harmony with the natural environment and to support the potential or capacity building of local institutions and stakeholders in the rural area with academic background.

In order to enhance the realization of the primary purposes of ISERD, the secondary purposes are;

- to facilitate interaction among international, governmental, non-governmental organizations and local communities,
- to hold conferences or symposia on environmental and rural development,
- to publish the International Journal of Environmental and Rural Development, and
- to encourage and develop local awareness concerning sustainable rural development.

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There shall be two categories of membership.

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An application for membership of ISERD shall be submitted to the secretariat of ISERD, where is located in the Research Center at Institute of Environmental Rehabilitation and Conservation (Japan) by writing or by other appropriate means.

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The 7th International Conference on Environmental and Rural Development

16-17 January 2016, Phnom Penh, Cambodia

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Organizing committee: Providing general direction for the organizing the conference

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Acknowledgement

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www.idrc.ca

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www.searca.org

The United States Agency for International Development Cambodia, Supporting Forests and Biodiversity Project (SFB) is assisting Cambodia to conserve its forest and natural resources. The four-year project is implemented by Winrock International in cooperation with numerous international and local NGOs, and works in the Eastern Plains and Prey Lang Landscapes. The project is designed around three complementary objectives:

1. Enhance the effectiveness of government and key natural resource managers to sustainably manage forests and conserve biodiversity.
2. Facilitate constructive dialogue to promote better decision making and equity in forest management.
3. Increase equitable economic benefits from forest management.

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Research and Extension for Asian countries

Institute of Environmental Rehabilitation and Conservation

I. Aims

Institute of Environmental Rehabilitation and Conservation, called ERECON established in April 2000, is a non-profit international organization for research and extension programs. ERECON shall aim to contribute to sustainable use of natural resources in Asian countries. Therefore the organization shall pursue the environmental rehabilitation and conservation as well as the environmental education for the harmony between the agricultural and urban development and the natural environment.

II. Programs

ERECON shall conduct following non-profit programs on research and extension.

1. Program on environmental rehabilitation and conservation in Asian countries
2. Program on sustainable use of natural resources in Asian countries
3. Program on environmental education in Asian countries
4. Other programs for achieving ERECON aims

III. Structure

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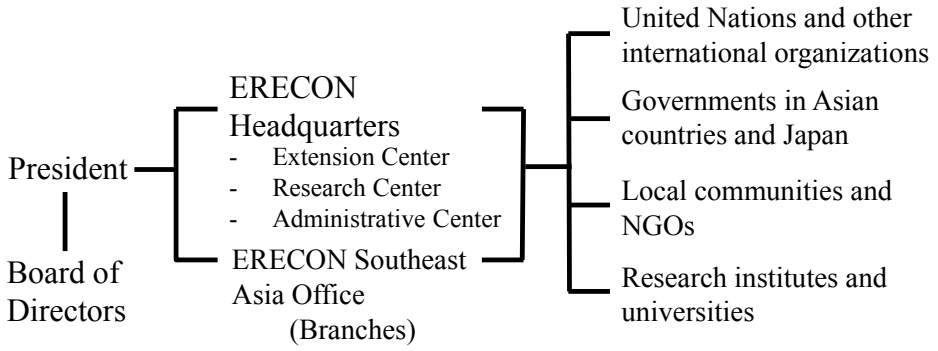

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