

Book of Abstracts

The 12th International Conference on Environmental and Rural Development (ONLINE)



From 5th to 6th March 2021

Organized by

International Society of Environmental and Rural Development
Institute of Environmental Rehabilitation and Conservation, Japan

Co-Organized by

United Nations University Institute for the Advanced Study of Sustainability

Collaborated with

The University of Queensland, Australia
The University of East Sarajevo, Bosnia-Herzegovina
Royal University of Agriculture, Cambodia
Tokyo University of Agriculture, Japan
Yezin Agricultural University, Myanmar
Bohol Island States University, Philippines
Khon Kaen University, Thailand
Association of Environmental and Rural Development, Thailand



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BACKGROUND: Under this circumstance of COVID-19 Pandemic, the International Society of Environmental and Rural Development has to decide that the 12th International Conference on Environmental and Rural Development is held by online during 5-6 March, 2021.

This online conference aims to discuss and develop the suitable and effective strategies for suitable agricultural and rural development taking into account of environmental aspects. Abstracts and Posters of all presentations are uploaded on the page set in the 12th ICERD of ISERD Website. Additionally, selected 48 presentations from all Thematic Sessions are invited to make online oral presentation.

Scientists and facilitators of all disciplines belonging to educational, research, international, governmental or non-governmental organizations are welcome to participate in the conference.

VENUE: Online (Zoom)

THEME: Approaches to Sustainable Agricultural and Rural Development

AG- Agricultural Systems and Food Innovation (*Organic farming, Conservation tillage, Mechanization, Irrigation and drainage, Nutrient and pest management, Agro-forestry, Indigenous technology, Animal management, Tropical feed resource, Food Science and Technology, Aquaculture, etc.*)

EM - Environmental Management (*Bio-diversity, Soil degradation and land conservation, Water quality conservation, Deforestation and sustainable forest management, Environmental management, etc.*)

RU - Rural Development (*Marketing, Partnership, Value added product, Community development, Access to technology, Gender, Cultural preservation, etc.*)

ED - Education for Sustainable Development (*Environmental education, Food and agricultural education, Participatory approach, Capacity building, Community empowerment, Agricultural extension, etc.*)

IN - Infrastructural Systems (*Water resource development, Land reclamation, Road construction, etc.*)

LANGUAGE: English

PUBLICATIONS: Full manuscripts from whom participated in the 12th ICERD are published in the International Journal of Environmental and Rural Development, IJERD after a peer-reviewing process.

HOST (12th ICERD): Research Center, Institute of Environmental Rehabilitation and Conservation

COMMITTEES:

Managing Committee:

President of ISERD Prof. Dr. Mario T. Tabucanon

Deputy Presidents of ISERD Prof. Dr. Bunthan Ngo, Prof. Dr. Anan Polthani, Prof. Dr. Eiji Yamaji

Organizing Committee:

Prof. Dr. Eiji Yamaji (Chair), Dr. Shinobu Terauchi (Co-Chair),

Prof. Dr. Jeeranuch Sakkhamduang, Ms. Mari Arimitsu and Ms. Keiko Aoki

Steering Committee:

Dr. Takashi Ueno (Chair), Ms. Keiko Aoki (Co-Chair),

Dr. Shinobu Terauchi, Ms. Mari Arimitsu, Dr. Sarvesh Maskey and Mr. Ognen Onchevski

Scientific Committee:

Prof. Dr. Machito Mihara (Chair), Prof. Dr. Jeeranuch Sakkhamduang (Co-Chair),

Dr. Kumiko Kawabe and Ms. Keiko Aoki

CHAIRMANSHIP:

Oral Presentation

Room 1

AG - Agricultural Systems and
Food Innovation

1st Session 10:30-12:00 (JST)

Chair

Dr. Chuleemas Boonthai Iwai

Co-Chair

Dr. Toru Nakajima

2nd Session 12:30-14:00 (JST)

Chair

Prof. Dr. Kiichiro Hayashi

Co-Chair

Dr. Nguyen Khoi Ngwia

3rd Session 14:30-16:00 (JST)

Chair

Dr. David R. Ader

Co-Chair

Dr. Narong Touch

Room 2

EM - Environmental Management

Chair

Prof. Dr. Machito Mihara

Co-Chair

Dr. Shuki Muramatsu

Chair

Prof. Dr. Barry Nollor

Co-Chair

Prof. Dr. Hiromu Okazawa

Chair

Dr. Junaid Alam Memon

Co-Chair

Dr. Chou Phanith

Room 3

RU - Rural Development,
ED - ESD, IN - Infrastructural Systems

Chair

Prof. Dr. Eiji Yamaji

Co-Chair

Prof. Dr. Marites M. Buot

Chair

Dr. Kasumi Ito

Co-Chair

Dr. Nina N. Shimoguchi

Poster Presentation

Chair **Prof. Dr. Regucivilla A. Pobar**

AG - Agricultural Systems and
Food Innovation

Co-Chairs

Dr. Borarin Buntong

Dr. Sergio Azael May Cuevas

EM - Environmental Management

Co-Chairs

Dr. Sinisa Berjan

Dr. Yuri Yamazaki

RU - Rural Development,
ED - ESD, IN - Infrastructural Systems

Co-Chairs

Dr. Mitsuru Hamano

Dr. Shinobu Terauchi

Scientific Program of the 12th ICERD ONLINE

ISERD / Research Center of ERECON Institute

Opening Ceremony

Moderators *Ms. Keiko Aoki and Prof. Dr. Machito MIHARA*

Zoom Access

<https://zoom.us/j/92651593076?pwd=bWlwYWZUMkZlcINGSDBZb2JUMU9xdz09>

[ZUMkZlcINGSDBZb2JUMU9xdz09](https://zoom.us/j/92651593076?pwd=bWlwYWZUMkZlcINGSDBZb2JUMU9xdz09)

*Zoom access is controlled,
so please kindly show your full name.*

Japan Standard Time

9:00-10:00

Opening Remarks

9:00-9:10

Professor Dr. Mario T. TABUCANON

ISERD President, Professor Emeritus at Asian Institute of Technology, and Senior Visiting Professor at the United Nations University Institute for the Advanced Study of Sustainability

Message from ISERD Councilors

9:10-9:20

Professor Dr. Machito MIHARA

ISERD Executive Secretary, Professor at Tokyo University of Agriculture, and President at Institute of Environmental Rehabilitation and Conservation, Japan

Introduction from ISERD Awards Committee

9:20-9:25

Professor Dr. Eiji YAMAJI (for Excellent Paper Award)

ISERD Deputy President, Professor Emeritus at the University of Tokyo, and General Director at Institute of Environmental Rehabilitation and Conservation, Japan

9:25-9:30

Professor Dr. Regucivilla A. POBAR (for Poster Presentation Award)

ISERD Regional Vice President (the Philippines), University President at Bohol Island State University, the Philippines

9:30-9:35

Professor Dr. Barry N. NOLLER (for Award of Sustainability Promotion)

ISERD Regional Vice President (Australia), Principal Research Fellow and Group Leader at Sustainable Minerals Institute, The University of Queensland, Australia

9:35-9:40

Professor Dr. Anan POLTHANEE (for Award of Outstanding Scientific Achievements)

ISERD Deputy President, Khon Kaen University, Thailand

Keynote Presentation

9:40-10:00

Professor Dr. Eiji YAMAJI

ISERD Deputy President, Professor Emeritus at the University of Tokyo, and General Director at Institute of Environmental Rehabilitation and Conservation, Japan

Scientific Session

10:30-16:00

Poster Presentations

All posters are exhibited in ISERD Website www.iserd.net. Please visit "Poster Presentation" located in "Conference" in the website.

10:30-16:00

10:30-12:00 **Session 1 Oral presentations**

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12:30-14:00 **Session 2 Oral presentations**

Please see following pages for Oral Presentation Program

14:30-16:00 **Session 3 Oral presentations**

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<i>Moderators</i>		<i>Mr. Ognen Onchevski and Dr. Takashi UENO</i>		<i>Dr. Sarvesh Maske y and Prof. Dr. Machito MIHARA</i>	
Zoom Access		https://zoom.us/j/98720211378?pwd=aWxkeEjU0JaejdGb2NqeTlsQ0lmdz09		https://zoom.us/j/92651593076?pwd=bWlwYWZUMkZlcINGSDBZb2JUMU9xdz09	
Chair		Dr. Chulemas Boonthai Iwai		Chair	
Co-chair		Dr. Toru Nakajima		Professor Dr. Machito Mihara	
Co-chair		Dr. Shuki Muramatsu		Co-chair	
Co-chair		Dr. Shuki Muramatsu		Professor Dr. Marites M. Buot	
<i>Japan Time</i>	<i>Code</i>	<i>Title</i>	<i>Code</i>	<i>Title</i>	<i>Code</i>
10:30-10:45	AG-01	Effect of Different Mulching Types on Insect, Disease Infestation and Yield of Onions (<i>Allium cepa</i> L.) <i>Chanthin Ouk and Kim Eang Tho</i>	EM-09	Evaluation of Site Contamination from Storage of Fertilizer <i>Barry N Noller</i>	RU-04
					Government-orientation on Contract Farming to Enhance the Confidence of Agricultural Investment in Cambodia <i>Vouchsim Kong, Vichhay Siek, Hour Phann, Pheach Kong, Borarin Buntong, Vutey Venn and Ravindra Chandra Joshi</i>
10:45-11:00	AG-14	The Acquisition of Passive Immunity (IgG) in the Newborn Piglets from Parity Sows in Contract Farm, Takeo Province, Cambodia <i>Vutey Venn, Phea Sum, Pheary Mol, Sovannkongkea Yan, Bunna Soychan, Laville Ly, Retha Mong and Alongkot Boonsoongnern</i>	EM-27	Effects of Chemical Extraction Methods on Physicochemical Properties of Shrimp Chitosan <i>Socheat Tong, Borarin Buntong, Laikong Sophal and Sokmean Vann</i>	RU-05
					Possibility of Value Addition on Traditional Rice Liquor in Cambodia <i>Mitsuru Hamano, Takashi Kuroda, Chim Chay, Boratana Ung and Kasumi Ito</i>
11:00-11:15	AG-15	Potential Measurement as a Method for Monitoring the Soil Chemical Environment <i>Narong Touch and Takahiko Nakamura</i>	EM-17	Effect of Adding Agricultural and Organic Lime on Survival Rate of <i>E. coli</i> and General Bacteria in Farmland Soils in Kampong Cham Province, Cambodia <i>Muyleang Kim and Machito Mihara</i>	RU-06
					Status of Production and Distribution Channel of Cassava in Cambodia -Future Prospects for Sustainable Production- <i>Kasumi Ito, Aya Nakatani, Tamon Baba, Hisako Nomura, Tha Than and Pao Srean</i>
11:15-11:30	AG-07	Effect of Temperature on the Cohort Life Table of Brown Planthopper (<i>Nilaparvata Lugens Stål</i>) (Homoptera: Delphacidae) <i>May Thu Htet, Moe Hnin Phyu and Thi Tar Oo</i>	EM-26	Identification of Glyphosate Tolerance Soil-borne Bacteria from Coconut, Coffee and Oil Palm Plantations in Universiti Putra Malaysia <i>Keiko Aoki, Wei Hong Lau and Vinailosni A/P Amirthalingam</i>	RU-08
					Factors Driving the Effectiveness of Community Fisheries Management Resulted from Fisheries Policy Reforms <i>Kaing Khim, Hori Mina, Kang Kroesna and So Nam</i>
11:30-11:45	AG-11	The Effect of the Application of Compost and Chemical Fertilizer on the Growth and Yield of Rice (<i>Oryza sativa</i> L.) <i>Theingi Win, Swe Swe Mar, Kyi Kyi Shwe, Win Yu Hlaing, Hsu Myat Thwin, Kyaw Ngwe and Toru Sakai</i>	EM-02	Preparation of Effective Microorganisms Based Compost Using Some Selected Wastes for Improvement of Plants Growth <i>Thi Dar Khaing</i>	ED-01
					School Gardens as a Method of Scaling Up Sustainable Technologies: A Review <i>Gracie Pekarcik and David Ader</i>
11:45-12:00	AG-20	Evaluation of Some Nutritional Values and Antioxidant Activities of Dried Tea Leaves in Seasonally <i>Chaw Su Hlaing, A Mar Wint, Ohn Mar Aye, Myo Thida Hteik</i>	EM-12	Study on the Water Quality of Indawgyi Lake Effected by Surroundings <i>Moe Tin Khainga and Daung Hawng</i>	RU-09
					Cambodian Culinary Tourism and Gastrodiplomacy: Challenges and Opportunities in a Post-COVID-19 World <i>Anna Di Nicola, Kristaps Kadikis and Lara Dunston</i>

30 minutes Break

Room 1 Agricultural Systems and Food Innovation		Room 2 Environmental Management		Room 3 Rural Development, Education for Sustainable Development and Infrastructural Systems		
<i>Moderators</i>		<i>Mr. Ognen Onchevski and Dr. Takashi UENO</i>		<i>Dr. Sarvesh Maske y and Prof. Dr. Machito MIHARA</i>		
Zoom Access		https://zoom.us/j/91861066770?pwd=Z2ZWUjdVeStJckZ2TDFQZDZIN0RlZz09		https://zoom.us/j/99852541034?pwd=cnRLUnB0OTFFR2diYVEvR0ozOW9Ndz09		
	Chair	Professor Dr. Kiichiro Hayashi	Chair	Professor Dr. Barry Nollor	Chair	
	Co-chair	Dr. Nguyen Khoi Ngwia	Co-chair	Professor Dr. Hiromu Okazawa	Co-chair	
<i>Japan Time</i>	<i>Code</i>	<i>Title</i>	<i>Code</i>	<i>Title</i>	<i>Code</i>	
12:30-12:45	AG-05	Characterization and Diversity of Selected Maize (<i>Zea mays</i> L.) Genotypes Using Qualitative Traits <i>San Kyi, Kyaw Kyaw Win, Hla Than, Soe Win and Nyo Mar Htwe</i>	EM-03	Assessment of Soil Properties Using GIS Technologies in Selected Area of Myanmar <i>Hla Moe Khaing, Kyaw Ngwe, Swe Swe Mar and Htay Htay Oo</i>	RU-10	Farm to Market: Post Covid-19 Opportunities and Challenges for Farmers in Kampong Cham Province <i>Mari Arimitsu, Kumiko Kawabe and Machito Mihara</i>
12:45-13:00	AG-02	Study on use of Plant Based Material as a Fertilizer <i>Pa Pa San</i>	EM-04	Spatial Variability and Mapping of Soil Properties Using GIS-Based Geostatistic in Myanmar <i>Tun Tun Hlaing, Swe Swe Mar, Chaw Su Lwin, Htay Htay Oo and Kyaw Ngwe</i>	EM-01	Economic Assessment of Biogas Production Potential from Commercial Pig Farms in Cambodia <i>Lyhour Hin, Bunthan NGO, Lytour LOR, Sengheang SUY, Dyna THENG, Chanphakdey DOK, Sokhom MECH, Chan Makara MEAN, Sovannndy YUT, Makara LAY, Rachana KONG, and Bart FREDERIKT</i>
13:00-13:15	AG-12	Effect of Chicken Manure and Chemical Fertilizer Applications on Growth and Yield of Rice (<i>Oryza sativa</i> L.) <i>Kyi Kyi Shwe, Swe Swe Mara, Theingi Win, Win Yu Hlaing, Hsu Myat Thwin, Kyaw Ngwe and Toru Sakai</i>	EM-08	Spatial Variability of Soil Salinity and its Influence on Rice Yield in Salt-affected Areas Using Remote Sensing Techniques <i>Aung Naing Oo and Lwin Bo Bo Thet</i>	ED-02	The Application of Intervention Mapping in Developing Parental Behavior Modification Program for Pesticide Exposure Prevention among Children in Agricultural Areas for Sub-District Health Promotion Hospital, Thailand <i>Chakkrit Ponrachom, Satee Siritwat, Apiradee Wangkahard and Sriwipa Chuangchaiya</i>
13:15-13:30	AG-24	Assessment of Some Promising Lines of Rice (<i>Oryza sativa</i> L.) for Salt Tolerance Using Microsatellite Markers Associated with the saltol QTL <i>Moe Kyaw Thu, Aung Naing Oo, Nyo Mar Htwe, Ohn Mar Lynn and Khin Thida Myint</i>	EM-18	Relationship between NDVI and Canopy Cover Sensed by Small UAV under Different Ground Resolution <i>Ke Zhang, Hiromu Okazawa, Yuri Yamazaki, Kiichiro Hayashi and Osamu Tsuji</i>	EM-06	Assessment of Insect Damage and Growth Performance of Dipterocarps Planted at Rainforestation Demonstration Farm at VSU, Baybay City, Leyte <i>Kleer Jeann Galgo Longatang, Maria Juliet C. Ceniza, Jimmy O. Pogosa, Dennis P. Peque, Marlito Jose M. Bande, Leonard Paolo Longatang</i>
13:30-13:45	AG-19	Assessment of Soil Quality of Different Practices for Rain-fed Lowland Rice Farming in Cambodia-Using Biofunctool Approach <i>Sar Veng, Kannika Sajiaphan, Wuthida Rattanapichai, Rada Kong, Alexis Thoumazeau and Florent Tivet</i>	EM-21	Spatial Analysis on Distribution of Yield and Management Practices of Rice in Selected Area of Central Myanmar <i>Aye Myat Mon, Ye Phyo Mon, Tin Nwe Win, Arkah Myint, Myat Moe Hlaing and Than Myint Htun</i>	EM-24	Changing Spent Mushroom Substrate into a Quality Vermicompost <i>Supawadee Ruangjanda and Chuleemas Boonthai Iwai</i>
13:45-14:00	AG-10	Evaluation and Preference Analysis of Improved Rice Genotypes in Thar Ga Ya Village, Tharsi Township, Myanmar <i>Nyo Mar Htwe, Su Latt Phyu and Khant Sanda Htet</i>	EM-28	Interactions among Soil Physical, Chemical and Biological Properties under Different Farming Systems <i>Marisol Terashima and Machito Mihara</i>	EM-16	Water Harvesting as a Mean for Water Conservation in Ovche Pole Region, Macedonia <i>Ognen Onchevski and Machito Mihara</i>

30 minutes Break

Room 1	Agricultural Systems and Food Innovation	Room 2	Environmental Management	Room 3	k.LAB Seminar
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<i>Moderators</i>		<i>Mr. Ognen Onchevski and Dr. Takashi UENO</i>		<i>Dr. Sarvesh Maskey and Prof. Dr. Machito MIHARA</i>		<i>Ms. Keiko Aoki and Dr. Shinobu YAMADA</i>	
Zoom Access		https://zoom.us/j/91861066770?pwd=Z2ZWUjdVeStJckZ2TDFQZDZIN0RlZz09		https://zoom.us/j/99852541034?pwd=cnRLUnB0OTFFR2dlYVEvR0ozOW9Ndz09		https://zoom.us/j/99335953906?pwd=VzBUNU5tTWVwd3ZnWWwxZlZldjYzUT09	
Chair		Dr. David R. Ader		Chair		Dr. Junaid Alam Memon	
Co-chair		Dr. Narong Touch		Co-chair		Dr. Chou Phanith	
<i>Japan Time</i>	<i>Title</i>	<i>Code</i>	<i>Title</i>	<i>Title</i>			
14:30-14:45	EM-15 Monitoring of Water Quality During the Dry Season in Cheung Ek Lake, Cambodia <i>Somara Oum and Machito Mihara</i>	EM-19	Conservation and Ecological Threats of Agarwood (<i>Aquilaria</i> sp.) on Leyte Island, Philippines <i>Lorraine Cristy E. Ceniza, Jimmy O. Pogosa, Suzette B. Lina and Marlito M. Bande</i>	What is Artificial Intelligence for Environment and Sustainability; ARIES Approach <i>Professor Dr. Ferdinando Villa</i> (video)			
14:45-15:00	AG-25 Rice Varietal Assessment for Climate Change Adaptation from Socioeconomic Point of View: A Study in Myitthar Township <i>Shwe Mar Than, Yin Nyein Aye and Yin Yin Thant</i>	EM-20	Growth Performance of <i>Trema orientalis</i> L. (Blume) Ulm. Seedlings in Response to Mineral Nutrient Omission <i>Ken N. Florentino, Jimmy O. Pogosa, Rommel B. Armecin and Marlito Jose M. Bande</i>	k.LAB Demonstration <i>Professor Dr. Kiichiro Hayashi</i>			
15:00-15:15	AG-06 Evaluation of Selected Chemical, Biological Fungicides, and Induced Resistance to Control White Rot (<i>Sclerotium rolfsii</i> Sacc.) on Tomato <i>Penghaing Ly, Tho Kim Eang, Nget Raby, Ong Socheat and Ouk Chanthin</i>	EM-13	Soil Organic Carbon Stabilization on Forested and Deforested Red-Yellow Soil under Different Temperature Conditions <i>Arostegui Keiji and Machito Mihara</i>	Mini Hydro Models <i>Dr. Yuri Yamazaki</i>			
15:15-15:30	AG-13 The Influence of Packaging Materials and Storage Duration on Seed Quality of Sesame (<i>Sesamum indicum</i> L.) <i>Hnin Thida Nyo, Nyein Nyein Htwe and Kyaw Kyaw Win</i>	EM-23	Effects of Air Injection and Iron Oxide Pellet Addition on Hydrogen Sulfide Removal and Biogas Production <i>Lytour Lor, Machito Mihara, Bunthan Ngo, Lyhour Hin, Dyna Theng, Sokhom Mich, Chan Makara Mean, Chhiengputheavy Chhorth and Bart Frederiks</i>	Future Perspective <i>Professor Dr. Hiromu Okazawa</i>			
15:30-15:45	AG-16 Evaluation of Acceptability of Cashew Apple Jam in Cambodia <i>Sokly Sorn, Yoshiki Muramatsu, Daiki Oka, Yuri Tanikoka, Masataka Uchino, Shuki Muramatsu, Motoe Sekido, Takahiko Nakamura, Toru Nakajima, Eiichiro Sakaguchi, Shotaro Kawakami, Chim Chay, Mari Arimitsu and Machito Mihara</i>	EM-14	Effects of Adding Rice Husk Biochar in GHG Emission and Compost Quality during Cow Manure Composting <i>Sarvesh Maskey and Machito Mihara</i>				
15:45-16:00	AG-23 Physiochemical and Preferences of Goat and Cow Milk Products <i>Pisey Vong, Sath Keo, Chim Chay and Mom Seng</i>	EM-05	Production and Uses of Crop Residues in Cambodia: Rice Straw, Corn Stalk, Cassava Stem <i>Dyna Theng, Lytour Lor, Chhengven Chhoem, Kanhara Sambath, Pisey Vong, Sorkuthika Srou, Vathana Chamroeun, Davuth Eang, Makara Lay, Gerald Hitzler and Rajiv Pradhan</i>				

Move to Closing Ceremony with Announcement of Award Winners

Closing Ceremony

Moderators *Ms. Keiko Aoki and Prof. Dr. Machito MIHARA*

Zoom Access

<https://zoom.us/j/99852541034?pwd=cnRLUnB0OTFFR2dIYVEvR0ozOW9Ndz09>

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Japan Standard Time

16:30-17:00 16:30-16:50

Announcement of Award Winners

For *Excellent Paper Awards* : **Prof. Dr. Eiji YAMAJI**,
For *Poster Presentation Awards* : **Prof. Dr. Regucivilla A. POBAR**,
For *Award of Sustainability Promotion* : **Prof. Dr. Barry N. NOLLER**,
For *Award of Outstanding Scientific Achievements* : **Prof. Dr. Anan POLTHANEE**

16:50-16:58

Invitation to 13th ICERD held in Bohol, the Philippines

Professor Dr. Regucivilla A. POBAR

ISERD Regional Vice President (the Philippines), University President at Bohol Island State University, the Philippines

16:58-17:00 **Group photos**

taken by **Dr. Takashi UENO**
Director (Administrative) at Institute of Environmental Rehabilitation and Conservation, Japan

Looking forward to meeting you at the 13th ICERD in Bohol, the Philippines in March 2022

All Presentations

Agricultural Systems and Food Innovation (AG)

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| AG-02 | Study on Use of Plant Based Material as a Fertilizer
<i>Pa Pa San</i> | 8 |
| AG-03 | Establishment of Optimized Manufacturing Conditions for Cooked Rice -Part I- Equilibrium Moisture Content and Latent Heat of Vaporization of Cooked Rice
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| AG-04 | Establishment of Optimized Manufacturing Conditions for Cooked Rice -Part II- Moisture Transfer Kinetics of Cooked Rice When Drying and Soaking in Water
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<i>San Kyi, Kyaw Kyaw Win, Hla Than, Soe Win and Nyo Mar Htwe</i> | 11 |
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| AG-09 | Effects of Flooding Stress at Different Stage on Growth and Aerenchyma Formation in Adventitious Roots of Sugarcane under Greenhouse Conditions
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<i>Nyo Mar Htwe, Su Latt Phyu and Khant Sanda Htet</i> | 15 |
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AG-21	Effect of Different Protein Levels on Growth Performance of Weaned Goat Kids <i>Phath Rathana, Vong Pisey, Prak Kea, Keo Sath and Seng Mom</i>	25
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AG-01

Effect of Different Mulching Types on Insect, Disease Infestation and Yield of Onions (*Allium cepa* L.)

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Abstract

Onion bulbs (*Allium cepa* L.) are important vegetables in Cambodia. However, they are mainly imported from neighboring countries, due to a lack of farmer skills, research and extension. This research was carried out to assess the effect of different mulching types on insect, disease infestation, and yield of onions. The experiment was conducted at the field farmer, Pouk district, Siem Reap province. The experiment was designed in randomized complete blocks design (RCBD) with eight treatments and 4 replications, 32 plots. The experimental treatments were: No mulch + Earth F1 (T1), No mulch + Texas Early Grano 502 PPR (T2), Rice Straw mulch + Earth F1 (T3), Rice Straw mulch + Texas Early Grano 502 PPR (T4), Silver Polythene mulch + Earth F1 (T5), Silver Polythene mulch + Texas Early Grano 502 PPR (T6), Black Polythene mulch + Earth F1 (T7) and Black Polythene mulch + Texas Early Grano 502 PPR (T8). Application of all treatments improved soil temperature, leaf number plant⁻¹, stand count, bulb diameter, single bulb, Insect incidence, Disease incidence and bulb yield as different of all treatments. As the result, the bulb yield of onions among the treatments was found superior in treatment (T8) with Black Polythene mulch + Texas Early Grano 502 PPR (44.81t/ha) followed by Silver Polythene mulch + Texas Early Grano 502 PPR (40.37 t/ha) and Rice Straw mulch + Texas Early Grano 502 PPR (33.56 t/ha) while the lowest was found in No mulch + Earth F1 (7.18 t/ha).

Keywords: Onion (*Allium cepa* L.), mulch, infestation and yield



AG-02

Study on Use of Plant Based Material as a Fertilizer

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Abstract

Soil is the mixture of mineral, organic material, living organisms, air and water that together support the growth of plant life. Fruit peels contain potassium, vitamins, minerals and some essential elements which enhance the growth of plant. Generally, fruit peels are thrown in garbage and it goes to solid waste dumping site. That causes odour problem due to degradation of peel content in dumping site. The present study deals with the utilization of different fruit peels such as orange peels and banana peels as fertilizer added to soil. The soil sample was collected from Shar-Taw-Lay village, Amarapura Township, Mandalay, Myanmar. Three soil samples were investigated by addition of organic waste fruit peel powder of orange and banana. Soil sample, S₁ (2000 g soil) as control, soil sample, S₂ (2000 g soil + 500 g orange peel powder) and soil sample, S₃ (2000 g soil + 500 g banana peel powder) were fertilized soil. The physicochemical properties of three soil samples such as pH, electrical conductivity, bulk density and texture were determined. The elemental composition of three soil samples was measured by applying EDXRF. The content of N, P, K nutrients of three soil samples were determined by chemical instrumental method. Different fruit peel powder add soil to compare the plant growth were investigated. The chemical fertilizers can be replaced by the fruit peel powder to protect the soil from the infertility. This fruit peel materials have not cost bearing and thus aids in converting this waste into a usable resource.

Keywords: fertilizer, fruit peel powder, nutrient



AG-03

Establishment of Optimized Manufacturing Conditions for Cooked Rice -Part I- Equilibrium Moisture Content and Latent Heat of Vaporization of Cooked Rice

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Abstract

The development of processed food made from rice at production location is expected to lead to regional revitalization and increased income for farmers. A simply processed food made from rice is dried cooked rice or pregelatinized rice. A general manufacturing process of dried cooked rice is as follows: 1) washing raw rice, 2) soaking the washed rice in water, 3) cooking or steaming the rice (the raw rice starch is changed to pregelatinized starch), 4) separating the rice kernel from the mass of cooked rice to a single cooked rice, and 5) drying the cooked rice. The dried cooked rice is usually rehydrated with water or hot water and then eaten. To determine the storage conditions and analyze the drying process, it is necessary to know the relationship between the equilibrium moisture content in the foodstuffs and the equilibrium relative humidity of the drying air or aeration air at a given temperature. This relationship is described by sorption isotherm equations. Knowledge of the moisture sorption isotherms of foodstuffs is valuable in solving food processing and engineering problems such as equipment design, drying, and storage processes as well as predicting shelf life. The latent heat of vaporization of water in foodstuffs is important for the design of drying equipment. The equilibrium moisture contents of cooked milled rice in the desorption process were measured at several temperatures (20-60 °C) and relative humidity levels (10-86 %) by a static method. The equilibrium moisture content of the sample increased with increasing equilibrium relative humidity at a constant temperature and increased with a decrease in temperature at any given equilibrium relative humidity. The Chen-Clayton equation, which is a sorption isotherm, was used to express the relationship between the equilibrium moisture content of the sample, equilibrium relative humidity, and absolute temperature. The latent heat of vaporization of water for the cooked rice was calculated by using the Chen-Clayton equation and thermodynamic theory (Clapeyron equation). At a moisture content of 5-30 % (d.b.), the latent heat of vaporization of the sample decreased almost exponentially with an increase in moisture content. For samples at a moisture content above 50 % (d.b.), the values of latent heat of vaporization sufficiently approached that of free water.

Keywords: cooked-rice, food processing, equilibrium moisture content, latent heat of vaporization, equilibrium relative humidity, sorption isotherm equations, Chen-Clayton equation



AG-04

Establishment of Optimized Manufacturing Conditions for Cooked Rice -Part II- Moisture Transfer Kinetics of Cooked Rice When Drying and Soaking in Water

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Abstract

The development of processed food made from rice at production location is expected to lead to regional revitalization and increased income for farmers. A simply processed food made from rice is dried cooked rice or pregelatinized rice. A general manufacturing process of dried cooked rice is as follows: 1) washing raw rice, 2) soaking the washed rice in water, 3) cooking or steaming the rice (the raw rice starch is changed to pregelatinized starch), 4) separating the rice kernel from the mass of cooked rice to a single cooked rice, and 5) drying the cooked rice. The dried cooked rice is usually rehydrated with water or hot water and then eaten. To determine the storage conditions and analyze the drying process, it is necessary to know the relationship between the equilibrium moisture content in the foodstuffs and the equilibrium relative humidity of the drying air or aeration air at a given temperature. This relationship is described by sorption isotherm equations. The data of the drying characteristics, equilibrium moisture content, latent heat of vaporization for cooked rice, and water absorption (rehydration) characteristics of dried cooked rice are required for optimizing processing operations, designing equipment, and ensuring high quality. The thin-layer drying characteristics of cooked milled rice during hot air-drying were measured at four temperatures (30, 40, 50, and 60 °C) and at a relative humidity of 40 %. The hot air-drying process of the sample was composed of the first falling rate, and the exponential model was applied to predict the changes in moisture content of the sample at each temperature. The drying rate constant of the sample increased as temperature increased and was expressed as an Arrhenius-type equation. The water absorption characteristics of dried cooked milled rice when soaking in water were examined at four temperatures (70, 80, 90, and 98 °C). The ratios of the changes in moisture content from 8 to 150 % (d.b.) were converted from the data of changes in moisture content. The first-order reaction rate equation could be applied to explain the water absorption process of samples. The water absorption rate constant had a tendency to increase with increasing soaking temperature and was expressed as a function of soaking temperature by an Arrhenius-type equation.

Keywords: cooked-rice, food processing, equilibrium moisture content, latent heat of vaporization, equilibrium relative humidity, water absorption rate, soaking temperature, Arrhenius-type equation



AG-05

Characterization and Diversity of Selected Maize (*Zea mays* L.) Genotypes Using Qualitative Traits

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Abstract

Phenotypic traits qualitatively and quantitatively are helpful as a preliminary evaluation of maize genetic diversity and provided practical and critical information required characterizing genetic resources. To find out the varietal characterization and grouping with similarity, fifty maize genotypes including hybrids and inbreds were examined in this experiment. This experiment was carried out in a randomized complete block design with three replications during wet season from June to October, 2019, at Maize and other Cereal Crops Section, Department of Agricultural Research (DAR), Yezin Nay Pyi Taw, Myanmar. The qualitative characters were recorded at different growing stages according to the International Union for the Protection of New Varieties of Plants (UPOV) Test Guide line (TG). The agglomerative cluster analysis was computed using Ward's hierarchical algorithm based of qualitative characters. According to the results, diverse qualitative traits were observed among the tested genotypes and genotypes varied different qualitative traits with different frequencies. Thus, comparisons of qualitative traits were made to know the extent of variation among maize varieties under investigation to estimate the genetic diversity. The tested maize genotypes could be grouped five clusters based on qualitative traits. Although some maize genotypes collected in an area are included in different groups because of the different characteristics they pose. Since qualitative characters have less environmental influences, these traits could be used for Distinctness, Uniformity and Stability (DUS) test and Value for Cultivation and Use (VCU) testing of plant varieties. Thus, the application of morphological markers according to UPOV descriptor could contribute to more efficient selection of parental pairs in the early generations of testing.

Keywords: cluster, variation, characters, maize genotypes

AG-06

Evaluation of Selected Chemical, Biological Fungicides, and Induced Resistance to Control White Rot (*Sclerotium rolfsii* Sacc.) on Tomato

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Abstract

Recent scouting at farmer's tomato fields in Siem Reap province, Cambodia revealed the high incidence of white rot on the plant's base with brown sclerotinia on the infecting areas. However, the disease incidence in the areas would be high if tomato plantation was done in rainy season or high humidity soil. This study was conducted to "EVALUATION OF SELECTED CHEMICAL AND BIOLOGICAL FUNGICIDES, AND INDUCED RESISTANT TO CONTROL WHITE ROT (*Sclerotium rolfsii* Sacc.) ON TOMATO". These experiments were conducted in Royal University of Agriculture, Cambodia, and divided into two sections. First section was conducted in vitro condition consist of four treatments T1 control treatment, T2 copper hydroxide, T3 azoxystrobin + difenoconazole, T4 metalxyl + mancozeb in Nagoya Laboratory started from 11st May to 15th May 2020. For section two was conducted in pot in net-house which started from 01st January 2019 to 19th February 2019 and 01st January to 19th February 2020 and arranged in Randomized Completely Block Design (RCBD) with six replications and nine treatments. T0 Negative control, T1 Inoculate but not treatment, T2 metalaxyl + mancozeb, T3 azoxystrobin + difenoconazole, T4 copper hydroxide, T5 acibenzolar-S-methyl, T6 chicken dung + *Trichoderma harzianum*., T7 acibenzolar-S-methyl + chicken dung + *Trichoderma harzianum*, T8 acibenzolar-S-methyl + metalaxyl + mancozeb. Based on the result in vitro condition metalaxyl + mancozeb was highly inhibited germination of *Sclerotium rolfsii*. when compared with another treatments. While application of copper hydroxide seems less effective compared with control. For in pod experiment, when treated after symptom appeared seem less effective on severity of southern blight. In contrast, when applied as protectant and curative when symptom appeared only systemic fungicide azoxystrobin + difenoconazole was significantly in reduced severity of *Sclerotium rolfsii* and delayed incubation period while compared with another treatments ($P < 0.05$) and followed by metaxyl + mancozeb. Whereas, copper hydroxide, acibenzolar-S-methyl, chicken dung + *Trichoderma harzianum*, acibenzolar-S-methyl + chicken dung + *Trichoderma harzianum*, acibenzolar-S-methyl + metalaxyl + mancozeb were less effective ($P > 0.05$). Based on the three experiments we can assume that fungicides were more effective in reduced growth of the pathogen and delayed incubation period of fungal colonization when compared with biological control and induced resistance.

Keywords: Tomato, White Rot, *Sclerotium rolfsii* Sacc., biological fungicide, chemical fungicide, Randomized Completely Block Design, *Trichoderma harzianum*



AG-07

**Effect of Temperature on the Cohort Life Table of Brown Planthopper
(*Nilaparvata Lugens Stål*) (Homoptera: Delphacidae)**

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Abstract

Different constant temperatures (24, 28, 32, and 36 °C) and room temperature used as treatments for the experiment done at the JICA-ELB 1 Laboratory, Department of Entomology and Zoology, Yezin Agricultural University from September 2019 to January 2020. This study aimed to investigate the effect of temperature on brown planthopper population dynamics and forecast information to the farmers for BPH outbreak. Test tube for oviposition filled with four gravid females from the colony. Each test tube removed the females after 24 hr. Rice plants with eggs were covered with cotton and placed at different temperatures. Each rice plant has studied for egg hatching. After hatching, the first instars were collected individually with the help of camel hairbrush and transferred to a new test tube with a new rice plant. The later instars were collected and transferred as the same way. The number of hatched and unhatched eggs counted from the old one. The nymphs were monitored daily for life table parameters until the adult emerges and the adult died. In the life table analysis, BPH's highest mortality has occurred in the first nymphal instar, which resulted in type III survivorship curve. However, 100% of mortality has happened in the egg stage at 36 °C. Brachypterous and macropterous forms' life table showed the high net reproductive rate at lower temperature regimes. The growth parameters of BPH have decreased at 36 °C, which reveals that the temperature increase above 32 °C is detrimental to the development of BPH. Results indicated that the egg and nymphal stages were significantly affected by temperature. Eggs hatching also decreased drastically with an increase in temperatures, especially at 36 °C.

Keywords: constant temperature, *Nilaparvata lugens*, life table parameters, rice



AG-09

Effects of Flooding Stress at Different Stage on Growth and Aerenchyma Formation in Adventitious Roots of Sugarcane under Greenhouse Conditions

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Abstract

Typical undulating landform of growing rice in north-eastern Thailand can be divided to upper and lower paddy fields. Rice grown in upper paddy fields, normally produced low yield which associated with global climate change in recent year caused rainfall to stop early during grain filling growth stage of rice. Department of Agriculture, Ministry of Agriculture and Cooperative, Thailand suggested farmers to shift of land use pattern by replacing rice with sugarcane economic crop. However, sugarcane upland crop in the fact that grown in upper paddy fields may experience to temporary flooding stress, due to heavy rain in the mid rainy season. Therefore, the objectives of this research work were to investigate the effects of flooding stress at different stages on growth and adaptation mechanism of sugarcane under greenhouse conditions. The sugarcane KK3 cultivar of the most popular employing by the farmers in the northeast was tested in the present study. Three growth stages (2, 3 and 4 months of age) were flooded for 30 days in comparison with no-flooding (control) laid out in a completely randomized design with four replications. There was no significant difference ($p \leq 0.05$) between plant height, tiller number, stem fresh weight, but significant difference was observed in leaves area and leaves dry weight at the time of harvest (8 months). The maximum leaves area and leaves dry weight were obtained in the non-flooding treatment. During flooding stress, some roots dried and adventitious roots with well formation of aerenchyma appeared from the submerged nodes, which may help plants to continue to take up water and nutrients, act as adaptation mechanism of sugarcane crop. As final stem fresh weight of sugarcane when experienced to prolong flooding stress (30 days) at different stages were similar as compared to well-watered entire the growing period (control). This indicates that sugarcane crop is fairly tolerance to flooding stress and could sustain high yields when their grown in the upper paddy fields under global climate change in recent year.

Keywords: sugarcane, flooding stress, adventitious roots, aerenchyma formation



AG-10

Evaluation and Preference Analysis of Improved Rice Genotypes in Thar Ga Ya Village, Tharsi Township, Myanmar

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Abstract

The experiment was conducted to identify high yielding and acceptable improved rice genotypes adapted to studied environment through farmers' participation. The experiment was conducted with randomized complete block design with three replications in TharGaYa village, Tharsi township, Myanmar. The sixteen improved rice lines and two check varieties were used. Farmers' votes for acceptance and rejection of varieties at vegetative and pre-harvest stages and were converted to a preference score. The significant difference among tested genotypes were found in yield per plant and its related characters. From the preference analysis, farmers and researchers selected SM1/THY-DH-1-1 was the best at vegetative stage followed by YAU-1214-183-3-1-2-1-1 and YAU-1201-90-2-4. At pre-harvest stage, farmers and researchers elected YAU-1211-90-2-4 was the best followed by YAU-1214-183-35-1-1-1 and YAU-1214-183-3-1-1-1-1. According to the sensory evaluation test, the best line was YAU-1201-90-2-4 and followed by YAU-1211-26-1-1 and YAU-1201-26-1-3. There was a very strong agreement between the male and female farmers' preference for the best performing lines. However, a weak correlation between scientists and farmers were identified. This indicated that farmers' and scientists' set different criteria on selecting the good performing lines. Farmers have shown their own way of selecting a variety for their localities such as uniformity, lodging, panicle length, effective tillers and earliness. Therefore, it is important to include farmers' preferences in a variety selection process.

Keywords: correlation, preference score, sensory evaluation, variety selection

AG-11

The Effect of the Application of Compost and Chemical Fertilizer on the Growth and Yield of Rice (*Oryza sativa* L.)

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Abstract

Turnover of compost to the soil can increase the efficiency of chemical fertilizers, improve the plant growth and sustain the environment. The field experiment was conducted at Yezin Agricultural University Farm, Yezin, Nay Pyi Taw, during wet season from July to November, 2020 to support the sustainable rice production with optimum productivity for farmers. The experiment was arranged in randomized complete block (RCB) design with four replications. The treatments were contained as T1 (control) (no fertilizer), T2 (100-16-66-12 kg N, P, K, S) ha⁻¹, T3 (4ton ha⁻¹) (Compost), T4 (4ton ha⁻¹) (Compost) + (50-8-33-6 kg N, P, K, S) ha⁻¹. The Urea, Triple super phosphate, Muriate of potash and Gypsum were used as N, P, K and S sources and the tested rice variety was Sinthukha. The plant growth characters were collected at biweekly interval and yield and yield components were recorded at harvest time. Based on the results, yield and yield components of all treatments were responded to different application materials. T4 produced number of panicles hill⁻¹, number of spikelets panicle⁻¹, filled grain percent, and harvest index and it was superior than other treatments. T4 achieved the more grain yield (7.93 tons ha⁻¹) and the lowest grain yield (5.71 tons ha⁻¹) was observed in T1. The maximum grain yield higher over T1 was obtained in the treatments followed by (7.03 tons ha⁻¹) T2 and (6.36 tons ha⁻¹) T3 treatments. According to the result of this study, the application of compost reduced the numbers of empty grain per tiller compared to control. Therefore, it was necessary to apply organic materials such as compost which is easy to reduce cost than chemical fertilizers and use for recovering of soil nutrients. Application of composts increased the rice grain up to 11-39 % compared to control.

Keywords: rice, chemical fertilizer, compost, yield

AG-12

Effect of Chicken Manure and Chemical Fertilizer Applications on Growth and Yield of Rice (*Oryza sativa* L.)

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Abstract

The field experiment was conducted at Yezin Agricultural University Farm, Yezin, Nay Pyi Taw, during wet season from July to November, 2020 to investigate the effect of chicken manure and chemical fertilizer applications on growth, yield and yield components of rice. The experimental design was randomized complete block (RCB) design with four replications. The four treatments were arranged as T1 (control) (no application), T2 (80 N, 20 P, 32 K) kg ha⁻¹ (recommended rate), T3 (5 tons ha⁻¹ of chicken manure), T4 (2.5 tons ha⁻¹ of chicken manure) + (recommended rate). The urea, triple superphosphate and muriate of potash were used as N, P, K sources and chicken manure was applied as basal. The Sinthukha rice variety was used as a tested variety. The plant growth parameters were recorded at biweekly interval and the yield and yield components data were also collected at harvest time. The results showed that the combined application of organic manure and recommended rate of fertilizer (T4 treatment) increased number of panicles hill⁻¹, number of spikelets panicle⁻¹, filled grain percent, and harvest index compared to other treatments. Moreover, the highest grain yield (6.87 tons ha⁻¹) was observed in T4 and the minimum grain yield (6.09 tons ha⁻¹) was found in T1. Among the treatments, T2 showed the second highest yield of rice in this study. The combined application of chicken manure and chemical fertilizer increased up to 12% grain yield over control. The application of chemical only increased 7% than control. The application of chicken manure increased 6% compared to control. The combined application of chicken manure and chemical fertilizer increased yield per ha up to 6-12% than control. It was necessary to apply combined fertilization (chicken manure + chemical fertilizer) to improve the yield of Sinthukha rice variety.

Keywords: rice, chicken manure, chemical fertilizer, growth, yield

AG-13

The Influence of Packaging Materials and Storage Duration on Seed Quality of Sesame (*Sesamum indicum* L.)

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Abstract

The process of seed deterioration could be associated with some physiological changes, such as progressive decrease in germinability, increase mean time of germination, increase in the number of abnormal seedlings and lower tolerance to adverse storage conditions. The study was conducted with the objective of to determine the seed quality losses associated with the use of different types of packaging materials during storage under farm condition. This study was conducted in collaboration with the sesame farmers during the period from August 2016 to March 2017 in Pwintphyu Township (pre-monsoon seed storage) and from January 2017 to August 2017 in Pakokku Township (post-monsoon seed storage). The sesame seeds were stored in the farmers' houses using two types of packaging materials, woven polypropylene bags and pioneer superbags. The data were recorded before storage and every two-month during the storage period of eight months. The results showed that the means of germination percentage and germination index of pre-monsoon seeds stored in woven polypropylene bag was significantly higher than that of stored in superbag, however, the effect of packaging materials could not influence on the germination percentage and germination index of post-monsoon sesame seeds. Regarding storage duration, germination percentage and germination index were significantly varied among the storage durations of both pre-monsoon and post-monsoon seeds. Although the seedling vigour index I and II of pre-monsoon seeds stored in woven polypropylene bag were significantly higher than that of stored in superbag, the seedling vigour index I and II of post-monsoon seeds were not affected by different packaging materials. The seedling vigour index I and index II of pre- and post-monsoon seeds varied significantly among storage durations. Germination was different between packaging materials (superbag and woven polypropylene bag) in pre-monsoon sesame storage. The germination of stored seeds in superbag was significantly lower than that in woven polypropylene bag, whereas, this effect was not observed in post-monsoon sesame. Black sesame cultivated in both pre-monsoon and post-monsoon season had dormancy with different dormancy period, and the effect of packaging materials on dormancy release time was not observed in both seasons. Therefore, hermetic storage can be used in post-monsoon sesame without adverse effect on germination. However, hermetic storage was not suitable for pre-monsoon sesame in current situation, which had negative effect on germination and it is necessary to conduct more research to solve this problem.

Keywords: sesame, germination percentage, germination index, seedling vigour index, storage



AG-14

The Acquisition of Passive Immunity (IgG) in the Newborn Piglets from Parity Sows in Contract Farm, Takeo Province, Cambodia

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Abstract

This study was to analyze specific antibodies of the PRRS virus (PRRSV) in porcine sera and breast milk samples in three parity sows vaccinated with Ingelvac PRRS® MLV at twenty-five weeks of age and maternal-derived antibodies that were detected in piglets from a contract farm located in Takeo province, Cambodia. Total of 12 parity sows were selected from the 1st, 3rd and 5th parity sows. The blood and breast milk samples were collected from these parity sows at 0hr, 6hr, 12hr and 24hr after delivery the newborn piglets. Total of 36 newborn piglets were selected for blood samples at 0hr, 6hr, 12hr and 24hr, respectively. All samples were collected and analysed repeatedly at week 1, 2, 3 and 4. The submitted samples were tested for PRRSV using Ingenasa ELISA kit at O.D (450nm). The O.D data was calculated for S/P ratio equaling to subtract sample O.D and average NC O.D divided by subtract average PC O.D and average NC O.D. The results show that all parity sows can transfer maternal antibodies to piglets through breast milk two times more than across placenta after delivery (/week1/parity/0hr/6hr/12hr/24hr). All parity sows decline IgG transfer of maternal antibodies to piglets through either breast milk or across placenta in week 2, 3 and 4. The piglets receive a high increase in immunity of the average of IgG/hr in week 1 at 0.30, 1.71, 2.00, 2.19 from 0hr, 6hr, 12hr to 24hr, while there is a decrease of the average of IgG/hr in week 2 at 1.36, 1.45, 1.43, 1.50; week 3 at 0.18, 0.14, 0.70, 0.73, and week 4 at 0.52, 0.50, 0.58, 0.47. In addition, from week 4 onwards, the maternal-derived antibodies are declined in piglets quickly after weaning. This study provides a fundamental data of antibody titer-IgG in sows and newborn piglets from parity sows that is a primary site for PRRSV gilt vaccination program at twenty-five weeks of age and herd health status management for Cambodian swine producers and Cambodia Livestock Raisers Association (CLRA), and contribute to raise CLRA's awareness to be well prepared for screening test antibody titer-IgG 30% of gilt replacement.

Keywords: PRRS virus, IgG, parity sows, breast milk, serum

AG-15

Potential Measurement as a Method for Monitoring the Soil Chemical Environment

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Abstract

Soil chemical environment (SCE) affects soil degradation and productivity, thus understanding of the temporal changes of SCE is important for obtaining higher soil productivity. Widely used indices of SCE included ion concentration, pH, and redox potential (ORP), but these cannot monitor SCE continuously. Previously, a study proved that continued potential measurement can represent temporal changes in the water quality at the sea floor. However, no report related to monitoring the SCE with continued potential measurement has been found. Therefore, this study proposes a method for evaluating soil ORP using continued potential measurement, and examine the method's validity in representing changes in SCE due to soil reduction, bacteria activation, and soil oxidation. Laboratory experiments were conducted using soils from rice paddy fields. A brush-type carbon electrode was installed in the soil layer that then connected to a reference electrode for measurement of the soil ORP. Different soil conditions were created by mixing the paddy soil with cow manure compost or potassium sulfate. The soil ORP was automatically recorded every 15 min using a voltage meter. The ORP of paddy soil decreased temporally and stabilized at 50 days after the start of the experiment, suggesting that soil reduction occurred over those 50 days. When testing the potassium sulfate-paddy soil mixture, the soil ORP rapidly decreased during the first day after the experiment started. When testing cow manure compost-paddy soil mixture, a larger decrease in soil ORP was observed compared to that in the paddy soil alone. These findings suggest that soil reduction is promoted by adding potassium sulfate or cow manure compost. Among the soil samples tested, there was a range of soil ORPs and trends in the potential decreases. Based on the results of this study, it was found that continued potential measurement is effective in evaluating soil ORP, which represents temporal changes in SCE due to redox reactions after the addition of cow manure compost or potassium sulfate. In addition, the effects of bacteria activation are revealed during continued potential measurement of soil ORP.

Keywords: soil chemical environment, redox potential, ORP, rice paddy, continued potential measurement



AG-16

Evaluation of Acceptability of Cashew Apple Jam in Cambodia

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Abstract

In Cambodia, a cashew plant is one of industrial crops and it is commercialized only cashew nuts. The rest of cashew fruit: cashew apples are not utilized and became a waste. Although jam product is the existing processed food, jam made from cashew apple is limited. New processed food made from local sites is expected to the increase of income for the farmer and also support independence of them. Jam can store at room temperature and comparatively easily made with no special devices. The aim of this study is an investigation of the acceptability of the cashew apple jam based on a sensory evaluation test in Cambodia. The sensory evaluation test for the two types of cashew apple jam was conducted in Phnom Penh, Cambodia, in September 2019 for 70 persons. The jam's raw materials were the cashew apple peeled the outside skin, sugar, low methoxyl pectin, and citric acid. These materials were mixed, dissolved, condensed, and prepared to 50 Brix % of sugar content while heating up to around 80 °C. The heated jam up to 80 °C was filled in a glass bottle. We call this sample a hot-pack jam. Some hot pack jams were reheated at 90 °C for 20 min; this process is sterilization. After 20 min, the jams were kept at room temperature for cooling with having the effect of sterilization. We call the sample added the sterilization procedure a reheated jam. The color, sweetness, acidity, taste, flavor, jelly state, smoothness, and overall of each sample were evaluated using a five-point hedonic scale (1: hate, 2: not like much, 3: usual, 4: like, and 5: like so much) at the sensory test. The hot-pack and reheated jams were tested by 40 panelists of Cambodian students and faculty members at the Royal University of Agriculture, Cambodia (RUA), and Tokyo University of Agriculture, Japan (TUA). 30 citizens evaluated only reheated jam at the supermarket in Phnom Penh. Almost panelists answered the reheated jam was sweeter than the hot-pack jam. Not a significant difference was recognized in the overall evaluation between the RUA's and TUA's panelists and the citizen's panelists for the reheated jam. Because the scores of both jams given by panelists ranged from 3 to 4, it denoted that the cashew apple jam was acceptable and had a possibility to become new processed food in Cambodia.

Keywords: cashew apple, new processed food, jam, sensory evaluation



AG-17

Estimates of Factor Shares for Rice Production in Japan for the Period of 1922-1944

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Abstract

After World War I, the development of the agriculture sector was delayed in contrast with the rapid growth of the industrial sector. Japanese agriculture accelerated by innovation after the economic revitalization following World War II. It clarifies the production structure of the rice production in Japan, and there is this study before the end of World War II after the First World War end during the analysis period. It corresponds to the Meiji period and the prewar age of the Showa period, and this period is a stagnation period of agricultural production. This study clarifies a change of factor shares of the rice production sector in this time. The purpose of this study is to elucidate the characteristics of the production structure of the rice production in Japan from 1922 through 1944, and the agriculture in Japan at this time is considered to be in a developing stage. The historic change of the rice production in Japan gives a suggestion for agriculture development in modern Asia. The measurement of factor shares of the rice production in the analysis period applies "a method to estimate land income as rest." In addition, it measures the Cobb-Douglas's type amount of production formation function. It clarify the element contribution of the factors of production. The changes of factor shares are as follows. The change of factor shares is land, labor, fertilizer, cost of draft animals, agricultural machinery, materials, building for agriculture, seed in order of the average value from 1922 through 1944. As for the development of production technological system, it is a technological innovations land-saving, labor-saving and fertilizer-using. The results of estimate by the amount of production formation function are as follows. In the periods of 1922-1944, the input of the labor is excess level, the input of the fertilizer is under level and the input of the land is equilibrium level.

Keywords: factors of rice production, agriculture development, Cobb-Douglas, input, technological innovations



AG-19

Assessment of Soil Quality of Different Practices for Rain-fed Lowland Rice Farming in Cambodia-Using Biofuntool Approach

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Abstract

Rice is the first staple crop and among the main agricultural products of Cambodia. During the last 20 years, the average rice yield has increased from 1.4 to 2.8 t. ha⁻¹ but rice productivity is often limited by soil fertility depletion, water availability and access. Conservation Agriculture (CA) cropping systems have been tested for several years with the main objectives to restore soil fertility, increase productivity and profits. This study assessed changes in soil health under contrasted practices of rain-fed lowland rice farming including (i) conventional tillage (CT), (ii) CA cropping systems (CA) and (iii) green manure management (GM), which represents different stages of an agroecological transition. The assessment was done by a multi-functional approach integrating a set of seven soil quality indicators related to three main soil functions (i.e., C transformation, nutrient cycling and soil structure). Soil chemical analyses were conducted at 0-5, 5-10, 10-20 and 20-40 cm depths to assess changes in nutrient contents. The study emphasized positive impacts of CA on C transformation, soil structure and nutrients contents. Higher SOC and N contents were recorded under CA at 0-5 cm depth when compared with other management representing an increase of C and N up to +7.0 g C.kg⁻¹ and +0.74 g N.kg⁻¹, respectively. Higher N contents were observed under CA at 0-5 and 5-10 cm depths when compared with CT and significant difference between treatments were observed at all soil layers. Higher values of labile-C (POXC) and SituResp were observed under CA at 0-5 and 5-10 cm depths. Significant difference was observed at 0-5 cm soil depth under CA when compared with GM and CT, representing higher labile-C inputs and soil biological activity of the mesofauna and microflora. Higher stability of soil aggregates and better VESS values were also observed under CA. CA and CGM exhibited 2 to 3 times higher available phosphorus than CT at 0-5 cm depth, and higher values were observed under CA from 0-20 cm depth. Higher values of Ca, Mg and K contents were recorded under CA and CGM from 0 to 40-cm depth. A trend of SOC stabilization was observed under CA soils (0-5 and 5-10 cm depths) when a trend of SOC mineralization was observed under CT and CGM soils. These results emphasized the positive impacts of CA to maintain and/or enhance soil health and to contribute to SOC accumulation. A diachronic analysis is needed to assess on-farm the long-term impacts of CA on soil health and crop performances.

Keywords: conservation agriculture, conventional tillage, soil quality, Biofuntool, cover crops.

AG-20

Evaluation of Some Nutritional Values and Antioxidant Activities of Dried Tea Leaves in Seasonally

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Abstract

Tea Leaf is one of the traditional foods in Myanmar. It is eaten as well as drunk with two main forms which are dried tea leaf or Lahpet chauk and wet tea leaf or Lahpet so. Tea is mainly grown in Shan state of Myanmar. The best quality and major cultivation are in Namhsan region, Northern Shan State. Tea leaves can be picked starting from April until October. At Namhsan area, tea leaves are generally divided into six kinds depending on the plucked season. There are "Shwephi-Oo", "Shwephi-Hnaung", "Khakan-Oo", "Khakan-Hnaung", "Kha-Naing", and "Kha-Hawt" or Hnin Tet". In this study, some nutritional value and antioxidant activities of six kinds of dried tea leaves in Namhsan region were evaluated by the aiming of which kind of dried tea leaves have the best quality for consumers. The analyses included examination of the dried tea leaves for their nutritional value (carbohydrate, protein, and amino acids), assessment of selected minerals, total ash, caffeine, catechin mixture and antioxidant activity. Nutritional contents of tea leaves were examined by preliminary phytochemical screening method and the selected mineral contents (Ca, Zn, Fe, Mn) were analyzed by atomic absorption spectrophotometry (AAS). Total ash contents were determined by ignition method. Antioxidant activities of dried tea leaves were evaluated by the DPPH free radical scavenging assay. Caffeine and catechin mixture (flavonoid) were extracted by using chemical reagents such as dichloromethane and chloroform. From the observed results, dried tea leaves in Namhsan region were rich in mineral contents (5.48-2.33 mg/kg of Ca, 1.94-1.40 mg/kg of Zn, 1.77-1.06 mg/kg of Fe and 8.06-21.06 of Mn) and high antioxidant activities (16.17-58.79 IC₅₀ value of DPPH scavenging assay) were found. Based on the studied nutritional values and antioxidant activity results, Shwe Phi Oo Lahpet chauk was confirmed that the best quality.

Keywords: dried tea leave, nutritional value, antioxidant activity, phytochemical screening, free radical scavenging, AAS

AG-21

Effect of Different Protein Levels on Growth Performance of Weaned Goat Kids

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Abstract

This experimental research was conducted to study about the effect of different protein levels on growth performance of weaned goat kids with specific 3 main objectives: (1) To identify daily intake of each treatment, (2) To identify daily growth rates of each treatment and (3) To identify digestibility in each treatment. Three feed types such as Mulato II grass (*Brachiaria hybrid*), rice bran and soybean meal were used for TMR mixes for this experiment with different protein levels of 12%, 14%, 16% and 18% for T1, T2, T3, and T4, respectively. Four native weaned goat kids with the same age with average live weight of 11.15 ± 2.83 kg were used in Latin Square experimental design (4*4). Experimental animals were put in individual cage to allow individual feeding and manure collection. There were 25 days for the data collection on feeding intake and weight gain, and last 5 days for manure collection. Result revealed that Dry Matter (DM) intake was highest in T4 (534.42 g/day) and intake was lowest in T1 (377.40 g/day), but there was no significant difference among treatments, $P > 0.05$. Organic Matter (OM) intake was shown highest for T4 (482.09 g/day), but there was no significant difference among treatments, $P > 0.05$. Crude Protein (CP) intake was highest in treatments 4 (82.20 g/day) and there were significant differences among treatments, $P < 0.05$. For digestibility dry matter (DDM) was highest in Treatment 3 (71.30%), however, there was no significant difference among treatments, $P > 0.05$. For the Digestibility Organic Matter (DOM) was shown that Treatment 3 had highest digestibility (73.84%) among treatments and there was significant difference, $P < 0.05$. At the same time, Digestibility Crude Protein (DCP) was highest for treatment 4 (86.93%) with significant differences among treatments, $P < 0.05$. However, Digestibility Ether Extract (DEE) was shown highest for Treatment 2 (85.33%), and there was no significant difference among treatments, $P > 0.05$. Digestibility Neutral Detergent Fibre (DNDF) was shown highest in Treatment 4 (61.85%), but there was no significant difference among groups, $P > 0.05$. The same for Digestibility Acid Detergent Fibre (DADF), Treatment 4 had highest digestibility (52.30%), but there were no significant differences among treatments, $P > 0.05$. The result indicates that treatment 4 used adlibitum Mulato 2 with soybean meal and rice bran in ratio of 74:26 with 18% CP allowed highest feed intake, highest nutrients digestibility and body weight gain.

Keywords: local goat breed, rice bran, soybean meal, Mulato 2, protein levels

AG-23

Physiochemical and Preferences of Goat and Cow Milk Products

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Abstract

A preference test was conducted to determine customers' preferences on goat and cow milk. The objectives of the study were: To enumerate microorganisms and physiochemical properties in goat and cow milk products, and to determine preferences of goat and cow milk. Goat milk (GM) was purchased from abroad while Cow milk 1 (CM1) and Cow milk 2 (CM2) were produced locally. Samples were undergone analyzed for PCA and Coliform prior to sensory evaluation. Basic composition such as fat, protein, lactose, solid non-fat (snf), total solid (TS), freezing point (FP), pH, Total Sugar Soluble (TSS), and titratable acidity (TA) were also analyzed. Samples were evaluated for color, aroma, flavor, mouth feel and general acceptability using a 9-point hedonic scale ranging from 1-9 (dislike extremely to like extremely). Drinking water and crackers were provided to rinse properly between testing. All panelists evaluated each sample monadically. Result shows that GM had 2.2% fat, 1.58% protein, 2.61% lactose, 4.53% SNF, 6.6% TS, -0.27°C FP, 8.6 °Brix TSS and 0.17% TA. CM1 had 3.54% fat, 2.9% protein, 4.69% lactose, 8.27% SNF, 11.8% TS, -0.50°C FP, 6.5 pH, 11.7 °Brix TSS, and 0.24% TA. Similarly, CM2 had 3.55% fat, 3.34% protein, 4.16% lactose, 8.12% SNF, 11.75% TS, -0.47°C FP, 6.61 pH, 13.25 °Brix TSS, and 0.17% TA. However, CMs' physiochemical were in ranges with literature reviews while composition for GM are much lower than literature reviews, except for pH. Also, CM1 and CM2 had a bit lower FP than literature reviews while GM was much lower. For bacterial counts, no harmful bacteria encountered for General Bacteria and Coliform. Sensory evaluation was conducted with 143 panelists and 46.85% were females. Four types of panelists were 21 (15.39%) RUA lecturers and researchers, 106 (77.62%) RUA students, and 10 (7%) General customers. The score for aroma was not significant different among samples from 5.89 to 6.31. For color, there were significant differences among GM and CM but no significant differences between CM1 and CM2 which CM2 had the highest score (6.79) then followed by CM1 (6.75) and GM (5.92). For flavor, there were significant differences among samples; CM2 received the highest core 6.77 then followed by CM1 (6.01) and GM (5.18). The same preference for mouth feel, CM2 was rated highest score and GM was rated the lowest. There was significant difference between GM (5.76) and CM2 (6.65) by $P < 0.05$ but there were no significant differences between GM and CM1 ($P > 0.05$), and between CM1 and CM2 ($P > 0.05$). For general acceptability, there were significant differences among samples ($P = 0.00$). CM2 received highest score (6.92) then followed by CM1 (6.21) and GM (5.61). For products ranking, CM2 received the most 1st choice ranking (51.75%) and GM received the least (19.58%). Result of bacterial count shows that milk products were safe for consumers and for sensory evaluation, GM had the least preference compared to CM samples. CM obtains basic components the same with CM2 was the most favorite milk for general consumers.

Keywords: bacteria count, milk compositions, goat milk, cow milk, Phnom Penh



AG-24

Assessment of Some Promising Lines of Rice (*Oryza sativa* L.) for Salt Tolerance Using Microsatellite Markers Associated with the *saltol* QTL

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Abstract

Rice is one of the most important staple food crops in the world that grown under extensive irrigation environment. Salinity is an important physical factor influencing rice (*Oryza sativa* L.) production. To combat this limiting factor, YAU developed 100 breeding lines of rice. After screening at seedling and vegetative stages at different salinity level (0.2, 6.0, and 8.0 dS m⁻¹), seven rice lines were selected as moderately tolerance genotypes. These seven promising salt tolerance lines (V1: YAU- 1211-14-1-1; V2: YAU1201-90-2-4; V3: YAU-1211-18-1-1; V4: YAU1211-195-1-1; V5: YAU-1201-26-1-1; V6: YAU1201-26-1-3; and V7: YAU-1211-82-1-1) and three local check varieties (Yatanatoe, Superhnankaut and Theehtatyn), one salt tolerance check (Pokkali) and one susceptible check (IR 29) were used in this study. Seven *Saltol* QTL associated SSR markers (RM5, RM9, RM140, RM472, RM493, RM1287 and RM3412) were used to check the usefulness of microsatellite (SSR) markers associated with *Saltol* QTL. Number of alleles of the SSR markers ranged from 2 for RM140 to 4 for RM3412. Polymorphic information content (PIC) value varied from 0.00 for RM140 to 0.62 for RM3412 with an average of 0.36. The SSR marker, RM3412, was found to be superior for analysis of genetic diversity in this study. Cluster analysis of the rice genotypes based on SSR data divided the genotypes into three groups each of which having Yatanatoe, Theehtatyn, Superhnankaut and susceptible check IR29 (cluster 1), V1, V2 and V3 (cluster 2), V4, V5, V6, V7 including salt tolerance genotypes Pokkali (cluster 3), respectively. Out of seven, four SSR markers (RM5, RM493, RM1287 and RM3412) could discriminate Pokkali (*saltol*) from IR29 (susceptible) genotype. Two specific alleles were found by RM5 (170) and RM493 (220) for Pokkali. At locus RM140, almost all genotypes possessed the same allele as Pokkali (260) except Theehtatyn and IR29 (null allele). RM1285 pointed out that four YAU rice lines (V4, V5, V6 and V7) as salt tolerance lines. The present result collectively revealed that V4: YAU1211-195-1-1 as a tolerance genotype. The RM5, RM493, RM1287 and RM3412 markers could be useful for marker-assisted selection of *Saltol* QTL.

Keywords: promising rice lines, *Saltol* QTL, SSR marker



AG-25

Rice Varietal Assessment for Climate Change Adaptation from Socioeconomic Point of View: A Study in Myitthar Township

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Abstract

Myanmar is the second most vulnerable country in the world to the effects of climate change. Agriculture is highly vulnerable to climate change. This study was conducted to find out farmers' knowledge to respond to the climate change impacts, to find out location-specific climate-resilient adaptation technologies in rice farming, to find out the desired characteristics of chosen rice varieties, and to estimate cost and benefits different rice production systems for their chosen variety. The study was carried out in Myitthar Township, a major rice-growing area in the middle of Myanmar and most of the rice areas are irrigated. Primary data were collected by conducting a socio-economic survey. Descriptive analysis and cost and benefit analysis were applied. More than 95 percent of the farmers adopted the strategy to use quality seeds. However, changing the sowing time was adapted by only 27% of them. About 41% of farmers grew Manaw Thukha rice variety followed by Ayeyar Min (33.62%), and Shwe Manaw (20.49%). The most preference of rice variety traits were high yielding and high marketability. The farmers practiced two different rice establishment methods: direct seeding and transplanting and grew both seasons. In Monsoon, direct-seeded Ayeyarmin got the highest BCR (1.75) and Manawthukha variety yielded the highest BCR in Summer (1.70). The study area was irrigated rice-growing area that farmers have not suffered much from climate change impacts in rice production yet, which implies the irrigation facilities are essential for climate change adaptation strategy.

Keywords: farmers' perception, knowledge, climate change adaptation, rice variety, irrigation facilities



AG-26

The Evaluation of Agricultural Production Information and Sources of Local Farmers in Rural Areas of Cambodia

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Abstract

Recently, with the economic development in Cambodia, the demand for various agricultural products such as vegetables and fruits has increased along with the staple food, rice. Despite these changes in domestic demand for agricultural products, the current situation in rural areas is that many local farmers only want to expand rice production. There are many farmers who produce vegetables and fruit in combination with rice farming, but the scale is small. Producing a variety of agricultural products in addition to rice production, for which demand is expected to increase in the future, will enable sustainable and stable agricultural management and is expected to improve the poverty problem in rural areas. In order to shift from traditional farming to sustainable and stable farming, it is necessary for local farmers to clarify their evaluation of important agricultural production information and sources. According to the above mentioned referred background, the main object of this study was to quantitatively grasp the relationship between agricultural production information and information sources, which local farmers attach great importance to in order to realize stable and sustainable agricultural management. A questionnaire survey of local farmers was conducted in Kampong Cham, Cambodia, and received 437 responses. The results of the analysis are summarized as follows. 1) According to the results of Multiple Correspondence Analysis, it was confirmed that the relationship between the information source and the agricultural production information necessary for improving the agricultural management of local farmers, specifically, agricultural production information related to daily farming is obtained from familiar sources such as other farmers in the village and parents. In addition, the same tendency is seen in the expected information sources. 2) According to logistic regression analysis, the current sources of information and the expected sources of information were identified for the four agricultural production information sources that local farmers consider the most important. It was confirmed that local farmers have high expectations for Government officers (DDAFF officers) in addition to familiar sources such as other farmers in the village and parents. However, the results suggest that they are not aware of specific sources of information regarding market information and agricultural production information related to new technologies, which are assumed to be necessary information for improving the current agricultural management.

Keywords: sustainable agricultural management, information source, questionnaire survey, Multiple Correspondence Analysis, logistic regression analysis



EM-01

Economic Assessment of Biogas Production Potential from Commercial Pig Farms in Cambodia

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Abstract

Commercial pig farms in Cambodia are increasing and represented 30% of the overall pig production in 2018. Pig farms utilize huge quantity of water, and its large proportion ends up being wastewater that can cause air and water pollution, fly-related illnesses, and methane emission. Anaerobic digestion (AD) is known as an effective solution to convert manure and wastewater into energy. Covered lagoons are an anaerobic biodigester that has long been used for commercial biogas plants in Cambodia due to acceptable investment cost and favorable climatic conditions for biogas production. However, lack of local technical data and technical assessment is a barrier to wider implementation of biogas systems in the country. Therefore, the study was conducted to explore the characteristics of commercial pig farms and wastewater use; to analyze the quality of biogas compositions from different covered lagoons; and to estimate biogas production, electricity generation, and CO₂ reduction equivalent from the collected data. The study was started from January to October 2020, selecting 9 farms with evaporative cooling systems for in-depth interviews, along with direct observations, biogas analysis, and power analysis. The findings indicate that all the studied farms were fattening farms operated under purchase contract with private companies. Pig production varied from 2,800 to 7,200 head per cycle, with two cycles per year. Moreover, daily wastewater was 0.033 m³ d⁻¹ head⁻¹, with dry matter (DM) accounting for 0.9%. Annual biogas production and electricity generation were 32.7 m³ y⁻¹ head⁻¹ and 42.5 kWh y⁻¹ head⁻¹, respectively. Biogas quality was 59.5% CH₄, 31.5% CO₂, 1.3% O₂, and 2,256 ppm H₂S. With biogas systems, individual farms could reduce CO₂ emission by 0.676 tCO₂eq y⁻¹ head⁻¹. Thus, benefits are high in social, economic, and environmental terms. However, initial investment should be taken into account before startup.

Keywords: CO₂ reduction, covered lagoon, methane emission, pig manure

EM-02

Preparation of Effective Microorganisms Based Compost Using Some Selected Wastes for Improvement of Plants Growth

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Abstract

Solid waste disposal is the most pressing problem facing mankind throughout the world. The solid waste management plays a significant role to create a sustainable environment. Compost is decomposed organic materials and it provides many essential nutrients for plant growth. Some vegetable wastes such as rice husk, cotton husk, coconut husk, pigeon-pea husk and chicken manure were selected for chemical analysis. The physicochemical properties of vegetable wastes were carried out by using standard methods. The effective microorganism (EM) solution was prepared from kitchen vegetable wastes except onion and garlic peels to ferment for two months. The microorganisms that contain in prepared EM solution were studied by using microscopic morphology. The pH of prepared EM solution was measured by using pH meter. The compost was prepared from the vegetable waste materials and prepared EM solution by using aerobic method. The yield percent of compost was determined by calculation method. The yield percent of prepare compost was found to 55%. The mineral contents of compost and soil sample were measured by using EDXRF spectroscopy. The physicochemical properties such as pH, moisture, ash, available nitrogen, available phosphorus and available potassium content in prepare compost and soil sample were determined by using standard methods. Planting the seedlings of some selected useful vegetables in various ratio of the prepare compost and soil sample. The growth of plant rates was found to be effective by the planting experiment.

Keywords: soil waste management, physicochemical properties, effective microorganism (EM)



EM-03

Assessment of Soil Properties Using GIS Technologies in Selected Area of Myanmar

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Abstract

A study was aimed to evaluate the selected soil properties and mapping under different cropping patterns of Sipintharyar village, Zeyarthiri Township, Myanmar. A total of 130 soil samples were collected from 0-20 cm depth using a Global Positioning System. Soil fertility maps were created using Kriging interpolation in ArcGIS software 10.5. Soil textures were loam, loamy sand, clay loam and sandy loam, respectively. The soils were strongly acidic to moderately alkaline and contained a very low status of soil organic matter (84%), available potassium (89%) while total nitrogen was medium (56.92%) level. Coefficient of variation (CV) showed that soil pH was the least variable (9.91%) with mean values ranging from 4.95 to 8.47 while available potassium was the highly variable (86.95%) with content values ranging from 1 to 578 ppm. Other selected properties such as bulk density, total nitrogen, CN ratio, electrical conductivity and soil organic matter were found to be most variable, 11.68%, 33.84%, 34.86%, 72.23% and 52.07%, respectively. Soil organic matter is highly significant and positively correlated with total nitrogen and available potassium. These variations in soil properties were probably related to the different cropping patterns and fertility management practices in the study area.

Keywords: soil properties, Global Positioning System, Arc GIS

EM-04

Spatial Variability and Mapping of Soil Properties Using GIS-Based Geostatistic in Myanmar

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Abstract

Precise information on the spatial variability of soil is a crucial component for intensive agriculture, sustainable development, and the management of natural resources. The primary purpose of the study was to investigate the spatial variability of soil properties at Yezin Agricultural University Field, Myanmar using geostatistic. A total of 94 composite soil samples were collected from the depth of 0 to 20 cm in a systematic grid (50 x 50 m²) on the field in May 2019. Soil pH, electrical conductivity (EC), soil organic matter (SOM), total soil nitrogen (TSN), available phosphorus (Ava-P), and available potassium (Ava-K) were measured by using standard analytical methods. Data were analyzed geostatistically based on semivariogram. The exponential model best fitted the semivariogram for pH, EC, Ava-P, and Ava-K; SOM was adapted from the Gaussian model while TSN was adapted from the spherical model. The nugget/sill ratio showed a strong spatial dependence for EC, Ava-P, and Ava-K and a moderate spatial dependence for pH, SOM, and TSN. Most of the soil was found to be strongly acidic in the soil reaction. It was also found that EC, SOM, and Ava-P are very low in most of the study area. Most of the areas were found to have low TSN levels, while Ava-K appeared low content in the entire area. With such an analysis, it is possible to plan better nutrient management practices for agricultural production and environmental protection. Therefore, geostatistical analysis with ordinary kriging is a useful tool for studying the spatial variability of soil properties.

Keywords: spatial variability, soil properties, geostatistic, semivariogram, kriging



EM-05

Production and Uses of Crop Residues in Cambodia: Rice Straw, Corn Stalk, Cassava Stem

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Abstract

Agriculture is a priority area of the royal government of Cambodia, has contributed about 20.8% to the gross domestic product (GDP) in 2019. Rice production has increased under the strong support of the royal government of Cambodia, was cultivated in 3.3 million hectare with the average rice yield is 3.3 ton per hectare. Besides rice, other cash crops such as cassava and corn were cultivated in almost 1 million hectare. In average, the ratio of cereal and residue is 50% by 50%. Therefore, it is about 10.9 million ton of rice straw, 13.5 million ton of cassava stem, and 1 million ton of corn stalk were produced annually. Some amount of these residues are used as animal feed among some other uses. Due to the lack of records on the production and uses of these crop residues, this study aims to identify the availability and applications of these crop residues to provide information to interesting industry for further investment plan. The study was conducted through a prepared questionnaire field survey to interview stakeholders including farmers, users and local authorities in 6 representative provinces of Cambodia. The results showed that just a small proportion (about 20-30%) of the rice straw is collected and used for household scale cattle feed, mushroom production, mulching for vegetable crops, and others. Generally, farmers keep burning in paddy field immediately after harvesting to catch the rainfall or irrigated water for next cropping season somewhere there is possibility to grow rice from 2 to 3 times a year. Although, somewhere there is not possible to grow more times a year, the rice straw collection remains limited because of there is no market demand and application. In the case of cassava stem, the major application is for next seedling (around one third of the production). The results obtained from the field survey indicated that most of the cassava stem is reused as a result of increasing cropping area annually. For corn stalk, the results showed that there is no any use at all, making burning it in the field as the option to clear the land for next cropping season. In conclusion, there is still limited uses of agricultural crops residues in Cambodia, a potential for industrial sector to value-added products using these wastes.

Keywords: agriculture, animal feed, mushroom, rice, maize



EM-06

Assessment of Insect Damage and Growth Performance of Dipterocarps Planted at Rainforestation Demonstration Farm at VSU, Baybay City, Leyte

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Abstract

Assessment of associated insects as well as leaf damage caused by the insect are essential concerning decisions to contribute to developing suitable rehabilitation techniques. Few studies have been done to identify the insect species associated with dipterocarp species and determine the damage caused by insects and their growth performance. Six species of dipterocarps, namely: *Dipterocarpus alatus* (hairy leaf apitong), *Hopea philippinensis* (gisok-gisok), *Shorea malibato* (malibato), *Shorea philippinensis* (manggasinoro), *Shorea polita* (malaanonang), *Shorea almon* (almon) were studied. This study was conducted to determine the insect associated fauna using the visual and handpicking method of insect collection, leaf damage assessment using the Bioleaf app, and the morphological traits (i.e., basal diameter and plant height) on growth performance of dipterocarps. There were eight orders of insects associated with the dipterocarps: Coleoptera, Diptera, Hemiptera, Heteroptera, Hymenoptera, Lepidoptera, Odonata, and Orthoptera. There was a significant difference ($p \leq 0.05$) in the leaf damage among the six dipterocarps species after 25 months from planting. *Shorea philippinensis* had the highest leaf damage ($8.68\% \pm 0.09$), and *Shorea almon* had the least leaf damage ($2.57\% \pm 0.09$). In terms of basal diameter, the species with the highest significant increment ($p \leq 0.05$) was *Shorea polita* (2.49 ± 0.67 mm), while *Shorea almon* had the least growth increment (0.98 ± 0.67 mm) 25 months after planting. For the plant height, *Dipterocarpus alatus* grows faster compared to other species with a significant increment ($p \leq 0.05$) of 32.90 ± 0.19 cm, while *Shorea philippinensis* had the least increment of 4.95 ± 0.19 cm. The study indicated eight orders of insects associated with the dipterocarps showing the significant damage on the *S. philippinensis*. Despite the insect association, the plants grow significantly with the fast increase observed on *D. alatus*.

Keywords: dipterocarp, defoliation, insect fauna, leaf damage, bioleaf

EM-08

Spatial Variability of Soil Salinity and its Influence on Rice Yield in Salt-affected Areas Using Remote Sensing Techniques

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Abstract

Soil salinity has become one of the major constraints to sustain crop production in Myanmar, especially in the dry zone areas. Salinity stress and its spatial distribution has been a useful for crop monitoring. Unevenness in early crop growth stage can support to identify yield limiting factors such as soil salinity, nutrient availability, and soil moisture. Remote sensing techniques have been used to collect reflectance numbers from crop canopies and to analyze the vegetative index (VI). This study aims to monitor the distribution of soil salinity and its influence on yield and chlorophyll content of rice by using remote sensing techniques. This study was conducted in the salt-affected soils at Myittha Township, the central dry zone of Myanmar during the rainy season of 2019. Apparent electrical conductivity (EC_a) of soil, and chlorophyll content in rice plant were collected at early growth, tillering and reproductive stages of rice. Sentinel-2 satellite imagery was used in the analysis for vegetation index (VI) at three different growth stages of rice. Total grain yield of rice was also measured. The acquired images analysis was implemented with ArcGIS 10.7 software to calculate vegetative indices. The results showed that the distribution of soil salinity was varied from 2.0-7.6 dS/m in the study area. The significant relationships were found between rice plant chlorophyll content and the VI values under different salinity levels. A relationship was also observed between NDVI and rice grain yield. Identifying the spatial distribution of salinity stress using the spectral remote sensing technology would be beneficial for rice production and thereby allow for decreasing soil salinity in the salt-affected areas.

Keywords: salinity, Sentinel-2 satellite imagery, vegetation index

EM-09

Evaluation of Site Contamination from Storage of Fertilizer

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Abstract

Australia has extensive areas under agricultural production of crops and livestock production. Regular fertilizer application maintains production rates of grain crops. Large quantities of phosphorus-based fertilizers are produced from phosphate rock by sulfuric acid extraction at designated production works at coastal locations and transported by train to distribution points in selected agricultural areas. Bulk fertilizer is stored in large sheds adjacent to railway lines and large or small trucks then make deliveries to farms. The storage sheds usually have bare soil floors and over periods of time fertilizer levels can build up. When such sites are disused or abandoned, they may leave soil contaminated with fertilizer phosphate, sulfate and sometimes sulfur. Occasionally fertilizer storage sites may have experience accidental contamination from railway engine or truck hydrocarbons. The objective of this study is to examine the extent of fertilizer contamination from phosphate, sulfate and sometimes sulfur at agricultural storage sites, identify environmental risks associated with the handling practices of storage sites, and distinguish from other contamination due to transport vehicles. Soil samples were collected using a grid-base sampling program to identify analytes of concern. Following preparation soils were analysed for phosphorus, sulfate, sulfur, petroleum hydrocarbons (aliphatic and aromatic), heavy metals and pesticides using standard procedures. A 'within a target area' was used to assess contamination levels by comparing the 95% Upper Confidence Limit (UCL) of the average concentration of each analyte of concern against respective 'contamination' criteria for industrial sites; exceedance of the 95% UCL against site criteria identified contamination. "Hotspots" were identified when analytical results from individual sites were 250% of the relevant criteria value, and when the standard deviation of the data set was <50% of the criteria. Statistical analysis of the data for different analytes in soil at fertilizer storage sites showed the relationship between contaminant levels and dispersion over respective sites. It was also possible to distinguish the dispersion of constituents of phosphate-based fertilizers showing extent of contamination during the operational phases of fertilizer handling activity from other vehicle-related site contamination. In conclusion, accurate estimation of contamination of sites could be provided using the grid-base sampling approach and 95% Upper Confidence Limit (UCL) criteria to distinguished transport vehicle-related contamination from phosphate-based fertilizer on site.

Keywords: phosphorus-based fertilizers, fertilizer contamination, agricultural storage site, transportation, environmental risks, fertilizer handling activity



EM-10

Bamboo Charcoal as a Lactic Acid Bacteria Carrier for Phosphate Removal

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Abstract

A decline in the demand for using bamboo products has led to abandoned bamboo forests in Japan. To reduce the area of abandoned bamboo forests, the use of bamboo as a construction material and bamboo charcoal as an absorbent have gained considerable attention in recent years. In the literature, many studies have described the formation of biofilms on biochar, leading bamboo charcoal to be considered as a microbial carrier. The aim of this study was to examine the potential of bamboo charcoal as the microbial carrier of lactic acid bacteria (LAB) for phosphate removal. Bamboo charcoal was immersed in a LAB solution for 24 h for LAB to adhere to the bamboo charcoal. Then, the charcoal was placed in a bamboo fermented solution. Two types of bamboo charcoal, i.e., without pretreatment and dissolved in tap water, were used in the experiments. The experiments were also conducted with and without aeration to determine the effects of oxygenation. The bamboo charcoal without pretreatment displayed an increase in the phosphate concentration, indicating that phosphate was released from the bamboo charcoal. LAB-attached bamboo charcoal demonstrated a much smaller increase of the phosphate concentration, suggesting phosphate was removed by LAB. Experiments with dissolved bamboo charcoal also indicated a reduction in the phosphate concentration. The removal rate of phosphate decreased with an increase in the solution pH, suggesting that alkaline conditions limited the activity of the bacteria. Furthermore, the redox potential of the solution became negative in the solution without aeration. Overall, the results demonstrated that bamboo charcoal can be a LAB carrier; however, the bamboo charcoal must be dissolved prior to its use for phosphate removal. Furthermore, aeration and an acidic during phosphate removal are needed to obtain a higher removal rate when using LAB.

Keywords: bamboo charcoal, lactic acid bacteria, phosphate removal, aeration

EM-12

Study on the Water Quality of Indawgyi Lake Effected by Surroundings

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Abstract

Water quality assessment was carried out at Indawgyi Lake, the biggest lake of Myanmar. The main aim of this research is to evaluate the current status of lake water quality affected by the surroundings and man-made activities for three seasons (cold, hot and rainy) in 2019. Some physicochemical properties such as temperature, pH, ORP, EC, NTU, TDS and DO of surface and deep water samples from each point and totally four different points were analyzed in situ by water quality monitor U-53-G(Horiba). The concentrations of Cr, Mn, Fe, Cu, As and Hg were also examined by atomic absorption spectrometer (AAS) and total hardness, total alkalinity, salinity and chloride were measured by their respective methods. Nitrate and phosphate were detected by LaMotte, SMART 3 colorimeter. The condition of chemical oxygen demand (COD) and biological oxygen demand (BOD) of the lake water were also investigated by standard incubating methods. In addition, counting of coliform was performed to detect pathogenic microorganisms of lake water. The resulting values were compared with the standard limits of World Health Organization (WHO) and it was concluded that the lake was urgently needed to sustain the long-life existence and its water qualities due to the findings of some physicochemical, biological, toxic and pathogenic effects especially produced from the domestic sewage, mining and agricultural waste with fluctuations and above the guideline limits.

Keywords: physicochemical properties, lake water, concentration, metal, standard guideline value

EM-13

Soil Organic Carbon Stabilization on Forested and Deforested Red-Yellow Soil under Different Temperature Conditions

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Abstract

Soil organic carbon (SOC) has an important role as a key indicator for soil health due to its contributions on mitigation and adaptation to climate change. Tropical areas cover with Red-yellow soil (Udults) such as Amazon represents the highest amount of soil carbon sources in the earth. Although it is affected by human impacts due to deforestation, it is important to maintain and increase SOC of tropical Red-yellow soil toward an optimal level for meeting challenges such as mitigating climate change effects. The aim of this study is to analyze the stabilization of soil organic carbon from Red-yellow soil under different temperatures conditions. A detailed comparison was made between forested and deforested conditions of Red-yellow soil. In order to analyze the temperature sensitivity, each treatment was kept under 25°C and 35°C, and the soil respiration ratio (SRR) was measured as well as SOC content by spectrophotometry method. Lastly, a treatment of biochar at 5% was added as part of stabilization mechanisms of carbon. The experimental results showed that there were significant differences in SOC content between forested conditions in contrast to deforested conditions, where 7.25 mg C/g was found in forest conditions while deforested conditions was 5.68 mg C/g. Although it was not found significant change in SOC under different temperature, SRR increased at 39% from 8.87 $\mu\text{L CO}_2/\text{h/g}$ to 11.90 $\mu\text{L CO}_2/\text{h/g}$ with temperature changes from 25°C to 35°C. Additionally, biochar application contributes to increase the value of SOC at more than 2.66 mg C/g in all treatments, however, it did not make a significant difference in SRR by temperature changes. Thus, biochar works as carbon sources to maintain and increase SOC content, but stabilization effects on Soil Respiration Ratio (SRR) should be observed in long term.

Keywords: soil organic carbon, Red-yellow soil, Udults, temperature, soil respiration ratio, biochar



EM-14

Effects of Adding Rice Husk Biochar in GHG Emission and Compost Quality during Cow Manure Composting

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Abstract

Agriculture is a major anthropogenic source of Green House Gases (GHG) and contributes 24% of total GHG emitted (IPCC, 2014). Livestock sector forms a significant part of agriculture and is responsible for major GHG emission. According to FAO, 2016, livestock manure contributes 23% to total GHG emitted in agricultural sector. N₂O, CO₂ and CH₄ are important GHG emitted during management of livestock manure. Against the background of global warming, there is increased motivation in reducing GHG emission. Therefore, this study deals to see the effects in N₂O, CO₂ and CH₄ emission by adding 5%, 10% and 15% rice husk biochar during cow manure composting. In addition, degradation rate and C/N ratio of manure samples were analyzed for determining the final compost quality. Subsequently, a composting experiment was conducted using rice husk biochar and gases emitted were measured periodically with static gas chamber method. The experimental results indicated that biochar was effective in reducing N₂O and CO₂ emissions. The cumulative emission of N₂O was reduced by 40% in 5% treatment, 46% in 10% treatment and 60% in 15% treatment. Similarly, there was decrease of CO₂ by 69% in 5% treatment, 68% in 10% treatment and 48% in 15% treatment. Biochar's well developed pore structure and adsorption capacity reduced the gas emission. Furthermore, addition of biochar enhanced degradation rate and better C/N ratio. Biochar addition provided necessary nutrients and habitat, facilitating growth of various microorganisms. The results of CH₄ emission did not show any significant difference between the treatments. The obtained results indicate that rice husk biochar addition is beneficial in reducing GHG emission and improving compost quality with faster degradation and better C/N ratio.

Keywords: GHG emission, cow manure composting, rice husk biochar, compost quality



EM-15

Monitoring of Water Quality During the Dry Season in Cheung Ek Lake, Cambodia

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Abstract

Cheung Ek Lake, being well known as the biggest wastewater lake inside the capital, has massive water and nutrient inflow. Around 70% of rain and wastewater in Phnom Penh flows into Cheung Ek Lake through three main canals: Trabek canal, Stung Meanchey canal, and Lou Pram canal before discharging into Bassac River. Since 2008, rapid urbanization of the satellite city in Phnom Penh has decreased the lake size and contributed to the lake's water quality degradation. Cheung Ek Lake performs many functions such as flood control, natural wastewater treatment and cultivation of vegetable production. There are several studies that pointed out the negative impact of lake's water pollution on the local ecosystem and human livelihoods. As an addition to these the objectives of this study are to: (i) analyze the daily changes of water quality parameters during the dry season and (ii) describe daily and hourly changes of phosphate (PO_4^{3-}) concentration in the lake. For that, selected chemical parameters such as pH, electroconductivity, nitrate, iron, dissolved oxygen were measured daily for 7 days. In addition, phosphate (PO_4^{3-}) was analyzed hourly for a week. The water samples were collected in 3 points: inlet, middle and outlet of the lake. Water samples were analyzed in-situ using a spectrophotometer DR900. The full results of this study are described in the poster as well as the manuscript.

Keywords: water quality, Cheung Ek Lake



EM-16

Water Harvesting as a Mean for Water Conservation in Ovche Pole Region, Macedonia

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Abstract

Ovche Pole is an area of Macedonia located in the central part of the country. The region is the second largest grain producing area in the country. Agriculture is the main economic activity for the most of the people in there. From an agro-ecological perspective, larger part of the region is part of the sub-humid agricultural zone; however, there is an area that is identified as semiarid agricultural zone, too. In both agro-ecological zones, main problem and constrain for agriculture production are the dryness and low precipitation in the growing period. This problem is especially emphasized on the agriculture land without irrigation system. Therefore, this study analyzes rainwater harvesting approach as a mean for water conservation and improvement of agriculture productivity in the research area. The first objective of this study is to determine the runoff potential in the research and the second is to identify suitable areas and measures for water harvesting. Remote sensing and geographic information system techniques were used to obtain, prepare and analyze input data. Because of simplicity and lack of hydrological data in the research area, SCS-Curve Number method was used for rainfall-runoff modelling. Hydrologic soil group (HSG) map was build using data obtained from the Macedonian Soil Information System (MASIS). Land use/land cover was prepared by using data from Corine Land Cover (CLC 2018) combined with Sentinel-2 satellite image used for visual interpretation and editing to improve the classification. Slope map was generated from a 20 m resolution DEM data obtained from the Agency for Real Estate Cadaster. The average year precipitation data were provided by the National Hydrometeorological Service (NHS). The site suitability for different water harvesting structures is determined by considering different varying parameters like runoff potential, slope, soil texture and land use. The results indicate that water harvesting can improve the water resource potential in the research area. Based on the study, several different water harvesting sites and measures were identified. The full results and conclusion of the research are elaborated in the poster as well as the manuscript.

Keywords: water conservation, surface runoff, rainwater harvesting, SCS-SN method, suitable site, measures selection

EM-17

Effect of Adding Agricultural and Organic Lime on Survival Rate of *E. coli* and General Bacteria in Farmland Soils in Kampong Cham Province, Cambodia

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Abstract

The farmers of Kampong Cham Province applied manure and compost to farmlands as fertilizer or soil amendment. The application of fresh manure or immature compost to farmlands have been notified as one of the main sources that spread the pathogenic bacteria *Escherichia coli* (*E. coli*) to the soil. *E. coli* is recognized as a hazardous microorganism in the environment and for public health. It is an important pathogen associated with several foodborne and waterborne outbreaks of gastrointestinal illness, which has been widely reported in Cambodia and other countries around the world in the last decades. Therefore, the contamination of farmlands, surface water, irrigation water, and fresh vegetables, can become a reservoir of infections. Most of the previous study has shown that soil pH is one of the dominant factors affecting the survival rate of *E. coli* in soil. Calcium carbonate (CaCO_3) has been known as one of the chemical compounds that raising pH. The study was focused on two main objectives as 1) to investigate the effects of different concentrations of CaCO_3 added to the soil, and 2) to analyze the relation of CaCO_3 with the survival of *E. coli* and other soil microorganisms. Limestone, eggshells and clamshells were used as CaCO_3 synthesis and added to soil at the ratio of 0 g, 5 g, 15 g, 30 g and 50 g with 200 g soil with the water content of 4.1%, respectively. In addition, other chemical and biological parameters such as pH, EC, K^+ , Na^+ , NO_3^- , TN, TP, OM%, and the general bacteria, were analyzed. The results are shown and discussed in the full manuscript.

Keywords: agricultural lime, organic lime, calcium carbonate, fertilizers, shells, soil pH, microorganisms

EM-18

Relationship between NDVI and Canopy Cover Sensed by Small UAV under Different Ground Resolution

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Abstract

Canopy Cover (CC) is a significant indicator to describe the development of crops, and is used to estimate the evapotranspiration volume of crop leaves within crop simulation models. During the last three decades, monitoring of CC for crops using Normalized Difference Vegetation Index (NDVI) obtained from satellite sensor such as Landsat TM and Sentinel-2, has been studied world-widely. However, a few studies have estimated CC of crops using NDVI obtained from UAVs, and there is no research showing that the NDVI basing on UAV imagery has the same linear regression relationship with CC as satellite imagery. One of the crucial advantages of UAV imagery is that it provides high resolution of less than 0.10m, while the resolution of satellite imagery is usually larger than 10m. Now that the UAV has become a popular method in agriculture science, it is necessary to prove the interchangeability of UAV and satellite imagery of monitoring CC. In this study, RGB and multispectral images of a peanuts field located in the experimental field in Obihiro University of Agriculture and Veterinary Medicine were taken by small UAVs and multispectral camera. Orthomosaic and reflectance map of the farming field were constructed using the UAV imagery, and then were used to obtain CC and NDVI values with a GIS software. CC was calculated as the ratio of the green canopy area, which was extracted from the orthomosaic using a supervised classification tool within GIS. CC was compared with NDVI values under various resolution of 0.50 m, 1.0 m, 2.5 m, 5.0 m and 10 m. The NDVI showed highly correlated linear relationship ($y=ax+b$) with CC under each ground resolution from 0.10 m to 10 m (R^2 of 0.88**, 0.92**, 0.94**, 0.89**, 0.93**, respectively). The shapes of the regression equations of NDVI and CC closely resembled to each other, with the slopes (a) of 1.16, 1.11, 1.09, 1.08 and 1.06, and the intercepts (b) of 0.247, 0.249, 0.250, 0.250 and 0.250, respectively. From the result of ANCOVA, the resolution of remote sensing imagery has not significant impact on the relationship between NDVI and CC. Although with the increasing of the ground resolution, more irrelevant factors, such as soil and mulching seat got included within one pixel of the images, the regression equations stayed the same. This study demonstrated the possibility of using UAV multispectral imagery for CC monitoring with the same regression equations as satellite multispectral imagery.

Keywords: UAV, NDVI, canopy cover, ground resolution



EM-19

Conservation and Ecological Threats of Agarwood (*Aquilaria* sp.) on Leyte Island, Philippines

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Abstract

Aquilaria is a genus of about 20 species distributed mainly in the Indo-Malesian region. The genus *Aquilaria* belongs to the Thymelacaceae family of Indo-Malayan trees known for producing the world's most expensive oils which are naturally occurring throughout the Philippines. *Aquilaria* is well known for the production of agarwood which is a highly wanted forest product of substantial economic value. In the Philippines, there is limited published information on the physical condition, habitat structure and ecological threats of *Aquilaria* which is a crucial factor to determine the optimum requirements to develop *Aquilaria* production system. Hence, this study was conceptualized to assess the habitat structure of *Aquilaria* as well as its conservation and ecological threats in the wild. Assessment, surveys and interview were conducted to gather on-site atmospheric data as well as ecological threats of *Aquilaria* in the wild. Soil collection was also gathered to analyzed soil properties. The results revealed that there were two species of *Aquilaria* documented in the study site, namely: *A. malaccensis* and *A. cumingiana*. Moreover, the soil chemical properties are not significant between different topographic expositions but it is acidic and have generally low nutrient status. Furthermore, the conservation and ecological threats documented in the study site are unsustainable harvesting, massive collection of regenerant and inflecting damage of *Aquilaria* by punching nails or drilling holes in the trunk of standing mature tree. Therefore, it is highly recommended that *Aquilaria* should be protected particularly *A. malaccensis* since it is rare and considered a new record of occurrence to Leyte Island as one of the major findings of the study. The establishment of *Aquilaria* production system is necessary as an option to reduce the rampant illegal poaching of agarwood in the wild but should be established in private land and registered with the Department of Environment and Natural Resources (DENR).

Keywords: *Aquilaria*, topographic expositions, ecological threats, habitat structure

EM-20

Growth Performance of *Trema orientalis* L. (Blume) Ulm. Seedlings in Response to Mineral Nutrient Omission

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Abstract

The Philippine forest land is among the top threatened biodiversity areas in the world and one of the major causes is deforestation. In reforestation, pioneer tree species are planted first to copy the natural flow of forest succession. Studies on early successional tree species are limited, especially on determining the growth performance as affected by nutrient deficiency. The study was conducted under screen house condition at the Terrestrial Ecosystems Division (TED), Institute of Tropical Ecology and Environmental Management (ITEEM), Visayas State University, Visca, Baybay City, Leyte. This study aimed at evaluating the effect of nutrient omission on morphological and physiological growth of *Trema orientalis* L. (Blume) Ulm. The experimental design was randomized complete block design, with 7 treatments [control (no fertilizer), -N, -P, -K, -Ca, -Mg, and NPKCaMg] and 3 replications with 35 seedlings in each replication which constituted a total of 735 seedlings. The root collar increment, plant height increment, number of leaves, leaf area, dry biomass and root shoot ratio were evaluated. After six months of fertilizer application, results showed that there was an increasing influence ($p \leq 0.01$) to the root collar diameter increment, plant height increment, number of leaves and leaf area specially in -Ca treatment. The biomass production and root-shoot ratio were significantly affected ($p \leq 0.01$) in control and -N treatments. Stunted growth and reduced leaf were exhibited in seedlings planted at -N and control treatments. Therefore, fertilizer application significantly enhanced the growth ($p \leq 0.01$) of the seedlings. Likewise, nutrient element omission significantly influenced ($p \leq 0.01$) the growth performance and biomass production of *Trema orientalis* L. (Blume) Ulm at seedling stage.

Keywords: nutrient omission, growth performance, biomass production

EM-21

Spatial Analysis on Distribution of Yield and Management Practices of Rice in Selected Area of Central Myanmar

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Abstract

The important contribution of rice to global food security requires an understanding of yield gaps in rice-based farming systems. In Myanmar, average yield in the farm land is still less than yield potential. Reducing yield gap is critical due to global population is increasing as well as farmer income will increase. Spatial analysis approach is to explore the maximum attainable yield, yield gap, and efficiencies of rice production. In this study we aim to provide mapping for spatial distribution of yield and management practices using spatial analysis and to quantifying the potential rice production of the study area and identifying the determining factors that are causes rice yield. Yearly survey interview was carried out to obtain farmers' actual yield at Kyee-Inn area, Pynmana from 2018 to 2019 rain fed rice cultivation system. These data were generated with geostatistical mapping and to find out the causes of yield gap. Mapping on spatial variation of rice yield gap were observed in two successive years. Wider yield gap found when comparing potential yield and farmers' actual yield in the 2018 and 2019 crop seasons. Results show that the actual grain yield in these regions were range from 3.6 to 4.9 t/ha in 2018 and 4.0 to 4.7 t/ha 2019. Most of the farmers didn't use good agricultural practices. Observed yield gap differences were 0.5 to 3.6 t/ha in 2018 and 0.6 to 2.8 t/ha in 2019. The actual grain yield in some regions is already approximating its maximum possible yields. Differences in yield production efficiencies are significantly correlated with management practices, irrigation, agricultural labor and global climate change. So, it is essential the adoption of good agricultural practices, increasing soil nutrient status, decreasing the higher bulk density and support extension to narrow down the yield gaps. Improved knowledge of yield gaps will play a critical role in future of farmers' food safety and livelihood.

Keywords: rice, special analysis, mapping, yield gap, good agricultural practice

EM-22

Survey of Pesticides and Fertilizers Use Patterns and Farmers' Perceptions in Tomato Production on Floating Garden in Inle Lake, Myanmar

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Abstract

Inle Lake is the second largest inland lake in Myanmar. The poor agricultural management by some farmers has resulted in contaminating the Lake ecosystem. This investigation includes the factors influencing the usage of pesticides and fertilizers of selected farmers for tomato production on floating garden in Inle Lake. A total of 80 farmers who cultivate tomato with good agricultural practice (GAP) and non-good agricultural practice (non-GAP) were interviewed in four villages out of 136 villages inside the Inle Lake, Nyaung Shwe Township during June to August 2019. Descriptive analysis and multiple regression analysis models were performed to achieve the research objective. The pesticides and fertilizers application increased in non-GAP when compared with GAP method. The results of multiple regression model revealed that the pesticide consumption of sample farmers was positively and significantly influenced by farm size, insect and pest damage of their crop, net profit but negatively and significantly influenced on different agricultural practices. Fertilizer consumption was positively and significantly influenced by experience in using pesticides and fertilizers, tomato yield but negatively and significantly influenced on different agricultural practices. Good agricultural practice had a positive effect on pesticide and fertilizer consumption for both models. Therefore, good agricultural practice would be a proper system for an environment-friendly agricultural production and sustainable agricultural practices in order to conserve the Inle Lake.

Keywords: good agricultural practice, tomato, fertilizer, pesticide



EM-23

Effects of Air Injection and Iron Oxide Pellet Addition on Hydrogen Sulfide Removal and Biogas Production

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Abstract

Hydrogen sulfide (H₂S) in biogas resulting from anaerobic digestion process is unwanted trace compound, because it is toxic and can corrode biogas engine. This study aimed to compare the 2 desulfurization methods, air injection and iron oxide pellets addition, on H₂S removal and quantity and quality of biogas. The experiment was carried out with two floating drum digesters (1 m³ each) constructed at Royal University of Agriculture, Phnom Penh, from January to August 2020. Three levels of air injection at 2%, 4%, and 6% of O₂ regarding the daily biogas production and iron oxide pellets addition at 1 kg, 2 kg, and 4 kg per m³ of biogas were applied to remove H₂S in biogas from different raw materials of pig manure and food waste. The amount of daily biogas production was quantified by gas flow meter, also gas quality was measured using a GEM5000 gas analyzer. The experimental results indicated that food waste had higher daily biogas production comparing to pig manure in both desulfurization methods. Biogas from food waste increased from 544 L d⁻¹ without iron oxide pellets addition (0 kg) to 657 L d⁻¹ with 4 kg iron oxide pellets addition; and to 566.5 L d⁻¹ with 2% of injected O₂. To the contrary, desulfurization for pig manure with 2% of O₂ and 2 kg of iron oxide showed high daily biogas yield of 348 L d⁻¹ and 340 L d⁻¹, respectively. For raw materials of pig manure, in both methods, had higher CH₄ content than food waste. Air injection was more effective in H₂S removal than iron oxide for both substrates, but higher level of H₂S reduction was observed with pig manure. Accordingly, it was concluded that desulfurization methods with air injection and iron oxide pellets addition were effective in biogas production as well as H₂S removal, but a clear trend appeared in the raw material of food waste.

Keywords: floating drum digester, anaerobic digestion, food waste, pig manure, H₂S removal

EM-24

Changing Spent Mushroom Substrate into a Quality Vermicompost

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Abstract

Safety food and healthy food gain widespread popularity nowadays. Therefore, consumption of mushrooms is increasing. Mushrooms are a healthy food because they have high protein and important substances that are effective in stimulating various immune system functions. It could cause a large amount of waste from cultivation of mushrooms become a waste problem. Therefore, the aim of this study was study to using spent mushroom substrate to increase nutrients quality in vermicompost. The study was conducted by using *Eudrilus eugeniae* cultured under six different ratios of bedding with spent mushroom substrate (100:0, 80:20, 60:40, 50:50, 40:60, 20:80). The result found that the highest growth rate of earthworms (2.5%) in bedding with spent mushroom substrate at the ratio 60:40. The value of pH, EC, OC and C/N ratio was significantly decreased. And the highest decreasing at the ratio 60:40. On the other hand, The increasing nutrient content (Total N, P, K, Mg, Ca) in this ratio. Therefore, Application of bedding with spent mushroom substrate at the ratio of 60:40 was suitable for produce vermicompost. To be able to reduced spent mushroom substrate that will affect the environment. It increases the amount of nutrients needed for plants, produced organic fertilizers that had a better chemical and biological properties quality. And can be applied to development of agricultural products.

Keywords: spent mushroom substrate, mushroom, earthworm, vermicompost quality



EM-25

Using Vermicompost and Organic Amendment to Cultivate Salt Tolerant Crops in High Salt-affected Soil

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Abstract

Salt-affected soil are widely distributed thought the world. In the Northeast of Thailand, an area of 17.81 million hectares of the region faces this problem. The soil in the Northeast has a low fertility rate due to sand soil texture in the most part of the area. Salt tolerant crops have been introduced for remediation of salt-affected area. However, for severely salt-affected soils, salt tolerant crops may be not cultivated. Therefore, the objective of this research was to study the effect of vermicompost and rice husk ash amendment on cultivation of salt tolerant crops (*Sesbania rostrate*) in high salt-affected soil. The experiment plan was randomized complete block design with 5 treatments and 4 replications; T1. Saline soil (Control), T2. Saline soil + Vermicompost 25:75, T3. Saline soil + rich husk ash 25:75, T4. Saline soil + Coconut coir 25:75 and T5. Saline soil + Vermicompost + rich husk ash +Coconut coir 25:25:25:25. The results found that *Sesbania rostrate* could growth in all treatment with saline soil 25%. The highest growth rate of salt tolerant crops was found in T5 with Vermicompost + rich husk ash +Coconut coir fiber and followed by T2 with vermicompost treatment and T3 and T4 after 10 weeks with 97 cm, 85.33 cm, 33 cm and 0 cm respectively. Salt tolerant crops could not survive in T1 saline soil. Vermicompost and organic amendments could increase soil nutrients and reduce electrical conductivity (EC). The results from this study would be useful knowledge to help increasing farmers' income by cultivating salt tolerant crops in severe salt-affected soil.

Keywords: saline, vermicompost, organic amendment, salt tolerant crops



EM-26

Identification of Glyphosate Tolerance Soil-borne Bacteria from Coconut, Coffee and Oil Palm Plantations in Universiti Putra Malaysia

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Abstract

Glyphosate is a non-selective herbicide used for killing a broad range of weeds, which was developed by Monsanto company since the early 1970s. High level of glyphosate usage for weed control in plantations has led to accumulation of the herbicide in soil, water and aquatic ecosystems, causing various adverse effects to the environment, non-targeted organisms, and human beings. Due to the concern of its toxicity, bioremediation can be considered as an innovative way to ease its negative effect, which exploits the ability of microorganisms to degrade harmful toxic substances into less toxic forms. In recent years, many scientists have enriched, isolated, cultured and screened a lot of bacteria, fungi, actinomycetes, alga endotherm microbial strains from the natural sewage or soil. However, most studies were done in temperate countries whereas studies in the tropical regions are still limited. In addition, a large proportion of microorganisms and their ecological roles are still unknown. In this study, a total 12 soil samples were collected from plantations such as coconut, coffee and oil palm which are located in Universiti Putra Malaysia, in where glyphosate is constantly applied for more than a decade. A total of 28 bacterial strains were isolated by mineral salt medium (MSM) enriched with glyphosate as the sole phosphorous source. Glyphosate tolerance test was carried out by striking individual pure isolates onto the nutrient agar with augmenting glyphosate concentration. Sixteen out of 28 isolates showed tolerance of more than 3,000 ppm glyphosate, in which 3 isolates managed to survive at 30,000 ppm glyphosate. Morphological and 16SrDNA identification were carried out on these 16 isolates. Two species were successfully identified as *Achromobacter xylosoxidans* and *Nguyenibacter vanlangensis*. *Nguyenibacter valangensis* is a glyphosate-tolerant bacterium but has yet been studied as a pesticide degrading bacterium in the past researches. This isolate was then measured its potential population growth (CFU mL/L) in MSM broth supplemented with two different concentrations of glyphosate and it showed rapid growth in higher glyphosate concentration. Further examination on *Nguyenibacter vanlangensis* is needed to confirm its potential use as a bioremediation agent in the future.

Keywords: glyphosate, herbicide, plantation, bioremediation, bacteria, mineral salt medium, isolation, 16SrDNA identification, *Achromobacter xylosoxidans*, *Nguyenibacter vanlangensis*, Malaysia

EM-27

Effects of Chemical Extraction Methods on Physicochemical Properties of Shrimp Chitosan

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Abstract

Chitosan extraction methods have not been applied and optimized in Cambodia where shrimp waste is abundantly found. This study explored the chemical extraction methods for Chitosan from shrimp waste (exoskeleton). Different sodium hydroxide (NaOH) concentrations for deacetylation were tested. Shrimp waste (exoskeleton) was sequentially treated with NaOH (3.5%) for deproteination at 80°C, HCl (4%) for demineralization at 80°C; NaClO (0.315%) for decolonization at ambient temperature and NaOH (40%, 50%, 60%) for deacetylation at 120°C. Yield, moisture content, total ash, lipid, fiber, solubility, nitrogen content, viscosity, and degree of deacetylation were determined. The commercial Chitosan bought from a local market was included for comparison. NaOH at 50% was found to be the optimum concentration for deacetylation based on increased solubility (96.27%), reduced ash content (0.56%) and increased degree of deacetylation (83.23%) as compared to that of 40% NaOH (93.61% solubility, 1.25% ash content, and 74.45% degree of deacetylation), though Chitosan yield in the former was lower (20.59%) than that in the latter (25.23%). Increasing the NaOH concentration to 60% had no significant advantage. Lipid and fiber content were not significantly affected with changes in NaOH concentration. The characteristic of Chitosan extracted with 50% NaOH at deacetylation stage were comparable to that of the commercial Chitosan.

Keywords: shrimp exoskeleton, Chitosan, chemical treatment, degree of deacetylation, NaOH concentration



EM-28

Interactions among Soil Physical, Chemical and Biological Properties under Different Farming Systems

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Abstract

The definition of soil quality has always been dynamic, changing over time within the soil science community. At first, the study focused more on fertility, the yield of crops, and less importance on a sustainable environment. In other words, science has defined soil quality in chemical and physical factors, such as the quantity or concentration of nutrients, organic matter, and water retention. Therefore, the definition of soil quality has changed in the last decade. The importance of biodiversity that exists both on the surface and within the soil began to be understood. These organisms have essential functions such as in the cycling of nutrients, the provision of nutrients for plants, the modification of the physical structure of the soil, water regimes, and the suppression of undesirable organisms in croplands. Some studies indicate that soil quality/health assessments are almost impossible due to the complexity of soil resources and where studies must focus on multiple points of view. Currently, it has defined soil quality as the function has within the environment, sustaining productivity, maintaining environmental quality, and promoting health in plants and animals. Accordingly, research interests have been moved to the interaction of the diversity of living organisms in their environment and their relationship with soil resources. In the previous studies, soil ecosystem health in different farming systems was discussed through observing the diversity of soil arthropod. Therefore, this study deals with the discussion on the interactions among the diversity of soil arthropods as soil biological properties and the soil physical properties such as water retention capacity, aggregates and organic matter. In addition, soil chemical properties such as total nitrogen, inorganic nitrogen components under the different farming systems were analyzed. The experimental results indicated that there was a certain trend in interaction among the diversity of soil arthropods and soil physical and chemical properties, the details are written in the manuscript.

Keywords: soil quality, soil health, the biomass of microorganisms, aggregates, total nitrogen



EM-29

Monitoring of Crop Plant Height Based DSM Data Obtained by Small Unmanned Aerial Vehicle Considering the Difference of Plant Shapes

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Abstract

Unmanned aerial vehicle (UAV) has been recognized as a potential tool to obtain the spatial information of crop state in small-scale farming fields. The objectives of this study were to assess the availability of UAV photographs to determine plant height (PH) for three crop varieties (barley, oat and perilla); and to evaluate the effect on the accuracy of estimated PH caused by different plant shapes. The UAV photography and ground survey were conducted weekly from May 31 to September 3, 2019, at the examination field of Obihiro University of Agriculture and Veterinary Medicine. Estimated PH was obtained from the differential value (D_value) of digital surface model (DSM) generated from UAV photographs through the structure from motion (SfM) process. The results demonstrated that the D_value of DSM produced the highest estimation accuracy ($R^2=0.97$, RMSE=9cm) for perilla, which is a herb crop with luxuriant spade-shaped leaves, and a moderate estimation accuracy ($R^2=0.87$, RMSE=23cm) for oat, which is a grain crop making small spikes during the heading time with lanceolate leaves. The estimated PH produced the lowest accuracy ($R^2=0.34$, RMSE=28cm) for barley, which makes outward spikes with long prickly awns above the ear of gain. However, a higher accuracy ($R^2=0.67$, RMSE=17cm) for barley was obtained after a lodging of spikes caused by rain at July 2. Furthermore, the accuracy of estimated PH increased in both barley and perilla field after corrected by plant coverage of the field. These findings suggest the D_value of DSM obtained from UAV photographs can provide accurate estimation of PH for crops with luxuriant leaves such as dicotyledons, but comparably less accurate estimation for crops with long and sharpe leaves such as monocots. Additionally, elimination of the effect of unrecognizable factors such as long awns and non-plant factors such as the ground can increase the accuracy of estimated PH.

Keywords: unmanned aerial vehicle (UAV), digital surface model (DSM), plant height estimation, plant shape

RU-02

Contracting and Negotiation Attributes: A Case of Sunflower Seed in Central Tanzania

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Abstract

In most developing country like Tanzania, poor farmers have limited access to agricultural inputs. One of the proposed solutions is to link farmers with private sector through contract farming. In Tanzania, sunflower oil has been preferred as edible cooking oil for many households since it has low level of cholesterol for human consumption. Moreover, sunflower-contract farming was adopted as part of new agricultural policy in 2009/2010 cropping season majoring in providing triangular benefit among the stakeholders: sunflower-farmers; private companies and the government of Tanzania. Despite the government of Tanzania to link the sunflower farmers with the private sector, contract farming has been facing some challenges in coordination such as pricing, production services and credit services. The purpose of this study is to investigate the impact of contract farming program among sunflower farmers. Specifically, the study aims to: (i) identify private firms providing contract farming among the sunflower farmers; and (ii) evaluate the relationship of the negotiation attributes in farmers' income growth among sunflower farmers. The field survey was conducted in March 2020, targeting 40 contracted farmers in two regions of Central Tanzania. In sunflower sector only two major private firms still provide contract farming among the sunflower farmers. Others did not continue to provide the contract because of the challenges in contract coordination. Additionally, credit access and production services were significant with farmers' income growth. The study suggests that the price the contractor pays for a project should be dependent on quality. This can work as an incentive if the producers feel their work is rewarded.

Keywords: contract farming, sunflower seed, Central Tanzania



RU-04

Government-orientation on Contract Farming to Enhance the Confidence of Agricultural Investment in Cambodia

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Abstract

Contract Farming (CF) in reference to the sub-decree 36 was officially endorsed by the Royal Government of Cambodia in 2011, and consequently implemented. In the current framework, the supervision emphasis and operating mechanism is led by Ministry of Agriculture, Forestry and Fisheries (MAFF) to coordinate with 18 ministries who jointly play the roles as committees and handle the issues if there are any. This paper introduces the framework and implementing mechanism of contract farming to improve the confidence of agricultural investment in the Kingdom of Cambodia, and identifies key success, challenges, and possible solutions of CF implementation. The data of contract farming implemented from the year of 2013 to 2020 were collected from 25 Capital-Provincial Department of Agriculture, Forestry and Fisheries (PDAFFs). Key informant interviews of a total of 14 selected cases including 10 agricultural cooperatives (ACs) and 04 agricultural companies in Kampong Thom and Preah Vihear provinces were interviewed using structured questionnaires. The results of research study show that the agricultural production contracts have been increased significantly, 60 contracts from 2013 to 2017; 90 contracts in 2018; 498 contracts in 2019, and 516 contracts in 2020 of agricultural commodities such as rice, cassava, cashew, vegetable, and pepper, etc. These CF schemes are formal contracts known as agreements of buyers and producers by involving government as coordinator and witness in signing the contracts. Meanwhile, the failure cases were happened by informal contract implementation; however, there were no certain data of failure contract farming because they were implemented out of control from government's competences. The implementation of contract farming was facing some challenges occurred intentionally by two parties and were likely happened due to limited capacity to satisfy the production requirements (quantity and quality), late payment, capital investment, logistics and transportation. With the formal contract farming implementation, the challenges have been solving by coordination from the government scheme. To build up the confidence in contract farming implementation, four solutions have been proposed by (1) pre-payment mechanism and warehouse receipt; (2) certification based; (3) financial and technical supports, and (4) policy support by the government. The introduction of framework and implementation mechanism of contract farming in this study may provide a reference for potential investments in agriculture and related sectors, and encourage farmers/producers, investors and relevant stakeholders to engage in contract farming.

Keywords: contract farming, framework, implementing mechanism, agricultural investment, Cambodia



RU-05

Possibility of Value Addition on Traditional Rice Liquor in Cambodia

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Abstract

Rice liquor is one of the traditional alcoholic beverages produced by small-scale farmers in rural areas. However, rice liquor production faced deficits and low profitability due to low sales price, low productivity, and high-frequency of production failure. The producers recognized low quality of rice liquor. It was hypothesized that the product quality improvement could enhance to add value and increase its profitability of rice liquor production. The key modifications of production techniques for quality improvement of rice liquor have been identified such as sanitary control of working place, equipment, and low material; and controlling the production process and quality control. However, it has not been clarified if the value addition on traditional rice liquor could be possible by improving product quality in Cambodian markets. This study aimed to assess the possibility of value addition on the traditional rice liquor in Cambodian markets. Firstly, the structured interviews with questionnaires to the consumers were conducted to identify the consumption trends and preferences on the rice liquor and other alcoholic beverages. Secondly, quality liquor produced with the modified techniques were provided for consumer tests on its quality and sales price in 2009. Finally, the trial marketing and sales of the quality liquor with the required registration for product commercialization were conducted to identify the possibility of adding value on the products in the markets at Phnom Penh from mainly 2010 to 2011. The survey results found that the traditional rice liquor was consumed more in rural areas than the urban areas. More male domestic consumers consumed rice liquor than female who consumed medicinal and fruit liquor more. A consumer test was conducted with tasting and observation of the products packaged with glass bottles and labeling after the necessary quality check. Both Cambodian and foreigners highly evaluated the quality liquor produced with modified techniques and indicated the possibility of putting higher price for sales as commercialized products. After the required registrations for commercialization, the quality rice liquor was trialed for marketing and sales. These activities resulted to attract the several super-markets, restaurants and souvenir shops, and agreed for sales contract at more than 9 times higher price than the producers' sales price at the local markets. These results showed the possibility of the traditional rice liquor to gain the market share in domestic and international customers with value addition by ensuring the quality and safety.

Keywords: rice liquor, value addition, questionnaires, commercialization, marketing and sales



RU-06

Status of Production and Distribution Channel of Cassava in Cambodia -Future Prospects for Sustainable Production-

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Abstract

Cassava cultivation in Cambodia has been increasing rapidly since 2010, and it has become the country's second largest crop after rice. Cassava is expected to become a major industrial crop in Cambodia, but most studies on its cultivation only discuss the potential for improving its production scale, productivity, and suitable cultivation techniques, including ways to protect the crop from diseases and pests. However, sustainability of its cultivation as the country's main industrial crop cannot be achieved only by introducing agronomically suitable cultivation methods. The cultivation must be economically viable, socially beneficial, and environmentally sustainable. However, little is known about locally existing sales and distribution mechanism that will contribute to maintain or improve the economic viability of cassava cultivation in Cambodia. Therefore, this study aims to identify and analyze the characteristics of cassava cultivators and their business activities, the current distribution channel and the challenges and prospects for sustainable cassava cultivation in Cambodia. This study selected two major cassava producing provinces in Cambodia—Battambang and Pailin—as the study area. These two provinces are located in the north-western part of the country, and both border on Thailand, the third largest cassava producing country in the world. Semi-structured interviews of 24 cassava cultivators were conducted in two major cassava-growing provinces in Cambodia—Battambang and Pailin—to understand the series of production events, including the way they sell their produce. In addition, owners of six consolidating points that collect and process cassava root to sell domestically or for export were interviewed about their sales partners and destinations to identify the distribution channel. As a result, three different distribution types, from producers to collecting points, were identified, and their selection criteria appeared to be the distance between the producers and the collection points. The direct and indirect destination of the produce from the collecting points was identified as Thailand. The identified distribution channel, including collection points, comprised only cassava cultivators and exporters to Thailand, and no production specialization was observed. This reveals that building an efficient and viable distribution mechanism and strategy by utilizing the existing system will be one of the most important challenges in making cassava cultivation a major industrial crop and thus expanding the revenue source for the country.

Keywords: cassava production, business, distribution channel, Cambodia



RU-07

Food Service Industry Development and its Effect to Distribution of Fresh Agri-products in Vietnamese Suburban Area

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Abstract

Food systems in developing countries are getting modernized. Although global retail chains are the main stakeholders in its development, the food service industry could be another driver to strengthen this movement. This research aims to show the current state of fresh agri-product (fruits and vegetables) procurement of food service (catering) companies in industrial parks, and to consider how expanding the food service industry impacts agricultural production and distribution in rural and suburban areas in Vietnam. A semi-structured interview was conducted with 15 local and international companies, which supply meals to local labourers at factories within the industrial zone in northern and southern Vietnam, particularly in Hanoi City, Hai Duong Province, Ho Chi Minh City, and Tien Giang Province. This research answers the following questions: 1) What are the general characteristics of these catering companies; 2) How do they procure fresh agri-products as ingredients; and 3) How does the development or modernization of the food service industry affect agricultural production and distribution in the surrounding areas of the industrial zone? It was found that offering catering services to factories in the industrial zone is competitive but not stable. It used to be dominated by small local individuals; however, foreign companies have already entered and outsourced their operations to local companies. Further, catering contracts are usually short-term, on a yearly basis, and on a low-price orientation. In the northern part where industrial parks are scattered, catering companies are more dispersed, and it is difficult to expand the scale. In the southern area, their businesses are relatively widespread and the companies are doing business in several provinces. With regard to the procurement of fresh agri-products as ingredients, direct transactions with local producers and purchases from local wholesale companies are observed in the northern part, while centralized collection at the HCM head office is common in the southern part. Finally, there is a tendency for distribution of fruits and vegetables to be concentrated and geographically extended, especially in the south. The parcels collected at the wholesale market in HCM city are distributed to the kitchens of each province via the warehouses of wholesalers or catering companies. The study points out the effects of the expansion of industrial parks in rural areas and the accompanying development of food service (catering) companies, the concentration of agri-product distribution in urban wholesale markets, and the increase in relay transactions from local distribution in the cities.

Keywords: food service industry, agri-product, agricultural production and distribution, business, market, Vietnam



RU-08

Factors Driving the Effectiveness of Community Fisheries Management Resulted from Fisheries Policy Reforms

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Abstract

There are almost two decades of implementing fisheries policy reforms since 2000 of the first and second in 2012, resulting 516 Community Fisheries (CFi) organized in the country, which required to overcome the factors driving to the effectiveness of CFi management in Cambodia. To explore those factors, the study have been conducted with cluster purposively selected of 16CFis, in which 527 CFi members randomly interviewed together 16 Focus Group Discussion (FGD) taken place for quality and quantitative analysis. The results shown that there are two key main factors influencing the effective CFi function and management. Firstly, it is the legal framework supporting the process of CFi establishment and management, expressed by all FGDs and 96% of interviewed CFi members. This given the reason that CFi legal framework is the driven and important factor influencing CFi function and official recognition of their value in the fisheries resource management. This legal framework provided in the form of a Royal Decree on the Establishment of CFi, followed by a Sub-decree on CFi Management, the amendments of Fisheries Law immediately after reforms and the declaration on CFi Guideline, which has never been before. The second equal necessary factor is the benefit of being CFi membership, expressed by 93% of the respondents and all 16 FGDs, because they have more access to fishing ground by small-scale fishers, getting more fish for consumption and income for improving their living, especially recognition of their values' participation in resource ownership, capacity building and work together as unity and trust creation. However, there are challenges and lessons learnt providing for brighter future of CFi management, requiring actions on the amendment of CFi legal framework particularly on CFi economic creation and financial support for effective CFi function and management. Those should include the expansion of CFi rights and roles on economic activities and benefits of being CFi membership, which needed to be clearly defined in the Fisheries Law and CFi sub-decree's amendment and followed by CFi Guideline. The important secure sources of financial support to effective CFi function for the sustainable fisheries resource management should be from the state, development partners and private sectors, which need to be addressed in CFi legal framework.

Keywords: fisheries policy reform, Community Fisheries (CFi), CFi legal framework, benefits of CFi membership, fisheries management



RU-09

Cambodian Culinary Tourism and Gastrodiplomacy: Challenges and Opportunities in a Post-COVID-19 World

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Abstract

Despite the legacy of the Khmer Empire and recent efforts to popularize the country's culinary heritage, Cambodian cuisine still remains among the least known cuisines of Southeast Asia. Conversely, some of the neighbouring cuisines like Thai and Vietnamese have achieved worldwide acclaim by implementing successful gastrodiplomacy campaigns. The subsequent development of culinary tourism and diversification of the tourism sector has provided additional growth for their economies, which are aspects Cambodia could also greatly benefit from. The presented article identifies potential causes for the low recognition of Cambodian cuisine and examines the current state of gastrodiplomacy in the country. By interviewing relevant stakeholders, analyzing the gastrodiplomacy strategies implemented by other Asian countries and adapting their relevant components to the Cambodian context, a customized gastrodiplomacy plan for Cambodia is presented. Such a plan could not only prove crucial for the recovery of Cambodia's tourism and hospitality sector in a post-COVID-19 world but also attract more investments, boost the economy and establish Cambodia as a culinary destination in Southeast Asia.

Keywords: Cambodian cuisine, gastrodiplomacy, investment, economic growth

RU-10

Farm to Market: Post Covid-19 Opportunities and Challenges for Farmers in Kampong Cham Province

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Abstract

This study deals with the farmers who engage in agricultural practices in Kampong Cham Province, Cambodia, and those who were given the access to training opportunities provided by an international non-governmental organization. The aim of this project was to alleviate poverty in the region by introducing sustainable farming techniques and eventually to produce low-input chemical products that are safe for the human body and environment and can also bring more income to the farmers. Approximately 1,500 local farmers in Kampong Cham Province are part of the project. The baseline survey of 500 principle farmers and the endline survey including 100 principle farmers were completed. The research was conducted to shed light on the impact of the project implemented over three years, while suggesting some perspectives to link the farm and the market in the post Covid-19 time. Hence, the objective of this study was 1) to recognize the impact of the project by data analysis of the surveys, 2) to conduct an analysis based on the consumers' awareness base survey regarding their behavioral change before and after Covid-19, and to suggest the way forward. This study concluded that the project was impactful in terms of target farmers being able to produce compost, liquid fertilizers, and bio-pesticides by utilizing surrounding natural resources. Over the project period, the local agricultural extension officers are more engaged with the farmers, and mobile phones (internet) have gained popularity as a mean of getting agricultural information, which indicates the possibility of extending their marketing online in the future. The challenge remains that farmers are struggling to find a market where they can add more value to their products. This is particularly important for economic empowerment of the female farmers in the region due to the fact that they play an important role in selling products in the market. In addition to the insufficient food value chain system in the region, the challenges remain that the consumers' perception of higher prices of the organic foods and no availability of organic/safe shops in Kampong Cham Province have hindered purchase the products. More education and training for farmers in terms of marketing may also be needed to adequately inform consumers on how to access organic/safe foods at affordable prices. The Covid-19 pandemic brought greater interests in human health, and a greater awareness of the importance of hygiene is recognized, although there is no specific, comprehensive law that addresses the full scope of consumer protection in the country.

Keywords: training, sustainable farming techniques, low-input, empowerment of female farmers, consumers' awareness and behavior, Covid-19 pandemic



RU-11

Marketing Strategies and Grape Farmers Welfare Improvement: Evidence from Afghanistan

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Abstract

The role of marketing channels in agribusiness has been extensively studied in the last decade. While most studies have focused on the general impact of marketing channels on sales, the impacts of different choices of marketing channels on net returns has not been widely studied. Focusing on Afghan grape farmers, this paper aims at investigating the determinants of marketing channels, as well as the impact of marketing channel choices on net returns. The marketing channels considered in this paper were channels through farmers' organizations, traders and farmers who do on spot selling. Using survey data from 150 grape farmers in Kabul, Parwan, and Kapisa provinces in Afghanistan, the results showed that grape farming experience, selling price, province, distance to markets and internet use were some of the factors that affected the choice of marketing channels. In addition, marketing channels through local traders had a positive impact on returns as compared to channels through farmers' organizations and on spot selling. The selectivity correction terms for all marketing contracts were significant indicating the existence of selectivity bias from unobserved factors.

Keywords: marketing channels, Afghan grapes, MNL Model, BFG Method, selectivity correction



ED-01

School Gardens as a Method of Scaling Up Sustainable Technologies: A Review

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Abstract

Current research on school gardens is primarily focused on improving student nutrition. Less examined is their potential to be agents of knowledge transfer to the wider community. This paper seeks to determine the potential of school gardens as a pathway to scaling agricultural innovations. Literature is reviewed for best practices and recommendations conducive to scaling up agricultural technologies using school gardens. Identified challenges and suggestions are then applied to a case study analysis of a USAID-funded project in Cambodia. The objectives of this study are 1) to review current and historical literature regarding scaling and adoption of agricultural innovations, and 2) to determine the impact of school gardens as a method of scaling up agricultural technologies. Review of theoretical and empirical literature found using key word searching. The key words included: ‘adoption’, ‘scaling’, ‘agriculture’, ‘school garden’, ‘knowledge’, ‘transfer’, ‘education’, and ‘sustainable intensification’. The findings are applied to a case study of the Scaling Suitable Sustainable Technologies (S3-Cambodia) project. The results showed that the best practices for scaling through school gardens included: Including parents in the learning process and upkeep of school gardens, collaboration and commitment among all stakeholders, establishment of hands-on, research-based agricultural curriculum in schools, financial assistance from government or outside organization for startup and upkeep, and establishment of home gardens alongside school gardens. Primary barriers included: Focusing on the ‘what’ and not the ‘how’ (i.e. scaling is not ‘one size fits all’), social mores and the relationship between parent/child, capacity building for and involvement of school heads, teachers, and parents, lack of social, human, and/or economic capital, and unintegrated commitment and partnership among stakeholders. School gardens have the potential to play a key role in scaling sustainable intensification (SI) technologies. They provide opportunities for knowledge transfer through teacher-student-parent communication. We can apply best practices and address key challenges through analyzing S3-Cambodia. S3-Cambodia targets youth as an entry point to extend target SI technologies to farm families. The project engages students in experiential learning opportunities by establishing “green labs” at secondary schools. Students receive a combination of hands-on training in SI practices and STEM-based instruction in SI principles. This preparation will culminate in the establishment of student home gardens featuring grafted vegetables and wild gardens. This paper reviewed current and historical literature regarding agricultural adoption to analyze the impact of school gardens on scaling. We find that school gardens can play a key role in scaling SI technologies through the transfer of knowledge if barriers are addressed efficiently.

Keywords: knowledge transfer, community, school garden, agricultural innovations, best practices, primary barriers, sustainable intensification (SI) technology



ED-02

The Application of Intervention Mapping in Developing Parental Behavior Modification Program for Pesticide Exposure Prevention among Children in Agricultural Areas for Sub-District Health Promotion Hospital, Thailand

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Abstract

This study used a research and development (R&D) design consisting of two phases. Phase 1 aimed to understand parental behavior regarding pesticide exposure among children in agricultural areas. Data were collected by multiple parent focus group in Sakon Nakhon Province. Data collected was then analyzed using content analysis. Phase 2 aimed to develop and study the quality of a parental behavior modification program for pesticide exposure prevention among children in agricultural areas. The results in phase 1 were used as input factors to develop the foreside program by the Intervention Mapping (IM). The developed program was then tested and reviewed and reviewed by nine experts. Data were analyzed with mean and standard deviation. We found that parent's behavior in preventing pesticide exposure in their children was influenced by a least three factors, namely: attitudes toward pesticide exposure in their children, social norms and perceived behavioral control about pesticides exposure in their children. This meets the basic structure of Theory of Planned Behavior. The second phase involved developing a parental behavior modification program for pesticide exposure prevention in children in agricultural areas for a Sub-District Health Promotion Hospital. The components of the developed program were: 1) background and significance; 2) objective; 3) organization; 4) role of involved people; 5) guidelines for organizing four learning activities for the parent behavior modification program; 6) monitoring and evaluation and 7) program management. The results of the program's quality assessment found that the overall quality of the program is in a very good level. When considered each aspect, it was found that all aspects; accuracy standard, utility standard, appropriateness standard, feasibility standard and generalizability standard were in very good quality as well. The findings of this study suggest that the developed program should be implemented with parents who had desirable pesticide exposure prevention behaviors.

Keywords: Theory of Planned Behavior, pesticide exposure, prevention behavior, health program modification, Intervention Mapping (IM)



ED-03

Experimental Study of Extension Impact on Farmers' KAP towards Sri Lankan Cassava Mosaic Disease Prevention in Cambodia

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Abstract

Cassava is the second largest income contribution to Cambodian smallholder farmer after rice in Cambodia. However, Sri Lankan Cassava Mosaic Disease (SLCMD) poses a serious threat to the cassava industry in Cambodia, as well as in the region, as it can reduce cassava yield by up to 80 percent or more in susceptible varieties. To prevent further spread of the disease, SLCMD has no clear prescription, and so far there is no remedy other than pulling out and incinerating the infected strain. Therefore, it is urgent to disseminate SLCMD infection prevention measures. In addition, as the damage is widespread, it is necessary to find efficient and effective measures to prevent the spread of SLCMD infection. Although in case of urgent information dissemination to prevent further infection in the region, there was no evidence on which media is more effective on the change of people's knowledge, attitude and practice (¹KAP). This is to examine for the first times extension impact on farmers' KAP. The first KAP survey was conducted from June to October 2018, targeting 468 producers who grew cassava from 2016/2017 to 2018, in Battambang Province. Experimental units are allocated into three groups by the random sampling method so that there is no significant difference in the variables of gender, age, years of education, and years of cassava cultivation experience, knowledge, and willingness to pay for certified healthy seedlings for these subjects. The intervention was performed from October 2019 to November 2019. For the 1st treatment group, the investigators distributed posters for each household. A workshop was held and posters were distributed to the 2nd treatment groups. In the posters and slides of the workshop, in addition to pest control based on the viewpoints of pathology and biological control, knowledge, awareness and practices that farmers lacked revealed in the first KAP survey. Finally, from November 2019 to February 2019, a second KAP survey was conducted on these surveyed persons to investigate changes in knowledge and awareness regarding pest control, practices, and willingness to pay for healthy seedlings. In the analysis, t test was being conducted. The results show that the dissemination of information by workshop plus poster is an effective way to improve farmers' knowledge, farmers' practices and slightly improve their attitudes to prevent the spread of pests and diseases. Policy implication is that we could share our know-how to run the workshop with other government as well as non-governmental and commercial associations and emphasize more about importance of not trusting untrusted source of stems.

Keywords: field experiment, extension, Knowledge, Attitude, and Practice (KAP), Sri Lankan Mosaic Disease, SLCMD, RCT



IN-01

Analyzing the Water Harvesting Potential and its Maximization by the Application of Clayey Dressing Application in Qargha Reservoir Watershed, Kabul, Afghanistan

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Abstract

The unfavorable impacts of climate change are experienced all over the world. Afghanistan is among the countries that are severely affected by the impacts of climate change. The adverse effect on water resources constitutes one of the most negative effects. Currently, water management authorities and researchers look for improved water management techniques that will reduce the pressure on the already stressed water resources. Surface runoff harvesting is becoming more popular in regions with an arid-semi-arid climate, such as Afghanistan because of the increasing demand for scarce water resources. Therefore, a study was carried out to analyze the water harvesting potential in Qargha Reservoir Watershed, and to evaluate the effectiveness of clayey dressing application in maximizing surface runoff compared to control conditions. Rational method and sorptivity method were used to estimate the potential surface runoff and clayey dressing (silty clay loam and clay loam) was applied as a conservation strategy. A small area of 2 ha was selected in suitable areas of Qargha Reservoir Watershed. Based on 16 rainfall events, the volume of surface runoff estimated by the rational method was 509.40 m³, which was larger than the 478.34 m³, estimated by the sorptivity method. After clayey dressing application, the estimated volume of surface runoff based on the rational method increased to 1392.36 m³. Furthermore, the estimated volume of surface runoff after clayey dressing calculated with the sorptivity method increase to 1608.46 m³ based on 16 rainfall events. Thus, proper soil surface treatment such as application of clayey dressing is highly recommended for achieving sustainable agriculture.

Keywords: water harvesting, Qargha Reservoir, clayey dressing application, silty clay loam, clay loam, sorptivity method