BOOK OF ABSTRACTS

The 14th International Conference on Environmental and Rural Development

14th ICERD

March, 03-05 2023

Angkor Paradise Hotel, Siem Reap, Cambodia

Organized by:

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FOOD TECHNOLOGY, RESEARCH AND INNOVATION PLATFORM

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CHINESE LEARNING CENTER

The 14th International Conference on Environmental and Rural Development

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March 3rd – 5th 2023
Angkor Paradise Hotel, Siem Reap, Cambodia

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Managing Committee & Chairmanship

14th ICERD

Managing Committee and Chairmanship

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
Chair of Organizing Committee	Prof. Dr. Bunthan Ngo
Chair of Steering Committee	Dr. Borarin Buntong
Chair of Scientific Committee	Prof. Dr. Machito Mihara
Chair of Awarding Committee	Prof. Dr. Eiji Yamaji

Chairmanship of Oral Presentation

Room 1

	Session 1: Water Management	Session 2: Soil Science	Session 3: Agricultural Production
Chair	Dr. Ivan Minchev	Dr. Chuleemas Boonthai Iwai	Prof. Dr. Dieter Trautz
Co-Chair	Mr. Lytour Lor	Dr. Sophornarith Ro	Dr. Samnang Ngoun

Room 2

	Session 1: Food Innovation	Session 2: Food Innovation	Session 3: Soil Science
Chair	Prof. Dr. Mom Seng	Dr. Rithy Chrun	Dr. Narong Touch
Co-Chair	Dr. Lalita Siriwattananon	Dr. Hiroyuki Hattori	Dr. Minh Phuong Nguyen

Room 3

	Session 1: Energy and Water Treatment	Session 2: Soil Conservation	Session 3: Water Environment
Chair	Prof. Dr. Masami Furuuchi	Prof. Dr. Barry N. Noller	Dr. Jeeranuch Sakkhamduang
Co-Chair	Dr. Yuri Yamazaki	Dr. Tory Chhun	Dr. Kasumi Ito

Room 4

	Session 1: GIS and Environment	Session 2: Rural Development	Session 3: Rural Development
Chair	Dr. Sanara Hor	Prof. Dr. Eiji Yamaji	Dr. Sinisa Berjan
Co-Chair	Dr. Sarvesh Maskey	Dr. Anucha Wittayakorn-Puripunpinyoo	Dr. Mardy Serey

Room 5

	Session 1: Rural Development	Session 2: Rural Development
Chair	Prof. Dr. Fumikazu Ubukata	Prof. Dr. Kiichiro Hayashi
Co-Chair	Dr. Kimchin Sok	Assoc. Prof. Dr. Tadao Yamamoto

Chairmanship of Poster Presentation

Chair for Poster Presentation: Prof. Dr. Dieter Trautz

Agricultural System and Food Innovation

Co-chairs	Dr. Kim Eng Tho	Dr. Junya Singkham
	Dr. Leila D. Landicho	Dr. Mouylin Chem
	Mr. Socheath Tong	

Environmental Management

Co-chairs	Ms. Lorraine Cristy E. Ceniza	Dr. Kumi Yasunobu
	Dr. Chau Nien Nguyen	Mr. Nareth Nut
	Dr. Dyna Theng	

Infrastructural Systems/ Education for Sustainable Development

Co-chairs	Dr. Sinisa Berjan
	Dr. Tetsuya Shimamura
	Dr. Muy Leang Kim

Rural Development

Co-chairs	Dr. Nghia Khoi Nguyen
	Dr. Yuko Fukuda
	Dr. Chalermsak Toomhirun

Program of the 14ᵗʰ ICERD

Friday, March 3ʳᵈ 2023

14:00 – 16:00 Steering Committee Meeting
14:00 – 17:00 Participants Registration at Angkor Paradise Hotel
16:00 – 17:00 Final Organizing Committee Meeting (OCM) of 14ᵗʰ ICERD with ISERD Councilors
17:00 – 18:00 Welcome Reception at Angkor Paradise Hotel

Saturday, March 4ᵗʰ 2023

Part I: Participants Registration

7:00 – 8:00 AM Registration

Part II: Opening Program (8:00 – 10:00 AM)

Opening Remarks from Distinguished Guests

- Opening Remarks by Professor Dr. Bunthan Ngo, Rector at Royal University of Agriculture, Cambodia
- Opening Remarks by Dr. Wenting Xu, Co-Director of Chinese Learning Center, RUA-HNU
- Opening Remarks by Dr. Shetty Seetharama Thombathu of CapFish Project, United Nations Industrial Development Organization
- Opening Remarks by Representative of EU
- Welcome Messages from ISERD
- Welcome Remarks by Professor Dr. Mario T. Tabucanon, President of ISERD
- Message from ISERD Councilors by Professor Dr. Machito Mihara
- Introduction from ISERD Awards Committees by Professor Dr. Eiji Yamaji
- Acknowledgement and Introduction of Scientific Session by Dr. Buntong Borarin

Keynote Presentation

- Keynote presentation by Dr. Vang Seng, Director-Department of Agricultural Land Resources Management, GDA, MAFF Cambodia

Part III: Scientific Presentation

10:00 – 10:30: Poster Presentation and Coffee Break
10:30 – 12:30: Oral Presentation – Session 1
12:30 – 13:30: Lunch Break and Poster Presentation
13:30 – 15:30: Oral Presentation – Session 2
15:30 – 16:00: Poster Presentation and Coffee Break
16:00 – 18:00: Oral Presentation – Session 3
18:00 – 20:30: Banquet and Awarding Ceremony

Sunday, March 5ᵗʰ 2023

7:30 – 16:00 Excursion

Option 1: Archeological Park
Option 2: Tonle Sap Lake
Option 3: Agricultural Community

Scientific Presentation
of the 14th ICERD

Oral Presentations

Room 1 – Ballroom

Session 1: Water Management 10:30 – 12:30
Chair : **Dr. Ivan Minchev** **Co-Chair** : **Mr. Lytour Lor**

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11:00 – 11:15	AG-14-05	**Development of a Simple-Concept Water Allocation Model at the Farm-Block-Level for Efficient Water Management** *Naohisa Nakashima and Testuro Fukuda*	p. 4	11:15 – 11:30	AG-14-06	**Clarification of Water Use Under the Complicated Irrigation System and Its Modeling in the Boribo-Bamnak River Basin, Cambodia** *Salpisak Heng, Yamamoto Tadao and Inoue Takashi*	p. 5
11:30 – 11:45	AG-14-22	**Effect of Drought Application on Flower, Yield and Leaf Mineral Content of Durian (Cv. Monthong) in Cambodia** *Sophal Var, Sreymom Sao, Sovathai Thea, Kim Khuy Khun, Kim Eang Tho, Sarom Men and Hong Cheang*	p. 15	11:45 – 12:00	AG-14-66	**Evaluation of Drought Tolerance of Selected Peanut (Arachis Hypogaea L.) Cultivars Under Net House Condition** *Kimmouy Meng, Kim Eang Tho, Raby Nget and Siranet Roeun*	p. 44
12:00 – 12:15	EM-14-30	**Drought Threshold and Drought Monitoring Using Google Earth Engine in Prek Thnot River Basin** *Kimsor Ol, Ty Sok, Kimsan Chan, Ilan Ich, Ratboren Chan and Chantha Oeurng*	p. 59				

Room 1 – Ballroom

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<td>The Effects of Green Manures on Sustainable Agriculture Soil Conservation Under Field Experiment in NMU
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<td>AG-14-01</td>
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Chair : **Prof. Dr. Dieter Trautz** **Co-Chair** : **Dr. Samnang Ngoun**						

16:00 – 16:15	AG-14-20	**Cotton Mutation Breeding using Ion-Beam** *Chhun Tory,* *El Ney Im, Hong Navin, Hol Sokkin, Song Sreyleak, Hayashi Yoriko, and Abe Tomoko*	p. 13	16:15 – 16:30	AG-14-27	**Experiment on Smart Mushroom Cultivation Using the Environmental Control System** *Chanreng Sey Nhim, Nita Chek, Chanthan Hel, and Rothna Pec*	p. 18
16:30 – 16:45	AG-14-29	**The Efficiency of No-Till Transplanter Use in Conservation Agriculture Tomato (Solanum Lycopersicum) Production in Battambang Province, Cambodia** *Sokleng Mang, Lyhour Hin, Hong Cheang, Sophoanrith Ro, Manuel R. Rayes and Chan Makara Mean*	p. 19	16:45 – 17:00	AG-14-04	**Effect of Pollination by the Apis Mellifera on Yield and Fruit Productivity Quality of Greenhouse Produced Sweet Net Melon in Cambodia** *Chhouk Chheang and Sopheak Tith*	p. 3
17:00 – 17:15	AG-14-33	**On-Farm Evaluation of Peanut (Arachis Hypogaea) Varieties in Different Agroecosystems** *Thy Yorn, Kim Eang Tho, Sophoanrith Ro, Siranet Roeurn, Chanthin Ouk, and Penghaing Ly*	p. 22	17:15 – 17:30	EM-14-08	**Factors Influencing and Limiting Contribution of Grape Farming to the Improvement of Livelihood of Grape Farmers in Yamanashi Prefecture, Japan** *Mohammad Mirwais Yusufi and Machito Mihara*	p. 47
17:30 – 17:45	AG-14-36	**Field Evaluation of Different Peanut Cultivars for Agronomic Yield Parameters, Pest and Disease Infestations** *Leng Theary, Tho Kimeang, Orn Chhourn, Rin Soriya, Ouk Chanthin and Ly Penghaing*	p. 24	17:45 – 18:00	AG-14-21	**Effect of Different Levels of 15-15-15 Fertilizer on the Growth and Flowering of Wingpod Purslane (Portulaca umbraticola)** *Lim Srengkhai, Nong Anisa, Nhebsae Osin, Chhem Net, Mat Madavy, Thoeurn Sreymao, Favzy Sapraeny, Sis Ahmatlampi, Phat Sophon, Ly Chhy, and Chhun Tory*	p. 14

Room 2 – KULEN Room

Session 1: Food Innovation **10:30 – 12:30**						
Chair : Prof. Dr. Mom Seng **Co-Chair : Dr. Lalita Siriwattananon**						
10:30 – 10:45	AG-14-09	**Improvements in Preservation Properties for Homemade-Style Pickled Cucumber in Cambodia** *Sokly Sorm, Shuki Muramatsu, Masataka Uchino, Yoshiki Muramatsu, Daiki Oka, Narong Touch, Yuri Tanikoka, Takahiko Nakamura, Toru Nakajima, Motoe Sekido, Shotaro Kawakami, Chim Chay, Mari Arimitsu and Machito Mihara*	p. 7	10:45 – 11:00	EM-14-44	**Antibiotic-Resistant Escherichia Coli and Aeromonas Spp. in Mono Cage Culture of Channa Micropeltes** *Vannmei Ly, Chanthol Peng, Oudam Heng and Domenico Carus*	p. 69
11:00 – 11:15	AG-14-59	**Evaluation of the Effect of Lactic Acid Bacteria on Histamine-Producing Bacteria Isolated from Cambodian Prahok** *Samoeun Dana, Top Sothalong, Buntong Borarin, Chhe Chinda, Chrun Rithy*	p. 39	11:15 – 11:30	AG-14-51	**Nutritional Evaluation and Physiochemical Properties of Cambodian Planchonella Obovata Products** *Sothea Kong, Chim Chay, Hiroyuki Hattori, Samnang Nguon and Kasumi Ito*	p. 34
11:30 – 11:45	AG-14-53	**Identification and Characterization of Lactic Acid Bacteria Isolated from Fermented Products (Nem Sbak Chrouk) in Battambang Province** *Chiva Ma, Chanthol Peng, Channeath Tep and Oudam Heng*	p. 35	11:45 – 12:00	AG-14-54	**Determination of Histamine Level and Its Correlation with Bacteria Viable Count in Cambodian Fermented Fish** *Lengheang Choeng, Chanthol Peng, Leangey Set and Seyha Doeurn*	p. 36
12:00 – 12:15	AG-14-49	**Isolation and Identification of a Compound from Melaleuca Extract and Its Bioactivites** *Ravor Seng, Akane Kuroki, Fumie Nanashima, Takahiro Shibata and Hiroyuki Hattori*	p. 33	12:15 – 12:30	AG-14-56	**Assessment of Antibacterial Activity of Lactic Acid Bacteria Isolated from Fermented Foods Against Escherichia Coli O157:H7, Proteus Penneri and Their Potential for Starter Culture** *Sineth Chev, Siveng Meng, Borarin Buntong, Chinda Chhe, and Rithy Chrun*	p. 38

Room 2 – KULEN Room

Session 2: Food Innovation **13:30 – 15:30** **Chair** : **Dr. Rithy Chrun** **Co-Chair** : **Dr. Hiroyuki Hattori**							
13:30 – 13:45	EM-14-39	**Selection and Optimization Preparation Conditions of Various Raw Materials for Inoculation of Lactic Acid Bacteria Under Ambient Temperature** *Chanthang Chin*, *Solida Sim, Ratboren Chan, Saret Bun, Vireak Met, Kimeng Sou, Phaly Ham, Chanthol Peng and Rathborey Chan*	p. 65	13:45 – 14:00	AG-14-55	**Effectiveness of Different Washing Solution for Bacterial Removal from Lettuce Collected from Market in Phnom Penh** *Panhavatey Sokhom*, *Chanthol Peng and Oudam Heng*	p. 37
14:00 – 14:15	AG-14-60	**Assessment of Secondary School Students' Knowledge and Perception through the training of nutrition-based wild food plant gardening** *Sreypich Chhun*, *Lyda Hok, Phanith Chou, David Ader, Leangsrun Chea and Chantha Sam*	p. 40	14:15 – 14:30	AG-14-41	**A Value Chain Analysis of the Cashew Sector in Kampong Cham Province** *Sodara Mean* and *Vathana Thun*	p. 28
14:30 – 14:45	AG-14-39	**An Exploratory Study on the Consumption of *Planchonella Obovata* Fruit Throughout Cambodia** *Sothea Kong*, *Samnang Nguon, Hiroyuki Hattori and Kasumi Ito*	p. 26	14:45 – 15:00	RD-14-33	**Sensory Qualities of Tawa-Tawa Flavored Ice Cream** *Marrecil Billasencio Enot*	p. 101
15:00 – 15:15	AG-14-14	**Prevalence of Aflatoxins in Different Peanut Products from Various Markets in Phnom Penh, Cambodia** *Sieng Hai Un*, *Kim Eang Tho, Pichmony Ek, and Rathna Hor*	p. 10				

Room 2 – KULEN Room

Session 3: Soil Science **16:00 – 18:00**						
Chair : **Dr. Narong Touch** **Co-chair** : **Dr. Minh Phuong Nguyen**						
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17:00 – 17:15	EM-14-20	**Influence of Native Trees on Soil Fertility in the Rainforestation Site in Mailhi, Baybay City, Leyte, Philippines** *Lorraine Cristy E. Ceniza, Jimmy O. Pogosa, Marlito M. Bande and Victor B. Asio*	p. 53	17:15 – 17:30	AG-14-10	**Determine Azadirachtin Contents in Neem Leaves Collected From Different Soil Types** *Srey Em Chuon, Rithy Chrun, Kim Eang Tho and Chanthin Ouk*	p. 8
17:30 – 17:45	AG-14-45	**Conditions of Bio-Slurry Application in Crop Production for Household Farmers in Kampong Cham Province** *Chan Makara Mean, Lyhour Hin, Sophoanrith Ro, Nareth Nut, Lytour Lor*	p. 31	17:45 – 18:00	AG-14-34	**Review on Causes, Effects and Management of Soil Salinity on Irrigated Rice Fields in Tanzania** *Jimmy Felix Macha and Machito Mihara*	p. 23

Room 3 – Paradise Lounge

Session 1: Energy and Water Treatment 10:30 – 12:30						
Chair : **Prof. Dr. Masami Furuuchi** **Co-Chair** : **Dr. Yuri Yamazaki**						
10:30 – 10:45	EM-14-33	**Effect of Hydraulic Retention Time on Removal of Pollutants in Anaerobic Baffle Reactor and Anaerobic Filter Treating Medium Strength Domestic Wastewater** ***Kimeng Sou**, Borith Pang, Sotheara Hour, Sreyleak Khorn, Chanmonineth Sreng, Rathborey Chan, Phaly Ham, and Saret Bun*	p. 59	10:45 – 11:00	EM-14-34	**Comparison Removal Performance of Conventional Septic Tank and Imhoff Tank in Treating Medium-Strength Domestic Wastewater** ***Sokmean San,** Saret Bun, Chanthang Chin, Kimeng Sou, Borith Pang, Phaly Ham and Rathborey Chan* — p. 60
11:00 – 11:15	AG-14-37	**Crop Growth Model for Hydroponic Cultivation of Solanum Lycopersicum (Tomato) in Semi-Automated Systems** ***Antonio Perez Fuentes**, Sarvesh Maskey, Hiromu Okazawa, Takahiko Nakamura, Ayako Sekiyama and Dickson M. Mazibuko*	p. 25	11:15 – 11:30	EM-14-37	**Attributing Variation of Spatio-Temporal of Groundwater Level and Recharge in Cambodian Mekong Delta** ***Penglong Koun**, Ty Sok, Ilan Ich, Kimsan Chann, Sameth Chan and Chantha Oeurng* — p. 63
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Room 3 – Paradise Lounge

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Chair : Prof. Dr. Barry N. Noller **Co-Chair : Dr. Tory Chhun**						
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14:00 – 14:15	AG-14-32	**Evaluation of Soil Erosion Risk from Weathering Effects on K Factor of Rusle in Cobija, Bolivian Amazonia** *Juan Uego Perez and Machito Mihara*	p. 21	14:15 – 14:30	EM-14-06	**Prediction of Land Use Change Using Ca-Markov Model: A Case Study in the Sangkae River Basin, Cambodia** *Chey Vanna, Yamamoto Tadao and Inoue Takashi*	p. 45
14:30 – 14:45	EM-14-05	**Development of erosion protection zones in the catchment of the reservoir "Kalimanci"** *Ivan Minchev, Ivan Blinkov, Aleksandar Trendafilov and Bozhin Trendafilov*	p. 44	14:45 – 15:00	EM-14-36	**Impacts of Land Use/Land Cover on Soil Erosion in Stung Sangkae Catchment using APEX Model** *Sakdanuphol Chan, Sokphalratanak Phem, Nareth Nut and Machito Mihara*	p. 62
15:00 – 15:15	EM-14-35	**Implementation of Land Use and Land Cover LULC 2020-ESRI Global Map to Estimate Soil Erosion in Stung Sangkae Catchment, Cambodia** *Sakdanuphol Chan, Nareth Nut, Kakada Sourng, Dyna Theng, and Machito Mihara*	p. 61				

Room 3 – Paradise Lounge

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16:30 – 16:45	EM-14-13	**Characterizing Salinity and Identifying the Significance of Salinity Composition on River Chemistry and Ecosystem Health** *Fiona H.M. Henderson and **Barry N. Noller***	p. 48	16:45 – 17:00	EM-14-22	**Nitrogen Removal from Mining Dewatering and Fate of Water Release to A River** ***Barry N. Noller*** p. 53
17:00 – 17:15	EM-14-17	**National Versus Local Climatic Variability and Implication for Communities in Protected Areas: The Cause of Lake Malawi National Park** ***Mazibuko Dickson***, *Lameck Fiwa, Sarvesh Maskey and Hiromu Okazawa*	p. 50	17:00 – 17:15	EM-14-31	**Watershed Health Condition Linkage with Anthropogenic at Tropical Watershed Scale** ***Sreyluch Phal***, *Ty Sok, Sotheanea Khe, Kimsan Chan, Sophanny Phan, Veasna Ly and Chantha Oeurng* p. 57

Room 4 – Cosy Room

Session 1: GIS and Environment **10:30 – 12:30** **Chair** : **Dr. Sanara Hor** **Co-Chair** : **Dr. Sarvesh Maskey**								
10:30 – 10:45	EM-14-43	**Evaluation of Different Satellite Image Products with Ground Data in Estimation Sediment Transport in Latest Tonle Sap Lake Tributary** *Veasna Ly, Ty Sok, Sophanny Phan, Sreyluch Phal, Kimsan Chan, Ratboren Chan and Chantha Oeurng*	p. 68		10:45 – 11:00	AG-14-44	**Comparison of Vegetation Indices Between NDVI and RGB Images in Rice Paddies Using UAV Imagery** *Muyleang Kim, Ke Zhang, Sarvesh Maskey, Ayako Sekiyama, Naomasa Suzuki and Hiromu Okazawa*	p. 30
11:00 – 11:15	EM-14-07	**Assessment of Windspeed Reduction Efficiency of Tree Windbreaks Systems Using Remote Sensing in Ovche Pole, Macedonia** *Ognen Onchevski, Ivan Minchev and Machito Mihara*	p. 46		11:15 – 11:30	EM-14-46	**Environmental Impact Assessment of Air Emission from Fertilizer Utilization and Rice Straw Burning from Rice Production in Cambodia** *Leakhena Hang, Sreyneang They and Sela Kong*	p. 71
11:30 – 11:45	EM-14-47	**Influences of Large-Scale Agricultural Residue Burning on Ambient Nanoparticles Observed in Phnom Penh, Cambodia** *Leakhena Hang, Srean Aun, Muhammad Amin, Worradorn Phairuang, Chanmoly Or, Takahiro Tabuchi, Mitsuhiko Hata and Masami Furuuchi*	p. 72		11:45 – 12:00	EM-14-02	**Global and Regional Aspects of Climate Change** *Dieter Trautz*	p. 43
12:00 – 12:15	EM-14-18	**Vegetation Description on Regenerative Disturbed Landscape at Lower Slope of Forest Reserve At Visayas State University** *Florante T. Sabejon and Justino M. Quimio*	p. 51					

Room 4 – Cosy Room

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Chair : Prof. Dr. Eiji Yamaji **Co-chair : Dr. Anucha Wittayakorn-Puripunpinyoo**						
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16:30 – 16:45	RD-14-05	**The Well-Being of People Through the Cooperatives Management: A Case Study of Ban Mankong Hin Lek Fai Cooperative Limited, Thailand** *Anucha Wittayakorn-Puripunpinyooa and Wiparat Sae Lee*	p. 82	16:45 – 17:00	RD-14-10	**The Effect of Globalgap Certification on Horticulture Production in Kenya** *Jane Githiga*, *Asres Elias and Kumi Yasunobu*	p. 85
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Agricultural System and Food Innovation
Co-chair

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Dr. Leila D. Landicho   Dr. Mouylin Chem
Mr. Socheath Tong

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Environmental Management

Co-chair

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Dr. Chau Nien Nguyen   Mr. Nareth Nut
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RCE Special Session: Sharing RCE Experiences

Saturday, March 4, 2023

Time: 13:30 – 15:00 (Cambodian Time)

(15:30 – 17:00 JST)

Secretary Room

(This is an online session. Please access following ZOOM)

https://zoom.us/j/96504366760?pwd=aVpEUDNBNlRRN0VmS3JJUkt0NjBQQT09

Meeting ID: 965 0436 6760

Passcode: 039948

Programme

- Chair: Prof. Mario Tabucanon, Visiting Professor, United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS)
- Co-Chair: Mr. Ognen Onchevski, Institute of Environmental Rehabilitation and Conservation (ERECON), Japan

13:30 – 13:35 Opening

13:35 – 13:45 Introduction
  "Regional Centres of Expertise on Education for Sustainable Development (RCE)"
  Ms. Miki Konishi
  Programme Coordinator, Innovation and Education Programme, UNU-IAS

13:45 – 13:55 Keynote presentation
  "Aligning circular economy with sustainable development goals (SDGs) in the built environment"
  Prof. Usha Iyer-Raniga, RMIT University, Australia

13:55 – 14:05 Q&A

14:05 – 14:35 Case study presentations

1. *"5Rs (Refuse, Reduce, Reuse, Recycle, Re-purpose) Campaign: Mechanism for Sustainable Waste Management"*
    Dr. Sherrymina Anak Kichin, RCE Kuching, Malaysia

2. *"Building Capacity of Farm Owners for Promotion of Organic Farming in Southern Vietnam"*
    Mr. Hoang Nhat Truong, RCE Southern Vietnam, Vietnam

3. *"Bamboo Production, Rehabilitation, and Processing: Sources of Food, Livelihood, and Environmental Protection"*
    Mr. Charlie Batin from RCE Ilocos, the Philippines

14:35 – 14:55 Q&A and Discussion

14:55 – 15:00 Wrap up and Closing

k.LAB Special Session

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Saturday, March 4, 2023

Kravan Room
Time: 16:00 – 18:00

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16:00 – 16:10 Opening

16:10 – 17:10 Presentation

    EM-14-55
    "Utilization of k.LAB Database Function for Hydrological and Crop Growth Model Development"
        Sarvesh Maskey, Ke Zhang, Hiromu Okazawa and Kiichiro Hayashi

    EM-14-56
    "Introduction of A Model for Evaluating the Potential of Small Hydropower Generation in k.LAB"
        Yuri Yamazaki, Kiichiro Hayashi, Sarvesh Maskey, Hiromu Okazawa, Feldinando Villa

    EM-14-57
    ARIES Customized Model for Energy and Environmental Assessment
        Kiichiro Hayashi, Ferdinando VIlla, Hiromo Okazawa, Stefano Balbi

17:10 – 17:50 Q&A and Discussion

17:50 – 18:00 Wrap up and Closing

Oral Presentations

AG-14-01

Nitrogen Use Efficiency and Soil Health Indicators in Corn Silage Production in a Semi-Arid Environment

Phearen Miller[a*], Jeanette Norton[a], Grant Cardon[a], Scott B. Jones[a], Jennifer Macadam[a], Matt Yost[a], Avneet Kakkar[a], and Yang Ouyang[b]

[a] Department of Plants, Soils and Climate, College of Agriculture and Applied Sciences, Utah State University, Logan, UT 84322
[b] Department of Microbiology and Plant Biology, University of Oklahoma, OK 73019
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Abstract
The world faces the dual challenge of increasing food production and reducing the impact of excess reactive nitrogen (N) in the environment. A field study examining different N sources in corn silage under semi-arid conditions was conducted at USU Greenville farm in northern Utah since 2012. The experimental design is a randomized complete block design with four blocks and four treatments: control (no nitrogen), low ammonium sulfate (AS 112 kg N/ha), high ammonium sulfate (AS 224 kg N/ha), and steer manure compost (224 kg total N/ha). We examined the effects of the contrasting nitrogen fertilizers on yield, nitrogen use efficiency (NUE), and soil health indicators. Total corn silage yields for AS 200, AS100, compost and control in 2012-2021 were 17,225, 14,847, 11,114 and 7,897 kg/ha, respectively. The yield of the compost treatment was significantly higher than that of the control treatment. The AS200 treatment had the highest yield, N uptake and NUE, but the values of soil health indicators did not differ from the control treatment. Compost treatment significantly increased the value of potential mineralizable N (No), and potential mineralizable C (Co) from 84 days incubation. Furthermore, the values of other soil health indicators such as soil total N, soil ACE protein, N-acetyl-β-D-glucosaminidase, soil total C and soil organic C were significantly increased under compost treatment. in short, continuous corn silage using only compost increased soil health values but did not produce higher yields than the ammonium sulfate treatment. in contrast, application of ammonium sulfate increased yield but did not improve the value of soil health. Therefore, to maintain their soil health, farmers should consider mixing compost with commercial fertilizers and adopting good soil health practices such as crop rotation or cover crops.

Keywords: nitrogen use efficiency (NUE), soil health, potential mineralizable C (Co), potential mineralizable N (No), soil protein, soil enzyme.

AG-14-02

Simple Weir Types and Their Prospects for Small-Scale Irrigation Development in Northern Zambia

Alex Lushikanda Kabwe[a*], Masahiro Hyodo[b], Hidehiko Ogata[a], Yoshihiro Sagawa[c], Yoshinao Adachi[c] and Masayuki Ishii[d]

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[b] *Faculty of Agriculture, Tottori University, Tottori, Japan*
[c] *Sanyu Consultants INC, Tokyo 170-0004, Japan*
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*Corresponding email: d21a3003k@edu.tottori-u.ac.jp

Abstract
in Zambia, simple weir technology is increasingly gaining popularity as an alternative method of irrigation among rural small-scale farmers. The now widespread adopted small-scale irrigation technology was first introduced in the northern region provinces of Zambia to enhance small-scale irrigation activities in communities. Simple weirs are structures built across a river to divert the flow for irrigation activities. The simple weir technology is used as the ''entry point'' to engage individual farmers and small groups of farmers with the potential to begin irrigation. These types of facilities are constructed using locally available materials such as forest poles, twigs, and thatching grass tied together by tree bark strips. However, challenges such as damages (breaching, breaking down) have been observed on the structures. in this research, we focussed on the simple weirs farmers have been constructing on a self-help basis for community-based irrigation schemes to enhance usage period from the current one irrigation season to two seasons. This research targeted the northern provinces (Luapula, Muchinga, and Northern) in Zambia because simple weirs are commonly used by small-scale farmers to divert water for crop and aquaculture production. Four types of simple weirs were characterized as: 1) single line, 2) double line, 3) inclined type and 4) trigonal type. It was observed that the single-line weir was the most popular weir for various reasons such as being easy to construct, less labour intensive, and easy to repair and maintain. Other concerns this research observed include: 1) high proportions of damaged weirs, 2) regular maintenance, and repairs, 3) compromised constructions, 4) a high number of re-constructed weirs annually, and 5) inconsistencies in key dimensions. These research findings are agreeable with concerns raised by farmers regarding weirs which need to be addressed if the technology must be effective in developing small-scale irrigation in Zambian rural communities.

Keywords: simple weir types, small-scale irrigation, river water diversion, damage

AG-14-04

Effect of Pollination by The *Apis Mellifera* on Yield and Fruit Productivity of Sweet Net Melon Under Greenhouse Conditions in Cambodia

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[a] Faculty of Agriculture and Food Processing, National Meanchey University, Banteay Meanchey Province, Cambodia
[b] Agricultural Education and Soil Chemical Laboratory Analysis, National Meanchey University, Banteay Meanchey Province, Cambodia
*Corresponding email: chheang.chhouk.mcu@moeys.gov.kh

Abstract

Sweet net melon (*Cucumis melo* L.) is an annual climbing plant famous due to its delicious fleshy fruit. It is one of the most widely cultivated and consumed in the world. This study aimed to investigate the efficacy of pollination by employing *Apis mellifera* L. (Hymenoptera: Apidae) on yield and growth in the greenhouse condition, compared to the traditional method of hand cross-pollination and self-pollination. The experiment was laid out in Complete Randomized Design (CRD) with 3 treatments and one hundred replications: T1 represented as self-pollination, T2 hand cross-pollination, and T3 *Apis mellifera* pollination. Fruit productivity such as fruit size and fruit number, fruit seed per plant was measured, and sweetness content was analyzed by using a meter named Portable refractometer. Results revealed that the *Apis mellifera* pollination has significantly promoted a greater fruit set of sweet net melon more than hand cross-pollination and self-pollination (100%, 74%, 62%). Furthermore, *Apis mellifera* has significantly enhanced fruit yield compared to self-pollination and hand cross-pollination. in addition, self-pollination, hand cross-pollination, and *Apis mellifera* pollination were not significantly different in sweetness, fruit thickness, fruit weight, number of seeds per fruit, and fruit size. Therefore, Pollination by *Apis mellifera* can be used for increasing fruit yield and food security by 2050. As well as it is one of the most power tools for agriculture adoption with climate change.

Key words: *Apis mellifera*, pollination, thickness, flower

AG-14-05

Development of a Simple-Concept Water Allocation Model at the Farm-Block-Level for Efficient Water Management

Naohisa Nakashima[a]* and Testuro Fukuda[b]

[a] Obihiro University of Agriculture and Veterinary Medicine, Japan
[b] Hino-Sato Munakata-City, Fukuoka, Japan
*Corresponding email: nnakashima@obihiro.ac.jp

Abstract

It is crucial to establish appropriate water management in agriculture. Due to financial difficulties, it is also necessary for farmers to work together with government agencies in water management. Existing water allocation models, however, require much effort to collect data. They are also black boxes difficult for farmers to understand, which may discourage farmers from participating in irrigation planning. in this study, we attempted to construct a farm-block-level water balance model with a simple tank model concept and easily collectible data. The model consists of two parts that reproduce the water distribution process from the farm block intake to each field (Canal Tank Model; CTM) and the water balance process in the paddy field (Paddy Tank Model; PTM), respectively. The model coefficients were identified using data from 2002 to 2003, and the model validity was evaluated using data from 2004 and 2005. The CTM coefficients were identified for each 2002 and 2003 because of the different land use patterns. The CTM runoff coefficients and hole heights were changed on days when the farmers were considered to have operated diversion ratios significantly. The PTM coefficients were identified using the SDFP method and trial and error referring to the groundwater level. However, the PTM seepage holes were fixed to the corresponding values that the vertical seepage was approximately 5 mm/d based on the on-site survey. As a result, despite the arbitrary water manipulation by farmers, the same CTM coefficients for 2002 and 2004 and 2003 and 2005, when the land use pattern was similar, were able to reproduce the water allocation well. Finally, we used the water allocation model to estimate the optimal delivery water management rate and to quantitatively evaluate the excess water withdrawal resulting from the labor reduction in water management.

Keywords: tank model, water balance and distribution, participation irrigation management (PIM), small district, arbitrary operation

AG-14-06

Clarification of Water Use under the Complicated Irrigation System and its Modeling in the Boribo-Bamnak River Basin, Cambodia

Salpisak Heng[a], Yamamoto Tadao[a*] and Inoue Takashi[b]

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[b] Research Faculty of Agriculture, Hokkaido University, Sapporo, Japan
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Abstract
Effective, equitable, and sustainable management of water resources in river basins requires clarification of the current river basin situation and potential water use and water balance challenges. This study performs a water balance calculation involving an analysis of the appropriate water distribution of the Boribo-Bamnak river basin, Cambodia. This river basin covers the Boribo and Bamnak basins, both of which are interlinked by the Bamnak headworks. Together, this constitutes an integrated irrigation and drainage system. The Soil and Water Assessment Tool (SWAT) model was used to simulate rainfall-runoff in the Boribo-Bamnak basin over a study period of nine years (2010–2018), whereupon a simulated daily streamflow was applied to the water balance computation in the river basin according to the water distribution ratio at Bamnak headworks. The SWAT model yielded NSE, PBIAS, and RSR values of 0.55, 9.70, respectively, and 0.67 for model calibration. It also obtained values of 0.51, 3.70, and 0.70 for model validation of the three quantitative statistics, NSE, PBIAS and RSR. The results of the calculated water balance indicate that although the Bamnak and Boribo rivers have abundant water in the wet season they have faced water shortages in the dry season during every year of the study period except 2016. Irrigation safety during the dry season is always low (approximately 10%). Attaining a desirable safety level of 80% in all existing irrigation areas would require additional water resources of approximately 6.0×10^6 m^3 for the Boribo river basin and 10^7 m^3 for the Bamnak river basin. in light of the above findings, this study provides recommendations for coordination strategies to improve water resource management and development plans in the river basin.

Keywords: water balance, water distribution, SWAT model, water shortage, irrigation safety

AG-14-08

Making of the First Organic State in The World

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Abstract

A small hilly state in India, Sikkim, decided to take a step towards environment conservation by declaring itself 100% organic. This declaration made Sikkim not just the first state in India but also the first state in the world to go 100% organic. During the last year, we saw Sri Lanka also trying to do the same and meeting with disastrous consequences. A ban on chemical fertilizers was declared suddenly and the ill prepared farmers could not cope up. Production plummeted in an already cash strapped nation. There was little foreign exchange left to import foodgrains. It is reported that 9 out of 10 Sri Lankan families had to skip meals due to food shortages. The case of Sikkim is entirely different. Sikkim decided to go the organic way in 2003-04. By 2015, it declared itself a 100% organic state, banning all chemical inputs. We talked to 100 farmers in South Sikkim (the only side of Sikkim that is connected with India, all other borders are international borders) and found that there is no black marketing of chemical inputs and that Sikkim, even after 20 years of experimenting, remains a truly organic state. This paper shows how Sikkim went about becoming fully organic. It shows how the government systematically planned the process. It also shows, using the data of 70 farmers, how the farmers have fared and what is their feeling about organic farming. We also looked into the replicability of this experiment (whether other small states in India can follow this path) and also the scalability (feasibility of a nation going fully organic). We conclude that scalability does not look that feasible and replicability too is difficult. But in spite of all these factors, Sikkim would remain organic, mostly by choice.

Keywords: organic state, Sikkim agriculture

AG-14-09

Improvements in Preservation Properties for Homemade-Style Pickled Cucumber in Cambodia

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Abstract
Pickled cucumbers selling at wet markets in Cambodia are recognized as popular pickles for local people. It has been reported that pickles using homemade recipes are at high risk of being spoiled and food poisoning because there are no heating steps in the production process. Therefore, it is necessary to improve hygienic condition of food supply and to make safe pickles in Cambodia. Heat treatments using hot pack filling and pasteurization lead to making microbiologically safe products and extending shelf life. This study aims to examine the effect of the heat treatments (hot pack filling and pasteurization) on preservative property and to evaluate the acceptability of the pickled cucumber added heating process. The pickled cucumbers with and without the heating process were made using a traditional Cambodian recipe and stored at 30 °C for 7 days. The presence of total viable bacteria, coliforms and *Escherichia coli*, yeasts, and molds in the pickled products were tested during the storage periods. The samples without the heating process resulted in contamination with coliforms and *Escherichia coli*, yeasts, and molds and were at initial putrefactive state because of the number of total viable bacteria. on the other hand, coliforms, *E. coli*, yeasts, and molds were not detected in the sample with the heating process from Day 0 to Day 7. This result indicated that the pasteurization treatment killed many spoilage microbes including foodborne pathogens. To investigate the acceptability of pickled cucumbers with the heating process, the sensory evaluation tests were performed. From the result of sensory evaluation and questionnaire survey, the pickled cucumbers with the heating process made either in Japan or Cambodia were acceptable to the Cambodian panelists; however, further improvement on the softness of pickles is commented.

Keywords: cucumber, homemade-style pickle, pasteurization, sensory evaluation, acceptability

AG-14-10

Determine Azadirachtin Contents in Neem Leaves Collected from Different Soil Types

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Abstract
Nowadays, many kinds of pesticides are circulating in the Cambodian market. If you look at the raw materials that can be used to produce some agricultural pesticides, some of them are cheap and easy to find on the market, namely neem leaves. on the other hand, since Cambodia does not yet have a method to determine the chemical composition in the neem leaves, and there is no research and production of various consumer products yet. Therefore, there is a study in the neem leaves of the plant that contains a chemical compound (Azadirachtin) that is very beneficial in agriculture, pest control, environmental protection and medicine. That's why I chose the topic "Determination of Azadirachtin compounds in neem leaves collected from different soil types using the boiling method" to study. Neem leaves were collected from Kandal, Takeo, Siem Reap and Battambang, including soil analysis. in purpose is to find the amount of the Azadirachtin compound in neem leaf and compare the Azadirachtin compound in neem leaf between the four provinces by different soil types. The study was divided into four treatments, each of which was made up of four replications that were boiled in a laboratory at 100 ° C for the same 20 minutes and then measured with UV-Vis Spectrophotometer. The amount of Azadirachtin compound measured by (UV-Vis Spectrophotometer) in the four provinces averaged between 4088-5920ppm(mg/Kg) of neem leaves. in conclusion, quantitative comparisons of Azadirachtin compounds among the four provinces have no significant differences in statistical definition (NS). The soil type is not effects Azadirachtin content. Compared to the market, the price of Azadirachtin measured unrefined is cheaper than the market 156 times.

Keywords: azadirachtin, neem leaves, UV-Vis spectrophotometer

AG-14-13

The Effects of Green Manures on Sustainable Agriculture Soil Conservation Under Field Experiment in NMU

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Abstract

By inoculating plant material into the soil, green manure is a nitrogen source for soil and enhances soil fertility and pH. The farmer often inoculated the plant material termed green manure for 40 to 50 days in uncovered land. When chemicals are used improperly, they cause soil erosion, harm to beneficial microorganisms in the soil, environmental pollution, and yield plant. Farmers need to use fertilizer based on the soil's requirements to solve this problem. National Meanchey University conducted this research to investigate the efficacy of green manure on soil improvement based on sustainable agriculture. The purpose of this exploration is to investigate the effect of green manure on soil inoculation and soil properties such as pH, EC, moisture content, and organic matter. The experiment was laid out in the randomized complete block design (CRBD) with 4 treatments and 3 replications. Analysis of soil pH, soil electric conductivity, moisture content, and organic matter was conducted. Treatment, T0 represented as control, T1 Soybeans, T2 Beans, and T3 *Aeschynomene indica* L. The result illustrated that T3 had higher soil pH which averages 7.14 and 0.46 EC, 19% moisture content, and 1.75% soil organic matter. Whereas, untreated soil was not significantly different among treatments. Therefore, the application of green manure can be a vital choice in soil improvement for sustainable agriculture.

Keywords: agriculture soil, effect, green manures, sustainable

AG-14-14

Prevalence of Aflatoxins in Different Peanut Products from Various Markets in Phnom Penh, Cambodia

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Abstract

Peanuts are a major oil and protein crop, consumed by Cambodian people as snacks and food ingredients. It mostly didn't analysis on safety level such as Aflatoxins (B1, B2, G1, and G2). in Cambodia, the maximum levels of total Aflatoxins in peanuts is 15 ppb. The objective of the study was to determine on prevalence, type, and level of Aflatoxins in peanut products (raw peanuts, roasted peanuts, ground roasted peanuts, and peanut snacks) from various markets in Phnom Penh. Aflatoxins extraction by the QuEChERS method was performed at the Nutrition Analysis Laboratory of the Division of Research and Extension of the Royal University of Agriculture and HPLC-FLD analysis at the Chromatography Laboratory of the Faculty of Chemical and Food Engineering of the Institute of Technology of Cambodia. All peanut samples were contaminated with Aflatoxins. The Aflatoxins range in confidence interval 95% in raw peanuts were 3.19 to 6.03 ppb, Roasted peanuts were 5.80 to 14.76 ppb, ground roasted peanuts were 9.98 to 19.70 ppb and Peanut snacks were 5.49 to 11.08 ppb. for maximum levels of Aflatoxins according to the standards for Cambodia, Codex Alimentarius, Malaysia, and Thailand, all raw peanuts were under the standard. for roasted peanuts, ground roasted peanuts, and peanut snacks, most of these three edible peanuts were under the standard of Aflatoxins limit. The results of this research will be able to recommendations on food safety and health, not to eat peanuts in massive quantities, and if possible, raw peanuts should be cooked when consumed, and should not be cooked to keep for a long time.

Keywords: aflatoxins, peanut, food safety, QuEChERS, HPLC-FLD

AG-14-16

Reuse of Unavailable Phosphate in Soils Using Solar Cell-Powered Electrokinetic Treatment

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Abstract
Electrokinetic treatment (ET) is widely used for soil remediation, specifically for removing heavy metals from soil. Till date, we have focused on the nutrients released in soils using a solar cell-powered ET, which contributes to increasing productivity of organic farming. Previously, when a 1.5 V solar cell was used in ET, the release of ammonium ions and the growth of microorganisms were observed. However, no release of phosphate ions was observed. Thus, it is presumed that a 1.5 V solar cell is insufficient to release phosphate in soils. Therefore, this study aims to examine the effects of solar cell voltage on the release of phosphate in soils. in laboratory experiments, an anode (oxidation reaction) and a cathode (reduction reaction) were installed in andosol mixed with cow manure compost, and a 3 or 6 V solar cell was used to produce an electric current between the two electrodes. Sixty-two days after current generation, the chemical properties of the soil were measured. The results suggest that soil redox conditions can be controlled by changing the solar cell voltage. From the pH distributions, a higher voltage of solar cells was used and a large change in pH was obtained. Furthermore, a decrease in soil redox potential was obtained by increasing the solar cell voltage. From the phosphate distributions, a 6 V solar cell is required to release phosphate in soils. It is recommended that applying ET powered by a 6 V solar cell (potential gradient: 0.12 V/cm) facilitates nutrient release in soils, which is the most important factor in organic farming.

Keywords: solar cell, voltage, electrokinetic treatment, soil reduction, phosphate, organic farming

AG-14-18

Application of Probabilistic Risk Assessment to the Chalky Rice Grain Issue in JAPAN

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Abstract

in recent years, extreme weather events have become more frequent, and there are concerns about the increase of chalky rice grain by them. Therefore, it is important to understand how often and how severe high-temperature injury occur in nationwide of Japan. Thus, the objective of this research is to analyze the hazard of high temperature in a probabilistic method by using the weather big data and to assess the risk of chalky rice grain. in this research, we analyzed air temperature data from around 800 stations of the AMeDAS (Automated Meteorological Data Acquisition System) in Japan and check the chronological changes. To assess the risk of chalky rice grain , Probabilistic Risk Assessment(PRA) method were applied and compared the risk for each of the 20-years from 1980 to 1999 and from 2000 to 2019. Chalky rice grains, which reduce rice quality, increase when the average temperature exceeds 26°C during the first 20 days after the heading date. A comparison of the areas with a high risk of high temperatures exceeding 26°C at least once per three years (33.3%) between the past and the recent 20 years shows that the risk of high temperatures has increased in the inland areas of the southern Tohoku region and in the southern part of Ibaraki Prefecture. and then multiple regression model was applied to identifying the affecting factor on the high temperature risk. The 20 days average daily temperature which have probability of 33.3% were set as dependent variable, and longitude, altitude and urban area ratio were set as explanatory variables. As a result, geographical condition has the greatest effect on the risk, however single regression analysis shows that the area having more than 30% urban ratio also shows high risk of chalky rice grain.

Keywords: climate change, climate hazard, agricultural damage, paddy rice

AG-14-20

Cotton Mutation Breeding Using Ion-Beam

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Abstract

Mutation breeding, is the process of exposing seeds to chemicals, radiation (such as gamma ray), in order to generate mutants with desirable traits to be bred with other cultivars. Mutants can be generated for disease, insect pest, and drought tolerance. The use of ion beams in mutation breeding has rapidly expanded since the 1990s in Japan, with the prospect that more ion beam-specific mutants will be generated. in the present study, we irradiated local cotton variety named Boskhnor with various dose of Ion-Beam. This research is to select cotton mutants showing drought tolerance and high yield. The cotton seeds (Bosknor) were sent to Research Institute of Physics and Chemicals (RIKEN), Japan. The seeds were irradiated with different dose of Ion Beam including 5, 10, 15, 20, 40, 60, and 80 Gy. We will present the results and discussion of the research according to research purposes as mentioned above.

Keywords: cotton, irradiation, mutant, ion beam

AG-14-21

Effect of Different Levels of 15-15-15 Fertilizer on the Growth and Flowering of Wingpod Purslane (*Portulaca umbraticola*)

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Abstract
Ornamental crops play an important role not only in decorating, but also to increase the income of growers. *Portulaca Umbratical* is an ornamental plant that has been imported from neighboring countries in recent years and is very popular in the market. However, the method of cultivating this flowering plant is still unclear, especially the optional utilization of chemical fertilizers. This experimental study observed on the effective application of 15-15-15 of different levels on the growth and flowering of the wing pod purslane plants in greenhouse conditions. The experiment was carried out in pots applied with different levels of fertilizers (three pots including 0 g/pot (as control), 0.2 g/pot, 0.4 g/pot, and 0.6g/pot. Each treatment contains three pots being placed in a greenhouse under natural conditions. Data related to plant height, number of branches and days to flowering were collected to compare the difference between the treatments. The results revealed that there is no significantly different in regard to the growth of plant height from week 1 to week 5 when grown with different amounts of 15-15-15 fertilizers. At week 1 and 3, significant difference was not observed but plants applied with high dose of 0.6 g/pot showed higher number of leaves than other treatments. However, plants grown with 0.4 g/pot induced earlier flowering than those applied with 0.6g/pot and 0.2 g/pot. These results suggest that for optional application of 15-15-15 fertilizer, 0.4 g/pot is necessary for early flowering.

Keyword: wing pod purslane, ornamental plant, 15-15-15 fertilizer, flowering

AG-14-22

Effect of Drought Application on Flower, Yield and Leaf Mineral Content of Durian (cv. Monthong) in Cambodia

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Abstract

in Cambodia, the durian production areas have increase exponentially which report over 5,000 hectares with yield obtained between 7 to 26 ton per hectare. Despite its high value and market demand, there stills the need to improve productivity which could keep up with any competition from neighboring countries. Yield of durian are strongly related with floral induction in which influence by many factors such drought, temperature and nutrient management. The study was aimed to determine the effect of drought on floral, yield of durian associated with leaf nutrient content under farmer field. The trial layout in randomize complete block design with 3 replications and consisted of 3 treatments include no drought applied (D0), applied drought 14 (D14), and 28 (D28) days respectively. Plastic mulch were used for drought treatment with size of 5 meter around the trunk and was remove after for further management and irrigation. Flower density, number fruit per plant, fruit weight, yield, edible portion and leaf mineral content was recorded. All drought treatment significantly influenced flower density, fruit set per plant ($P_{value}<0.05$), exclude fruit weight and edible portion. However, 28 days significant intensify flower density number of fruit set (36), number of harvest fruit (25) and yield of 77.04 kilograms per tree compared to 14 days and 0 drought respectively. Continue drop and lowest leaf mineral was recorded where drought was applied. Nitrogen content was significant reduced after drought for 28 days while its obtained the highest carbon content and C/N ration. Thus, suggested prolong drought up to 4 weeks had fasten motorization of the tree, induce flower and increase durian productivities under farmer field condition in Cambodia.

Keywords: nitrate, plastic mulch, fruit drop, carbon

AG-14-23

Effect of Different Foliar Potassium Source on Fruit set and Yield of Durian (cv. Monthong) in Cambodia

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Abstract

in this day, the durian production areas have increase exponentially which was reported over 5,000 hectares. Despite its economic value, local producers were far to compete with neighboring countries in term of price and market supplied. Cambodian farmer only obtained average yield of 13 tons per hectare. Yield of durian are strongly related with nutrient management and climate condition specially fruit drop which highly concerned by the owners. Potassium application as foliage was suggested to enhance fruit set and yield of many crops. Thus, the study was aimed to evaluate the effectiveness of potassium nitrate and mono potassium phosphate as foliage application on durian under farmer field. The trial layout in randomize complete block design with 3 replications and consisted of 3 treatments include potassium nitrate (KNO_3), mono potassium phosphate (MKP) and without K foliage application, applied (FP). The mixture of 1,500 ppm of KNO_3 and MKP was sprayed on branch of trees after third flush leaves display dark green color. Flower density, number fruit per plant, percentage of fruit drop, number of harvest fruit, fruit weight, yield and edible portion was recorded. All foliar K treatment significantly intensify number of flowers, fruit set, yield ($P<0.05$), but had not any influence on fruit weight and edible portion compared to none application ($P>0.05$). KNO_3 application had highest number of fruit set, number of harvest fruit followed by KMP and FP. in contrast, MKP application had the lowest fruit drop (25.27%) while KNO_3 and FP with average of 28.96% and 35.93% respectively. However, both KNO_3 and MKP had similar flower density, and yield (67.12 and 63.83 kilogram per tree) while FP only had about 41.68 kg. Thus, the result suggested that KNO_3 and MKP could be use as source of foliage potassium to increase durian production in Cambodia.

Keywords: potassium nitrate, mono potassium phosphate, drought, fruit drop

AG-14-24

Isolation and Selection of Potassium Solubilizing Bacteria from Rhizopheric Soils in Mekong Delta Region of Vietnam

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Abstract

Potassium (K) is considered as the third essential nutrient after N, P; however, most of the K (90-98%) in insoluble mineral form, which represents a limitation for the absorption of this nutrient by plants. The aim of this study was to isolate and select some potassium soluble rhizobacterial strains from the soil of different crops including rice, maize, kumquat and onions in the Mekong Delta. Aleksandrov medium supplemented with 0.2% micas mineral was used to isolate potassium-soluble bacteria, the soluble K content in liquid medium was determined by atomic absorption method at the wavelength of 766.5 nm. The result showed that there were 24 strains of bacteria with the ability to dissolve potassium were isolated, among them, the two best potassium-soluble bacterial strains were identificated *Burkholderia vietnamiensis* L1.1 and *Staphylococcus hominis* T7.3, with the the content of soluble potassium after 2 days of inoculation were 0.57 mg/L and 0.49 mg/L, respectively. The study demonstrated that The release of potassium from muscovite was favored at 35°C, pH 5 and a saline concentration of 1%NaCl. Thus, two bacterial strains *Burkholderia vietnamiensis* L1.1 and *Staphylococcus hominis* T7.3 have great potential in dissolving insoluble potassium into a useful K for plant to absorb so it is necessary to evaluate their effects on the ability of plant growth promoting.

Keywords: *Burkholderia vietnamiensis*, K release capacity, muscovite, potassium solubilizing rhizobacteria, *staphylococcus hominis*

AG-14-27

Experiment on Smart Mushroom Cultivation Using the Environmental Control System

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Abstract

The purpose of this research is to implement the smart mushroom cultivation practice by applying the sensor network and control algorithm to test the performance of the system and yield obtained compared to the conventional method. This research introduced innovative technology in agriculture by applying automated technology to the growth of rice-straw mushrooms by utilizing sensor technology and a controller with a control algorithm. It used the control algorithm to automatically control the environment in the mushroom house based on feedback from the sensors to maintain the environment in an optimum condition for mushroom growth. This experiment has two cycles for growing the rice-straw mushrooms in different control environments. There are three stages per cycle. The first stage is used during the vegetative phase. The second stage is used to control mushroom growth during the spawn-run stage. The last is applied during the pinhead and cropping stages. The first cycle of the experiment is implemented to verify the circumstances surrounding the growth of the mushroom in automation control based on three parameters: ambient temperature, relative humidity, and carbon dioxide (CO_2). It used one controller with four pieces of equipment to automate control based on those parameters, which are the ventilation fan, exhaust fan, sprinkler, and motor pump for the cooling pad. After testing the first experiment, it met some problems with the CO_2 sensor and the exhaust fan, so it needed to implement manual control and automated control in controlling algorism for the second experiment. After completing these experiments, we can know that with combination of automatic and manual control, the farmer has been able to save time, money, and labor while also Increasing mushroom yield to satisfy market demand.

Keywords: smart mushroom cultivation, rice-straw mushroom, automation control system, automation technology, environmental control system

AG-14-29

The Efficiency of No-till Transplanter Use in Conservation Agriculture Tomato (*Solanum lycopersicum*) Production in Battambang Province, Cambodia

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Abstract

Conservation agriculture is a production system that involves minimum soil disturbance, preferably no-tillage; continuous cover and diverse crops in rotation and in association. No-till vegetable transplanter is needed by farmers in Cambodia for large scale commercial CA production of vegetables. The performance of the United States Department of Agriculture National Soil Dynamics Lab (USDA-NSDL) no-till vegetable transplanter was tested in a farmer's field containing cover crops residue and compared with the performances of a punch planter and a manual conventional transplanter in conventional tillage (CT). The experiment was about three months from March to June 2022 and was located in Battambang province, Cambodia. Sunn hemp and Pearl Millet cover crops were first sown and grown for six weeks. The cover crops were terminated using a NSDL roller crimper mounted in an Oggun tractor. A Mongal F1 tomato (*Soanum lycopersicum L.*) was transplanted on clay loam soil in a randomize complete block design with the three planting methods and four replications with area 5 by 25 m per plot. Results showed that the single-row NSDL no-till vegetable transplanter mounted in an Oggun tractor is two times quicker than the two other planting methods.

Keywords: conservation agriculture (CA), no-till vegetable transplanter, cover crops

AG-14-31

Effect of Potassium on Growth and Yield of Guava (Psidium guajava. L) cv. Kim Ju

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Abstract
Guava (Psidium guajava L.) is known as "poor man's fruit" which is a well-known crop in tropical and subtropical. Its native is believed to be in America. Guava contents higher vitamin C than in orange and tomato. in addition, it produces high yield every year and gives good profit for growers. Thus, several farmers take up guava cultivation on a commercial scale. There are many factors' effects on productivity, especially nutrients management. Growing guava with proper level of nutrients will provide high yield. Thus, the research entitles "Effect of Potassium on Growth and Yield of Guava (Psidium guajava L.)" was conducted to investigate the growth and yield performance of Kim Ju guava under different level of potassium. This experiment was factorial in Completely Randomized Design (CRD) with four treatments and three replications, having 3 plants per treatment. The plant growth characteristics were collected 2 months after application of fertilizers and yield components were recorded at harvest time. All data were analyzed by using Statistix 8. Results represented that potassium had influence on number of leaves, fruit weight, yield per plant and brix in all treated plants. Application of potassium can increase yield of guava from 43% to 47%. on the other hand, there was not significant difference between all treatments on number of new shoots per branch, number of flowers per branch and leave area. According to the new finding, the application of potassium can improve crop yield with good quality.

Keywords: potash, Kim Ju, shoot growth

AG-14-32

Evaluation of Soil Erosion Risk from Weathering Effects on K Factor of RUSLE in Cobija, Bolivian Amazonia

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Abstract
Soil erosion by water is a serious problem in Amazonia area. in the area of Cobija in Bolivia, around 5 Mg ha^{-1} of amazon soil is lost to the nearby watershed annually. The physical weathering of soils under natural conditions is one of the important key processes to know the structural changes in the soil. The soil erodibility (K) factor in RUSLE represents the susceptibility of soils to erosion, which can be measured with the standard unit plot experiment or the calculation with particle sizes and organic matter. Soil weathering affects the distribution of soil particles, which has a close relationship with the K factor. Therefore, the purpose of this research is to evaluate and determine the change in the distribution of soil particles as well as K value. The experiment was conducted in the laboratory of Tokyo University of Agriculture, a total of 120 cans with 1 g of soil, respectively were used and treated with different periods of time and volumes of water. The simulated weather conditions were set according to Bolivian Amazonia. The pipette method was used to determine the distribution of soil particles. The final results indicated that there is a modification in the distribution of the soil particles, reducing the presence of fine sand and increasing the silt content, which modifies the loss of soil as a result of the RUSLE.

Keywords: soil erosion, weathering, RUSLE, Amazonia, soil particle, Bolivia

AG-14-33

On-Farm Evaluation of Peanut (Arachis Hypogaea) Varieties in Different Agroecosystems

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Abstract
Peanut (Arachis Hypogea) is an important oil crop in the world. However, the yield of this crop is limited mainly due to uncovering suitable areas for groundnut production and shortage of improved varieties suited to specific areas. It is grown in many countries around the world, including in Cambodia but there are not too many varieties. The field experiment was conducted along the Mekong River in November 2021 to April 2022 at Tboung Khum Province, Cambodia. There are ten varieties were evaluated included Smooth Shell, Roug Shell, Cap 1, Carwile's Virginia, N Kati Sari, Yen Yaw OSO, Sarinut 2, Georgia 06G, Red Banteay Meanchey, and Chinses. The trial was laid in a Randomized Complete Block Design (RCBD) with 4 replications and 40 plots. The aims of this study are to evaluate peanut varieties on adaptation to agroecology and identify insect pests and disease in Cambodia. Data were collected on 50% Day of flowering, Plant height, Plant tillering, insect pests and diseases scouting, 30 pots size, 100 seeds weight, shell weight, and Yield per hectare. on-farm trials reveal that Three varieties Roug Shell, Red Banteay Meanchey and Sarinut 2 has higher stand count. in addition, Sarinut 2 has the highest 100 seeds weight and shell weight. Georgia 06G has the best performance to be resistant to aphids, leafhoppers, rust, early and late leaf spot. Carwile's Viginia has the earliest flowering, the longest stem, and the highest hug pod size among these ten varieties. Yen Yaw OSO variety, from Ghana, has the highest plant tillering, whereas Chines has the highest seed per 30 pods. Roug Shell has the highest pod per plant and the highest yield compared to other varieties. The result of this study is very crucial to select the best peanut variety and recommend it to farmers along the Mekong River.

Keywords: *Arachis hypogaea*, agroecosystems, on- farm, evaluation, insect pest and disease resistance, grain yield.

AG-14-34

Review on Causes, Effects and Management of Soil Salinity on Irrigated Rice Fields in Tanzania

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Abstract

Salinization is a process that results in an increased concentration of salts in soil and water. Soil salinity is one of the most serious agricultural problems in irrigation agriculture in Tanzania. Severe salinity can cause significantly lower yields, food insecurity, and environmental degradation. If not properly understood and addressed, soil salinization can accelerate and potentially expand to currently unaffected irrigated agriculture land. Despite the efforts made by the government and other stockholders rice production in the irrigated rice fields are still having low yields. Current rice yields are between 2.5 and 4 tons/ha which is lower compared to the average rice yields reported in other countries. Salinity problems may be caused by the prevailing climatic characterized by high evapotranspiration, geological and geographical characteristics of the area, quality of irrigation water, inadequate land use practices. This paper tries to sum up and review available information on the causes and effects of soil salinity on irrigated rice fields in Tanzania. And it provides information on management strategies to adjust soil salinity and improve soil fertility.

In this review, the various reasons that cause soil salinity in irrigated fields in Tanzania have been identified, which are the nature of rocks, poor irrigation managements and non-compliance with established irrigation regulations. Also, the effects of soil salinity in Tanzania have been shown which are decrease in yields, increase in costs of production, poor quality of products and water shortages for irrigation. Lastly are ways should follow to solve the challenges of soil salinity, the identified ways are to set up a local drainage system in affected land, renovate some irrigation facilities, reclaim the affected soil by gypsum and manure and to flush all salt affected water with non-salt water.

Keywords: review, soil salinity, causes and effects, irrigated rice field, Tanzania

AG-14-36

Field Evaluation of Different Peanut Cultivars for Agronomic Yield Parameters, Pest and Disease Infestations

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Abstract

Peanut (Arachis hypogaea L.) is one of the world's major food legume crops. in Cambodia, it has been one of the more profitable crops grown in for many years. However, average yields are low compared to yields of other countries such as China and India. Relatively low peanut yield in Cambodia is attributed largely to the deleterious effects of insect pests, diseases, weed interference, lack of nutrients and cultivars. This research was carried out to find the better peanut cultivar with a higher yield and adapted to insect pest and disease infestation. The experiment was conducted at the Cambodian Agricultural Research and Development Institute, Dangkor district, Phnom Penh, Cambodia. The experiment was designed in randomized complete blocks design (RCBD) with eight cultivars as treatment and four replications, 32 plots. The experimental treatments were: Cap 1, Smooth Shell, Roug Shell, Red Banteay Meanchey, Georgia-06, Local Chinses, Carwile's Virginia and Sarinut 2. Data were collected on Plant height, 50% Day of flowering, Plant tillering, Day of harvesting, insect pests and diseases scouting, 100 seeds weight, and Yield per hectare. As the result, the yield of peanut among the cultivars was found superior in Smooth Shell (5.85t/ha), Carwile's Virginia (5.73t/ha) and Roug Shell (4.92t/ha) followed by Cap 1 (4.04t/ha), Red Banteay Meanchey (3.96t/ha), Georgia-06(3.77t/ha), while the lowest was found in Local Chinses (2.41t/ha), and Sarinut 2(1.29t/ha).

Keywords: *Arachis hypogaes*, cultivar, yield, pest and disease infestation

AG-14-37

Crop Growth Model for Hydroponic Cultivation of Solanum Lycopersicum (Tomato) in Semi-Automated Systems

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Abstract

Hydroponic agriculture is a cultivation method that maximizes resource efficiency and promotes soil conservation. Modalities of this system allow for full control of the growth of the plants or management through semi-automated facilities with a cost reduction. The objective of this study was to build a crop model applicable to the growth of tomato (*Solanum Lycopersicon*) when being irrigated using three types of water: a) tap water and fertilizer as a control, b) renewable water, and c) reclaimed water. The experiment was carried out until 70 days after sown (DAS) using a portion of a plot of 10m x 1m for every treatment. Soluble fertilizer was applied to the treatment of tap water on days 1 and 49. Logistic curves were suitable to predict the growth in treatments with reclaimed and renewable water ($RSME_{b,c}$=3 cm). However, a single logistic curve was not able to predict the plant's growth (RSME=7.3 cm) in the treatment *a* due to the additional load of fertilizer applied. Therefore, we attempted to create a growth model which considers changes in growth affected by the application of fertilizers at a later stage. for the vegetative and budding stages of tomato, a logistic curve was adapted to estimate the height of the plants as a function of time. for the late budding and ripening stage, a new module was included in the previous logistic curve equation. The results show that the new growth model can be used to estimate the height with accuracy (RSME = 13mm). Since fertilizer application is necessary for hydroponic cultivation, the proposed model will be an important step in hydroponic management in semi-automated systems.

Keywords: hydroponic tomato, logistic model, renewable water, reclaimed water, semi-automated system

AG-14-39

An Exploratory Study on The Consumption of Planchonella Obovata Fruit Throughout Cambodia

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Abstract

in Cambodia, most historical materials have been lost due to the genocide and the book-burning policy under the Pol Pot regime, and there are limited scientific records of the names, raw materials, manufacturing methods, ingredients, etc. of traditional foods. *Planchenolla Obovata* fruit, generally known in Khmer as Madenh or Romdenh, is one example. Although some of the products made from it, including pickles or jam, are solely at local markets, the existing varieties of processed products and trends of consumption have yet to be known. There is a danger that such traditional foods will disappear unrecorded due to changes in lifestyle, eating habits, and heightened awareness of food safety. This study, therefore, aims to identify the consumption trends of the *Planchenolla Obovata* and its processed products. An interview survey using a questionnaire form was conducted in all 25 provinces of Cambodia. Two primary local markets in each province were selected for the survey, and 7-10 customers in each market were interviewed. in total, 514 customers were interviewed, and valid response rate was 100%. As a result, six ways of eating *Planchonella Obovata*, including pickles, smashed and mixed with sugar, raw as it is, jam, pickled in honey, and pickled in rice liquor, were found. The most popular one was pickled in salt and sugar, which 94.4% of the respondents consumed followed by smashed and mixed with sugar (65.6%). The respondent 186(36.20%) believed using *Obovata* plants as a Khmer traditional remedy to cure some diseases such as fever 59(11.50%), flue 38(7.40%), baby deliveries 31(6%) or vertigo 33(6.40%). Further studies on nutrient contents to understand the relationship with identified eating habits is necessary. Those analyses will contribute to prevention of traditional foods.

Keywords: consumption, trend, effectiveness, products

AG-14-40

Impact of a Drip Irrigation System on Planning and Management of Water Delivery in A Large-Scale Irrigation Scheme in Morocco

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Abstract

Increasing water scarcity is lowering the agricultural production of the Tadla region in Morocco. This necessitates the Moroccan government to actively stimulate farmers about converting their irrigation systems from surface irrigation (furrow) to drip irrigation and subsidize the investment costs by 80 to 100%. Therefore, this study aimed to clarify the impact of the drip irrigation system on the planning and management of water delivery after the conversion program from surface (furrow) irrigation to drip irrigation, in the Beni Amir irrigation district on the right side of the Tadla region. The water management practice before and after conversion was gathered through discussions and interviews with officials and representatives of the management team responsible for the study irrigation scheme. An open questionnaire survey was also conducted, focusing on farmers' irrigation management practices such as on-farm water distribution methods, application rate, water adequacy, and equity water satisfaction level before and after conversion, and the results were analyzed by paying attention to their farms' upstream, midstream, and downstream locations. The analysis reveals that most of the interviewed farmers indicated satisfaction with equitable water distribution. Some variations in the water management system may occur due to the conversion project, such as an increase in irrigation time and increased cost and labor in water management. These will have an impact on the CDA's (Agriculture Development Center) overall water management monitoring and planning at the tertiary canal, as well as farmers' water management labor.

Keywords: water scarcity, surface irrigation, drip irrigation, water management

AG-14-41

A Value Chain Analysis of the Cashew Sector in Kampong Cham Province

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Abstract
Cambodia's cashew sub-sector has strong potential to grow, create jobs and improve income for tens of thousands of poorer, rural Cambodians. According to the IFC Advisory Service in East Asia and the Pacific's report (Cashew Industry Worldwide and prospect for Cambodia's Cashews), Cashew nut kernels earn high prices in markets around the world and consumption has been growing steadily in both long-standing and new markets, and is likely to continue. Study and experience also show that with the modest technical supports, cashew yield sand earning can be significantly improved and with modest financing, local processing industry could be launched. Cambodia produces and estimated 60,000 mt (Metric tons) of in-shell cashew nuts. This makes it the tenth largest producer in the world, with just over 2% of world production. It is difficult, however, to ascertain exact production in Cambodia, with estimate ranging from 30,000 mt, up to 100,000 mt. However, to ascertain exact production in Cambodia's production is considered large enough to support a shelling industry. Cambodia's production is considered large enough to support a shelling industry. Production in Cambodia is very similar to small cashew-production countries elsewhere, with small farms mixed with larger farms and small plantations. Initial, until the cashew tree canopy closes, other crops are grown between the cashew trees. As in Vietnam, cashew production has to compete with crops such as cassava and rubber. The main of this study is to collect and analyze all relevant information/data on the value chains of cashew produced by farmers and factory in Kampong Cham province in order to have a better understanding on cashew market system and cashew producing system. The results of this study will be used as a contribution to cashew sector analyze that will be made for developing a policy on Cambodia Cashew Sector (CCS).

Keywords: modest technical, processing industry, shelling industry, cashew producing

AG-14-42

Effect of Swine Slurry and Chemical Fertilizers on Soil Enzyme Activities

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Abstract
Organic nutrient source is an effective way to improve soil fertility and increase crop yield. Swine slurry provides tremendous nutrient potential for vegetative and reproductive growth of field crops with long term sustainability. By applying the swine slurry in the field for long term basis help in reducing fertilizer demand and provide an environmentally-friendly method of maintaining productivity and soil health. Soil enzyme activities were enhanced by swine slurry. Enzyme activities to fertilization takes precedence than microbial biomass in the short term. The study aimed (1) to compare microbial load in soil from different sources, (2) to identify enzyme reaction within and fertilizer granules or droplets, and (3) to compare the growth of corn using swine slurry and chemical fertilizer. The research was conducted from November to December 2022 at Throckmorton Plant Sciences Center, Faculty of Agronomy, Kansas State University, the United States. The experiment was conducted in the pot under the greenhouse condition with 3 replicates and 5 treatments such as: Treatment 1: Control (without fertilizer), Treatment 2: swine slurry, Treatment 3: urea, Treatment 4: NH_4NO_3 and Treatment 5: KNO_3+NaNO_3. Each treatment was conducted in replication with 1 pot planting to 2 seeds. The activities of soil enzymes, biomass of corn above ground and root will be analyzed.

Keywords: crop, corn, slurry, soil fertility, soil health

AG-14-44

Comparison of Vegetation Indices between NDVI and RGB images in Rice Paddies Using UAV Imagery

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Abstract

Unmanned aerial vehicles (UAVs) are gradually become more widely used in smart farming, specifically for crop growth monitoring. Several vegetation indices have been developed, of which the Normalized Difference Vegetation Index (NDVI) is the most used. However, relatively expensive multispectral sensors are required to create NDVI maps. Therefore, like the NDVI, indicators that use only RGB data have been developed, such as the Visible Atmospheric Resilience Index (VARI) and the Triangular Greenness Index (TGI). The objective of this study is to compare the relationship between NDVI and RGB-based spectral indices VARI and TGI for two paddy field images. The two paddy field image data were collected in April, July, and August 2022. Then, NDVI, AVRI and TGI values were obtained in ArcGIS Pro software. NDVI values were compared to VARI and TGI values at 1 m and 2 m resolutions. for the two paddy fields in April, 1 m and 2 m resolution showed no relationship between NDVI and VARI and NDVI and TGI as April was the early growing period of rice, however, as July was the middle growing period of rice, NDVI and VARI and NDVI and TGI showed a high relationship with R^2 ranged 0.8611 and 0.931, respectively. Similarly, August, was the final stage of growth, NDVI showed a high correlation with VARI with R^2 of 0.8028 but only in the second paddy field. 1 m and 2 m UAV image resolution has no significant effect on the relationship between NDVI, VARI, and TGI. VARI showed a good relationship with NDVI and can be used like NDVI to predict plant growth status; TGI can only be used to detect the leaf chlorophyll contents and nitrogen requirements and therefore shows no relationship with NDVI.

Keywords: UAV, NDVI, RGB, vegetation indices, rice paddy field

AG-14-45

Conditions of Bio-Slurry Application in Crop Production for Household Farmers in Kampong Cham Province

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Abstract:
Bio-slurry is an organic fertilizer produced from the decomposition of organic waste or residues in anaerobic digestion. It is applicable to improve vegetable production as it contains necessary nutrients such as nitrogen, phosphorus, and potassium for plant growth. About 29,000 biodigesters have been installed across Cambodia to dispose of animal waste, so huge quantities of bio-slurry are produced. Therefore, this study aims to understand the condition of applying bio-slurry in crop production. The research was conducted between April and September 2022 by randomly selecting 30 farming households that have biodigesters and use bio-slurry for crop cultivation in Cheung Prey district, Kampong Cham province. As a result, 31pprox. 80% of farmers used bio-slurry for rice cultivation and backyard vegetables, basically for soil before planting. Additionally, the farmers usually utilized bio-slurry mixing with compost or cow manure stored around 3-6 months before using for rice cultivation. They preferred to use fresh liquid slurry rather than solid one for their crops. However, bio-slurry was commonly mixed with chemical fertilizer in growth's stage. According to their experience, they are willing to use both slurry and chemical fertilizers as this helps the plants to grow well and have higher yields.

Keywords: bio-slurry, biodigesters, crop production, vegetables, chemical fertilizer

AG-14-46

Effects of Salinity Gradient on Soil Properties: A Survey Study on Saline-Affected Soils in The Coastal Areas of Vietnamese Mekong Delta

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Abstract

Saline intrusion in the coastal area of Mekong River Delta (MRD) has modified soil properties, particularly to unfavorable condition for agricultural production. Salt-affected soils contain high amounts of soluble salts might cause many obstacles to crop production, such as increasing osmotic pressure and hindering water uptake of root plants, causing toxicity and unbalancing in crop nutrient uptake, as well as altering the physical soil environment. in order to evaluate the effect of changing in salinity gradient due to saline intrusion on the soil properties, two survey transects was conducted in the coastal areas belongs to Ben Tre and Kien Giang provinces of MRD. The result of the study showed that, soil salinization and sodification are related to and also affected by the farming systems. Along the survey transect, the further inland area where is less affected by saline intrusion, the cropping systems are quite diverse, such as: coconut, double-rice cropping, fodder grass (in Ben Tre), or upland crops as banana and ginger (in Kien Giang); whereas in the regions seasonally affected by saline intrusion, the major farming system is alternative rice-shrimp cultivation; whilst the one which frequently affected by sea water movement, the common farming system is specialized shrimp or salt-water aquaculture. in addition, soil salinity in both survey areas has a very close interrelation with the content of basic cations in dissolved and exchanged forms, especially Na^+ and Ca^{2+} cations. Saline soils in An Minh, Kien Giang have high sodic potential (EC is highly correlated with ESP). Sodification will adversely alter soil physical condition (poor structure, high soil bulk density, poor permeability and drainage, etc.). Therefore, it is necessary to take proper measures in soil management (particularly salt leaching, fresh water irrigation and soil amendments applications) to minimize the potential for soil sodification under the farming system having salt water.

Keywords: salt-affected soils, survey transect, cropping systems, rice-shrimp

AG-14-49

Isolation and Identification of a Compound from *Melaleuca* Extract and its Bioactivities

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Abstract

The Myrtaceae family contains at least 3,000 species in 130–150 genera and is widely distributed throughout tropical and warm-temperate regions in the world. in this family, *Melaleuca* species are typically found in the provinces of Svay Rieng, Kampot, Preah Sihanouk, and Koh Kong in Cambodia. The leaf is mainly used to produce essential oils, which have a lot of bioactivities such as anti-bacterial, anti-inflammatory, and anti-oxidant effects. Although many useful compounds in the *Melaleuca* essential oil are well known, it has not been fully studied on the constituents in the *Melaleuca* extract and the bioactivities contributing to enhancing our health. in this study, we aimed to isolate and identify the chemical structure of the constituents in *Melaleuca* extract and investigate the bioactivities. The plant materials of *Melaleuca* leaves and roots were collected in the provinces of Svay Rieng, Koh Kong, and Kampot. The dried samples were powdered and extracted with methanol and the extracts were successively extracted with hexane, chloroform, and ethyl acetate. The hexane fraction was separated by silica gel open column chromatography and obtained 28 fractions (HFr.1–28). HFr. 6 was subjected to preparative high performance liquid chromatography (PHPLC) and isolate Compound 1. The nuclear magnetic resonance (NMR) and high resolution-electrospray ionization mass spectrometry (HR-ESIMS) were used to determine the structure. According to the instrumental analyses, Com.1 was identified as 7-*O*-methyl-cryptostrobin, which is a known compound from the *Eugenia mattosii* plant but has not yet been reported from the *Melaleuca* plant. To understand the bioactivities of *Melaleuca* extracts, we investigated if it shows anti-oxidant for 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical-scavenging and superoxide dismutase (SOD) like properties, and anti-inflammatory activities by western blot. The results showed that the extract from Svay Rieng province showed the strongest anti-inflammatory and anti-oxidant activities.

Keywords: *Melaleuca* extract, isolation, anti-inflammatory, anti-oxidant, flavanone

AG-14-51

Nutritional Evaluation and Physiochemical Properties of Cambodian Planchonella Obovata Products

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Abstract

in Cambodia, traditional foods are generally considered suitable for maintaining health. However, most of the ingredients and nutrients have yet to be elucidated, despite the high frequency of consumption. The product of *Planchonella obovata* is one such traditional Cambodian food that is widely sold in many markets. This study evaluates its nutrition and physiochemical properties of it. There are two replications done with the fresh and processed (pickled and smashed-in-sugar) *Planchonella obovata* by taking 10 shops from Phnom Penh city, Cambodia, in September 2022. The parameters including pH, total acid, moisture content, vitamin C, sodium chloride (NaCl), ash, calcium (Ca), magnesium (Mg), total soluble solid, total sugar, tannin and total phenolic contents are specifically identified. As a result, each product showed a different amount of these parameters. The fresh product contains the highest value in pH, vitamin C, total phenolic contents and tannin compared to the pickled and smashed-in-sugar products. The processed products still had half the vitamin C content in fresh ones. Moreover, the chemical properties such as NaCl, Ca and ash of both processed products were not much different from each other; but they were higher than the fresh ones. The moisture content, total soluble solid and total sugar of the smashed-in-sugar product were the highest among others. The functional foods should be more explored and the processing method should be enhanced for reducing loss of main nutrition, especially vitamins. The high-performance liquid chromatography (HPLC) analysis and the anti-oxidant assay will be conducted using the extracts from *Planchonella obovata* products to give some more scientific evidence.

Keywords: physiochemical properties, P*lanchonella Obovata*, traditional foods, Cambodia

AG-14-53

Identification and Characterization of Lactic Acid Bacteria Isolated from Fermented Products (Nem Sbak Chrouk) in Battambang Province

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Abstract
Nem Sbak Chrouk (NC) in Khmer is a sour fermented product produced from minced fish mixed with pork skin with two to three-day fermentation at ambient temperature. Fermented foods are commonly associated with Lactic Acid Bacteria (LAB), while these bacteria also improve the flavor, and texture of foods and provide numerous health benefits as probiotic bacteria. for this reason, LAB has been studied and screened for use as a starter culture. This study aims to isolate and screen LAB from NC collected from Battambang (BB). Four samples of NC from four producers in BB province were first enumerated and isolated LAB using the spreading plate and streaking method on the De Man, Rogosa, and Sharpe selective agar media. LAB was characterized by a biochemical test such as catalase, salt, and pH tolerance through optical density observation and identified the strains by Matrix Assisted Laser Desorption Ionization-Time of Flight Mass Spectrometry (MALDI-TOF/MS). After isolation, purification, biochemical test, and MALDI-TOF/MS confirmation, 3 species of LAB were identified such as Lactobacillus plantarum (n=5), Companilactobacillus farciminis (n=5) and Lactobacillus sakei (n=1). LAB was evaluated their salt tolerance at (3% and 5% of NaCl) and pH tolerance of 3 to classify essential characteristics of potential starter culture for fermentation. Three strains of Lactobacillus plantarum and all Companilactobacillus farciminis showed high tolerance to salt at both concentrations and moderate tolerance to pH 3 compared to the control. At the same time, Lactobacillus sakei is moderate to salt at both concentrations but has a low tolerance to pH 3. These findings are crucial to understanding the nature of LAB in NC products that can be further studied for use as a starter culture.

Keywords: fermented products, lactic acid bacteria, starter culture

AG-14-54

Determination of Histamine Level and Its Correlation with Bacterial Viable Count in Cambodian Fermented Fish

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Abstract

Nem Trey (NT), *Sangvak* (SV) (minced fish), *Nem Sbek Chrouk* (NC) (minced fish mixed with pork skin) are fermented fish products with two to three days of fermentation and ready-to-eat except for Sangvak, which is grilled before consuming. These appetizers are popular; however, their safety concerns over biogenic amines, such as histamine, are neglected, which could pose a health problem. Biogenic amines are nitrogenous organic chemical compounds mainly produced from the decarboxylation of amino acid, histidine by the activity of certain bacteria associated with fish products with poor hygiene and temperature control. This study aimed to determine the histamine level in NT, SV, and NC products and studied its correlation with the bacterial viable count (BVC). Twenty-six samples, NT (n=12), SV (n=5), and NC (n=9), were collected from different producers from Battambang (BB) and Kratie (KT) provinces. A Histamine Test kit, a colorimetric enzymatic assay, was used to determine histamine level. The BVC was done using the spread plate technique on Luria Bertani agar media incubated at 37o C for 24h. for KT, NT and NC contained BVC (log10 cfu/g) in the range 5.74±0.02 to 6.57±0.01 and 5.52±0.01 to 5.98±0.01, while histamine (mg/kg) ranged from 0 to 156.43±0.13 and 28.76±0.71 to 73.87±0.13, respectively. SV, NT, and NC from BB province ranged the BVC (log10 cfu/g) from 6.02±0.16 to 6.56±0.15, 5.97±0.15 to 6.04±0.15, and 5.69±1.18 to 6.12±0.11, while histamine (mg/kg) ranged from 6.10±0.44 to 54.52±0.00, 0 to 10.90±0.14, and 0 to 38.54±0.00, respectively. The BVC and histamine showed a significant correlation, with a value of 0.448 (>0.3) (p-value <0.05; based on SPSS, 2018). Some samples from KT showed a higher histamine than the European Commission standard limit (<100 ppm). Therefore, raw materials, processing, and storage condition along the production chain should be evaluated in further study to ensure the safety of the products.

Keywords: histamine, fermented fish, bacteria count

AG-14-55

Effectiveness of Different Washing Solution for Bacterial Removal from Lettuce Collected from Market in Phnom Penh

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Abstract
Lettuce is a leafy vegetable popular for raw or direct consumption without cooking and also has a high contamination risk with microorganisms from different sources. Washing and disinfection are crucial steps for reducing microorganisms of public health concern. The objective of the present study was to evaluate and compare the efficacies of different washing solutions, such as single-use of organic acid citric acid (CA) and acetic acid (AA). Two commercial washing solutions (CWS-A and CWS-B) purchased from the market were used for comparison too. The lettuce samples in this study were purchased from the Psar Kilo 4 and Samaki market in Phnom Penh on the day of the experiment by randomly selected from different vendors. The acetic acid solution and citric solution were used to wash lettuce samples at concentrations of 1, 2, 4, and 5% (v/v); CWS-A (NaCl 3%, Citric acid 1%) and CWS-B (NaCl 3%, Acetic acid 4%, Citric acid 1%). The total plate count was enumerated on Luria Bertani agar to determine the concentration initially and after washing with the different washing solutions for 10 min at static conditions. Washing with deionized water was used as a control. After washing for 10min, acetic acid at 1, 2, 4, and 5% could reduce the total bacteria count for 1.95, 2.79, 3.6, and 3.7 log10CFU/g, respectively. Citric acid was reduced by 1.55, 1.73, 3.3, and 3.6 log10 CFU/g, respectively. The commercial product of CWA was reduced to 1.1 log10CFU/g, and CWB was reduced to 1.39 log10CFU/g. Among all washing solutions, organic acid as acetic and citric acid at a concentration of 4 and 5% were the most reduced total bacteria count than other conditions. Further study is needed to investigate if the potential solution can treat pathogens and affect the leafy vegetable's physical and nutritional properties.

Keywords: total bacteria count, lettuce, washing solution. bacterial removal

AG-14-56

Assessment of Antibacterial Activity of Lactic acid bacteria Isolated from Fermented foods Against *Escherichia coli* O157:H7, *Proteus penneri* and their Potential for Starter Culture

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Abstract
Fermented fish and vegetables produced by spontaneous fermentation are the most well-known traditional foods in Cambodia. Even though fermented foods provide health benefits related to nutrition, probiotics, and postbiotics, some of them are not safe due to the survival of human harmful bacteria. The purpose of this research is to examine *in vitro* the antibacterial activity of lactic acid bacteria (LAB) isolated from fermented fish and vegetables against *E. coli* O157:H7 and *Proteus penneri*, histamine forming LAB, and the survival of LAB in low pH level and high salt concentration using pH and salt tolerance tests. LABs were isolated from 134 naturally fermented fish and vegetables from four different provinces and identified using the Biolog GEN III MicroStation semi-automated system. The antagonistic properties of these isolates against *E. coli* O157:H7, and *Proteus penneri* were examined using co-culture method at 24, 48, and 72 hours of incubation times. As results, 36 species of lactic acid bacteria were identified from a total of 134 samples. Seven LAB species out of 36 species can survive at pH 3 for 6 hours, while four of these seven LABs can tolerate pH 2. *Lactobacillus plantarum, Lactobacillus lactis, Lactobacillus gasseri, Leuconostoc lactis,* and *Leuconostoc gilidum* have a significant capacity to inhibit *E. coli* O157:H7 and *Proteus penneri* growth when compared to control. These five LABs do not produce histamine and can tolerate up to a 10% salt concentration. All the results demonstrate that *Lactobacillus plantarum, Lactobacillus lactis, Lactobacillus gasseri, Leuconostoc lactis,* and *Leuconostoc gilidum* have a great potential for use as starter cultures for suppressing pathogenic bacteria growth in fermented fish and vegetables.

Keywords: fermented fish and vegetables, *E. coli* 0157:h7, lactic acid bacteria, antimicrobial activity, pH and NaCl tolerance

AG-14-59

Evaluation of the Effect of Lactic Acid Bacteria on Histamine-Producing Bacteria Isolated from Cambodian Prahok

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Abstract
Prahok (fermented fish paste) is commonly used as a side dish or condiment in Cambodian cuisine. Because of the raw material and inadequate hygiene during processing, this type of fermented fish was frequently loaded with histamine toxicity. The purpose of this study was to examine the potential histamine-producing bacteria isolated from Prahoks collected from three provinces in Cambodia and to evaluate the efficacy of local lactic acid bacteria (LAB) in controlling those histamine-producing bacteria (HPB). for HPB isolation, modified Niven's agar was used and the bacteria species were identified using the Biolog GEN III Semi-automatic system, while histamine concentration was quantified using a colourimetric enzyme assay. The antibacterial activity of 14 LAB strains from the stock collection of Laboratory Food Biotechnology, Faculty of Agro-Industry, was used to evaluate their antibacterial activities against HPB using the co-culture method and compared to a control by growing HPB without LAB. As results, five identified histamine-producing bacteria isolated from Prahok, including *Enterobacter aerogenes, Klebsiella oxytoca, Morganella morganii, Proteus penneri,* and *Staphylococcus xylosus,* can produce histamine at levels of more than 200 ppm in vitro. A co-culture examination demonstrated that the growth of all potential HPB cultured with three LABs (*Lactobacillus plantarum, Lactobacillus gasseri, and Lactococcus lactis*) of a total 14 LAB strains was inhibited compared to the control. in conclusion, because the three LABs listed above cannot create histamine, they are promising candidate LABs to apply in Prahok processing to control HPB as well as histamine levels in the final product.

Keywords: prahok, histamine producing bacteria, histamine, lactic acid bacteria, antimicrobial

AG-14-60

Assessment of Secondary School Students' Knowledge and Perception Through Training in Nutrition-Based Wild Food Plants Gardening

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Abstract

in Cambodia, wild food plants (WFPs) are available for human consumption and medicinal use; however, many species have been neglected and underutilized. Therefore, enhancing knowledge on WFPs, which are available and accessible in the local areas particularly to school-aged children, is a key factor to improve the understanding of nutrition for healthy growth and development. This study aims to evaluate the effects of training in nutrition-based WFPs gardening to secondary students on improving perception and knowledge of WFPs. By following the design from cluster randomized controlled trails (RCTs), 240 students from grade 7 to 11 of two public schools are randomly selected and classified equally into two groups included treatment group (students receive training) and control group (students not receive training). The independent t-test is used to detect significant differences in WFPs' knowledge and perception between the treatment and control groups. The result is expected that students who attend the training improve their knowledge and perception toward WFPs as well as the basic knowledge of food and nutrition.

Keywords: wild food plants, nutrition, knowledge, perception, secondary student

AG-14-62

Agronomic Characteristic of Chinese Cabbage (Brassica Pekinensis L. Rupr.) Production in Rainy Season at Lowland Area of Cambodia

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Abstract

The solution on the issues of unstable supply of vegetable production in Cambodia due to saturated soil condition during rainy season, leaving the comparative advantage to the neighboring countries, namely Vietnam and Thailand, has been proposed through the effort of introducing sub-surface drainage system under our previous experiment technique with Chinese cabbage to determine the potential in increasing the production period and productivity during rainy season. To explore further, on-farm experiment was continued to conduct with farmers in Svay Chrum District, Svay Rieng Province by including the plastic house and net house. The experiment was assumed as a Randomized Complete Block Design (RCBD), with a total of 45 plots including 9 combined treatments and 5 replications. The results of the experiment show positive improvement in terms of yield and growth of the Chinese cabbage at a rate of 23% and 43% for drainage type of T2 and T3; and 97% and 157% for net house and plastic house, respectively. However, the analysis still excluded the cost effectiveness and efficiency of the experiment due to the absence of detail expenditures on drainage pipe, construction of the net and plastic house, and water consumption being excluded.

Keywords: agronomic characteristic, Chinese cabbage, management condition, drainage, rainy season

AG-14-66

Evaluation of Drought Tolerance of Selected Peanut (*Arachis hypogaea* L.) Cultivars Under Net House Condition

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Abstract
Drought is an abiotic stress which affects yield and peanut quality in rain fed area. The study of this topic is to evaluate the combination of peanut ages and peanut cultivars. This study was started in late dry season to early rainy season in Phnom Penh, Cambodia. It was designed in Randomized Completed Block Design (RCBD) with two factors. The first factor is peanut cultivars which consists of six cultivars include three local cultivars and three imported cultivars. The second factor is four different peanut ages. These two factors make 24 treatments in total. There are two main data which are incubation period (number of days to death while drought) and accumulate wilting scoring (AWS) which is the sum of day to day wilting score (1-9). The first result shows that Sarinut 2 (imported cultivars) with drought after 3 weeks old of planting has the highest incubation period which is 30.5 days. While Yenyawoso (imported cultivars) with drought after 12 weeks old of planting has the lowest incubation period which is 6.75 days. on the other hand, through kruskal-walis data analyzing shows that each of peanut cultivar has the highest AWS while drought after 12 weeks old and 9 weeks old also shows the highest AWS. Besides six weeks old and 3 weeks old drought after planting show the lowest in terms of accumulation wilting score. These results illustrate that the older the peanut is drought, the earlier it will die. Farmers or peanut planters should try to prepare a good crop calendar in order not to be effect by drought.

Keywords: drought, peanut

EM-14-02

Global and Regional Aspects of Climate Change

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Abstract
Climate change is safe to be one of the biggest challenges of mankind. Human activities, especially the combustion of fossil fuels, contribute to the increase of greenhouse gases in the atmosphere and thus to the pace of climate change. The effects of climate change are already being feit, and the resulting damage will most likely be enormous worldwide. Following aspects will be addressed in my oral presentation Causes of climate change Climate change versus climate emergency Planetary bounderies Tipping points Advancement of IPCC-scenarios from 1992- 2021/22 Regional Aspects: Greenhouse gas emissions of hydropower in the Mekong River Basin.

Keywords: climate change, IPCC, tipping points, Mekong river basin, hydropower

EM-14-05

Development of Erosion Protection Zones in The Catchment of The Reservoir "Kalimanci"

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Abstract
Construction of reservoirs is a priority for providing sustainability of the water resources. in the Republic of North Macedonia there are 23 big and over 120 small water reservoirs. on the other hand, erosion and filling the reservoirs with sediment is one of the main problems of reducing the lifespan of the reservoir. The total annual accumulated sediment in all the reservoirs in the Republic of Macedonia is 3.000.000 m^3 (Erosion map of RM, 1993). The study area of this paper is "Kalimanci" reservoir in the frames of the catchment of the river Bregalnica. The main method used to estimate the sediment transport on catchment level is the EPM Gavrilovic method and the validity is assessed with the accumulated sediment in the reservoirs. The EPM method only estimates total transported sediment on one point. in order to estimate how the sediment is transported, re-transported and accumulated in the river bed it was used a hydraulic sediment transport model – HEC RAS. Then the critical sub-catchments from erosion point of view are delineated. Most of the critical subcatchments are situated around the reservoir "Kalimanci", the middle of the catchment is with medium severity and the highest parts of the river Bregalnica is the least critical. The largest part of the sediment transported by the river Bregalnica is deposited in the valleys, almost 75%. With the aggregation of the previous steps, the zones of the reservoir "Kalimanci" from erosion point of view were created.

Keywords: erosion, bathymetry, GIS, zoning, erosive sediment material

EM-14-06

Prediction of Land Use Change Using the CA-Markov model: A Case Study in the Upper Sangkae River Basin, Cambodia

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Abstract
An expansion of agricultural land and diminishment of forest cover in Battambang province has been recently reported. While the forest cover has decreased, the amount of water resources in the river is likely to vary. We need to evaluate for future impacts of such a changing landscape. This study aims to predict changes in land use in 2030 in the upper Sangkae river basin. We predicted land use changes in 2022 and 2030 using remote sensing and GIS techniques to analyze satellite data from 2014 to 2018 as data input maps in the Cellular automata-Markov model. Meanwhile, we integrated the CA-Markov model and GIS spatial analyst tools to assess what may have happened in the presence of policy intervention from land use development planning in 2030. The model was simulated between the actual and predicted land use in 2022 for accuracy assessment confirmed by the Kappa Index of Agreement. The modeled scenario, without a land use policy, predicts the increase in built-up land and the decrease in the natural forest cover in 2030. It points out that in the absence of a land use policy in development plans, the forest cover will suffer from continued least deforestation because forest clearing seems to reach to protected area boundary. in contrast, with the presence of land use policy from local development planning, the model shows an increase in forest covers in 2030, even though some areas have been allocated under economic land concessions for industrial agriculture. Non-forest cover, such as farmlands and paddy fields, is almost not expected to decline. Nevertheless, built-up land is forecasted to continue dramatically increasing with or without policy intervention. This study sheds light on practical evaluation tools for governmental land use policy effects. Our attempts will contribute to further research on the impacts of changes in land use patterns on hydrological environments.

Keywords: CA-Markov model, land use change, land use policy, GIS

EM-14-07

Assessment of Windspeed Reduction Efficiency of Tree Windbreaks Systems using Remote Sensing in Ovche Pole, Macedonia

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Abstract
Ovche Pole is one of the most significant agricultural areas in Macedonia. It is considered a sub dry-humid arid region, with a local climate characterized by low precipitation and high ambient temperatures during the growing period and prevailing winds which are frequently present throughout the year. in the 1950s the movement implemented projects for the establishment of tree windbreaks (field shelterbelts) to reduce wind velocity, protect agricultural land, and increase crop productivity. Throughout the years a significant part of these tree systems was either lost or degraded. Even though these tree windbreaks have an important function for the agricultural production in the region until now there are no scientific studies that assess their current performance. Therefore, the objective of this study is to assess the windspeed reduction efficiency of these systems based on the tree degradation level of windbreaks, optical porosity, and NDVI. Accordingly, the field measurements for wind velocity, optical porosity, and drone (UAV) survey were done on 7 (seven) windbreaks sections. At each windbreak site, the level of degradation is determined using the photogrammetric method. To determine the windspeed reduction efficiency, windspeed measurements (using anemometers) are done at one point on the windward side and at three points on the leeward side. A drone with a multispectral camera is used to extract and record rernote sensing indices values at each windbreak site. The data of this investigation are still under analysis; the results and conclusion are presented in the full manuscript.

Keyword: windbreaks, windspeed reduction efficiency, optical, NDVI, Ovche pole region

EM-14-08

Discussion on Influencing and Limiting Factors on
Sustainable Grape Farming in Yamanashi Prefecture, Japan

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Abstract
Viticulture has been an important agricultural arm throughout history in many countries. in Japan, grape growing areas is 17,800 ha and estimated annual production is 172,700 tons. The leading prefecture for grape production and winemaking is Yamanashi Prefecture. The land under grapevine in Yamanashi prefecture is around 3,780 ha with an estimated production of 36,900 tons per year. in Yamanashi, grape production and winemaking are two main sources which farmer's income depends on. Despite many advances in grape and wine production, still productivity and quantity of grape is not satisfied in the whole agricultural society of Yamanashi. The objectives of the study were 1) to examine social economic characteristics of grape farmers, 2) factors influencing and limiting contribution of grape farming to household income, and 3) to assess challenges facing grape farmers and wine producers in the study area. Therefore, field surveys were conducted with grape farmers and wine producers supported by structure and semi structure questionnaires during the ripening and harvesting grape season in 2022. Data was analyzed descriptively using the statistical package for social sciences (SPSS). The preliminary findings indicated the average age of those involved in grapevines and wineries are above 60 years old, with a minimum of 30 to 40 years old, grape farming is predominantly male activity and main source of income. The majority of the respondents had more than 20 years of experience as well as higher agriculture education background. The result indicated that factors affected by external environmental influences on grape bunch were light exposure, temperature, humidity, wind, rainfall and physiology of the grapevine by water and nutrients. on the other hand, limited production factors such as initial investment, labor, small size of land, and depopulation of rural areas identified the economic challenges and core factors influencing and limiting contribution of grape farming to household income. Thereby, if these issues are not considered, the long-term viability of grape production and winemaking will be at risk.

Keywords: grapevine, challenges, influences, limiting factors, Yamanashi, Japan

EM-14-13

Characterising Salinity and Identifying the Significance of Salinity Composition on River Chemistry and Ecosystem Health

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Abstract

Salinity is a measure of dissolved salts (major anions and cations: Na^+, Mg^{2+}, Ca^{2+}, K^+, SO_4^{2-}, HCO_3^-, Cl^-,) in soil or water. Natural salinity in rivers can vary in composition due to changes in aquifer lithology, natural salt deposits in the Australian landscape (primary salinity) and salt accumulation due to land altering activities such as mining or land clearing (secondary salinity). Monitoring waterway salinity is vital to managing adverse impacts on agriculture, drinking water supplies and ecosystem health. To date, excess amounts of salinity is a significant issue in regions of the Murray-Darling Basin in New South Wales, Victoria and south-western Australia. in this paper, case studies are examined to determine the influence of varying saline characteristics in river systems associated with mining activities. Generally, electrical conductivity and total dissolved salts give a significant correlation in river water. Coal mineralization, for example, is known to drive high concentrations of hardness and alkalinity. It is postulated that salinity characteristics of high hardness and alkalinity enable buffering capacities in river ecosystems. Hardness and alkalinity can influence metal speciation and subsequently metal toxicity. As a method we apply salinity factor k (Total Dissolved Solids [TDS in mg/L /EC in μs/cm) to characterize salinities in river waters. The salinity factor can also be plotted as a cumulative distribution for various sampling sites to observe differences in salinity factor between various sites. The aim of this study is to demonstrate a methodology to characterize different sources of salinity in river water. Various study examples are drawn from Burdekin River catchment and tributaries in Queensland including proximity to gold mining sites of Mt. Leyshon and Ravenswood, and distinguish these from agricultural activities. The consideration of different sources of salinity provides a means to identify if contributions to salinity are significant to downstream river water quality.

Keywords: salinity, salinity factors, sources, water quality, environmental health

EM-14-14

Identifying Causes of Heavy Metals Pollution in Cheung Ek Lake, Cambodia

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Abstract
Water pollution is a serious environmental problem in Cambodia. in Phnom Penh, untreated domestic wastewater is discharged into Cheung Ek Lake located in the southeast part of the city. As a result, the water quality has deteriorated, which influences the agricultural activities in the lake. for example, vegetables growing in the lake contain heavy metals. Therefore, the causes of these heavy metals should be identified. This study aimed to identify the origin of heavy metals in Cheung Ek Lake. Water morning glory, wastewater, sediment and fertilizer samples were collected and pH, EC, DO, NO_3^-, NH_4 PO_4^{3-}, Fe, Cr, and Cu of the samples were measured. The water samples were collected from different depths of the inlet, middle, and outlet. The concentration of Cr and Cu were detected in the surface water at the inlet (Cr 0.02-0.04 mg/L and Cu 0.02-0.07 mg/L) and bottom water at the middle (Cr 0.01-0.03 mg/L and Cu 0.13-0.15 mg/L). The concentration of Cr (3 mg/kg) and Cu (4 mg/kg) were also observed in the water morning glory (*Ipomoea aquatica*) that grows in the lake. The high Cu concentration was detected in fertilizer which made it the primary contributor to the Cu contamination of the water morning glory. While the inlet also shows high concentrations of Cr and Cu, which also contribute to the causes of vegetable and water contamination. The accumulation of heavy metal in the sediment caused elevated Cu at the bottom water. The low concentration at the surface of the middle was primarily because of the uptake by plants that grow there, resulting in the high concentration found in water morning glory plants. To ensure the safe consumption of the vegetables grown in Cheung Ek Lake, a countermeasure with the appropriate technologies should be proposed and implemented for farmers and in the inlet points.

Keywords: Cheung Ek Lake, heavy metal, Phnom Penh

EM-14-17

National Versus Local Climatic Variability and Implications for Communities in Protected Areas: The Case of Lake Malawi National Park

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Abstract
Understanding rainfall dynamics of a nation/region is key to decision making, especially regarding agriculture. The existing variability at local scale, is crucial to understand how localized climate fluctuate. for communities interfacing protected areas, such an understanding can determine the long-term sustainability of such an area. This study aimed to assess the rainfall dynamics of Cape Maclear and associated villages within Lake Malawi National Park (LIVNP). Using 35-year annual rainfall data, rainfall trends and return periods. The return period was calculated using Rainbow; a software package for analyzing data and testing the homogeneity of historical data sets. MarkSim DSSAT-WG was used for maps. It has been found that Cape Maclear rainfall frends resonate with national drought events, though with variations. The analysis shows an agreement between national drought events and local rainfall trends provides a possibility of making localized predictions of such events. The return period shows annual rainfall of between 500-900mm occurs every 2-3 years. Due to the sensitivity and fragility of LMNP ecosystem, there is need to design local solutions for the communities living within the park to enable them sustainably adapt to future climatic shocks especially rainfall inadequacies.

Keywords: climate, community, drought, rainfall, protected area

EM-14-18

Vegetation Description on Regenerative Disturbed Landscape at Lower Slope of Forest Reserve at Visayas State University

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Abstract

The forest reserve of the Visayas State University had scattered parcels that had been subjected to a variety of past management interventions. The study described the site, physiognomy and species composition of the forest stands in lower slope of Visayas State University Forest Reserve in Leyte, Philippines through Braun-Blanquet methodology. It aimed to assess quality of forest in terms of structure and species composition. The study had 40 plots, at 20 m x 20 m per plot.

The elevation was 52-160 m. Soil parent material predominantly basalt with some andesite. The soil type was sandy loam to sandy clay. The area is climatically wet, with rainfall of 3,561 mm/yr. The vegetation is described as having low partially open canopy, dominated by small to medium-size trees. More than half (57.7%) of measured trees had DBH of 10-20 cm and about one-fifth (19.6%) had DBH of 21-30 cm. Average stem density for trees having DBH of at least 10 cm was 904 trees/ha. Average wood stock was 710 cu.m./ha.

A total of 248 species, in 79 families and 184 genera were recorded. These included 170 tree species, 13 shrub, 3 palm, 23 herb, 18 fern, 11 vine, 8 grass, and 1 rattan. The tree layer only had few high-value timber species, high number of non-premium and pioneer trees. The highly represented tree families were Euphorbiaceae with 14 species, Moraceae 14, Dipterocarpaceae 13, Mimosaceae 6, Caesalpiniaceae 5, Combretaceae 5, Guttiferae 5, Meliaceae with 5 species. in conclusion, premium timber in the area were mostly planted. Regeneration of forest species was generally very slow due to absence of mother trees. Forest tree diversity can be restored only by direct planting. It is recommended that a clear restoration plan for tree diversity enrichment in the area be crafted and implemented with a degree of urgency.

Keywords: species inventory, tree diversity enrichment, forest restoration plan, vegetation physiognomy, floristic diversity

EM-14-19

Growth and Mineral Uptake of Moringa oleifera Lam. in Low-Permeability Soils at Different Salinity Levels

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Abstract

This study investigated the uptake of minerals by moringa (Moringa Oleifera Lam.) and examined the salt tolerance of moringa under different salinity treatments (0, 4, 8, 16 dS/m). The effect of root growth on soil permeability at different salinity levels was also examined. Moringa showed significant negative effects of salinity on growth parameters at 8 dS/m. Significant growth inhibition was observed for moringa at 16 dS/m. The higher C/F ratios, calculated as (assimilated organ mass) / (nonassimilated organ mass), in moringa in the 16 dS/m treatment may be due to the inhibition of nitrogen uptake by the roots, causing photosynthesis in the leaves to produce assimilates to sustain the body of the tree. In the aboveground plant parts (branches and stems), the mineral concentrations of Fe and Mg showed a tendency to decrease with increasing Na concentration, while in the roots, the P concentration increased with increasing Na concentration. It was suggested that moringa roots may have promoted growth by increasing P uptake in response to increased Na. The correlation matrix of the mineral concentrations in each organ showed that correlations with Na were significant only for Fe in stems ($r = -0.566$, $p = 0.004$), Mg ($r = -0.417$, $p = 0.04$) and P in branches ($r = -0.452$, $p = 0.03$) and P in roots ($r = 0.631$, $p = 0.001$). There were no significant correlations between the Na concentration and the other mineral concentrations, which were independent of each other. It was suggested that increases in soil salinity and Na concentration do not inhibit the uptake of minerals by moringa. There was a positive correlation between the length of moringa main roots and saturated hydraulic conductivity. The saturated hydraulic conductivity of the soil without moringa cultivation was 1.1×10^{-6} cm/s, and moringa root growth increased the saturated hydraulic conductivity by two orders of magnitude (10^{-4} cm/s) at 0 and 4 dS/m and by one order of magnitude (10^{-5} cm/s) at 8 and 16 dS/m. There was a positive correlation between root dry weight and the length and circumference of the main root (length: $r = 0.99$, $p = 0.0006$; circumference: $r = 0.98$, $p = 0.001$).

Keywords: moringa, soil salinity, root growth, mineral uptake, soil permeability

EM-14-20

Influence of Native Trees on Soil Fertility in The Rainforestation Site in Mailhi, Baybay City, Leyte, Philippines

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Abstract

The Philippines is one of the few countries in the world which was originally and thoroughly covered by rain forest. The conversion of natural forests to agricultural land uses has led to land degradation. Soil is a vital resource for human survival in that it is the medium in which most plants grow, it cleans and stores water, detoxifies pollutants, and plays a key role in the regulation of the Earth's temperature. One of the intentions of rainforestation farming (planting of native tree species) is to regenerate the soil fertility. However, the effect of native forest trees on soil fertility is still poorly understood. Hence, this study was conducted to evaluate the influence of native trees on the fertility status of the soil in Mailhi, Baybay City, Leyte, Philippines. Two adjacent sites were evaluated and sampled. These were the 22-year old rainforestation farm and the nearby coconut plantation. in each site a 20m x 20m plot for sampling purposes was established which was divided into four parts. in each part, four (4) composite soil surface samples were collected from the 0-20 cm soil depth using a soil auger. Each of the four composite samples came from three (3) subsamples. The subsamples were mixed and one-half kilogram was placed in properly labelled plastic bags and brought for processing and laboratory analysis. Results revealed that the rainforestation farm when compared with the nearby coconut plantation did not have an effect on water holding capacity and soil pH but significantly increased the organic matter and total N contents of the soil. on the other hand, available P and exchangeable K were lower in the soil under native tree species compared to the coconut plantation. The results indicate that indeed, the native trees in the rainforestation site have caused important changes to the fertility status of the soils.

Keywords: rainforestation, native trees, soil fertility

EM-14-22

Nitrogen Removal from Mining Dewatering and Fate of Water Release to a River

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Abstract
Seepage water in underground mining voids arises from interception with aquifers that may become contaminated with nitrogen-based explosive during underground blasting operations. The nitrogen-contaminated water may be pumped from underground mining voids and stored at the surface or discharged to a nearby river without treatment if sufficient dilution is achieved to minimize effects to the aquatic environment and pastoral activities. Maximum nitrogen concentration in dewatering water was observed to be 200 times the receiving water of the nearby river when compared against ANZECC/ARMCANZ (2000) water quality guidelines. This study sought to identify sources of nitrogen contamination of underground seepage water, pumped to the surface for discharge to the nearby river. The level of protection (for an aquatic ecosystem) specified the water quality objectives to be achieved following water release. The ANZECC/ARMCANZ (2000) has three levels of aquatic ecosystem protection, and 'Level 2 Aquatic Ecosystem' was selected being described as applying to a slightly–moderately disturbed systems including rural streams receiving runoff from land disturbed to varying degrees by grazing or pastoralism, nearby or adjacent to metropolitan areas. The study considered river flow data, underground dewatering production, discharge rates and river water quality for upstream and downstream of the discharge point, quantities of explosives used underground at specified % nitrogen in explosives estimated to remain following blasting. The most important nitrogen form present in the mine discharge wastewater was found to be oxidized nitrogen (>93%). Only 0.54 % of end of pipe discharge was measurable in the downstream river and indicated that rapid dilution and removal of oxidized nitrogen (nitrate/nitrite) by biota could be achieved. The level of nitrite plus nitrate-N expressed as load discharged to the river showed that the quantity of nitrogen discharged was similar in magnitude to the spillage of 4% explosive.

Keywords: nitrogen, explosive, mining, dewatering, water release, effects, aquatic species

EM-14-29

Assessment of Socio-economic Damage Due to Flood Events at the Southern Part of Phnom Penh Capital City, Cambodia

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Abstract
Disaster managers and decision makers increasingly recognize the benefit of tools that directly translate the flood hazard (flood extension during the events) into the expected socio-economic impacts (the affected population and economic term). While previous studies focused on the wide-reaching flood impacts at local or regional scales, this paper presents a simple approach for estimating the fine and local scale at the impact area. This study aims to establish the flood damage function and assess the direct economic loss due to flood events in the southern part of the Phnom Penh Capital City of Cambodia. The study is applying Google Earth Engine (GEE) using Sentinel-1 synthetic aperture radar (SAR) to assess floods, including the generating of the flood extent and flood depth. While the impact assessment module translates the flood extents and depths estimated by the flood map module into quantitative assessments of socio-economic impacts. This is done based on a combination of the flood depths with information about socio-economic exposure and economic vulnerability in the flooded area. It has been decided to separate the impacts into categories that can be expressed in quantitative terms. The study included: the population in the flooded area, economic losses, and affected critical infrastructure. The study is helpful for rapid flood impact in terms of economic value.

Keywords: socio-economic exposure, economic vulnerability, PHNOM PENH CAPITAL, Cambodia

EM-14-30

Drought Threshold and Drought Monitoring Using Google Earth Engine in Prek Thnot River Basin

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Abstract
The leading natural disaster in Cambodia is flooding, and public awareness typically overlooks what comes the second, which is drought. Agriculture is indeed important in this country because most people rely on it, especially rice farming, which needs a huge amount of water, so drought is as harmful as a flood to agriculture if there is no precaution and a better understanding of drought in the basin. Consequently, this paper aims to classify drought events using the standard precipitation index (SPI) and the standard streamflow index (SSI) to identify the drought threshold and confirm the drought events with NDVI in Prek Thnot of Cambodia facing both flood and drought hazards. Nevertheless, how do we know that in the units of a millimeter or cubic meter per second? The answer lies in this study within the drought threshold. The initial objectives were satisfied by the use of precipitation and streamflow historic data from 1997-2020 from stations in the basin and spatial data from Google Earth Engine. The results demonstrated that drought frequency from one station to another was different. Similarly, the drought threshold varied not only from station to station but also from month to month. Rather than confirming drought events in 2002 and 2004 in Cambodia, the hydrological station in the basin also confirmed the drought events in 2016 with agreement from NDVI visually cross-checked. The study has set up the drought threshold for the tropical basin.

Keywords: drought, Prek Thnot river basin, SPI, SSI, threshold

EM-14-31

Watershed Health Condition Linkage with Anthropogenic at Tropical Watershed Scale

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Abstract
Regarding human and environmental health, the watershed is the best unit for assessing water resources and planning and managing land use. It is an interesting topic for both hydrologists and ecologists. Watershed health assessment is one of the most practical methods for defining the conditions and dynamics of watersheds. The overall goal of this study is to use a new approach based on spatial analysis to assess historical and current watershed health using a geographic information system (GIS) and the analytical hierarchy process (AHP) technique. The proposed method (AHP) employs nine parameters, including land use/land cover (LULC), Soil Type, Precipitation, and Slope is applied in the Prek Thnot Watershed (PTW) in Cambodia as the example of tropical watershed scale. As a general assumption of assessing watershed susceptibility based on how each parameter influences the overall watershed health, the selected parameters are presented in GIS raster maps for assessing watershed health. A quantitative rating was used with weighted sum overlay analysis to reclassify sub-criteria values and generate a final vulnerability map with the watershed vulnerability level zone categories. The results revealed five vulnerability categories: very low, low, moderate, high, and very high. The downstream area, primarily dominated by agricultural land, and the area that receives a high amount of average annual precipitation, sediment load, and nitrate load, are mostly determined to have very high susceptibility levels.

Keywords: Prek Thnot river basin, analytical hierarchy process, watershed health vulnerability

EM-14-32

Surface Water Quality Characteristics in 9C Region of the Mekong River

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Abstract

Surface water quality is vulnerable to pollution from runoff which is contributed by multiple natural factors such as intensity and composition of rainwater, chemical reactions between water and soil or sediment, biochemical reaction, surface water, groundwater interactions, as well as human activities. This research focused on the assessment of surface water quality and aims to identify the correlation between water quality parameters and analysis of the water quality parameter using the Cluster Analysis method and Principal Component Analysis method. Multivariate statistical techniques such as cluster analysis (CA) and principal component analysis (PCA) were applied for the assessment of spatial and temporal variations of a complex water quality data set of the 9C region (Tonle Sap Lake basin), generated for more than 20 years (1986–2011) by monitoring of 16 parameters specifically the water temperature, pH, Total suspended solids (TSS), Calcium (Ca), Magnesium (Mg), Sodium (Na), potassium (K), sodium sulphate (SO_4), Selenium (Si), Chloride (Cl), Dissolve Oxygen (DO), Total Phosphorus (TOTP), Ammonium Nitrogen (NH_4), Conductivity (COND), Electroconductivity (EC) and Alkalinity (Alk) at different sites. The positive significant correlation coefficient in Tonle Sap is between Alkalinity and Conductivity According to the water quality characteristics, hierarchical cluster analysis (CA) grouped 15 sampling sites of Tonle Sap into two different clusters. PCA applied to the data sets thus obtained ten latent factors with sixteen water quality parameters, explaining 65.93%. This study highlights the usefulness of multivariate statistical assessment of complex databases in the identification of pollution sources to better comprehend the spatial and temporal variations for effective river water quality management.

Keywords: Cluster Analysis (CA), correlation analysis, Principal Component Analysis (PCA), surface water quality

EM-14-33

Effect of Hydraulic Retention Time on Wastewater Treatment Performance using Anaerobic Baffled Reactor and Anaerobic Filter

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Abstract
Anaerobic baffled reactor (ABR) and anaerobic filter (AF) are regarded as promising systems compared to septic tank since it can maintain high treatment performance under high organic loading and various compartments and media designed play a significant role in the degradation of organic. However, research on ABR and AF performance for comparative purpose is still limited in previous research under a single study with the same condition and environment. Therefore, the main objective of this research is to determine the effectiveness of ABR and AF consisting of 5 compartments and operating at hydraulic retention time (HRT) of 12 and 24 hours. The biomass in both reactors grew substantially following more extended operation while 70% of sponge bio-media was submerged in each AF compartment. The feeding wastewater had pH, TSS, COD, and BOD values of $4.55 - 8.92$, 130.38 ± 40.05 mg/L, 871.24 ± 153.3 mg/L, and 275.88 ± 87.44 mg/L, respectively. Both reactors were found to reach steady-state conditions at around week 12th. Average removal of TSS at all reactors was between 76.4% and 88.45%. Alkalinity and VFA were also measured at 125. 8 mg/L and 576.7 mg/L, showing a ratio lower than 0.21. Furthermore, for ABR-12hr and 24 hours, the average COD elimination was 39.34% and 50.14%, respectively, while it is 55.74% and 73.56% for AF 12 and 24 hours. To sum up, AF with 24 hours outperforms the other three conditions. Precisely, the removal of the ABR's first port was 23.24%, while the AF could accomplish up to 31.08%. It is almost 10% removal efficiency in the AF compared to ABR. Based on a first-order kinetic degradation rate of 0.015 h^{-1}, turbidity removal via the sponge media reaches 90% within 24 hours and the removal of organic compounds in ABR and AF may proceed via degradation and adsorption through the sponge. The sponge medium, which helps to hold a settled particle in the reactor and was the habitat for microbial growth, may be responsible for COD removal.

Keywords: anaerobic baffled reactor, anaerobic filter, hydraulic retention time

EM-14-34

Comparison Removal Performance of Conventional Septic Tank and Imhoff Tank in Treating Medium-strength Domestic Wastewater

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Abstract

Wastewater has become one of the most concerning issues in Cambodia, as the country's legal framework aimed at promoting effective and sustainable sanitation and wastewater management would be effectively controlled by 2050. Decentralized wastewater treatment systems, as an alternative to centralized treatment systems, are determined to be promising technologies for developing countries with limited resources to effectively manage sanitation and wastewater management issues. A conventional septic tank and an Imhoff tank have been chosen as alternative treatment systems for small industries and individual households because they have no operating costs. Within 24 hours of the hydraulic retention time (HRT), both systems could remove organic residuals of lower than 50%. However, when HRT is extended beyond 24 hours, there is limited reporting from both systems. Furthermore, no study in Southeast Asian countries has found the comparative effectiveness of both systems operating under the same conditions. As a consequence, the main objective of this research is to compare the removal efficiency of a conventional septic tank with two chambers (2:1 ratio) and an Imhoff tank operating at an HRT of 48 hours. There was no sludge seed in either reactor at the start. Thus, the increase in active microorganisms in reactors is proportional to the length of operation time. The fluctuation of total alkalinity (TA) and volatile fatty acid (VFA) was observed to be caused by both reactors, which did not reach the steady stage condition during the first 9 weeks of operation. After 10 weeks of operation forward, steady stage conditioning was reached and TA and VFA in both reactors were observed at 485-530 mg/L as $CaCO_3$ and 163-282 mg/L as CH_3COOH. This range (0.1-0.33 VFA/TA ratio) showed the capability of the system to move from the fermentation process to the methanogenesis process. in terms of removal performance, the septic tank could remove the total suspended solid (TSS), biochemical oxygen demand (BOD), and chemical oxygen demand (COD) of 73%, 51%, and 57% while they were observed only 60.2%, 48.5%, and 39.3% in Imhoff tank, respectively. Based on these results, septic tank performance was found to outperform Imhoff tank removal efficiency. It is caused in this case by two chambers connected in series in the septic tank, which function as the main organic digestion port and complimentary port. in contrast, the Imhoff tank has only one chamber, which poses a high risk to microorganisms when the organic loading in the system fluctuates.

Keywords: septic tank, Imhoff tank, medium-strength domestic wastewater, hydraulic retention time

EM-14-35

Implementation of Land Use and Land Cover LULC 2020-ESRI Global Map to Estimate Soil Erosion in Stung Sangkae River Catchment, Cambodia

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Abstract

Soil erosion is a global problem that threatens human health and lives, and it is a major obstacle to agriculture and food production. in recent years, the Stung Sangkae river catchment has suffered from floodings caused by heavy rains. in addition, the soil erosion from flooding caused damage to agricultural crops due to loss of soil fertility from the soil surface, landslides, and damage to infrastructures in Battambang province. The main objectives of this study were 1) to determine the amount of erosion in the Stung Sangkae catchment in 2020 and 2) to analyze the potential geographical area of erosion in the Stung Sangkae catchment. The Universal Soil Loss Equation (RUSLE) tool was used to estimate soil erosion in the Stung Sangkae catchment and requires some data such as recorded rainfall data, digital elevation model (DEM) data, soil type, and land use and land cover data derived from land use and land lover (LULC) 2020-ESRI global map. As a result, the average annual low erosion rate was from 0.2 to 7.1 tons/hectare/year and high erosion rate was between 13.8 and 75.1 tons/hectare/year were found in the upstream of Stung Sangkae catchment. The total annual soil loss was 1,437,087 tons/year of erosion in 2020 for the Stung Sangkae catchment. in addition, the most areas prone to erosion are mostly agricultural uplands in the upper reaches of the Stung Sangkae river. To reduce the amount of excessive soil erosion, we should consider the implementation of some mitigating measures to protect and conserve the soil erosion in the catchment such as the implementation of 1) biological methods, including contour planting, cover crops, mix cropping, zero tillage and minimum tillage, mulching, and selective weeding and 2) mechanical methods, including stone terraces, drains, earth bunds, and preparation of terraces.

Keywords: RUSLE model, soil erosion, Stung Sangkae catchment, LULC 2020-ESRI global map

EM-14-36

Impacts of Land Use/Land Cover Change on Soil Erosion in Stung Sangkae Catchment using APEX Model

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Abstract

Stung Sangkae is one of the key sources of water for the foundation of city development in Battambang province, Cambodia. The main objectives of this study are to: 1) estimate land use change from 2002 to 2020 in Stung Sangkae catchment, 2) simulate and predict stream flow and sediment yield between land use from JICA in 2002 and land use from ESRI in 2020. in this study, Agricultural Policy/Environmental eXtender Model (APEX) tool is used to model monthly runoff in Stung Sangkae from 2007 to 2018, while we used the DEM, land use, soil type, weather data, cultivated calendar data, and observed flow data are also applied for the model simulation. As the result, monthly streamflow calibration and validation are acceptable ($R^2 > 0.5$, NSE > 0.5, PBIAS $\leq \pm 25$) for both land use of JICA and ESRI. However, changes in land use between 2002 to 2020 due to deforestation (11.5%), loss of grassland (12.2%), and expansions of agricultural land (18.8%), urban area (2.7%), and shrubland (2.1%) have increased the mean annual flow and sediment yield from $0-91$ m^3/s and 6.7$-$7.2 t/ha/yr, respectively. Additionally, the predicted sediment yield from 2020 to 2030 have increased 3.5 t/ha/yr. we can conclude that APEX model is suitable to simulate current and future changes in hydrological variables of streamflow, sediment yield, and nutrients. The results of this study can be useful for development planners, decision makers and other stakeholders. Strategies for managing water resources in Stung Sangkae catchment should be used to adapt the future climate change.

Keywords: APEX model, land use/land cover, sediment yield, soil erosion, Stung Sangkae catchment

EM-14-37

Attributing Variation of Spatio-Temporal of Groundwater Level and Recharge in Cambodian Mekong Delta

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Abstract
Challenging climate change and increasing population and development, it is critical to understand groundwater level conditions, trends, and recharge patterns in order to manage water supplies sustainably and predict water shortages. Prey Veng and Svay Rieng provinces in Cambodian Mekong Delta have the most intensive groundwater use and exploitation for domestic and agricultural purposes. However, groundwater level fluctuation and recharge patterns are not always known, and there is no scientific proof. The study aims to assess the Spatio-temporal groundwater level trend direction and trend magnitude for 28 monitoring wells in Cambodia's most intensive groundwater exploitation. The Spatio-temporal variation trend in the groundwater level indicates a decline in most groundwater monitoring wells in the study area. in comparison, the trend of rainfall is significantly decreasing 2020 over the study periods. The trend magnitude in Prey Veng and Svay Rieng is approximately 0.25m/year and 0.24m/year in the dry season from 1996-2008 and 2015-2020, respectively. This study is expected to close knowledge gaps and contribute to a more robust evaluation of groundwater resources.

Keywords: groundwater recharge, Mann-Kendall test, Mekong delta, trend magnitude, water table fluctuation

EM-14-38

Estimation of Soil Erosion Using RUSLE Model and GIS in Rotanak Mondol District, Battambang Province, Cambodia

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Abstract
Agricultural expansion and urban development without proper soil erosion control measures have become major environmental problems in Cambodia. Due to a high population growth rate and increased economic activities, land use and land cover (LULC) changes will cause environmental disturbances, particularly soil erosion. in northwestern part of Cambodia, conservation agriculture is being promoted to mitigate environmental issues through agricultural practices, especially soil erosion which lead to lose the nutrient from the topsoil. This research aimed to estimate total amount of soil loss by comparing the soil loss under conservation agriculture (CA) and conventional tillage (CT), and to map spatial distribution of soil loss using the Revised Universal Soil Loss Equation (RUSLE) model intergraded with a Geographic Information System (GIS) environment. GIS and RUSLE model is useful tools to building soil erosion maps and defining vulnerable areas through spatial distribution data. LULC 2020-ESRI global maps was used to determine the coefficient of control of land use and land cover (C & P factor) in practice in the RUSLE. The results showed that the average soil loss from Rottanak Mondul district was 3.95 tons/ha for conservation agriculture practice and 6.64 tons/ha for traditional agriculture practice. The estimation of total soil loss in 2020 was 313,204 tons/year for conservation agriculture practice and 525,651 tons/year for traditional farming practice. Thus, we observe that conservation agriculture has significantly contributed to the prevention of erosion and made agricultural practice more sustainable, while understanding the root cause of soil loss would define an accurate data supporting the conservation and sustainable use of land and natural resources. The results will be contributing to a baseline study, and it will be useful for developing conservation plans and policy reform to the catchment area.

Keywords: soil erosion, GIS, RUSLE , conservation agriculture, conventional tillage, LULC 2020- ESRI

EM-14-39

Selection and Optimization Preparation Conditions of Various Raw Materials for Inoculation of Lactic Acid Bacteria under Ambient Temperature

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Abstract
An activated microorganism (EM) containing most lactic acid bacteria (LAB) should decompose the organic matter in wastewater by converting it to carbon dioxide (CO_2) and methane (CH_4). Moreover, enhancing degradation activity using the EM in the septic tank could further reduce sludge volume, resulting in higher removal performance of the organic and longer operation and maintenance of the septic tank system. As known the LAB is gram-positive and the inoculation process of this bacteria from household food waste could conduce using a simple and low-cost technique within the ambient temperature. However, the information on the proper method for the preparation of raw materials for culturing LAB bacteria is limited in Cambodia. Moreover, the selection of the proper raw material has also not been identified yet. Therefore, the main objective of this research is to select and optimize the preparation conditions of raw materials such as rice, vegetable and fruit waste, and organic waste for maximum LAB growth. The culturing of the LAB from those materials was examined through natural growth, additional nutrients, additional glucose, and additional both nutrient and glucose. Culturing was conducted in triplicated for 30 days while samples were selected once per two days interval. At the initial stage, the pH value of batch tests varied from 4.5-4.9 while this value decreased to 3.0 after 30 days of operation. Based on the data from the measuring turbidity method (OD_{600nm}), the highest growth of lactic acid bacteria was estimated in rice ($OD_{600nm} = 2.18$) followed by organic waste ($OD_{600nm} = 2.08$) and vegetable and fruits waste ($OD_{600nm} = 1.95$). Similarly, the mixing of raw material with tape water could maintain the high growth of LAB. in contrast, additional glucose and nutrient in the sample could inhabit LAB growth by 10-40%. in addition, the maximum LAB growth could reach within 2 weeks of inoculation.

Keywords: lactic acid bacteria, rice, vegetables, fruits, organic waste

EM-14-40

Photocatalytic Oxidation of Volatile Organic Compound (VOC) by using Coated Titanium Dioxide in Plastic Media carry in Immobilized Annular Tube Reactor

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Abstract

Photocatalytic oxidation (PCO) is generally regarded as an innovative and promising process for volatile organic compound (VOC) removal. This technique bases on destructive compound in which generates environmentally benign end products (i.e., carbon dioxide, water, and less harmful constituents). Titanium dioxide (TiO_2) is the most frequently used photocatalyst due to their availability, low cost, chemical stability, and non-toxic characteristics. However, the performance of VOC degradation is limited by selective photocatalyst type and the operational conditions. Therefore, this research aims to investigate the effect of VOC concentration, gas retention time, and photocatalyst recycle test on the removal efficiency that carried out an immobilized annular tube reactor, by using coated TiO_2 on plastic media and UVC lamp as the catalyst and light source, respectively. There is a clear trend of increasing of VOC removal efficiency from 41% at operation gas retention time 0.5 min to 94% at RHT = 10 min. The result in batch operation suggests that 2 min of gas retention time is an optimum condition (less time and high efficiency) for the VOC gas degradation. Moreover, it can be observed that the VOC removal efficiency significantly depended on its operational inlet concentration which decreased from 90% at C_{in} =120 ppmv to 57% at C_{in} = 1000 ppmv. Interestingly, the selective photocatalyst 5TPcB was tested five times recycles. The result indicated that it was remained the high efficiency and durability toward degrade VOC in gas phase.

Keywords: Photocatalytic Oxidation (PCO), Volatile Organic Compound (VOC), Titanium dioxide (TiO_2)

EM-14-42

A Comparison of Organic Matter Dynamics Among Degraded, Dam Restored and Preserved Peat Swamp Forest

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Abstract

Development of tropical peatland has triggered serious environmental problems such as forest and peat fire, loss of biodiversity and emission of greenhouse gases. Dam construction has been expected to decrease vulnerability of peatlands to fire, enhance regeneration of degraded lands. The present study investigates the effects of dam restoration on organic matter dynamics which regulates peat condition.

We laid out three types of research site in Palagnkaraya, Central Kalimantan Indonesia less-drained forest, drained forest dam restored forest. Both drained and dam restored forest had experienced drainage in 1995, but dams were constructed in the dam restored site in 2005. Within each site, we measured litter-fall, fine root production and decomposition as indices of peat accumulation rate, water table and soil moisture.

Mean water table and mean soil moisture of dam constructed site were significantly higher than those of drained forest, although they were not higher than that of less-drained forest. Litter fall and fine root production showed the highest at less-drained forest and the lowest at dam restored site. There was no difference in decomposition constant among the study sites. We applied the obtained variables to a model which estimates amount of peat increase or decrease. The result showed amounts of peat accumulation after 5 years are 1.01, 0.09 and -0.722 kg/m2 in less-drained, drained and dam-restored site, respectively. The result showed dam construction site showed peat loss, while drained forest showed least accumulation. A possible explanation for the observed result is increased primary production in drained forests caused by reduction of flooding stress and increased nutrient supply from oxidized peat.

Keywords: tropical peat swamp forest, production, decomposition, dam construction

EM-14-43

Evaluation of Different Satellite Image Products with Ground Data in Estimation Sediment Transport in Latest Tonle Sap Lake Tributary

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Abstract
Sediment transport is a naturally occurring process, the results we see all around us. on geomorphic time scales, the shapes of our rivers, coastlines, canyons, and mountains are largely made due to erosion, sediment transport, and deposition. The advantage of sediment transport is improving operation and maintenance costs, reducing environmental impacts, and optimizing beneficial uses of sediment. Sediment transport is particularly concerned with water quality and quantity in Tonle Sap Lake (TSL), especially in large tributaries such as Stung Sen River basin. This study aimed to set up Google Earth Engine (GEE) model to estimate the amount of turbidity (TU), total suspended solids (TSS), and sediment transport. Initially, assemble the correlation using remote sensing from satellite products (MODIS, Landsat, and Sentinel-2) with ground data of TU for prediction and validation use. in this study, we evaluated and selected Sentinel-2 to estimate. in addition, provide TU measures to assess with TSS analysis to build a correlation in the river basin at Stung Sen River. With four analysis runs, the coefficient of determination (R^2) value for each parameter was 0.95. Finally, using the flow data observation from the hydrological station at Stung Sen in 2019-2020 to estimate sediment load. Subsequently, this study provides an insightful overview and understanding of the sediment load at Stung Sen River of Tonle Lake Basin.

Keywords: NDTI, sediment loads, sentinel-2, turbidity, and TSS

EM-14-44

Antibiotic-Resistant *Escherichia coli* and *Aeromonas Spp.* in Mono Cage Culture of *Channa Micropeltes*

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Abstract

Misuse and overuse of antibiotics in aquaculture have led to the development of antibiotic-resistant bacteria, causing a public health concern. This study aims to determine the antibiotic susceptibility profiles of *Escherichia coli* and *Aeromonas spp.* in mono cage culture of *Channa Micropeltes* (MGi) and to evaluate their physiochemical water quality. Fish, water, and sediment samples were collected from 5 cages in Phat Sanday (PS) communes, Cambodia. *Aeromonas spp.,* and *E. coli* were determined using the spread plate method for fish and sediment samples on selective media; the filtration technique was used for the water samples. Eight antibiotics used in aquaculture and human: Oxolinic acid (OA, 2µg), Ampicillin (AMP, 10µg), Erythromycin (E, 15µg), Florfenicol (FFC, 30µg), Gentamicin (CN, 10 µg), Trimethoprim (W, 1.25µg), Ciprofloxacin (CIP, 5 µg), and Cefpodoxime (CPD, 10µg) used for antibiotic susceptibility test by disk diffusion method and the normalized resistance interpretation method for resistant or susceptible classification. Eight strains of isolated *Aeromonas spp.* were confirmed by matrix-assisted laser desorption ionization-time of flight mass spectrometry analysis, including *Aeromonas jandaei* (n=2), *Aeromonas veronii* (n=1) and *Aeromonas caviae* (n=1) detected in water, while *Aeromonas hydrophila* (n=3) and *Aeromonas veronii* (n=1) detected in fish samples. *Aeromonas spp.* was found to be resistant to AMP (100%), followed by CIP (88%) and OA (63%). While 100% susceptible to CN. 55 *E. coli* were isolated and were resistant to AMP (67%), W (49%), and OA (47%). The pH (6.69 to 6.79), temperature (29.68 to 29.83°C), Total Dissolved Solid (54 to 58 mg/L), and Electrical Conductivity (108 to 123.6 µs/cm) were reported in an acceptable range for water. Dissolved Oxygen (3.09 to 3.82 mg/L), Oxidation Reduction Potential (98.6 to 123.6 mV) were below the recommended range. Therefore, a management strategy in aquaculture farms is needed to improve productivity and reduce the health risk.

Keywords: antibiotic resistance, aquaculture, *Channa Micropeltes*

EM-14-45

Analysis of Flood Characteristics Under Different Upstream Water Release Scenarios in The Prek Thnot River Basin

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Abstract
The Prek Thnot River Basin's largest risk of damage is flooding. The downstream of the basin is threatening Cambodia's Capital city, Phnom Penh, and recently in 2020. The hydrological system is influenced by several factors, with discharge and rainfall being two of the most significant. The availability of water as well as the frequency of droughts and floods are impacted by variations in rainfall. Additionally, this natural disaster had an impact on some parts of the Prek Thnot River Basin, particularly the Southern part of Phnom Penh. The objective of this study is to evaluate flood inundation using various discharges with the integration of the SWAT model and HEC-RAS. This study set up the HEC-RAS model and provided maps of the flood depth and flood extent. Four flood events—2000, the most significant flood event; 2001; 2010, and 2020—are simulated by the HEC-RAS model through the input flow from Hydrological Model (SWAT). for these events, hydrographs, flood depth maps, and flood extent maps were generated. Overall, Prek Thnot River Basin HEC-RAS modeling performs well in terms of river discharge and flood extent. The calibration and validation results for each flood event showed good agreement between the simulated and observed discharges. Briefly, the scenarios of R20, R30, and R40, resulted in a reduction in the area of flood inundation from 113 km^2, 100 km^2, and 77 km^2, respectively, at depths of 0 to 2 m in 2020. The study has been providing a useful model for quick assessment of the flood study.

Keywords: flood inundation, upstream water release, Prek Thnot River Basin, HEC-RAS

EM-14-46

Environmental Impact Assessment of Air Emission from Fertilizer Utilization and Rice Straw Burning from Rice Production in Cambodia

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Abstract

Rice has an important role in being the most stable food for nearly half the whole population and a stable food for almost entirely in Asia. This study aims to investigate the impact assessment of air pollutants from rice production in Cambodia from two activities such as pollutants that emitted from chemical fertilizer and from rice straw open burning. Additionally, it analyses the life cycle impact assessment on two categories such as human health and Ecosystem impact terrestrial acidification by using an analytical tool called Life Cycle Assessment (LCA) and to provide a recommendation on bad impacts reduction. To make it easy in assessment, this study is conducted three scenario categories. Scenario S0 represents the condition of farming application of fertilizer. Scenario S1 represents the experimental method of reducing fertilizer application, and Scenario S2 represents no residue open burning with reduced fertilizer 60%. The results show that the pollutants that emitted from activity of open burning rice straw was (85%) higher than pollutants that are polluted from fertilizer (15%). and the damage to human health is represented in units of Disability Adjusted Life Year (DALY), the damage to ecosystems is presented in units of Potentially Disappeared Fraction of species (PDF.m2.yr) was presented under scenario. The total human health impact (S0) was 5.35E+01 DALY, (S1) was 5.27E+01 DALY; (S2) was 3.75E-01 DALY. The total ecosystem impact (S0) was 4.38E-02 (PDF.m2.yr), (S1) was 3.60E-02(PDF.m2.yr), (S2) was 4.85E-03(PDF.m2.yr). Furthermore, based on these three scenarios illustrate that the minimization of using fertilizer and no open burning can reduce the number of pollutants that affects human health and ecosystem soil acidification. in addition, based on these three scenarios, it showed that reducing the burning of straw waste can reduce the toxins that affect human health by 99% and can reduce the increase in soil acidity 94% as well.

Keywords: $PM_{2.5}$, air pollution, DALY, LCA, rice production

EM-14-47

Influences of Large-scale Agricultural Residue Burning on Ambient Nanoparticles observed in Phnom Penh, Cambodia

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Abstract
Based on the observation of total suspended and size fractionated ambient particles down to ultrafine range (<0.1 µm) in Phnom Penh City in Cambodia between 2011 and 2022, the number of hot spots (NHSP) in Cambodia evaluated through satellite images using MODIS was discussed in relation to the mass concentration of each size fraction of particles as well as to the concentration of particle-bound carbonaceous components. The hot spots were used as a measure of large-scale open burning of agricultural residues. Both high volume air sampler and a cascade air sampler that can collect PM0.1 (<0.1 µm) have been used at a site located on a roof floor of a 5-story building on the campus of the Institute of Technology of Cambodia (ITC) located near the city central. It was found that the mass concentration of particles (PM) was found to slightly increase with NHSP in drier season as April – September during which NHSP increased. However, correlations for all size fraction particles were not so clear because of large fluctuations. Contrarily, the correlation between carbon concentration and NHSP was rather clear during a dryer season as October – March in a period of 2018-2022. A large decrease in NHSP in 2022 was confirmed to be related to a decrease in PM concentration.

Keywords: log-term behavior, biomass burning, hot spots, aerosol, ultrafine particles, carbon

ESD-14-01

A Study on Vulnerability on Selected Local Government Units in the Philippines (Sapangdaku, Cebu City; Tago, Surigao del Sur; Calatrava, Negros Occidental; Cuaming Island, Bohol; and Badian, Cebu)

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Abstract
Vulnerability is the condition determined by physical, social, economic, and environmental factors which increases the susceptibility of an individual or community that could lead to deaths, malnutrition, extreme poverty, degradation of the environment, destruction of infrastructures, and deterioration of the quality of human life. in Southeast Asia, Philippines and Indonesia were considered among the top 5 most vulnerable countries to disaster. in the Philippines, land-use changes like urbanization and logging increase the hazards of flooding and landslides, thus increasing the susceptibility of communities to calamities. Factors such as poverty, weak infrastructure, mainly housing conditions, low income families, and the risky location of residences in danger zone areas are key indicators of increased vulnerability. The researchers found that housing materials and infrastructure, especially structures or houses situated in areas that are deemed risky such as in a steep-slope mountain; examples of which are areas being studied in this paper namely Sapangdaku and areas with close proximity to the coast of Cuaming Island, Badian and Calatrava, and a river situated in Tago. It has also been found out that the disaster management education drives whose purpose is to serve as an awareness platform was not fully realized in a micro-level via household to household dissemination as was intended. Local Government Unit's also failed to create a very crucial component which is the comprehensive land use plan, which would have served as an important component in giving the different barangays direction in an event of any disaster that the community could face. Finally, an increase of illegal settlers in high risk areas was also noted, many of which do not have the proper papers from the government to legally settle in their current areas, most of which are living in areas vulnerable to natural occurrences such as landslides, storm surges, and flooding.

Keywords: vulnerability assessment, vulnerable areas in Visayas-Mindano, disaster management, community empowerment, disaster preparedness system, disaster awareness

ESD-14-05

Factors of Education Disparity in Ceylon Tea Cultivation Areas - Residential Sectors and Tea Industry in Low-country, Sri Lanka

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Abstract

The purpose of this study was to explore the factors behind the education disparity of children based on the tea cultivation management types. In comparison to other South Asian countries, Sri Lankan education indicators are better in relation to its economic levels. Educational disparities between residential sectors, however, remain. Sri Lanka has faced the challenges to improve educational attainment, especially on the estate sector.

A two stage-mix method analysis was conducted: Quantitative analysis using national census data and Qualitative analysis based on questionnaires and interviews. Quantitative analysis was conducted to find factors behind educational disparities among the four residential sectors (urban, rural, estate and farmer). Logistic models revealed that children living in the estate sector faced the lowest school enrollment and that housing condition best explained the education disparities among the four residential sectors.

To deepen understanding of the structure of educational disparity, field surveys were conducted from 2013 and 2015.The field surveys focused on the relations between the environments surrounding children and their enrollment status, based on the different management types of tea cultivation in low-country. Qualitative analysis indicated that educational disparity among management types existed. Analysis identified interrelated variables that result in education disparities and suggested that relocation was one factor behind educational disparity.

Keywords: Sri Lanka, Children, education disparity, residential sector, tea industry in low-country

ESD-14-12

Participation of Women Farmers in Conservation Agriculture Production System: Challenges and Perception Changes

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Abstract
The adoption of conservation agriculture (CA) production systems among women farmers is still limited and women need tailored training that addresses perception changes to adopt CA practices. This study aims to identify challenges faced by women farmers and to engage them through training intervention towards the adoption of CA practices. Qualitative and quantitative data will be collected in Reaksmey Sangha commune, Rotonak Mondoul district, Battambang province. The data collection process will be done by three methods including a household survey using structured questionnaires, focus group discussion, and key informant interviews. Stratified sampling method will be used for the household survey with a total of 85 farmer households. Focus group discussion will be a selected sample from a household survey that is divided into male and female farmer groups with eight per group to examine their challenges and perception in adopting CA. Two agricultural extension agents and local authorities will be sampled for the key informant interviews to understand their contribution to women's engagement in CA training. Data will be analyzed for descriptive statistics and a logistic regression model to examine the factors that influence women farmers towards adoption of CA. It is expected that the perception of farmers in adopting CA practices tends to change within those who receive intervention training. The barriers that prevent women famers from participating in the training at the study sites will be also identified.

Keywords: conservation agriculture, adoption, challenge, perception change

IS-14-01

Impact Assessment of New Dams Construction in Nam Ngum Watershed on Electric Generation at Num Ngum1 Dam

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Abstract

Lao People's Democratic Republic (Lao PDR) is a landlocked country and around 90% of the country are located in Mekong River Basin. Average annual rainfall is around 1900mm and 35% of annual flow in Mekong is from Lao tributaries, so many hydropower dams have been constructed against the backdrop of abundant water resources. The generated electricity is exported to Thailand or surrounding countries, and has become an important means of earning foreign currency for Laos. in particular, the Nam Ngum 1 Dam has been in operation since 1971 in the Nam Ngum watershed near Vientiane, the capital of Laos, and several dams have been completed in this watershed since 2010. Hydropower has great potential to boost the national income and to raise living standards and create opportunities for the establishment of electricity-using industries in Lao PDR. While hydropower reservoirs also have a large number of potential cross sector impacts, including changes in downstream flows and water quality, dam safety. Therefore, the purpose of this study was to evaluate the impact of the construction of multiple dams in the Nam Ngum watershed on the river flow regime, as well as on the hydropower generation of the preceding Nam Ngum 1 dam.

in this study, the fully-distributed TOPMODEL was developed and applied to analyze the water flow in Nam Ngum watershed with a spatial resolution of 1 km x 1 km. Meteorological and hydrological data from 2002 to 2009, and spatial data such as topography, land use, soil properties were collected for model simulation. Simulated river discharge and dam storage were good agreement with observed data, and then, we investigated the impact of dam construction considering NamLik1/2, NamNgum2, and NamNgum5, which were newly developed after 2010. As a results, new dam construction have positive effects to decrease in flood flow in the rainy season and to increase discharge in the dry season, and electricity generation at the Nam Ngum1 dam also increased in 6.8%.

Keywords: water resource development, hydropower, multi reservoirs, Laos

IS-14-02

Information Transfer among Mango Contractors: Sources, Channels, and Priorities

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Abstract

Information transfer is vital in improving knowledge and proper technology implementation, especially in agriculture. This paper aimed to determine the information system the Pangasinan mango contractors use. Specifically, it aimed to 1) identify the sources of information for the mango contractors, 2) determine information channels for information transfer, 3) establish the type of information that mango contractors prioritize, 4) determine the challenges and issues in the transfer of information, and 5) recommend interventions to improve information transfer among mango contractors.

The study area is Pangasinan, Philippines, the country's top mango-producing province. The research used purposive sampling of 55 mango contractors covering six mango-producing municipalities. Descriptive statistics and correspondence analyses were employed in the study of the paper. Results showed that most mango contractors generally receive information on the production and marketing of mangoes from farm technicians and buyers. They usually get information on production technologies from farm technicians and other mango contractors. Expectedly, they get their information on mango marketing from their buyers.

on the other hand, information transfer usually happens through mobile phones and during farmers' meetings. Furthermore, contractors prefer to get information on the buying price of mangoes, followed by the quality requirements of buyers. Contractors also choose to have a face-to-face conversation when obtaining information. The next preference is through text and call using mobile phones. in summary, mango contractors still use the more traditional information system through face-to-face conversations, text, and mobile phone calls. These are also their preference in communication. This has implications for the implementation of modern technologies used for information dissemination. Mango contractors might not be receptive to new ways of receiving communication, even if the information might be urgent or essential. It is recommended that contractors be trained to use modern communication technologies to make them more receptive to other communication channels.

Keywords: information transfer, correspondence analysis, mango contractors

IS-14-03

Can Current Reservoir Development Reduce Extreme Flow in The Flood Prone Area in Southern Part of Phnom Penh, Cambodia?

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Abstract

Flooding is the most common natural disaster in Cambodia, which wreaks havoc on people and infrastructure. Recently, the southern part of Phnom Penh city has become a significant region of destructive floods. in response to flood disasters, reservoir development and operation for flood management is essential for regulating flow regimes; however, it is less-well studied to prove its efficiency in flow reduction. Therefore, the study aimed to prove the performance of Tasal reservoir of Prek Thnot River Basin for extreme flow reduction in the flood-prone area, particularly in southern part of Phnom Penh. The impact of reservoir operation on the main river of the basin is examined through the combination of SWAT and HEC-ResSim models from 2000 to 2020. The result of the targeted water level was defined by the seasonal variation operation, which the water in the dam should be kept at 10% in July before receiving a huge amount of rainfall in the rainy season and 95% in October during the peak flow period. Based on this operation, the monthly flow at the downstream showed a slight decrement during high flow period, while the daily peak flow decreased enough flow to reduce the floods. Additionally, the daily flow in 2020 revealed a notable reduction in the high flow period. Plus, the monthly flow does not yield significant changes due to reservoir capacity and the long distance of the reservoir to the downstream area; however, it is also reduced some amount of daily peak flow in the downstream. Moreover, the development of the newly proposed reservoir will improve flood management in the downstream region of the basin. Thus, it can be concluded that the current reservoir has the capacity to reduce some amount of extreme flow and the development of new reservoir will reduce the floods magnitude.

Keywords: Tasal reservoir, flow reduction, HEC-ResSim, seasonal variation operation

RD-14-01

Assessing the Acceptability and the Feasibility of an Agricultural Package of Technologies for Risk Management in Southern Haiti

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Abstract

Climate risks linked to natural disasters are one of the most critical issues faced by Haitian farming. Losses due to hurricanes, droughts, floods, and diseases seriously threaten productivity. This paper aims to study the feasibility and acceptability of an agricultural package of technologies whose goal is to manage risk while improving the productivity of farming in Haiti. Significant risks faced by farmers seem to be uninsurable risks due to their systemic and catastrophic character. Therefore, the proposed package of technologies includes a paid-in-kind "stabilization accounts" component as a financial tool for risk management. We collected data from 28 agricultural experts and 1400 farmers, including 234 maize farmers in southern Haiti. We adopted the new product development (NPD) process to test the feasibility of the concept. We used the Multinomial Logistic Regression to determine factors affecting the openness of Haitian farmers to innovation. We also conducted the Cochran-Mantel Haenszel test to analyze the association between "saving habit" and "openness to innovation".

Seventy percent of farmers expressed their propensity to pay from 6% to more than 12 % of their harvested crop as a stabilization account. Farmers with "saving habits" will be two-fold more open to innovative technologies. Farm size, gender, and association membership have a significant positive impact on openness to innovation. However, unlike the usual trend in the literature, we found that risk aversion may have a positive effect on the acceptance and the adoption of some technologies. The results also suggest that, in Haitian farming, risks linked to natural disasters are more related to financial incapacity than uncertainty. Therefore, access to proper inputs in due time completed by a financial tool to overcome uncertainty will be a significant boost to the adaptability and resilience of Haitian farmers toward weather risks.

Keywords: product development, technology adoption, microinsurance, stabilization accounts

RD-14-03

The Bio Circular Green Economic Model: A Case Study of Agricultural Cooperatives in Thailand

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Abstract
Bio Circular Green Economic Model (BCG) has been introduced and promoted by the Thai government as a new economic model for inclusive and sustainable growth. The research objective was to study the response of Agricultural cooperatives (ACs) to BCG as a part of the agricultural production sector in the Thai economy. A survey research methodology was applied to collect the primary data from Nabokham Pattana Agricultural Cooperative Limited, Kamphaeng Phet province located in the middle part of Thailand. Findings were expressed the ACs responded to the BCG model by setting the solar power plant to generate the electricity from solar energy and supply both the ACs members and surroundings. The ACs is mainly concerned with BCG which conforms to the United Nation Sustainable Development Goals, integrates bio, circular, and green economy, and is the foundation of Thailand's strengths in agriculture and natural resources, diversity, and geography. BCG encompasses the bio-economy as the production of renewable biological resources and their conversion into value-added products, the circular economy as the reuse and recycling of resources, and the green economy as keeping the economy, society, and the environment in harmony, resulting in sustainable development. According to the ACs regulation as a startup project, it has been started commercial solar electric power to Provincial Electricity Authority (PEA) as stipulated in the contract for 25 years. Due to the green energy, solar power is known as pollution-free and causes no greenhouse gases to be emitted after installation. Renewable clean power that is available every day of the year, even on cloudy days produces some power. Solar power has no maintenance as solar panels last over 30 years. It also economically created jobs by employing solar panel manufacturers, solar installers, etc. and in turn, helps the local economy.

Keywords: bio circular green economic, agricultural cooperatives, solar power plant

RD-14-04

A Resource or a Toxin? Social Processes of Soil Salinization and Local Inland Salt Production in Khon Kaen, Thailand

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Abstract

Soil salinization is one of the problems which inhibits agricultural development. on the other hand, local people may be able to benefit from saline soil through salt production. in such cases, rural sustainable development requires to balance salt production and saline soil management. Yet little is known, however, about the condition and context under which local people regard saline soil as a resource or a toxin. The concept of resourcification, a non-essentialist understanding of resources which clarifies how social process transforms mere natural materials into resources, can open the way to identify these contexts. Applying this resourcification concept, this study therefore explored how saline soil has socially transformed in northeast Thai villages.

The authors conducted field surveys in two salt-affected areas in Khon Kaen province, northeast Thailand in September 2017 and March 2019. During the survey, a total of 17 villagers were interviewed, as well as field observations, about their life history and their relationships to saline soil and salt production. Additionally, we conducted interviews to officers in Land Development Department in order to collect complementary information on soil salinization and saline soil management. With the help of our past surveys and local archives, collected data were analyzed chronologically.

The results first indicate that the two villages have more or less followed de-resourcification processes due to the long-term socioeconomic changes. They both reduced salt production, and increasingly regarded saline soil as an inhibitor to agriculture. Second, they nonetheless had a differences in the recent transformation trends. While a village continues to follow de-resourcification path, another village are experiencing a re-resourcification thanks to the outsiders' notice on their unique history and cultural aspects. These findings suggest the importance of dynamic, site-specific, and pluralistic understandings of social transformation of saline soil, and natural resources in general.

Keywords: northeast Thailand, resourcification, local villagers, saline soil, inland salt production

RD-14-05

The Well-being of People Through the Cooperatives Management: A Case Study of Ban Mankong Hin Lek Fai Cooperative Limited, Thailand

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Abstract
The Well-being of people in society express as their living with good condition fundamental include the housing and employment. Over 30 years, the Royal Thai Government has concerned as main policy to implement. Due to this policy, the Community Organizations Development Institute (CODI) had been launched. The implementation of CODI set up the housing cooperatives known as Ban Mankong Hin Lek Fai Cooperative Limited. The research objective was to investigate the Cooperatives' performances the satisfaction and Well-being of Cooperatives members through its management. Survey research methodology was applied with the primary data collection through the questionnaire and in-depth interview. The secondary data were collected from the database of the Department of Cooperatives Audition. The Data Envelope Analysis (DEA) and Multiple Linear Regression analysis were used as data analysis tools for secondary data while the primary data were analyzed by content analysis. The findings showed that the cooperatives itself had been performed in the good shape and showed the potential of its performance. Since it applied the housing cooperatives philosophy that all members had their role of cooperatives management as their own cooperatives. All of 70 members who joined and had their participations with cooperatives expressed their satisfactions and their well-beings. They absolutely expressed their bell-beings for not only their better standard of life but also their better education, income and employment. Ban Mankong Hin Lek Fai Cooperative Limited could be one of the successful outcomes of the Royal Thai Government policy implementation to give Thai people the well-being through the housing cooperatives management.

Keywords: well-being, housing cooperatives, cooperatives management

RD-14-07

Impact of Agriculture Certification for Silk Farmers in The Case of Khon Kean Province in Northeast Thailand

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Abstract
Despite the rapid economic growth, income inequality between the rural and urban areas remains an important social issue in Thailand. in 2020 the disparity between the Northeast region, which has the lowest GRP per capita, and the East region, which has the highest GRP per capita, is approximately 5.05 times, Northeast Thailand is an agriculture area and is famous for silk production. According to the Queen Sirikit Department of sericulture in 2017 sericulture silk yarn production is 520 metric tons, and 82,071 households conducted sericulture. Around 80% of households conducted sericulture in the Northeast region. Therefore, improving the silk industry in the Northeast area is essential to promote economic development in this region obtaining certification that guarantee quality is considered one effective way to increase farmers' income. Hence, this paper focuses on four certifications: Organic Thailand Geographical indication (GI), OTOP, and Peacock. We clarify the difference between the farmers who can obtain certifications and who cannot obtain them and impact of obtaining certification for farmers' profile of silk weaving. We take a case of farmer living in khon kean province in Northeast Thailand. To clarify those two questions, we conducted both quantitative and quantitative analyses based on the primary data collected through in-person interviews with 103 farmers from October to November 2022. We find that the important factors for the price of silk waving are design, the kind of dyestuffs, and the ability to access markets where products fetch high prices. To show the key factors to obtain certification, we used logistic regression, and to show the impact farmers' community is an important factor to obtain a certification, and farmer who have certification tend to earn more income compared to non-certificated farmer.

Keyword: agricultural certification, sericulture, propensity score matching, Thailand

RD-14-09

Impact of Technology Adoption on Economic Well-being of Rice Farmers in Cambodia

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Abstract

Variety is a key factor for the quality and productivity of paddy rice. The Royal Government of Cambodia promulgated a paddy/rice policy since 2010, through which 10 high-yielding rice varieties have been introduced to farmers. This study investigated socio-economic factors influencing farmers' decision to adopt the high-yielding rice varieties while examining the impact of the adoption of the varieties on yields and profits. Probit regression and propensity score matching methods were applied for analysis. The empirical results of the probit regression indicated that gender (male), paddy field size, and distance to tarred road had a significantly positive influence on farmers' adoption of the improved rice varieties. Meanwhile, household size, the number of paddy field plots owned, car ownership, off-farm job engagement, and the number of cows owned had a significantly negative effect. The results from propensity score matching methods revealed that farmers who had adopted high-yielding rice varieties had a significantly positive impact on yields and profits.

Keywords: technology Adoption, Economic Well-being, High-Yielding Rice Varieties, Cambodia

RD-14-10

The Effect of Global GAP Certification on Horticulture Production in Kenya

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Abstract
Promoting sustainable production systems is one of the pillars of sustainable development goals. Rural development strategies therefore should enhance production systems that are sustainable for the future. in Kenya, horticulture exports are a state-induced development strategy meant to raise incomes, improve productivity, and eradicate poverty in rural areas. However, with the ongoing proliferation of regulatory standards and stiff competition it is becoming increasingly challenging for producers in developing countries. Phytosanitary standards have become a de facto requirement for participating in the lucrative market with the intention to bridge the information asymmetry between buyers and producers as an assurance of food safety and environmentally conscious production systems therefore ensuring that more areas of production are certified. Consequently, buyers prefer certified producers to at least one of the internationally recognized schemes. Every producer wants to be on that list sometimes certifying part of the area of production for the purpose of meeting requirements which could hinder the efforts of good agriculture practices. This study seeks to assess what has been of the more priority for Kenyan horticulture i.e more certified producers, or more certified area of production, what are the trends and how does it affect production. Using panel data obtained from GlobalGAP and FAOstat (2008 to 2020), the study finds that certified producers and certified production areas(ha) have increased. The Pseudo–Poisson Maximum Likelihood (PPML) estimator shows that increasing the number of certified producers has a significant effect on exported volumes and total value while the area of certified production areas both covered and uncovered crops has no significant effect. This could imply that farmers are keen on maintaining the market requirements as opposed to increasing the certified area which is important for long-term growth.

Keywords: GlobalGAP, certification, horticulture, regulatory standards

RD-14-12

The Change of Rice Production Scale by Individual Farmers in Northeast Thailand: An Investigation Using Household Panel Data

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Abstract

The size of rice cultivated area by individual farmers has become smaller and smaller since 2010s in Northeast Thailand. The trend has been proceeding concurrently with decreasing the number of farming population and aging of farmers. Since Northeast Thailand is a major rice growing area in Thailand, this movement implied the concern of declining rice productivity at the national level in the future. To consider the feasibility of this concern and how to cope with it, we should understand details of this movement with individual farm data at first. Thus, we grasped the fluctuation of rice cultivated area by individual farmers in 2010-2019 and clarified the characteristics of rice farmers reducing or expanding the size of rice cultivation. We used secondary household panel data collected from 1,051 farmers in 3 provinces (Nakhon Phanom, Ubon Ratchathani and Buriram) in 2010-2019. The data was collected by Thailand Vietnam Socio Economic Panel project founded by the German Research Foundation. We sampled 445 and 208 farmers which reducing or expanding their rice cultivated area from 2010 to 2019, and compared rice productivity, disposal of production and usage of inputs. As a result, the farmers which cultivated rice with more than 20 rai paddy decreased and which cultivated rice with less than 10 rai paddy increased from 2010 to 2019. The number of farmers cultivating rice with 10-20 rai paddy was not changed significantly in the term. From the comparison between the farmers reducing and expanding rice cultivated area, while the unit yield of expanding group was higher than the reducing group in 2010, the unit yields of expanding groups was less than the reducing group from 2016. This result implied the possibility that the farmers expanding the size of rice cultivation could not keep the intensity of rice production.

Keywords: rice farmer, fluctuation of farm size class, unit yield, farm inputs

RD-14-13

Technical Efficiency of Potato Producers in Benguet Province, Philippines

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Abstract

The Philippines, particularly Benguet province is endowed with distinct agro-ecological zones favorable to produce high value vegetables. Potato is one of the top ten vegetables in terms of production volume, area, and high value in Benguet. However, potato production is characterized by low yield in which the Philippines in general is among the lowest yield per hectare (15.5 tons) compared to world average yield (20.9 tons) in 2018. This paper examined the technical efficiency (TE) and inefficiency determinants of potato producers in Benguet province, Philippines. Data from 101 farmers in 2019 was collected from major provinces that produce potato. We employed Cobb-Douglas stochastic production frontier after the null hypothesis for translog function was rejected. The production function result revealed that land, hired labor, organic fertilizer (chicken dung) and fungicide had significant effect on potato yield. We also found that the mean technical efficiency of potato farmers is about 0.89, implying that farmers can increase their production by about 11% or on average yield would increase from 15.8 to 17.6 t/ha with existing resources. The yield gap result further revealed that farmers are producing below the production possibility frontier. However, the observed average yield is about 50% lower than the potential yield (31 t/ha) found by Benguet State University. The inefficiency model result depicted that household size, education level, using Granola potato variety, receiving training related to vegetable production and partial irrigation significantly improve technical efficiency. Whereas hand tractor ownership and rainfed cultivation were the major sources of technical inefficiency in potato production. Based on the results, we conclude that concerned stakeholder such as Department of Agriculture, research institutes, among others should promote Granola seed, organic fertilizer on top of providing training related to potato production to improve efficiency of potato producers and in turn productivity in Benguet province, Philippines.

Keywords: potato production, technical efficiency, stochastic production function, Philippines

RD-14-16

Improving the Farm Business and Resilience of New Farmers: Case from a Greenhouse Tomato Farmer in H City, Tokyo, Japan

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Abstract

Tomato is the most common fruit vegetable consumed fresh or processed in Japan. for new farmers, tomato is considered one of the favored commodities to produce. With a wide variety of tomatoes available in the market, new farmers face various issues related to price, market competitors, market channels, sweetness, production management, competitive advantage, and brand recognition. These same challenges may influence the new farmer's decision to continue or discontinue farming. Therefore, there is a need for studies that will provide insights and innovations to improve the farm business and resilience of new farmers. This study aims to clarify the characteristics of repeaters and consumers' brand familiarity with a new young farmer's greenhouse tomato farm in H City, Tokyo, using randomly selected respondents in the consumer survey conducted in May and June 2022. Although 470 respondents were collected, only 240 respondents (51%) have experienced buying tomatoes from the farm. Moreover, 67% of these respondents started buying tomatoes more than a year ago, and 38% previously bought tomatoes within a week, conveying that the farm has already created repeaters. However, there seemed to be a problem with brand recognition since some buyers did not know the farm's name or did not recognize its logo.

Keywords: repeaters, brand recognition, tomato, new farmer, consumers

RD-14-17

Assessing the Support for New Farmers in H City, Tokyo, Japan

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Abstract

in Japan, engaging in agriculture as a new farmer comes with various challenges and uncertainties. To sustain and secure the agriculture sector's future, national and local governments, farmers, private entities, and other stakeholders provide a wide range of support. Seeking best practices is a sound basis for increasing the number of new farmers and improving their resilience. Through a case study approach, this paper aims to clarify the current condition and issues of support for new farmers in H City, Tokyo, and determine the initiatives and support system that allowed a young female farmer to establish an urban farm. This study conducted interviews with a young female farmer and city officers. The in-depth key informant interviews revealed that training, subsidy, securing land services, and referral to farmer's organizations are some of the available supports. The recent revision of the Law on Productive Green Areas is considered a significant opportunity for her to rent farmland, which is a challenge for most new farmers experience. Despite the 5-year rental period commonly practiced, she could avail of a 30-year lease, conveying the importance for new farmers to also gain trust, confidence, and a good relationship with the farmland owner. for further study, even though she has successfully established a farm, there is a need to clarify consumer preferences, buying behavior, and their degree of familiarity with her farm and products to improve her farm business and resilience.

Keywords: new farmers, Law on Productive Green Areas, farm resilience

RD-14-18

Potential of Small-scale Producers for Sustainable Cassava Production in Cambodia: An Analysis of Income Diversity of Cambodian Cassava Farmers

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Abstract

Cassava is envisioned as a strategic crop for Cambodia in line with the "Industrial Development Policy 2015-2025" and "National Cassava Policy 2020-2025" to transform the country into a cultivation and processing hub of the crop. These policies indicated small-scale producers as one of the vital keys to increasing cassava production in Cambodia. However, small-scale cassava producers can be easily affected by the significantly unstable price of cassava which tends to be fluctuated by export demand. Therefore, this study aims to clarify the income diversity of small-scale producers and discusses their potential contribution to sustainable cassava production. The survey was conducted in 6 districts in Battambang and 2 districts in Pailin provinces, major cassava production areas in Cambodia, from April to November 2017. A total of 205 cassava producers were selected randomly for structured-interview by using designated questionnaire form. The interview survey covered the status of cassava production, including planting area, sales amount, costs, and the socio-economic situation of producers, including respondents' attributes, family structure, livelihood activities, income, household expenditure. As a result, most surveyed farmers started producing 5-6 years ago, and 79.5% answered cassava is a primary income source. Nevertheless, cassava was the primary source of income in 26.8% of the surveyed households, and non-agricultural income, such as off-farm business and labor work, was higher than agricultural income among average household income. These results indicated that most producers have diverse income sources, including non-agricultural income, however, it still accounts for a relatively large proportion of total income and is essential for maintaining livelihoods. It is essential to have a strategy to secure sufficient and stable profits for small-scale producers for sustainable cassava production in Cambodia.

Keywords: cassava, production, producers, socio-economic characteristics, Cambodia

RD-14-19

Challenges and Opportunities for Increasing Vegetable Production in Rural Cambodia

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Abstract

The amount of vegetable production in Cambodia is extremely limited, and 70% of the country's internal consumption is dependent on imported vegetables, primarily from Thailand and Vietnam. in order to satisfy the country's market needs, the government is encouraging vegetable production. However, the current status, issues, and challenges of vegetable production in the country, which are important for establishing detailed strategies for vegetable production, have not yet been clarified. This study aims to identify the challenges of vegetable production in Cambodia by clarifying the status of vegetable cultivation, including producing amount and varieties, vegetable production business conditions, and producers' socio-economic characteristics. A commune in Takeo province was selected as the study area, and the semi-structured interview based on a questionnaire was conducted with both vegetable producers and non-producers for comparative analysis. The number of valid responses included 113 households (HHs) from producers and 89 HHs from non-producers. The results of the survey indicated that 97% of vegetable produces had a surplus; however, the average net profit (35 US dollars) was very small in comparison to other income sources such as factory work. Most producers were not cultivating any vegetables during the rainy season, despite owning arable upland to avoid disease risk due to unsuitable production methods. on the other hand, the costs of seeds, fertilizer, and fuel were positively correlated with the leafy and beans vegetables. This result indicated that the utilization of quality seeds and fertilizers would be adequate for production. Additionally, nearly 60% of non-producers had arable upland, and they stopped production due to a lack of distribution channels. This study identified limited distribution channels and production methods as challenges for Cambodia's increasing amount of vegetable production.

Keywords: vegetable production, issues, challenges, rural area, Cambodia

RD-14-20

Household Income Diversity of Small-scale Cassava Producers in Vietnam

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Abstract
in Vietnam, cassava is ranked in the third important staple crops after rice and corn among agricultural sector, and the third most important export crop. This crop is planted in 40 of 51 provinces with 513 thousand hectares and its production reaches 9.85 million tons per year. Small-scale cassava producers play an important role in cassava sector in Vietnam, however, their income diversity has not been fully clarified. While the cassava price is fluctuated by international processing industries, their income might not rely on cassava production only. This study clarifies how small-scale cassava producers attempt to stabilize their household income. The survey was conducted from April to December 2017 in Dong Nai, Tay Ninh and Gia Lai provinces that are major cassava producing provinces, and 182 small-scale cassava producers were selected for interview. The questionnaire was designed to analyze their all-income sources: agricultural income including cassava income, non-farm income, pension, and remittance. The result indicates that each household has 4.5 members and 2.1 of them are working for cassava production and the average of total household income per year is $7,071.29 and the income per one employee is & 3,535.15. This is 36.8% lower than the average income of Vietnamese employee. The main income is from two sectors, i.e., $3,648.41 (51.59%) from agricultural income and $ 3,422.88 (48.41%) from non-agricultural income, together with $25.0 (0.4%) from remittance and $14.7 (0.2%) from pensions. The cassava income shared 23.57% in agricultural income and 12.16% in the total household income with an average of $859.81. in agricultural income, some small-scale cassava producers produce industrial crops such as rubber tree, sugarcane, cashew, tobacco and acacia as their main income. Further, they also produce vegetables, fruits and engage in animal husbandry activity and agro-processing business. in non-farm income, they work as hired labors and receive stable income from government or private companies. Thus, small-scale cassava producers in Vietnam stabilize their household income by various sources of income and do not overly rely on cassava.

Keywords: cassava, production, producers, socio-economic current status, income, Vietnam

RD-14-22

Agroforestry Promotion for Enhancing Resiliency of Community-Based Forest Management Areas in The Philippines

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Abstract

The national policy of the Philippine government for sustainable forest management called for the establishment of community-based forest management program, where upland dwellers in the state lands are recognized as stewards of the forestlands. To meet the twin-goal of economic development and environmental conservation, agroforestry was placed at the core of the program implementation. An action research was implemented in the selected community-based forest management areas in 2019-2022 primarily to promote sustainability and resiliency of the local communities and the landscape through an enhanced agroforestry promotion. This action research employed resiliency assessment, land capability assessment for agroforestry, ecological assessment, capacity-building of the people's organizations, and the establishment of appropriate agroforestry models. Four agroforestry models were established based on the socioeconomic and biophysical conditions of the areas, and the potential economic and ecological contributions of the different components. These include two fruit tree-based agroforestry models where perennial crops particularly high-value fruit trees are the dominant components; vegetable-based agroforestry model, where high-value vegetable crops are the dominant components; and aquasilviculture, where mangrove areas are integrated with aquatic resources. Soil and water conservation measures were also established to control soil erosion in the sloping areas. Livelihood technologies were also introduced such as processing of turmeric into powder, and processing of coconut meat into copras. The local communities were trained on the technical and management aspects of the four agroforestry models. Harvests from the annual agricultural crops indicate a potential additional farm income to the farmer-cooperators, while harvests from the aquasilviculture provided an additional income to the people's organization.

Keywords: environmental conservation, vegetable-based agroforestry model, livelihoods, action research, community-based

RD-14-23

Empowering Rural Farming Communities Through Capacity Development Programs: Implications to Agricultura Extension Services

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Abstract

The multidimensionality and complexity of development issues such as climate change, food insecurity, environmental degradation, poverty, and the recent COVID-19 pandemic have exacerbated the livelihoods of vulnerable rural farming communities. This calls for innovative approaches for community empowerment towards building their resilience and enhancing their adaptive capacity. Community empowerment is anchored on harnessing the potential and the capacity of the local people and communities to address and resolve their problems, and mobilizing them to promote community well-being. This paper highlights the experiences and lessons generated from the selected capacity development projects in Southeast Asia, which were funded by the Asia-Pacific Network for Global Change Research (APN). These capacity development projects employed varying extension approaches and strategies, which centered on building the institutional capacity of rural farming communities, local government units, and state colleges and universities. These programs put emphasis on promoting nature-based and sustainable farming practices such as agroforestry, conservation farming, rainwater harvesting, and indigenous agricultural practices that helped farming communities cope and adapt to climate change impacts. At the core of these capacity development programs are collaboration and partnerships that were built and institutionalized among the academe, local government units, and farming communities. Among the best practices that were distilled from these capacity development projects include engaged participation of the farming communities; multisectoral collaboration; integration of sustainable farming practices; participatory approaches to project planning and implementation; science-policy linkage; and, need-driven activities. These projects have generated numerous outputs that paved the way for enhanced social and human capital development of farming communities, science-based decision-making by the policy makers; adoption of sustainable farming practices; sustained local multisectoral partnership; improved farm productivity; awareness about environmental issues and ways of addressing them; and, developed a model for enhancing the adaptive capacity of rural farming communities in Southeast Asia.

Keywords: multisectoral collaboration, capacity-building, agroforestry, engaged participation, farming communities

RD-14-24

Reducing the Public Health and Economic Risks from Future Potential Zoonotic Diseases in Cambodia

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Abstract

This is a desk review study to contextualize the status of the zoonotic diseases in Cambodia for policy intervention. It looks for more effective policy influencing to break the zoonotic links between animals and human. The review is structured under the framework of the One Health concept that is a link between environment health, human health and wildlife health. It provides a conceptual analysis framework of pathogen flows between wildlife, livestock and human. Breaking the zoonotic links do need a number of coherent support from knowledge, skills, research, regulation, policies and national and regional cooperation. Through a primary desk review of issues and policy gaps related to wildlife and zoonotic diseases, the analysis is conducted with support of key informant interviews from relevant key experts and stakeholders.

The review reveals that poverty and zoonotic disease are interconnected in a vicious cycle as the poor are more likely in close contact with wildlife and livestock through wildlife hunting and livestock farming. Reducing the public health and economic risk is an integral part of improving health, ensuring economic growth and achieving development goals. Because the underlying causes of zoonotic diseases are within the direct influence of the health and agriculture sectors, successful strategy to prevent and control the risk of zoonotic diseases should lie on coordinated action among government agencies and other stakeholders such as development partners, community leaders and traders.

Cambodia needs a comprehensive approach which requires a range of interventions in order to reduce the public health and economic risks from future potential zoonotic disease. However, as Cambodia needs to put in place regulations and policies to share the responsibility of preventing emerging and reemerging zoonotic diseases from wildlife as well as livestock, this policy brief focuses on national legislation and policy aspects as well as the areas of capacity building, education and extension, and institutional arrangement essential to needs and circumstances of the country.

Keywords: zoonoses, zoonotic diseases, zoonotic risk, wildlife, public health, animal production

RD-14-25

A Survey of Household Water Use and Groundwater Quality Assessment in a Rural Community of Kandal Province, Cambodia

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Abstract

Addressing water scarcity in a rural area using groundwater can be considered as a potential and possible solution. in order to propose an efficient system, understanding about water consumption and groundwater quality is important for optimizing the preparation. Therefore, the present work aims to access the current household water consumption and groundwater quality of the domestic wells being used in a rural community, Prasat commune of Kandal province, Cambodia. It will be used as a practical and beneficial model for water resources sector in the rural area development. The questionnaire survey was designed as the main instrument for collecting the household water use as face-to-face interviews. The result showed that the average daily water consumption in the Prasat commune is about 134 liters per capita, which is less than the minimum water quantity recommended by World Health Organization (WHO), 150 liters per day per capita. Furthermore, almost half of the households rely on groundwater (45%), followed by rain water and water supply (38%). More than half of the people in Prasat wishes to have a clean water supply. in terms of groundwater quality in the Prasat commune, it was analyzed in terms of physicochemical parameters including pH, dissolved oxygen, oxidation-reduction potential, total dissolved solids, electrical conductivity, salinity, turbidity, arsenic, iron, fluoride, chloride, and total hardness. As a result, it was mainly contaminated by arsenic, iron, conductivity, and turbidity. in terms of water quality index, half of the investigated groundwater wells were classified as poor, very poor, and unsuitable water for drinking purposes. Lastly, the suitable water treatment and supply should be considered in order to reduce the effects on people's health as well as to improve living conditions.

Keyword: household water use, Kandal province, groundwater quality, questionnaires survey, water quality index

RD-14-26

The Value Chain of Households' Pangasius Catfish Culture in Batheay District, Kampong Cham Province

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Abstract

The Pangasius Catfish is the among of popular species in Cambodian aquaculture that including the small, medium, and large farm for fish processing and export. However, Cambodia's aquafarming rose from 50,000 tonnes in 2009 to more than 300,000 tonnes in 2019 (MAFF, 2019). The main objective of the study focused on the fish production, the value chain, and SWOT analysis. The mixed methods (qualitative and quantitative) was applied for the face to face interview with total 54 samples including fish farmer 50 households, 2 middleman and 2 retailer. The target of study areas are included three difference communes such as Tang krang, Chelea and Sambo commune in Batheay district, Kampong Cham province.

in the study area, most of the fish farmers have not received the training on aquaculture. Majority of pond farms are extensive. The fish farmers have experienced on aquaculture between 5-15 year and their knowledge depended on family, friends and input supplier. The production cycle of Pangasius was 11 months raising fish, for whom selected the fry of Pangasius Catfish and 7 months for those, who choose the fingerling of Pangasius Catfish. The feed of fish used by the fish farmer is natural fish feed and Commercial fish feed such as bran, trash fish, chicken intestines, and homemade. for the value chain of fish production there are four mains characters in this area, the first character is a input supplier, the second is a producer, the third is a middleman/collector and the last is a retailer. Fish farmers sold Pangasius Catfish to collectors 4,200 riel / kg, nevertheless the collector sold fish to middleman in price 4300riel/kg, the middleman distributed to the retailer 4700riel/kg and the retailer sold fresh fish to the customers on the price between 5500 to 8000 riel/ kg and was gotten 10,000 to 15,000 riel / kg as processed fish.

Therefore, the input supply are the high cost especially fish feed and production cycles are the long period. Moreover, there are less of technical training on aquaculture such as water quality control and feed management and fish diseases. for the market price was limited and set up price by middleman/collector. The Pangasius Catfish's price remains stable as the raw materials increase from cycle to cycle, there is the main cause of making fish famers which have more accessible declining profits including the Pangasius Catfish import competition have led some fish farmer to abandon their fish farm.

Keywords: value chain, fish production, SWOT analysis

RD-14-28

Gender and livelihood in small-scale fisheries: A case study in the Cambodian floodplains in Kandal province, South Cambodia

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Abstract

Fishery is one of the most significant sources of income and food security for rural people in Cambodia. Women are involved in aquaculture as well as individual fishing and participate in community fishery (CF) but their contribution to these sectors is often not made explicit. This study aims at (1) identifying the roles of women in individual and community-based fishing activities, (2) identifying the challenges women face when involving in fishing activities and (3) understanding how they and the men they work with perceive such involvement and challenges.

The study area is located in the Cambodian floodplains, between the Mekong and Bassac rivers in the upper Mekong delta, in what was the former Fishing Lot No. 9. Khmer, Cham and Vietnamese fisher folks can be found in the area. We randomly selected and interviewed 45 fisher-men-and women who fish in this area with structured questionnaires. 50% of the interviewees were women and 50% men and they represented a diversity of fisher folks and practices. We also conducted open ended interviews with 3 key informants and organized 4 focus group discussions (2 with groups of women and 2 with groups of men).

The three groups fishing in the area have different practices with Khmer folks being involved in the local Fishery Community (FC) (in addition to fishing individually) while Cham and Vietnamese minorities are not. Cham and Vietnamese women engage in fishing activities alongside their husbands more than Khmer women do. Regarding fishing "in the field", all respondents framed the role of women as being a "supportive" though "important" role to their husband but also highlighted three main constraints for women to engage in such activities: social constraints, children's care and their husband's preference that their wife stay at home. Further, all respondents recognize that women assume a key role in processing and selling fish and make their own decision about this. As far as the community fishery is concerned, most respondents perceived that women were not incorporated enough in the management and operation of the CF even though they could play a role in accounting of administrative tasks. This is because women are little encouraged to participate. There are also cultural and religious impediments for women to be involved in CF activities. 80% of men are aware of the difficulties of their wives to go for fishing with them at the field, especially to who has no land-based houses and mainly relies on fishing as their main source of income.

Keywords: capture fishery, community fishery, governance, gender, perception, Kandal, Cambodian floodplain

RD-14-30

Language Register in the Farming of Palay in Sierra Bullones and Dagohoy, Bohol

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Abstract
Sociolinguistics is the study of ideas on the diverse use of language by individuals and groups with diverse activities and interests. Language is viewed as a collective force, a gathering of people from various cultures, social activities, and groups, rather than a simple means of communication. This study aims to present and analyze the language registers used in rice cultivation in the municipalities of Sierra Bullones and Dagohoy, Bohol. The study focused on the acquisition of words used in the seeding, planting, and harvesting processes; students will also learn the structure of each word and its use. To collect data, a qualitative research method based on "content analysis" was used, with interviews and questionnaires serving as research tools. Farmers' rice planting language registers have been discovered. These words are divided into three categories: seeding, planting, and harvesting - the processes involved in rice farming. Sierra Bullones has 49 language registers, while Dagohoy has 37 words. It was also discovered that rice farmers in Sierra Bullones and Dagohoy commonly used "simple form of word" registers. The aforementioned municipalities had a large language register. According to the data collected, the words collected for the farmers' language register can be used as a guide and additional knowledge through a glossary. The glossary will be analyzed based on word structure and contains terms used in this field. The study will broaden the vocabulary of the Filipino language and serve as a response to the current curriculum on Language Varieties and Variations based on words that are consistent with each field of people to meet the needs of students that are consistent with the world standard. It is recommended to study the language and register in another field or profession based on the information gathered.

Keywords: register, planting, farming, rice, palay

RD-14-31

Farmers' Profile and Farming Engagements as Determinants of Economic Well-being During Covid-19 Pandemic

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Abstract

Awareness about the resilience and sustainability of the different farming engagements has an inestimable potential of protecting and prepping the agricultural sector against the unprecedented impact of the pandemic. This paper attempts to examine influential factors of savings and investment of 403 randomly selected farmers during the pandemic. We used the two variables as proxy measures of the economic well-being of farmers. Logistic regression analysis shows engagement in livestock and poultry farming leads to a positive effect on both savings and investment – evidence that this farming activity is still viable despite the uncertainty of farm business operations when disrupted by a pandemic like COVID-19.

Keywords: logistic regression, farmers' profile, farming engagement, COVID 19

RD-14-33

Sensory Qualities of Tawa-Tawa Flavored (*Euphorbia Hirta*) Ice Cream

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Abstract
Ice Cream is a mixture of milk, cream, eggs, sugar, salt and gelatin. Meanwhile with other ingredients like pulverized tawa-tawa plants. The main objectives of conducting this study was to determine the preference level of Tawa-tawa flavored Ice cream in terms of the following; appearance, aroma, taste and texture, to identify if there was a significant difference among the three treatments; Treatment 1 with 25grams of pulverized air-dried tawa-tawa plant, Treatment 2 with 50 grams of pulverized air-dried tawa-tawa plant, and Treatment 3 with 75 grams of pulverized tawa-tawa plant. The study used the experimental-descriptive research designed through the use of a rating scale questionnaire using 4-point hedonic scale. There was a total of 50 chosen respondents, composed of 27 first year food technology students,10 3rd year of food technology students, 10 2nd year students of food technology students and three CTAS food technology instructors. The data were treated using the Weighted Mean and ANOVA-Single Factor to determine the difference on the preference test and Scheffe's test to determine the difference in the preference level of the tawa-tawa *Euphorbia hirta* flavored ice cream. The computation showed that the respondents preferred Treatment 2 more than Treatment 1 and 3 in terms of aroma, taste and texture. on the other hand, future researchers could also refer to this study as a guide to conduct related studies and produce a new product out from the Tawa-tawa plant. Wherefore, Tawa-tawa flavored Ice Cream can be a considered as the one of the choices of cold dessert to be serve in any occasion and potential income generating enterprises.

Keywords: Tawa-tawa plant, ice cream, cream, plants, pulverized

Poster presentation

AG-14-03

Study on Presence of Parasitic Species on Raising Cow Along Tonle Sap River Provinces

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Abstract
Animal production plays an important role in supplying food draft animal and main income source of farmers in Cambodia. in general, raising cattle and buffaloes as a family is like raising them in the open field, and such raising makes the animals more susceptible to diseases, especially diseases caused by parasites, which cause the animals to become thin, weak, tired, sick and unable to sell. Due to such encounters, research has been conducted on "Study on presence of parasitic species on raising cow along Tonle Sap River Provinces." The study was conducted to find out the presence of parasites in cattle raised as a family in the provinces around the Tonle Sap Lake. To find out the presence of parasites, blood samples and feces were collected from 134 cows from 5 provinces, including: Battambang, Pursat, Kampong Thom, Kampong Chhnang, and Siem Reap province for analysis. These samples were analyzed in the laboratory of the General Department of Animal Health and Production of the Ministry of Agriculture, Forestry and Fisheries. The results of the analysis showed that almost 100% of samples tested contained parasites in the feces and blood. These include: Paramphistome, Fasciola, Strongylus, Babesia and Anaplasma. These results suggest that most lean domestic cows are caused by the presence of parasites.

Keywords: cow, parasite, household cattle raising, infectious disease

AG-14-07

Effect of Plant Hormone Auxins on The Growth of Hybrid Rose Tissue Culture in Vitro

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Abstract
Plant hormone auxins play almost every aspect of plant growth and development including cell division and development, promoting differentiation and root development and embryo development at the early seed development. Auxins are typically divided into 2 groups 1) naturally occurring auxin including indole-3-actic acid (IAA) and indole-3-butyric acid (IBA), and 2) artificial auxin including 1-Naphthaleneacetic Acid (NAA) and 2,4-Dichlorophenoxyacetic Acid (2,4-D). However, these auxins are not clear in regard to rose tissue growth and development. The present study is aimed to comparing the efficacy of IAA, NAA, and 2,4-D in inducing hybrid rose tissue growth in vitro. The experiment was conducted using small cutting stems and grown in MS media supplemented with 0.5 mg/L; 1.0 mg/L and 1.5 mg/L of IAA, NAA, or 2,4-D. The results showed that all levels of plant hormones of the mentioned 3 auxins was able to induce tissue germination 100% though they promoted germination in different way. for example, at 0.5 mg/L NAA can induce more callus formation than IAA and 2,4-D, while they can promote bud initiation at low dose. When concentration increased to 1.0 mg/L or 1.5 mg/L, NAA was still more efficient in callus induction than IAA and 2,4-D. These results suggest that NAA plays an important role in callus induction whereas 2,4-D acts to promote shoot and leaf formation. on the other hand, IAA has a similar efficient with NAA in callus induction in plant tissue of hybrid rose.

Keywords: auxin, rose, callus, bud

AG-14-11

Effect of Different Levels of Benzyl Adenine on Banana Tissue Growth of Cavendish in Vitro

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Abstract

Plant hormones play a significant role in plant growth and development. Plant hormone cytokinin, Benzyl Adenine (BA), is naturally occurring plant hormone that acts to promote shoot growth and development. However, the role of BA in inducing cavendish banana (*Musa acuminata*) tissue culture remained an elusive. The present study focused on effect of different levels of BA on the tissue culture growth of cavendish in vitro. There are 5 treatments including T1: BA 0 g/L; T2: BA 2.0 mg/L; T2: BA 4.0 mg/L; T3: BA 6.0 mg/L and T5: BA 8.0 mg/L. It is noted that the culture media was prepared in two different conditions; one is hard media and another is liquid media. Both of which supplemented with different concentration of BA as mentioned above. The results showed that banana explants incubated with 4.0 mg/L BA produced an average of 4.15 seedlings higher than other treatments under hard media condition. However, under liquid media condition, it required only 2 mg/L of BA to induce 7.7 seedling. The number of days required for maximum seedling induction is 27 days and 17 days, respectively, for hard media and liquid media. on the other hand, explants grown without BA resulted in root formation though severe growth of aerial parts. in conclusion, it is recommended to use hard media for initial culture which requires 4 mg/L of BA. However, the liquid media should be used for subculture of banana plantlets and it requires 2.0 mg/L which leads to vigorous growth and healthy plants.

Keywords: cavendish, tissue, hormone, Benzyl Adenine

AG-14-12

Method for Producing Organic Pesticide from Bamboo and Its Effect on Insect Elimination

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Abstract
Imports of pesticides into Cambodia have increased significantly from year to year, and the use of chemical pesticides to control pests has created serious concerns for human health, animals and the environment. Therefore, the research and production of organic pesticides plays an important role in maintaining the health of consumers and the environment and reducing the use of chemical pesticides and reducing the cost of crop production costs. The current study was done focusing on optional method to produce organic pesticides made from bamboo (leaves and bamboo charcoal). The method of making organic pesticide from bamboo used Khmer bamboo (Ping Pung bamboo) collected from Kampong Cham and Tbong Khmum provinces. The bamboo pesticide was later applied on the plants infested with insects and it showed very effective to eliminate the insects especially aphids.

Keyword: agri-chemical, insecticide, organic, bamboo.

AG-14-15

Effects of Aeration and pH on the Performance of Lactic Acid Bacteria-Attached Carbon Fiber Electrode

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Abstract
Lactic acid bacteria (LAB) and iron ions dissolved from steelmaking slag (SS), when attached to an electrode surface, improve the performance of carbon fiber electrodes. However, the electrode potential decreases during the attachment (fermentation without aeration), leading to a decrease in electrode performance when used as a cathode. Additionally, SS dissolution increases the solution pH, which can affect the survival rate of LAB. in this study, the effects of aeration on an electrode potential and solution pH on the survival rate of LAB in solution during the fermentation are examined. in the experiments, SS, LAB beverage, bamboo powder, and carbon fiber electrodes were placed in a bottle with and without aeration. Temporal measurements of the solution pH, iron ion concentrations, adenosine triphosphate (ATP), and electrode potential were performed. The results showed that aeration prevented the electrode potential from declining due to fermentation. The concentrations of iron ions and solution pH temporarily increased during the fermentation, suggesting that SS have been dissolved. ATP began to decrease when the solution pH exceeded 8, indicating that the solution pH influences the survival rate of LAB. It is recommended that the fermentation should be conducted within three days. Furthermore, to improve the performance of a sediment microbial fuel cell (SMFC), the electrodes with and without aeration should be used as the cathode and anode of SMFC, respectively.

Keywords: carbon fiber electrode, steelmaking slag, lactic acid bacteria, aeration, pH

AG-14-17

Changes in Soil Physical Properties Owing to Soil Reduction Treated with Electrokinetic Treatment

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Abstract
Increasing soil water content due to soil reduction is generally confirmed in rice paddy soils after flood irrigation or in littoral sediments with high organic matter content. This could be caused by soil aggregates during the reduction process through biological and electrostatic phenomena. in the literature, changes in liquid and plastic limits owing to soil reduction treated with electrokinetic treatment (ET) have been reported; however, there was no report relating to changes in other soil physical properties, such as grain size distribution (GSD) and water-holding capacity (WHC). Thus, this study aims to examine changes in soil physical properties caused by soil reduction treated with ET. in the laboratory experiments, changes in GSD, hydraulic conductivity, and WHC were examined to understand soil aggregates due to soil reduction. During the ET application, a decrease in electrical conductivity was observed, indicating the cohesion of ions (soil aggregate). This resulted in increases in the percentage of particles ranged 0.075–0.212 mm, hydraulic conductivity, and WHC. However, particle dispersion occurred when the electrical current was high (10 mA), resulting in a significant decrease in hydraulic conductivity and WHC. Therefore, it can be said that soil aggregates can develop electrostatically. Thus, ET can be used for developing soil aggregate.

Keywords: soil reduction, electrokinetic treatment, soil aggregate, grain size distribution, hydraulic conductivity, water-holding capacity

AG-14-26

Discussions on Soil Characteristics in Vineyard for Vinification in Tokyo

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Abstract
Global warming is currently causing various problems. in particular, global warming is expected to change the viticultural environment in warm regions. in wine production, grape quality is one of the important factors, and the deterioration of grape quality due to global warming will directly affect the balance of aroma, sugar, and acidity in wine, and there is concern that wine quality will decline. Research on the physical and chemical properties of vineyard soils, which enable the production of superior quality grapes, has not been sufficiently conducted in Japan compared to Europe and the United States. in addition, the conditions being necessary to maintain vinification grape cultivation in the face of further global warming in the future and the soil conditions suitable for such cultivation have not been clarified. in this study, we investigated the physical and chemical properties of the soil in Nerima Ward, Tokyo, and compared them with the secondary data from Osaka Prefecture in Japan, so as to clarify the soil characteristics of vinification grapes. Regarding physical properties the experimental results showed that the permeability of the subject site was better than that of Osaka Prefecture, although the rainfall conditions of the previous day were different from those of Osaka Prefecture in the soil sampling survey. As for the chemical properties measured, low pH, low EC, and low exchangeable calcium, but the cultivated grapes were vinified without problems and shipped as products, suggesting that they may not affect the cultivation of grapes for vinification. The more discussions on soil characteristics in vineyard for vinification in Tokyo are made in the poster presentation.

Keywords: wine, terroir, vinification grapes, water permeability, Tokyo

AG-14-28

Effects of Adding Coconut Charcoal on Soil Physical Properties and Maize Performance

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Abstract
Tonga is one of the tropical countries that are vulnerable to climate change. One of the biggest challenges for the agricultural sector in Tonga is the prolonged dry period without rainfall caused by El-Nino climate phenomena. in 2015-2016, the drought season caused an economic crisis that increased the price of food products. Due to the food deficit, the country had to import perishable goods that were more expensive than the goods supplied locally. As an example, the normal price of local tomatoes (1 kg $0.60 USD) was cheaper than the imported (1 kg $6.00 USD), which led the inflation in markets. Therefore, the agricultural sector requires investments in installing irrigation systems capable of providing sufficient underground water for plant growth. This research tries to address the issue of water shortage during periods of drought by using coconut charcoal as a soil water amendment. The experimental results indicated that adding coconut charcoal as soil amendments can improve soil physical properties, especially the water-holding capacity of the soil, thus reducing plant water stress. Overall, coconut charcoal as soil amendment improved general plant performance, indicating such as leaf area, plant height, and weight of dry plants. Therefore, coconut charcoal can be recommended as a soil amendment that conserves water resources and reduces costs for irrigation and other expenses for small farmers. As a result, Tonga's agricultural sector and small farmers become more resilient to the drought caused by El-Nino. This would contribute to reducing the import of perishable agricultural products from overseas during the period of drought.

Keywords: El-Nino, drought, coconut charcoal, soil water holding capacity, water conservation

AG-14-47

Real Color Crop Imaging for Improved Crop Status Monitoring on Cassava

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Abstract

The basic advantage of crop image acquisition is to gather non-invasive plant growth and development information. However, optical measurements instrument such has multi-hyperspectral cameras are very expensive. Therefore, the objective of this work is to develop a low-cost but high resolution RGB imaging. RGB color images reflect visible light information (400-750nm) and image acquisition is generally performed with CMOS sensors. in this study, we have three objectives: a) Are RGB images in principle suitable to indicate irrigation need and lack of fertilizer? b) How is the information quality of RGB images compared to the use of more detailed and wider reflection spectra, what is the relevant image information of RGB images, and can the information content be improved by using spectral filters? c) Do RGB images from the field show spatial patterns with respect to possible significant image information, which make automatic pattern recognition possible? The study is conducted at three locations, for example in Germany experiments will conduct under control conditions whereas, in Thailand and Cambodia field trails will be done. During the experiments, Cassava plants will be supplied with different levels of nitrogen and water status conditions. All the images will be taken by the hand held RGB camera and mini UAV will be used to capture the pictures at the fields. Simultaneously, ground based data such as chlorophyll content, leave porometer, soil moisture content, soil water tension, leave nitrogen concentration, and weather data are also collected.

Keywords: cassava, RGB image, UAV, vegetation index, spectral filters

AG-14-50

Antibiotic Use and Antimicrobial Resistance in Poultry Production in Low Land Provinces, Cambodia

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Abstract

in a small-scale farm where people are owners and contract farmers in Cambodia, the disease has been caused by microorganisms as well as viruses: fungi, parasites, and bacteria, including Salmonella spp. These are pathogens for human health, animal health, and the environment. Salmonellosis and antimicrobials affect public health. in addition, I would like to show my topic, "Antibiotic use and antimicrobial resistance in poultry production in lowland provinces, Cambodia." To understand the knowledge, attitude, and practices (KAP) that could reduce antimicrobial resistance, these studies rely on stakeholders such as farmers, feed and veterinary drug retailers, and animal health workers. The result showed that poultry farmers' knowledge, attitude, and practice in understanding the definition of antibiotics that kill bacteria are worse than others. Knowledge of antimicrobial use (AMU) and antimicrobial resistance is superior to practice because knowledge of uses accounts for approximately 60% of the total. on the contact side, feed and veterinary drug retailers' knowledge of the definition of antibiotics that kill bacteria are poorer than that of others questioned, but knowledge of antimicrobial use (AMU) and antimicrobial resistance is superior to practices because it is more effective than training courses, based on previous experience. The prevalence of Salmonella spp. in poultry farms was 7%, which is not a significant risk to poultry health. However, those resistant to Tetracycline are 100%, Oxytetracycline is 100%, and Penicillin G is 100%, but 95% and 90% were resistant. enrofloxacin and sulphathiazole That's the risk of antimicrobial resistance. They use antibiotics to promote and protect the poultry when transporting animals to the farm. The type of antibiotics like enrofloxacin and oxytetracycline routinely used on farm in addition, using antibiotics in food and water to prevent poultry disease is a risk factor for antibiotic resistance. All in all, Farmer, Veterinary Medicine, and veterinary drug retailer must get attention to antibiotics focused on Dose and time before use. After the veterinary medicine has used antibiotics who will recommend to the owner or Farm knowledge of pathogens like bacteria viruses and parasites, that are infected.

Keywords: *Salmonlla* spp., resistance, AMU and AMR

AG-14-52

Xylooligomer From Phyllostachys Pubescens by Predrolysis During Biorefining

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Abstract

Generally, hemicellulose in hardwood is xylan, whereas it is glucomannan in softwood. Many plant xylan materials are heteropolysaccharides with homopolymeric backbone chains of 1,4-linked β-D-xylopyranose units. Xylooligomer (degree of polymerization from 2-7) products after hydrolysis of hemicelluloses are considered the important products for functional food or dietary fibers and are used as food supplements for health benefits. Extraction of hemicellulose by hydrothermal processing (prehydrolysis) is an alternative method for the valorization of bamboo under the biorefinery approach. Prehydrolysis is an effective pretreatment approach that enables the recovery of soluble saccharides in oligomeric form. in prehydrolysis, only water is added without any chemicals, which confers an important benefit for the recovery process. in this study, prehydrolysis was conducted on 50 g oven-dried bamboo chips mixed with 245 mL of distilled water (liquid-to-bamboo ratio of 5 mL/g) at a temperature of 150 °C for various durations (3, 5, and 7 h). The result presents the saccharide content (%) data in prehydrolysate after 3, 5, and 7 h of prehydrolysis. Extension of the prehydrolysis time did not significantly increase xylose, whereas xylooligomer content increased from 1.51% to 5.68%. This indicates that approximately 28% of the bamboo xylan was dissolved into the prehydrolysate as xylooligomers. in addition, ion chromatograph system analysis of the xylooligomers in bamboo prehydrolysate showed that 7 h of prehydrolysis achieved higher peaks. According to the results, the prehydrolysate obtained from 7 h prehydrolysis was an alternative source of the xylooligomer products.

Keywords: prehydrolysis, degree of polymerization, ion chromatograph

AG-14-57

Quantity and Quality of Green Manure Crops Growth under Environments in Chaiyaphum Province, Thailand

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Abstract

In the area of Chaiyaphum Province, Thailand, most of the soil is sandy loam texture with lack of fertility. Using green manure to improve soil is another effective way to increase soil fertility. The quantity and quality of green manure crops growth in Chaiyaphum province were studied. This field experiment was laid out in T-test with four treatment and five replications. The treatment comprised of Sun hemp (*Crotalaria Juncea*), Jack Bean *(Canavalia ensiformis)*, Cowpea *(Vigna unguiculata)* and Sesbania rostrata *(Sesbania rostrata Brem, Oberm)*. The results were found that soil properties as pH, organic matter, available phosphorus and exchangeable potassium were different. Soil in Sun hemp plot showed the highest of pH and available phosphorus. Soil in Sesbania rostrata plot showed the highest of organic matter. Soil in Cowpea plot showed the highest of exchangeable potassium. The growth and quantity of green manure biomass in the environment of Chaiyaphum Province was found that Sun hemp have the highest number of plants, Jack Bean showed the highest fresh plant weight, above ground fresh weight and nitrogen, potassium and phosphorus content was the highest in Sun hemp.

Keyword: green manure crop, biomass, soil property

AG-14-58

Utilization of Soil influenced by Volcanic Rock for Vermicompost Production

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Abstract

Thailand has many volcanic-influenced areas especially in the upper part of Thailand. This study aims compared the efficiency of nutrient of vermicompost using soil influenced by volcanic rock mixing various materials via vermicomposting systems during a 45 days period. Chemical properties of compost and vermicompost and number and growth of earthworms were studied. The experiment was set up in completely randomized design (CRD) with 3 replications consisted of Treatment 1: 40% soil + 30% cow manure + 20% rice husk biochar + 10% azolla + 30 earthworms, Treatment 2: 40% soil + 30% cow manure + 20% rice husk biochar + 10% cassava pulp + 30 earthworms, Treatment 3: 40% soil + 30% cow manure + 20% rice husk biochar + 10% vegetable residues + 30 earthworms, Treatment 4: 100% soil + 30 earthworms The CRD was planned for 3 replications of 4 samples. The results showed that after 45 days, the treatment of using 40% soil + 30% cow manure + 20% rice husk biochar + 10% cassava pulp gave the highest growth of earthworms and increased the total number of earthworms by 1000%. for vermicompost quality, total nitrogen, phosphorus and potassium increased significantly higher than compost systems, pH and EC found significantly decreased. Therefore, soil influenced by volcanic rock could be utilization for vermicompost production.

Keywords: volcanic soil, sustainable agriculture, earthworm, vermicompost

AG-14-63

Effectiveness of Washing Techniques for Reducing Pesticide Residue on Tomatoes

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Abstract

Tomatoes are vegetables that are popular for eating either fresh or cooked. According to the World Vegetable Center, tomatoes have an epidemic of disease as well as insects that make use of pesticides, it makes consumers worried about the safety of Chemical hazard affect human health as chronic diseases. Responding to this concern led to the study of the topic "Effectiveness of washing techniques for reducing pesticide residue on tomatoes". The study was conducted to study the effects of washing on tomatoes by determining their responses to seven chemical compounds of pesticides such as Fenvalerate, Cyhalothrin (Lambda), Cypermethrin, Beta-Endosulfan, Dimethoate, and Deltamethrin. The sample was processed by washing with treatments such as T_1 (soaking in 2% salt solution), T_2 (tapping water), and T_3 ($T_1 + T_2$) and analyzed for final remaining residues after washing. Among all the treatments, the most effective one will be washed with tomatoes from a farm in Kondal and Battambang provinces and tested by comparing the amount of pesticide residue left after washing with EU and Codex MRL standards. Preparation of analytical samples using the QuEChERS Method and analysis of pesticide residues by GC MS/MS. The results showed that washing tomatoes with T_3 (soaked in 2% salt solution and then washed with tap water) caused a substantial reduction in residues, up 68% to 99.9%, which means the amount of pesticide residue left after washing was lower than the MRL standard of the EU and Codex. Hence, this washing treatment is a good method to use to wash tomatoes before consuming them both fresh and cooked, since this method can reduce the high percentage of pesticide residue.

Keywords: residue pesticide, MRL standard, QuEChERS, GC MS/MS

AG-14-64

Determination of Multi-Pesticide Residues in Local and Imported Tomatoes Sold in Phnom Penh City Markets

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Abstract

Tomatoes are difficult to grow fruits and vegetables, which causes farmers to use a lot of, pesticides to prevent pests. Using such pesticides has led to doubts about safety factors, especially regarding the chemical safety of fruit and vegetable products, which is a major issue today. Tomatoes were collected from some markets in Phnom Penh, 16 samples of which were packed in a sample bag and frozen at -20 degrees Celsius. *GC MS/MS* was use to analyze the pesticide in tomatoes and the Agilent Method and QuEChERS Extract Pouch, EN Method (Bund Elut Salt) in Sample Preparation. The results showed that the tomato samples with high pesticide content were imported from the local market with residues of chlorfenapyr 0.1776 (± 0.0091) and 0.1965 (± 0.0128) in excess of EU standard (0.01 mg/kg). The composition of Cypermethrin 0.2816 (± 0.0177) and 0.3576 (± 0.0526) exceeds the EU standard amount (0.05 mg/kg). The chlorfenapyr compound, Cypermethrin, was found to exceed EU quantities but was also under Codex standards for both domestic and imported samples.

Keywords: residue pesticide, MRL standard, QuEChERS, GC MS/MS

AG-14-65

Determination of Multi Pesticide Residue on Post Pesticides Spraying Tomato From Kandal and Battambang Provinces

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Abstract

Tomato is one of the most important vegetable crops in the world and is considered a high-value vegetable. Tomato crops are also sensitive to disease damage. Nevertheless, farmers haven't used pesticides properly. The main problem seemed to be that pesticides were applied to tomatoes for only a few days after harvesting began. The purpose of this study was to identify and quantify multi-pesticide residues on post-pesticide spraying tomato in the provinces of Kandal and Battambang. Tomato samples were collected in Kandal and Battambang provinces. Once was grown in a greenhouse, and the other was grown in the field after spraying pesticide for 1, 3, 7, 10, and 14 days. Determinate with six compounds, such as Acetamiprid, Carbofuran, Chlorfenapyr, Cypermethrin, Fipronil, and Chlorpyrifos. The quantification is then compared to EU and Codex standards. in total, 12 samples were packaged in proper, close-up bags. Prepare samples by using the QuEChERS method and analyzing them by GC MS/MS. As a result of this, Kandal province Only three pesticide residues were found in greenhouses, and the quantifiable compound chlorpyrifos was found to be 0.0080 ($\pm$0.008) mg/kg, which is lower than the EU and Codex MRL standards. in the field, 14 days after spraying, there were 4 pesticide residues found, with the highest concentration being acetamiprid at 0.4262 ($\pm$0.0036) mg/kg, which was lower than the EU and Codex MRL standards. for Battambang province. in greenhouses, Acetamiprid was the only one that was found to have 0,0076 ($\pm$0,0010) mg/kg, and in fields, Acetamiprid, Chlorfenapyr, Cypermethrin, and Chlorpyrifos were found. According to European standards, acetamiprid and chlorpyrifos residues are safe 7 days after spraying. Chlorfenapyr and cypermethrin are safe for 10 days after spraying. for Codex, Chlorfenapyr, and cypermethrin are safe 7 days after spraying.

Keywords: residue pesticide, MRL standard, QuEChERS, GC MS/MS

AG-14-67

Processing of Ethanol from Cassava Root

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Abstract
Cassava is scientifically known as "Manihot esculenta". Nowadays, cassava is a Cambodia's second largest industrial crops, where exported to Vietnam in the form of fresh cassava tubers, exported to China in the form of dried slices and exported to Thailand both fresh and dried product. The experiments on how to process ethanol from cassava for using in everyday life was designed aiming at evaluation of appropriate proportion of raw material include yeast, enzyme and amount of cassava for better yield in ethanol production. 5 kg of fresh cassava with 10 liters of water, 0.75 g of Amylase enzymes, 1.125 g of Glucoamylase enzymes, and divided the experimental treatment into different types of yeast that used red star yeast 3.75 grams, Vietnamese yeast 85 grams and local yeast 100 grams were used in the experiment. As result, after the fermented process, the treatment using red star yeast had a total acid content of 0.07 %, total soluble solids of 2.3 brix and a pH of 6.5. The treatment using Vietnamese yeast had a total acid content of 0.08 %, total soluble solids of 2.07 brix and a pH of 6.23. and using the local yeast had a total acid content of 0.07 %, total soluble solids of 2.00 brix and a pH of 6.5. After the distillation, for the treatment using red star yeast, the ethanol yield was 80 degrees, 760 ml, Vietnam yeast get a yielded of ethanol was 77.33 degrees, 644 ml, and the local yeast the yield of ethanol was 77.67 degrees, 494 ml. This is to conclude that the red star yeast has higher yield and better quality of ethanol than other treatment

Keywords: fermented, distillation, yield, fresh cassava, red star yeast, amylase

AG-14-68

Morphological and Leaf Nutrients Characteristics of Different Peanut Cultivars in Alluvial Soil Condition

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Abstract
Peanut (Arachis hypogaea L.) is the 13th of economic crop and 3rd of an important oil crop in the world. Actually, peanut growing condition in Cambodia is such of potential that would be involved to the gate of economic increase in Cambodia while economic income mostly from agricultural sector. Exactly, there are a lot of provinces in Cambodia enhance to peanut growth such as Kratie, Rathanakiri, Modulkiri, Kandal, Battambang, Kompong Cham province and other. Since 2020, there were 20 000 tons of peanut production on 18 000 hectares of area (USDA, 2021).
But there is no more detail for various characteristic that could be affected to yield, leaf protein, nut protein, oil, carbohydrate and energy that is a problem for farmers. Base on above that's why there is a study on Morphological Leaf and Nut Nutrient characteristic of Different Peanut Cultivars in Alluvial Soil Condition. To valuate about different physiology of peanuts leaf and nut nutrients.
This trial aimed to study about morphology of different peanut cultivars and leaf nutrient, there are 11 treatments (T1: Smooth shell Local, T2: Striped shell local, T3: Cap1, T4: Chinese Ghana, T5: N Kati Sar 1, T6: Yen Yaw 050, T7: Sarinut 2, T8: Georgia 06, T9: Red Local, T10: Chinese Local and T11: Carwile's Viginia) with 4 replications total 44 plots on area of 1320 m^2 located in Tbong Khmum district Tbong Khmum province. As the result, the higher yield of peanuts among the treatments was found superior in treatment T2, T7 and T9. The best nutrient result in the laves is the treatment T10, T9, T11 and T5.

Keywords: morphology, nutrients, peanut, alluvial soil

AG-14-69

Evaluating the effectiveness of organic fertilizer from mango waste on growth and yield of water spinach under net house conditions

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Abstract
The objective of the study was (1) to evaluate the qualities of two by-products of organic fertilizers (solid and liquid) made from damaged mango fruits inoculated with organic material decomposers, *Aspergillus oryzae* H9-6 fungus and *Acetobacter orientalis* B7 bacteria, and (2) to assess the efficacy of these two by-products of organic fertilizers (solid and liquid) on the growth, yield of water spinach, and some alluvial soil properties under the greenhouse conditions. The results showed that the composting treatment with a ratio of 50% cow dung and 50% damage mango fruit in a combination with microbial products including fungi and bacteria helped to increase the decomposition rate, electrical conductivity (EC) and fungal density of the solid organic fertilizer. in addition, in the liquid fertilizer product treatment inoculated with *Acetobacter orientalis* B7 made an increase in the decomposition rate, EC, N_{tt}, P_{av}, K_{tt} and bacterial density of the solid organic fertilizer. Results of survey on the effectiveness of two types of organic fertilizers from mango by-products supplemented with benificial *Bacillus megaterium* MQ-2.5 fixing nitrogen and synthezing IAA on growth, yield of water spinach and alluvial soil characteristics under the greenhouse conditions after one experimental crop showed that the use of solid organic fertilizer by singly applying with a dose of 5 tons/ha or in combination with 1% liquid organic fertilizer spray every 7 days helped to increase plant height, number of leaves, chlorophyll content in leaves, fresh yield (8.8-11.2%), and dry biomass (12.9-16.8%) as the control treatment only with 75% NPK application.. Therefore, it can be concluded that microbial organic fertilizer made from mango and cow manure has a great potential in safe vegetable cultivation.

Keywords: *Acetobacter orientalis* b7, *Aspergillus oryzae* h9-6, *Bacillus megaterium* mq-2.5, microbial organic fertilizers, mango by-products, water spinach

AG-14-70

Effect of Dry Brewery Residue on The Growth of Local Chicken (*Gallus domesticus*)

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Abstract
The residual from the food industry such as dry brewery residue (DBR) has the potential to replace the traditional ingredients which its cost greatly increases year by year. Thus, DBR may be the alternative feed used for animal production. The current study was aimed to evaluating the effect of different levels of DBR on the growth of chicken growth. The basic diet was supplemented with 0% (used as control), 20%, 25%, or 30% of DBR. The broiler chickens were raised in a Completely Randomized Design (CRD) with three replicates, and each replicate contains 10 of 6-week-old broilers. Experimental results showed that there was no significantly different in mean weight of chickens among the four treatments from week 1 to week 5. However, in week 6 and 7, the third treatment, which applied 25% of DBR, gained more weight than the first treatment which did not use dry beer waste (0%), the second treatment used 20%, and the fourth treatment used 30% ($P < 0.05$). on other hand, the intake of feed taken by chickens in the third treatment was significantly higher than other treatments ($P < 0.05$) during week 6 and 7. Taken together, these results suggest that basic feed supplemented with 25% of DBR can promote chicken growth better than other levels of DBR, and this better growth is likely promoted by more feed intake.

Keywords: Brewery Dried Residue (DBR), local broiler chicken, growth

AG-14-71

Optimum Yeast Amount for Ethanol Production

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Abstract

Cassava *(Manihot esculenta)* is known as Cambodia's second largest industrial crop. This crop has been observed to be shifting from household cultivation to commercial cultivation in order to increase household income. Rather than process into other final product it is export to abroad in form of raw cassava root and dried chip. Yeast is an important microorganism that help in conversion sugar in cassava to ethanol in final product. This study focuses on finding the optimum amount of yeast for ethanol production for daily life usage. With the ratio of 1:1 (cassava and water), three treatments were designed by using different of yeast amount (25%, 30%, and 35%) for this experiment. As the result the treatment with 25% of yeast gave the highest ethanol degree of 82%, follow by ethanol yield of 929ml, and spent the least fermentation period only 10 days. As for treatment used yeast 30% gave ethanol degree of 67%, follow by ethanol yield of 1,567.50ml, and spent the longest fermentation period up to 20 days. for treatment used yeast 35% gave the lowest ethanol degree of 52%, alcohol yield for 1,000ml, and spent only 10 days for fermentation. Therefore, the treatment used 25% yeast was found as the optimum amount for yeast using in the ethanol production due to it spends the least day for fermentation and costing compare to other treatment. Furthermore, it gave the highest ethanol degree that can be used in many purposes.

Keywords: cassava fermentation, yeast, treatment ration, rural Cambodia, cassava chip, raw cassava root

EM-14-03

Physical Structure Assessment of Rivers Used By Grazing Livestock

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Abstract
When considering a sustainable livestock industry, livestock farmers face many challenges: increasing productivity, reducing environmental impact, reducing greenhouse gases, and improving animal welfare. in particular, Japan is highly dependent on imported feed. Therefore, the effect of fluctuations in imported feed prices on business is enormous, making a shift to self-sufficient feed an urgent issue. Now, multiple advantages of pasture-based livestock farming have been cited: it not only realizes a labor-saving and low-cost production system and contributes to improved animal welfare but is also expected to utilize unused land. However, the number of grazing operations in Japan is minimal, accounting for only 10% of the total. in the future, it will be essential to propose environmentally friendly management methods for spreading grazing livestock production. Still, the lack of examples of grazing livestock production in Japan means that discussions on the environmental impact of grazing need to be more comprehensive.
The author has researched forest grazing, in which forests are used as part of the grazing land as a form of sustainable livestock production. in pastoral livestock farming, the size of the pastureland is often large, or multiple pastures are owned. If the rivers and waterways on the property can be used as drinking water for livestock, it is possible to save farmers the labor of supplying water. Therefore, water quality monitoring is essential for using rivers as drinking water for livestock and for the environmental impact of using rivers. on the other hand, habitat surveys in rivers and waterways are also important when considering aquatic ecosystems, and river physical environment assessments are being promoted in Japan. Here, we conducted a physical environment assessment of river used by grazing cattle. We considered the use of waterways in grazing and their coexistence with the ecosystem.

Keywords: physical structure assessment, RHS-HQA, forest-grazing, pasture-based livestock

EM-14-04

Considering Environmental Standards Based on Soils and Water Quality in the Biotopes around Urban Areas in Japan

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Abstract
Biotope, where the ecosystems have been lost due to industrial development and urbanization, should be restored to rehabilitate the organisms of the original inhabitants. Although there are more than 1,500 school biotopes in Japan, few types of research have been conducted for evaluating their soil and water quality. Compared to lakes and rivers, biotopes have problems as there is less data on soil and water quality. Furthermore, there were no "environmental standards for biotopes", so we cannot evaluate if their soil and water conditions are appropriate for biotopes. Accordingly, the aims of this study are to determine soil and water quality in several biotopes and to develop a draft of environmental standards for biotopes. Various surveys were conducted by disseminating questionnaires to elementary school students on current management systems and their perception of the function of biotopes. Soil and water samples were collected at a public park and four elementary schools in Tokyo and Kanagawa Prefectures. As biological characteristics, *E. coli* and coliforms were measured from soil samples. Also, total nitrogen (TN), total phosphorus (TP), pH, EC, SS, *E. coli* and coliform were measured from water samples.
The results were both TN and TP tended to increase in summer due to the increase in algae. The school that keeps bantams and goats near the biotope detected *E. coli* and coliforms. The excrement of these animals looks to be a cause of the contamination. However, the questionnaire results indicated that the water appears to be clean. Accordingly, there was a difference in their perception and water quality condition. Therefore, the draft of environmental standards, TN, and TP values should be consistent with the standards for the lakes, although there are size differences between lakes and biotopes. Also, considering the fact that children often play with biotopes, the standards for *E. coli* and coliforms should be more restricted.

Keywords: biotope, environmental standards, *E. coli*, Tokyo

EM-14-09

A Pro-active Response to a Disaster Incident: The Sibonga, Cebu Case

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Abstract

The increasing impact by natural hazards, intensified by climate change is a great havoc to the community worldwide. Understandably with the damage that these natural hazards are capable of in its wake, government should, by default be responsible for the development of disaster risk and reduction management policies which is geared towards the lessening of any perceivable fatality and other losses to either life or property. Furthermore, an enlarged comprehension by the community on how to address the root of climate change is momentous which the government should focus on.

The entirety of the paper would like to broaden more the information on how a local government unit in the Philippines has associated, analyzed and responded to Super Typhoon Rai that barreled through northern Mindanao and the Visayan provinces in the country. Based on the document reviews,interviews, and discussions with the head of Municipal Disaster Risk Reduction Management in the local government unit of Sibonga, Cebu and other functionaries, the results highlighted the strategies developed and implemented which has the overall aim of 'zero casualty.' Concerns like establishment of early warning system; identification of susceptible areas to flooding, landslide and water surges; formation of household clusters ('purok system') and evacuation of families in most vulnerable areas were made prior to the passage of the typhoon. Related actions by the local government unit like stockpiling of food items in strategic locations, pro-active partnerships with businesses like gasoline stations, water refilling stores and training community volunteers in health, retrieval and clearing operations were factors that alleviated community disruptions during and immediately after the typhoon.

The insights that were drawn out from the municipality's experience will be disseminated to other local government units through manual production of resources such as manuals and the like, as well as sharing sessions, for the purpose of information sharing.

Keywords: DRRM Response, municipal planning and development office, San Fernando, Cebu, RCE-Cebu, Philippines

EM-14-10

Twin Lakes Eco-Tourism: A Case study on People-managed Projects in the Philippines

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Abstract

Threats to biodiversity from increasing populations and poverty has resulted in the use of investments in livelihood support activities as economic incentives for natural and biodiversity conservation. In the Central Visayas region, Philippines, with 24 declared protected areas with unique and distinctive natural features whose biodiversity warrant protection. These protected areas are habitats of different plants and animals that are either endemic and/or threatened. Almost all are inhabited, thus the need to carefully factor in their social dimension and define the role of the host communities. There are ongoing attempts to draw in people's organizations and local government units in managing these sites through ecotourism and other innovative approaches. Communities were given the responsibility to manage/protect these invaluable treasures. This initiative is a departure from the more punitive and exclusive approach of natural resource management.

The experience of Balinsasayao Twin Lake Natural Park is a good example of people managing an eco-tourism project. Major features include safeguarding the environment through maintenance of the protected area by using basic technologies in pump-boat operation; regular monitoring of protected areas (volunteer forest rangers (" Bantay Gubat") and assistance for those opting to walk around the two lakes ; strict prohibition on the use of drones ; food preparation using locally available ingredients/materials (native ferns, native chicken and spices) and regular sharing/interaction sessions between visitors and people's organization members. In the process, it provided opportunities in facilitating and maintaining quality visitor experience.

Challenges like the two unanticipated events of COVID-19 and Typhoon Odette or internationally known as Typhoon Rai, affected the operation of their project. At present, they are still in 'recovery mode' with the main focus on investing in damaged facilities and the issue on carrying capacity of visitors visiting the protected area.

Keywords: eco-tourism, community empowerment, people's organization, women empowerment, biodiversity conservation

EM-14-12

Urban-Rural Synergy Improvement Through The Ecosystem Services of The Blue-Green Infrastructure in Greater Tokyo Area.

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Abstract
With the advancement of technology, the physical and temporal boundaries between rural and urban regions are shrinking, requiring interaction between the sectors. While the idea is to grow each region without compromising their recently found harmony, there are still numerous impediments and issues that limit this unavoidable urban-rural link.
The abundant water network of the Greater Tokyo Area is recognized as an asset that can serve as a linkage between the suburban agriculture areas and densely populated and built urban areas and preserve their harmony. This study identifies two major types of waterways. One that is culverted and operates as a greenway and the second, that is open water canal. Depending on its context and location this type can have several connotations like irrigation, drainage or simply being a creek. This network represents an ecosystem that is worth of further exploration. This research is accessing and mapping the multiple benefits of the ecosystem's services of the linear blue and green infrastructure (GBI). Those services are classified as provisioning, regulating, cultural and supporting of habitat. They are crucial for the local sustainable development and be able to alleviate poverty and food insecurity.
With this survey the local authorities can have a scientific basis on how to preserve and develop the existing linear blue and green infrastructure and implement new.

Keywords: green-blue infrastructure, ecosystem services, urban-rural, Great Tokyo Area

EM-14-15

Evaluating Water Purification Capacity of *Patinopecten yessoensis* Shells Inoculated Effective Microorganisms

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Abstract

in Japan, biotopes have been created in many places since the end of the 20th century. Since, biotopes are closed water systems with high influxes of nutrients, one of the main problems related to water quality is the occurrence of blue-green algae. in this environment, reduction and control of the blue-green algae cannot be done by chemicals. It is necessary for water quality to be maintained by other non-chemical means. Therefore, this study aims to investigate the effectiveness of *Patinopecten yessoensis* shells inoculated with effective microorganisms as a method for nutrient and water quality control in a biotope environment. The problem in Japan is that huge numbers of *Patinopecten yessoensis* shells are left out in the open because they cannot be properly handled. Although *Patinopecten yessoensis* shells are porous and have been studied for water purification. Accordingly, research attention has been paid to the water purification capacity of *Patinopecten yessoensis* shells inoculated with effective microorganisms.

in the study experiment, *Patinopecten yessoensis* shells inoculated with *Lactobacillus*, *Bacillus subtilis var. natto*, and *Saccharomyces cerevisiae* were used, to purify water samples taken from a pond in Yatoyama Park in Kanagawa Prefecture, Japan. To compare the nitrogen removal capacity, in total the experiments consisted of 8 treatments. in four treatments, *Patinopecten yessoensis* shells were burned at 600 degrees to increase the pore size and distribution and inoculated with the above-mentioned microorganisms. in the second group of four treatments, *Patinopecten yessoensis* shells were not burned, they were only inoculated with the microorganisms. Uninoculated burned and unburned shells were used as control treatments.

The experimental results showed total nitrogen removal rates of 42% for unburned and uninoculated shells, 0% for *Lactobacillus*-inoculated unburned shells, 45% for *Bacillus subtilis var. natto*-inoculated unburned shells, 58% for *Saccharomyces cerevisiae*-inoculated unburned shells. Regarding the burned shells, results showed 51% nitrogen reduction at the uninoculated shells treatment. *Lactobacillus*-inoculated burned shells reduced nitrogen by 47%, *Bacillus subtilis var. natto*-inoculated burned shells reduced by 34% and *Saccharomyces cerevisiae*-inoculated burned shells reduced the nitrogen in the water sample by 69%. Since this was a short-term experiment, a long-term experiment as well as field-applicable methods need to be discussed in the future.

Keywords: water purification, microorganism, *Patinopecten yessoensis, Lactobacillus, Bacillus subtilis var. natto, Saccharomyces cerevisiae*

EM-14-16

Use of Remote Sensing in Estimating Water Resources Potential in Data Scare Region

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Abstract
Identifying suitable areas for cultivation in dry season is difficult especially in areas where there is scarcity of data. Remote sensing is one of the solutions to this problem. Remote areas like Chembe, an enclaved village in the Lake Malawi National Park have a tendency of paucity in data availability. Its agricultural activities are limited to the rainy season due to lack of irrigation facilities as well as exploring sustainable options in using the few available water sources. Immense pressure on agricultural productivity has been observed due to an increase in population and hand migration of people for economic opportunities in fishing and tourism sectors. It is therefore essential to (1) monitor the trend of spatial expansion of farmlands over the years and (2) assess the water resources potential in the dry season to derive strategies for efficient management of available water resources for sustainable dry season agricultural production. Therefore, this study used Sentinel 2 imagery and 30-arc second SRTM data to estimate NDVI (Normalized Differenced Vegetation Index) and TWI (Topographic Wetness Index) respectively, to evaluate spatial distribution of farmland, water resources and hydrological process, thus assessing potential water resources. Results indicate the expansion of cultivable land while the dry season assessments indicate that the potential of water sources exist with the area shrinking as the dry season extends from July to October. The areas with high NDVI in the dry season over the years are decreasing with time in a season, indicating that more land is used for the same water for irrigation due to an increase in demand for food. This calls for the implementation of more efficient irrigation methods to conserve the water as well as to increase agricultural production. An example is the use of drip irrigation and early maturing crop cultivars.

Keywords: Lake Malawi National Park, water use potential, remote sensing

EM-14-21

Effect Of Different Soil Amendments on Some Soil Properties, Growth And Yield Of *Calotropis Gigantea* Grown Under Salinity Conditions

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Abstract

The extremely soil salinity is classified as barren area in the northeastern Thailand. In general, most crops are not able to cultivate such area. However, Calotropis gigantea (L.) W.T. Aiton was observed that they can survive saline area. This crop may produce yield under proper soil management and provides household income when they grow under extreme soil salinity. Therefore, pot experiment was conducted to investigate the effect of adding soil amendment materials on changes in soil properties, soil moisture, growth, and yield of Calotropis gigantea (L.) W.T. Aiton under extreme soil salinity concentration level (EC$\geq$16 dS/m). The treatments consist of (1) non-application (control), (2) coarse sand alone, and (3) coarse sand+M.Calabura dry leaves+Polymer. The results showed that the electrical conductivity in soil solution decreased, whereas soil bulk density, soil moisture content, and macronutrients increased, regardless of coarse sand+ M.Calabura +polymer application, compared with the coarse sand application alone and non-application control treatments. Consequently, applying these soil amendment materials decreased Na+: K+ ratio in plant results in improved growth characters and yield of Calotropis gigantea (L.) W.T. Aiton grown under extreme salt stress conditions.

Keywords: soil salinity, soil moisture, organic matter, polymer, Calotropis gigantea (L.) W.T. Aiton

EM-14-24

Evaluation of the effect of Alternate wetting and drying irrigation on the growth of paddy rice plant height using a Logistic Model

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Abstract
Climate change poses a challenge to irrigation water supply especially with continuous flood irrigation method (CF). Alternate wetting and drying irrigation (AWD) is a widely used method of rice cultivation as a mitigation measure for water consumption, without reducing yields. in order to better promote AWD in areas where water scarcity occurs in the future, it is necessary to quantify the impact of AWD on growth. This study used pot culture trials to evaluate the effect of AWD on rice growth measured using plant height. The analysis shows that by using AWD, irrigation capacity was reduced by approximately about 19%. A multiple regression analysis indicates that temperature, sunshine hours and relative humidity had significant effects on plant growth. A growth model (RMSE= 2.98 to 3.82 cm) was generated by applying a logistic curve where the daily mean integrated values of meteorological data as explanatory variables and plant growth as the objective variable. Using the model, it was found that AWD increased the growth rate but slowed the time to start growing compared to CF.

Keywords: alternate wetting and drying, logistic model, plant growth model, rice paddy

EM-14-25

Effect of Nutrients in Treated Sewage Water on Crayfish (*Procambarus clarkii*) Cultivation

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Abstract

The crayfish is a familiar crustacean species in Japan which are abundant in paddy fields and other water habitats. However, as an invasive alien species, it is considered to cause damages to the ecosystem and has become a subject of extermination. on the other hand, in countries such as China, cray fish is considered as a food resource. in Japan too, crayfish can be utilized as a food resource by promoting it as a sustainable food resource. Also, in Japan, sewage is purified to environmental standards at sewage treatment plants before being discharged into the sea. Therefore, the treated sewage water is considered as a safe and effective water resource. This study focuses on the possibility of a crayfish aquaculture system utilizing treated sewage water. Therefore, the objective of this study is to clarify the effects of nitrogen and phosphorus in treated sewage water on the growth of crayfish. An aquaculture experiments were conducted using treated sewage, recycled sewage and tap water (control) over a period of 10 weeks, and the effects of nitrogen and phosphorus on the growth of the crayfish were evaluated. According to the results, it was found that there was a significant correlation between the concentrations of total nitrogen (R = 0.60**, 0.57**, 0.58** for tap water, reclaimed water and treated water, respectively) and total phosphorus (R = 0.61**, 0.59**, 0.66** for tap water, reclaimed water and treated water, respectively) on the growth of crayfish. From this, it can be concluded that treated water and reclaimed water, which have relatively higher concentrations of nitrogen and phosphorus than tap water, have a growth-promoting effect on crayfish. This study was able to determine the impact of treated and reclaimed water on the growth of crayfish and proposed a method to improve the efficiency of crayfish aquaculture as well as the sustainable and recyclable use of water resources.

Keywords: crayfish, aquaculture, sewage water, water quality

EM-14-27

Development of indexes to evaluate the effectiveness of Low water level control in irrigation ponds-A case study of irrigation ponds in Tottori, Japan

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Abstract

The spillways of most irrigation ponds in Japan should be repaired to safely pass the 200- year flood event, which is the design criteria set by the government. Low water level control (LWLC) in irrigation ponds is currently recognized as one of the countermeasures to mitigate floods. However, the pond managers do not know what extent the water level of the pond should be lowered. in this study, flood mitigation function of LWLC in each pond was quantitatively evaluated, and indexes were proposed to determine whether it is worth to practice LWLC in each pond or whether the spillway needs to be repaired. Seventy-two irrigation ponds in Tottori prefecture are selected for analysis and water balance of each pond is calculated with 10-, 50-, and 200-year rainfall events. The results show that half of the ponds cannot safely pass the flood even if they are empty before the 10-year rainfall event. Such ponds are often larger than 50 in terms of the ratio of catchment area to the full water area. on the other hand, ponds with the ratio of less than 50 show a high flood mitigation function due to LWLC. in addition to this, the priority can be evaluated from that point of view that spillway can pass peak runoff or not, because the size and the type of spillway is different among ponds. The effectiveness of LWLC can be evaluated in terms of the ability of the spillway to pass the peak runoff from the catchment when the pond is full. The three indicators, the ratio of catchment area to the full water area, difference of peak flood reduction rate, and peak discharge ratio, are simple and useful indexes for LWLC to prevent irrigation pond failure.

Keywords: flood mitigation, spillway, water management, water balance

EM-14-28

Ecosystem Carbon Stock Assessment in Upland Forest: Case Study in Koh Kong, Mondulkiri, Preah Vihear and Siem Reap province

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Abstract
The problem of climate change is caused by the human-induced increase in the stock of greenhouse gases (GHG) in the atmosphere. Carbon storage in forests is one measure that can be taken to mitigate climate change. Forests provide many important ecosystem services to Cambodia, such as food production, natural medicine, water supply, and protection from wind and storms. However, the amount of carbon stored in forests varies depending on spatial and temporal factors such as forest type, size, age, stand structure, associated vegetation, and ecological zonation, to name a few. This study presents the results of carbon stock assessment in the different forest types of the pilot project provinces. in addition, this study represents the baseline assessment of carbon stock in these sites by estimating carbon stock in all carbon pools. It is the first step to calculate all carbon pools in Cambodia. Normally, the aboveground biomass pools and belowground biomass pools are studied. However, in this study, five carbon pools are investigated, namely aboveground biomass pool (AGB), belowground biomass pool (BGB), litter biomass pool, deadwood biomass pool, and soil organic carbon pool (SOC). National inventory method which published by FAO was applied in the research study, the size of the rectangular plot is (30m x 50m). The results of an estimate of carbon stocks in Cambodian forest types are reported in tonnes per hectare. The total carbon stock of the ecosystem in Koh Kong province as semi-evergreen forest is 203.03 tonnes C/ha, in Mondulkiri province as deciduous forest is 248.86 tonnes C/ha, in Preah Vihear province as deciduous forest is 185.68 tonnes C/ha, in Siem Reap province as deciduous forest is 210.53 tonnes C/ha, and as evergreen forest is 418.71 tonnes C/ha. This result shows that the different carbon stock in different provinces and forest types will contribute to improving environmental quality, reducing greenhouse gas emissions, and supporting the government's strategy for sustainable management of the forest sector in Cambodia.

Keywords: above ground biomass, below ground biomass, dead wood, litter, soil organic carbon, CO_2

EM-14-48

Monitoring of Microplastics in Different Soil Ecosystems

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Abstract
Microplastics are particles of plastic at size <5 mm and ubiquitous in soil and water ecosystems all over the word. However, recently drawn considerable attention because the pose a great threat to entire ecosystem. The research has focused on microplastic in mostly marine and freshwater ecosystems. Resulting in studies of microplastics in soil ecosystem is still limited compared with that in water ecosystems. This study aims to monitor the residue of microplastics in soil from the different types of land. The soil samples from different types of land (Landfill 10 years, Landfill 57 years and agricultural area with the plastic mulch has been used) were analyzed for microplastic. Results showed that the shape of microplastics found in the study area were mainly fragments, followed by fiber and string shapes. Examination of the amount of microplastics found that soil from the Landfill 57 years had the highest amount of microplastics residues, followed by Agricultural area and Landfill 10 years respectively.

Keywords: microplastic, soil, environment, residue

EM-14-49

Using Vermifiltration Combined with Biochar for Domestic Wastewater Treatment

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Abstract

The aim of this study was to assess the potential of vermifiltration combined with biochar to treat domestic wastewater using earthworm, *Eisenia foetida*. The study experiments were conducted at the Department of Soil Science and Environment, Faculty of Agriculture, Khon Kaen University, Thailand with a model experiment completely randomized design: CRD 4 treatments 4 replications (geofilter, vermifilter, geofilter with biochar and vermifilter with biochar) and using samples of domestic wastewater from wastewater treatment plant at Khon Kaen University. The result showed that using vermifiltration combined with biochar could reduce the biological oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS) in domestic wastewater highest followed by vermifilter with biochar, vermifiltrater, geofilter with biochar and geofilter, respectively. The results demonstrated the percentage removal of BOD was $93.95\pm8.08\%$, COD ($87.50\pm11.18\%$), TDS ($84.47\pm14.40\%$). Using vermifiltration for wastewater treatment in domestic wastewater could be the eco-solution for nutrient recovery, water resource recycles and minimize pollution and efficient wastewater treatment in developing countries.

Keywords: vermifiltration, wastewater, biochar

EM-14-50

Vermicomposting Under Different Organic Materials With the Chromium Contaminated Soil

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Abstract

The increase in the textile industry has increased the release of chromium wastes. Vermi-remediation is a technology that is gaining attention for its ability to reduce soil toxins solve soil contamination problems and also to create fertilizers. This study aimed to determine the ability to reduce chromium VI toxicity in soil and the ability to make fertilizer in chromium-contaminated conditions 15 ppm under a different type of bedding during 30 days. The experiment was set up in completely randomized design (CRD) with 3 replications consisted of Treatment 1: 85% soil + 15% azolla, no earthworms, Treatment 2: 85% soil + 15% azolla + 30 earthworms, Treatment 3: 60% soil + 20% azolla + 20% cow dung, no earthworms, Treatment 4: 60% soil + 20% azolla + 20. % Cow dung + 30 earthworms, Treatment 5: 60% soil + 15% azolla + 20% cow dung + 5% biochar, no earthworm, Treatment 6: 60% soil + 15% azolla + 20% cow dung + 5% biochar + 30 earthworms, Treatment 7: 80% soil + 15 % azolla + 5% biochar, no earthworms, Treatment 8: 80% soil + 15% azolla + 5% biochar + 30 earthworms. The CRD was planned for 3 replications of 8 samples. The results showed that after 30 days, the treatment of using 60% soil + 15% azolla + 20% cow dung + 5% biochar + 30 earthworms Chromium VI decreased 71.65%. The treatment of using 60% soil + 20% azolla + 20% cow dung + 30 earthworms, earthworm has increased weight up 0.45 – 0.49 g and has the greatest number of cocoons 298.6 – 386.8 cocoons. for vermicompost quality, total nitrogen, phosphorus and potassium 60% soil + 15% azolla + 20% cow dung. + 5% biochar + 30 earthworms have the largest percentage increased to 5.85 – 7.15, 0.90 – 0.98, 0.08 – 0.24, respectively.

Keywords: vermicomposting, organic materials, chromium contaminated soil

EM-14-51

Cassava Waste Recycling to Produce Quality Vermicompost

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Abstract
Cassava is a carbohydrate-rich crop that has a wide range of uses for food, feed, fuel and factories. for many years, global demand for cassava has been high for many industrial uses. Therefore, it is need to properly manage cassava wastes for a sustainable environment. The aim of this study was to investigate the recycle of cassava waste on vermicompost quality. The study was conducted by using *Eudrilus eugeniae* cultured under bedding (mixed soil: cow dung: rice husk ash at the ratio 4:3:2) with cassava pulp and without cassava pulp. The results showed the treatments supplemented with cassava pulp waste improved the growth of earthworm, while the carbon-to-nitrogen ratio of these vermicomposts decreased significantly ($p < 0.05$) due to the improved total nitrogen contents (5.70 g kg^{-1}). and increased the total phosphorus, potassium, magnesium and calcium were 224.14, 175.00, 34.73 and 347.41% respectively. Therefore, recycling of cassava waste to produce vermicompost resulted in organic fertilizers with improved chemical properties.

Keywords: cassava waste, vermicompost, vermicompost quality

EM-14-52

Impact of Chlorpyrifos on Pycnoporus Sanguineus (NUOL-PKK02) and on Its Possible Antagonistic Activity Against Fusarium Wilt of Banana Under in Vitro Conditions

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Abstract

Chlopyrifos is the main pesticide that has been used in a banana plantation in Laos for controlling pests. The assay was conducted to evaluate the effect of Chlorpyrifos on *P. sanguineus* mycelia growth and on the potential biological agents in controlling Fusarium wilt of bananas. in the compatibility test were four different concentrations varying from 0, 500, 750, and 1,000 µg/mL. While for the antagonistic activity study, treated *P. sanguineus* was tested against *F. oxysporum* f.sp. *cubense* causal agent of Fusarium wilt of banana disease by using the Bi-culture technique and *in vitro* bioassay of three crude extracts of *P. sanguineus*. Significant differences were observed between control, 500, 750, and 1000 µg/mL concentrations of Chlopyrifos used in the inhibition of mycelial growth of *P. sanguineus* at 72, 75, and 75 % respectively. It shows that *P. sanguineus* has the ability to tolerate or compatibility with Chlopyrifos as well. Observation from the Bi-culture test found that *P. sanguenues inhibited the mycelia growth of F. oxysporum at 53.40 % and 82.38% of conidia production. in* bioassay on crude Hexane, Ethyl acetate and Methanol extraction of *P. sanguineus* inhibited the pathogen as *F. oxysporum* at 80% of crude Hexane followed by Ethyl acetate and Methanol at 64 and 50%. Regarding from the results of the study indicated the potential for the development of this Lao strain *P. sanguineus* (NUOL-PKK02) as biological control agent to control Fusarium wilt of bananas and will be the alternative way for farmers to use biopesticide instead of the application of chemical pesticides. It will enable the choice of combining *P. sanguenues* (NUOL-PPK02) with chemical pesticides for further bioremediation investigation.

Keywords: antagonistic fungi, bioremediation, *P. sanguenues* (NUOL-PPK02), compatibility *Fusarium oxysporum* f.sp.*cubense,* Chlopyrifos

EM-14-53

Impact Evaluation of Climate Change on Disaster Risk of Forested Watershed River in Snowy Regions using SWAT+

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Abstract
in this study, runoff and inundation analyses were conducted in Mishima town, Fukushima , where is a snowy and cold region in Japan, under climate change scenarios to analyze the disaster risk and watershed management assessment of development, e.g., agricultural land development through deforestation, and to clarify the causal relationship between deforestation for agricultural land and disaster risk under climate change.

Firstly, to ensure the reproducibility of the model, we attempted to improve its accuracy using automatic calibration functions, including SWAT+. SWAT+ can adjust specified parameters from actual measured values, such as flow rates, to improve the model's accuracy. The model reproducibility was verified from NSE and RMSE by correcting lateral flow travel time (lat_time) in this study. The calibration improved RMSE and NSE values, and the annual mean value of NSE was more than 0.5.

The effects of rising temperature and agricultural land expansion were simulated. We focused on snowfall and snowmelt for the temperature rise and conducted simulations by increasing the temperature (maximum and minimum) from 0.5°C to 2.0°C based on actual measurements. Snowmelt in March decreased by 74%, and average flow decreased by 8% by 2.0°C rise. for the agricultural land expansion, we assumed deforestation and simulated a decrease in forest area and an increase in agricultural land area from 0.4 to 30%. The average annual runoff and daily peak flow after the land use change were increased, and daily peak flows were increased up to 1.7 times. on the other hand, the Surface runoff increased (1.21 times), and volume of groundwater decreased significantly after the land use change.

Keywords: SWAT, climate change, snowmelt, runoff, prediction

EM-14-58

Greenhouse Gas Emission During Vermicomposting of Organic Wastes under the Effect of Biochar

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Abstract
Vermicomposting is biological technology commonly used to manage organic or biodegradable Waste. However, the climate change problem and greenhouse gas emission are increasing concerned. The tools and techniques to drive climate-smart agriculture, reduce carbon emissions, and lower the carbon footprint are needed. Therefore, the objective of this study was to assess the carbon dioxide (CO_2) and methane (CH_4) emissions from vermicomposting organic waste under the influence of different species of earthworm and different bedding with and without biochar compared with composting without earthworm. The experiment was conducted for 30 days, and *Eisenia eugeniae* and *E. foetida* were used for vermicomposting. The results found that vermicomposting with biochar bedding reduced CO_2 emissions and CH_4 emissions with compared with control. This study concluded that vermicomposting with biochar bedding could be an option for reducing greenhouse gas emissions.

Keywords: vermicomposting, greenhouse gas, biochar, climate change, earthworm

ESD-14-03

Educational Material Research on The Color of Crayfish for Conversion To Edible Resources

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Abstract

The crayfish *(Procambarus clarkii)*, an invasive alien species, is consumed as a food source worldwide. However, the demand for it as a food resource in Japan is extremely low and is considered as a target species for extermination. One of the reasons for lack of progress in considering crayfish as a food resource is due to limited education on crayfish as a sustainable food resource during secondary education. It is well known that astaxanthin is the pigment responsible for the body color of common red crayfish and crustaceans such as shrimp and crabs. There are ample study materials on plant pigments in science education in junior high and high schools in Japan. However, there are no such materials focusing on animal pigments as a study materials in our knowledge. Therefore, the objective of this research was to develop teaching material to deepen understanding of color for food component of crayfish by experiment through extracting and separation of their pigments.

Using pigments extracted from red crayfish shell, we developed experimental teaching material to observe astaxanthin, a pigment of body color, by thin layer chromatography and HPLC. in addition, an experiment was conducted to see the effect of different feeds on crayfish body color. for this, feed was developed to make crayfish body color to white (decolorization) and orange. The results of feeding the decolorized crayfish with norbixin or bixin, which are components of the orange annatto pigment, showed that norbixin tended to accumulate in the shell by the apparent body color change and thin-layer chromatography. These findings are expected to be useful for science education and nutrition education for increased understanding of crayfish as a food resources.

Keywords: education, teaching material, *Procambarus clarkii*, pigment, food resource, SDGs

ESD-14-04

Identifying the Japanese Foreign Technical Intern and Training Program (TITP) in the Agriculture Sector and Its Outstanding Training Models, Case Study of Indonesia

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Abstract

The Japanese government established the Foreign Technical Intern and Training Program (TITP) for developing countries to improve technology, skills, and knowledge pragmatically and practically in an actual work environment so that trainees from developing countries can apply their skills when they return home. However, due to several issues it has caused, such as improper wage payments and overwork, this approach has received harsh criticism from human rights organizations inside and outside Japan (Godo, 2019). Previous research has primarily focused on the negative aspects of this program, with little emphasis placed on its positive impacts. TITP is considered critical for Indonesia because it provides high-paying jobs for "unskilled" youth, who account for more than half of the unemployed population. This research aims to identify the current general condition of the TITP, classify the different programs under TITP, and compare the alumni's condition after finishing TITP and returning to Indonesia. Based on the initial finding, we can assert that TITP in the agriculture sector has successfully attracted TITP alumni to pursue a career in agriculture, thereby contributing to more young farmers, which is desperately needed for Indonesia's agriculture future. The majority of alumni became farmer entrepreneurs. The average income of the alumni working in the agriculture sector is more than three times the amount of average Indonesian farmers' monthly income. The typical scheme under TITP is the Industrial Training Program (ITP) and the Technical Intern Program (TIP). However, it is known that the Nouen Taya Farm (NTF) is an exceptional case with ideal training, including entrepreneurship development for the trainees. All NTF alumni now own their own land, and their average income is slightly higher compared to the ITP and TIP alumni.

Keywords: Japanese Foreign Technical Intern and Training Program (TITP), agriculture entrepreneurship, human resource development, young farmers, education for sustainable agriculture

ESD-14-07

Agriculture 4.0: An overview of concept, tendencies and policy implications in Cambodia

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Abstract
The fourth industrial revolution in agriculture has been widely adopting in many countries and has just started in Cambodia. This paper aims to discuss the overview of concept and interrelated components of the Agriculture 4.0, tendencies in technology innovation and development in agricultural economics, natural resources, environmental management, crop production, animal production, aquaculture, food storage and processing, marketing and agricultural extension. The paper also points out some benefits and challenges of the Agriculture 4.0 and provides policy recommendation for sustainable development of Cambodia's Agriculture 4.0.

Keywords: industry 4.0, agriculture 4.0, agricultural policy, agricultural development

ESD-14-13

What do Iranian Agricultural Experts Think about the Sustainable Development Goals (SDGs)?

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Abstract
One of the most important indicators of achieving sustainable development in all dimensions is special attention to the agricultural sector. Today, changing human attitudes in all sectors, including agriculture, is on the agenda of development organizations because guiding a group of people towards a specific goal requires creating a favourable motivation for it. The purpose of this study was to investigate the perceptions and attitudes of the employees of the Jihad Agricultural Organization of Guilan province (northern Iran) about the Sustainable development goals (SDGs). in terms of methodology, quantitative research method was used. The statistical population of this study included all the experts of the Agricultural Jihad Organization in Guilan province (N=500). The sample size was determined using the minimum sample size table of Bartlett et al. (n=152) and this number was selected by random sampling method. in order to measure the educational needs of respondents, Borich's needs assessment model was used. Data analysis was done using SPSS21 software. The calculated priority scores showed that out of the seventeen investigated SDGs, fourteen SDGs rank high in the educational needs assessment regarding knowledge and skills in the field of sustainable development, and among these 14 SDGs, the goals of "peace, justice and strong institutions", "good health and well-being" and "life below water" were considered as the most important priority goals for education, respectively. Also, "affordable and clean energy" was placed in the last educational priority; but in relation to the three SDGs of "no poverty", "zero hunger" and "quality education", they need to strengthen their knowledge. The results of t and F tests showed that the variables of gender, age and work experience had a significant effect on the attitude of the respondents at the error level of 0.01.

Keywords: perception, attitude, 2030 Agenda for Sustainable Development, Sustainable development goals, SDGs

IS-14-04

Verification of Optimum Flying Conditions for UAV Photogrammetry in Structural Assessment of Hydro-Structural Infrastructures

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Abstract

Monitoring hydro structural infrastructures is becoming an important and challenging issue. in Japan, there are increasing number of ageing hydro structural infrastructures, which needs to be inspected and detected to guarantee their strength and durability function. Unmanned Aerial Vehicle (UAV) photogrammetric images has been used in detection of structural deterioration of various infrastructures. However, there is a challenge in determining the optimum flying conditions (height, angle of camera and flying patterns) of UAV for obtaining images. The designs, shape and size of hydro structural infrastructures also possess a challenge for obtaining ideal images. in this study, verification of various flying conditions for producing images were proposed for gates and open surface water channels. UAV was used for visual inspection and obtaining the image of a gate and water channel in Tone diversion gate, Saitama, Japan. Various geometric patterns were pasted in the surface and walls of the structures to evaluate the detection of the patterns with the images taken from UAV at different flying conditions. The obtained orthomosaic images were processed by PIX4D mapper to obtain a point cloud-based 3D model and were compared with the actual measurements of the patterns. The results of the study suggested that altitude and camera angles effected the quality of images significantly. Camera at lower angles provided better images, however, cameras at high altitude with wider angles were efficient too. on the other hand, double grid flying pattern performed well compared to circular flying pattern. for circular flying pattern to generate satisfactory results, flying had to be conducted multiple times with changing heights and angles of the camera. The outcomes of this study can be used as an index for optimum flying conditions of UAV for structural assessment.

Keywords: UAV photogrammetry, hydro structural assessment, point cloud 3D model

RD-14-11

The Current Situation of Farmers' Custom on Rice Seed Use in Cambodia: An Exploratory Study using The Micro Data of Farmers in Takeo Province

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Abstract
Rice productivity have enhanced dramatically in the last decades in Cambodia: from 1.9 t/ha in 1999 to 3.6 t/ha in 2018. The major factor of this breakthrough was a diffusion of irrigation facilities and modern varieties. However, the system of rice seed production and supply is still not established well, and most farmers are using self-collected seed. Under the situation, the newly developed varieties are difficult to keep their utility because of losing their genetic purity. This study investigated the actual situation of farmers' custom of rice seed treatment and a concern which the custom interferes an enhancement of rice productivity in Cambodia. The data for this study was collected from 80 conveniently selected farmers in irrigated and rainfed areas in Takeo province. Regarding rice production, the farmers in irrigated area cultivated modern varieties, and sold the most of their production. on the other hand, the farmers in rainfed area cultivated traditional varieties and mainly used for self-consumption. in both areas, farmers procured rice seed by self-collection and in the case of purchasing seed when they change variety to cultivate, they mostly get it through farmer to farmer transactions. This fact suggested that most seeds used by the farmers were collected by farmers themselves, and possible to lose their utility because of the contamination. The amount of seed use per hectare in irrigated area was two times larger than the rainfed area. in addition, the rice yield per a unit usage of seed in the irrigated area was lower than the rainfed area, even the farmers in irrigated area were cultivated modern varieties. This result implied the possibility that the farmers in irrigated areas overused rice seed with low quality to pursue land productivity.

Keywords: seed renewal, variety adoption, irrigation access, farmer to farmer transaction

RD-14-14

Brand Community, Brand Love and, Word of Mouth: A Case of Traditional Thai Textile

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Abstract
Thai textile products are popular such as silk and woven cotton. Farmers and local people can gain more income by producing and creating such products. in this regard, marketing is very important and plays a significant role in expanding the opportunity of Thai textiles and providing more income to the farmers. in contemporary marketing literature, brand community, brand love, and word of mouth are the keys to success in connecting with customers. Therefore, the purpose of this research is to examine the relationship between brand community, brand love, and word of mouth in the traditional Thai textiles industry. The surveys were used as tools to collect data from 220 customers in October 2022 in Thailand. Path analysis was used to evaluate the collected data. The result of the study revealed that brand community has direct and indirect influence on word of mouth through brand love.

These findings are particularly useful for government agencies and businesses responsible for supporting farmers and local groups of traditional Thai textiles.The findings can serve as guidelines for developing sustainable marketing in order to build brand community and brand love for these textiles. There are benefits to the conservation and sustainability of traditional textiles, which is culturally important for Thailand.

Keywords: brand community, brand love, word of mouth, traditional Thai textile

RD-14-15

Consumer Behavior towards Ethical Bananas in Japan

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Abstract
Bananas are the most consumed fruit in Japan, which imported over 1 million tons of bananas in 2021. Meanwhile, problems such as unfair contracts and unpleasant working conditions exist in banana production fields. Although consumers' interest in ethical consumption is growing in Japan, the market of ethical bananas, referring to fair trade (FT), rainforest alliance (RA), and organic in this study, is still a niche. Promoting ethical bananas and expanding its market can be considered one of the ways to improve the situation in the production areas. However, past studies on ethical bananas and consumer behavior seemed limited in Japan. Therefore, this study aims to identify consumer behavior toward ethical bananas and the possibility of expanding the ethical banana market in Japan. Therefore, this study aims to identify consumer behavior toward ethical bananas and possibilities for its market expansion in Japan. This study conducted an online questionnaire using Google Forms throughout August 2021 and collected 279 valid respondents. Factor analysis and cluster analysis revealed three clusters: quality-conscious, ethical-possible, and unconcerned. in addition, conjoint analysis clarified that price was the most important when purchasing bananas, followed by appearance, ethics, and cultivation method. Furthermore, RA and organic bananas had a utility as high as non-ethical bananas, conveying a potential demand increase for organic and RA bananas. However, since FT bananas had low utility, there seemed no possibility of any growth for FT bananas in the future. Meanwhile, the ethical-possible cluster, which accounts for over 50% of the respondents, had the highest utility towards FT bananas among the three clusters. Hence, to expand the market for ethical bananas in Japan, there is a need to increase the recognition of the social issues in the production areas and lower the FT bananas price to the prices of RA and organic bananas.

Keywords: consumer segmentation, ethical consumption, fair trade, rainforest alliance, organic

RD-14-29

Needs for Agricultural Extension on Buffalo Raising of Farmers Around Kaeng Lawa Reservoir Wetland, Ban Phai District, Khon Kaen Province, Thailand

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Abstract

The objective of this study was to study 1) some selected social and socio-economic backgrounds of Thai buffalo raising farmers, 2) practices on buffalo raising and 3) needs for extension on buffalo raising of farmers. Data collection used questionnaires to 45 farmers in May – October 2020 by convenience sampling. SPSS for Windows was used for analysis to determine percentage, mean, minimum and maximum. and in-depth interview was done with village headman and the staff.

The results experiencendicated that members had 23.90 years' experiencee on buffalo raising and the had buffaloes for the average of 8-9 heads per household. The majority of them, 92.1 %, sold their buffaloes per head to local merchants and earned the annual income of 63,233.71 baht per household. and farmers sold the buffaloes dunk by 20 kilograms bag for 20-25 baht, earned of 2,000 – 3,000 baht a year. Regarding the extension on buffalo raising, it was found the farmers had needs in the following: 1) Knowledge aspect; having the high level of needs in the topics: selecting and buying female breeder, breeding improvement, keeping buffalo manure and added values of buffalo dunk, 2) Training course aspect; 81.16% of farmers wanted training provide at the village, 76.15 % would like have livestock officers to be resource person of training, 3) Support aspect; the farmers had high level of needs in the items; buying good breeder from government organization, service on injection for animal health, providing vaccination and prevention of disease.

Keywords: buffalo rising, needs of extension, wetland

RD-14-32

Assessing Consumer Behavior Towards Vegetable Consumption Among Households in Phnom Penh, Cambodia

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Abstract

Cambodians consume vegetables to meet their daily nutritional needs and the purchase decision-making process of each consumer is unique. Understanding consumer behavior is important for better decision-making along the supply chain and market strategy. The objectives of this study were to assess the status of vegetable consumption and to identify critical influencing factors behind vegetable consumption among urban vegetable consumers. 120 individuals were randomly interviewed around Dangkor commune, Dangkor district, Phnom Penh. The results indicated that an average household size was four members and an average age of respondents was 27 years old with an average total monthly household income of 387 USD. 65% of respondents finished university degrees, indicating a high level of education. 52% of women played a role in making decisions on vegetable purchases and 63% of households purchased vegetables at the wet market. 40% of the households preferred going to the market daily and 31% went in the morning and 28% in the afternoon at 7-9 am and 5-7 pm, respectively. The respondents showed a significant tendency to the quality and the freshness of vegetables accounting for 80% and 82% of households used plastic bags for warping vegetables after the purchase. Most people received information about safe vegetable promotion through a social media, Facebook, accounting for 87%. The households regularly consumed five species of vegetables including morning-glory (70%), lettuce (63%), cucumber (61%), bok choy (60%), and curly cabbage (59%). in conclusion, women have a tendency to go to the wet market daily, in the morning and afternoon, by regularly consuming the morning-glory most and plastic bags is become a popular way for wrapping vegetables from the market. Additionally, income, education level, household size and social media promotion have an effect on consumer behavior regarding the quality and quantity of vegetable consumption

Keywords: consumer behavior, safe vegetable, vegetable consumption, vegetable production, vegetable quality

RD-14-35

Food Security in The Context of The War in Ukraine: Case of North Africa

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Abstract
The war in Ukraine has profoundly impacted food systems in North Africa. This paper analyzes the consequences of the conflict in Ukraine on food security and food systems in North Africa, with a particular focus on Egypt, Morocco, and Tunisia. It also explores the potential long-term socio-economic effects on the region. The paper draws upon an extended analysis of both scholarly and grey literature sources, including academic articles, government reports, and news articles. It suggests that the conflict in Ukraine has significantly impacted North African food systems through its impact on the global economy, trade patterns, and food prices. The consequent high fertilizer prices have also affected local food production, leading to food shortages and an increase in food prices, which has contributed to widespread poverty and malnutrition in the region. Furthermore, the rise in food prices will have a widespread impact on the region. However, those countries with substantial financial resources will likely be able to mitigate the adverse effects on their citizens. in contrast, countries with limited resources - such as Egypt, Morocco, and Tunisia -or failed states may struggle to ensure the food security of their populations. The paper contributes to a deeper understanding of the multifaceted interconnections between conflicts, food security, and the global food system. It stresses the importance of considering the impacts of conflicts on food systems when addressing global food security challenges in North Africa and beyond. The food security situation in North Africa serves as a reminder of the interconnectivity of global food systems and the need for continued efforts to ensure food security for all, thus achieving the Sustainable Development Goal (SDG) 2 "Zero hunger" by 2030.

Keywords: food insecurity, malnutrition, Egypt, Morocco, Tunisia, conflict

RCE Special Session

AG-14-61

Building Capacity of Farm Owners for Promotion of Organic Farming in Southern Vietnam

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Abstract

The Southwest region of Vietnam, which includes the Mekong Delta, is the biggest agricultural production area in the whole country. This region supplies agricultural products for the whole country, as well as for export internationally. The region's flat floodplains support the high yield of agricultural activity, with key products from this region being rice, vegetables, fruit, and aquaculture products. However, intensive cultivation within the region has led to environmental degradation, which in turn has affected agricultural productivity. Agriculture in the region is heavily dependent on synthetic fertilizer as well as herbicides and pesticides. This leads to the risk of reducing the value of agricultural products, creating obstacles for export, and affecting the health of surrounding ecosystems. The issues at hand are the need to maintain high productivity of agricultural crops, while ensuring food safety, as well as increasing the value of products while at the same time maintaining the well-being of these farming communities. This needs to be done within the context of protecting the surrounding environment to ensure the long-term survival and benefit of both people and nature. One of the obstacles farmers within southwestern Vietnam encounter in trying to gain knowledge on organic farming practices is the piecemeal nature of educational content on organic farming practices in tropical flood plains. With its role in promoting sustainable development in Vietnam, this presentation will demonstrate step-by-step how RCE Southern VN built the capacity of ranchers for sustainable organic farming in the Mekong Delta, Vietnam.

Keywords: agriculture, organic farming practices, sustainable development

ESD-14-09

Aligning Circular Economy With Sustainable Development Goals (SDGs) in The Built Environment

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Abstract

The building and construction industry consumes a high proportion of raw materials, as the very process of building and construction has an impact on material use and biodiversity loss. The material consumption in this industry is only increasing, considering the volume of materials to be used in the rapid city growth regions of the world. Rather than relying on the traditional approaches to buildings and construction where virgin materials have been consumed, the emerging shift to a circular economy in the built environment heralds an opportunity to conserve natural resources, reduce waste, utilize digitalization where possible, and minimize overall impacts.

The research, undertaken as part of the ProSPER.Net project focuses on understanding circular economy concepts and principles, and the alignment between circular economy and SDGs in the built environment. The qualitative research method employed consisted of a literature review and case studies. Case studies are used to analyze the circular economy underpinning construction projects in the five selected countries (Australia, India, Kyrgyzstan, Thailand and Sri Lanka). Using the literature and case study analysis, a new understanding of circular economy principles in the life cycle of construction projects has been developed to demonstrate how various R-principles can be applied in different stages of such projects, which in turn, respond to the underpinnings of the Sustainable Development Goals (SDGs). The SDGs do not focus on the circular economy, but the principles that the SDGs and circular economy engage with are aligned. The study recommends the necessity of implementing multiple R-principles in the built environment to create more incentives/benefits for this industry. The study benefits educators, policymakers, and external and internal project stakeholders such as developers, designers, and builders to fully understand the diversity of circular economy implementation; to create and promote greater circular economy practices throughout the supply chain in the built environment sector and assist in achieving circular economy outcomes for projects whilst also meeting specific SDG indicators.

Keywords: circular economy, built environment, building and construction, sustainable development goals (SDGs), R-principles, case study

ESD-14-10

5Rs (Refuse, Reduce, Reuse, Recycle, Re-purpose) Campaign: Mechanism for Sustainable Waste Management

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Abstract
Regional Centre of Expertise (RCE) Kuching strongly believes that proper implementation of 5Rs (Refuse, Reduce, Reuse, Recycle, Repurpose) concept starts with education. in line with UNESCO's ESD for 2030 roadmap, the centre intends to address Education for Sustainable Development (ESD) through empowering learners with the knowledge on proper habits of waste management. Through this, the centre urged students who live along the Sarawak Kiri River region to be proactively involved in river conservation efforts. It has been noted that in the region, there has been a habit among the people of dumping their rubbish into the river. Often times their rubbish consists of plastic bottles and bags, as well as other items that could be reused, recycled, or repurposed. Since the 5Rs' inception, the campaign has been used as a mechanism to teach the young people in the targeted region on how they can reduce these problems through implementing the 5Rs in their schools and villages. A total of 172 students have participated in the project and it has been conducted on a monthly basis with three schools within the vicinity – SK St Bernard, SK St Paul, and SMK Siburan. The 5Rs campaign comprises of three phases which include (1) Knowing phase, (2) Doing phase, and (3) Being phase. The "Knowing" phase aims to enable the learners to understand the concept and benefits of the 5Rs (cognitive learning). The "Doing" phase aims to enable the learners to participate in 5R hands-on activities for waste management in their schools and local communities (socio-emotional learning). The "Being" phase aims to enable the learners to plan, implement, evaluate, and replicate 5R activities that contribute to efficient waste management at their homes, in their schools and local communities (behavioural learning). Hence, it is hoped that by 2030, the model of 5Rs could be replicated in other settings in order to improve water quality by reducing pollution, eliminating dumping of waste, and minimizing the release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and substantially increasing recycling and safe reuse globally in line with SDG 6.3.

Keywords: refuse, reduce, reuse, recycle, repurpose, sustainable waste management

ESD-14-11

Regional Centres of Expertise on Education for Sustainable Development (RCE)

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Abstract
Our world has been facing numerous social, environmental, and economic challenges. Education has been playing a central role in empowering people to transform their mindsets and behaviours towards achieving the global vision of sustainable development. The Regional Centre of Expertise on Education for Sustainable Development (RCE) is a unique and powerful mechanism that translates the global sustainable agenda into local actions in more than 180 regions and communities globally. The United Nations University has acknowledged RCEs since 2005, which function as a platform for multi-stakeholder partnership and collaboration to tackle complex sustainability issues in the respective localities. As an introduction to the Special RCE Session, this presentation will provide an overview of RCEs. It will introduce the concept and practices of RCEs and the development of the global network. Additionally, the role of UNU-IAS as the Global RCE Service Centre, the roadmap of the RCE community towards 2030 and the forthcoming publication on sustainable consumption and production will be presented.

Keywords: SDGs, ESD, multi-stakeholder partnerships, community-based learning and actions

RD-14-34

Bamboo Production, Rehabilitation and Processing: Sources of Food, Livelihood and Environmental Protection

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Abstract
Bamboo technologies have been developed by various institutions to address issues and concerns in the bamboo industry. Through MMSU's commitment to help the bamboo industry including the people it serves, the university developed various technologies, from bamboo propagation until processing which benefits bamboo farmers especially in the increase in income of family household.

This project development initiative aims to enhance the production and commercialization of quality bamboo poles through bamboo technologies for various clients which provides the community people a source of income thereby alleviating poverty in far flung communities.

Through this project, bamboo farmers and enthusiasts are trained on bamboo technologies. in coordination with the Local Government Units (LGU's), bamboo farmers are identified and clustered based on location and proximity. Eleven (11) municipalities of the province of Ilocos Norte are considered as project partners for this project. Out of these municipalities, depressed communities are chosen and made as project sites. Many of the natural bamboo clumps are rehabilitated and quality planting materials are produced leading to the establishment of 13 hectares of bamboo plantation and bamboo nurseries in the province. The increase in bamboo hectarage provides the community a ready source of quality bamboo poles that led to the increase income and livelihood opportunities of community people.

As a result, the project paved way in the creation of employment among community people especially for out-of-school youth. An increase in income is noted to family households as a result of marketing bamboo planting materials and bamboo poles to the consumer from the public and private sector at reasonable prices. The increase in income of bamboo farmers in Ilocos Norte is attributed to the active participation and involvement of the community people, Local Government Units support, bamboo manufacturers, and the technical experts provided by higher learning institutions.

Keywords: bamboo, bamboo technologies, bamboo farmers, livelihood opportunities, poverty alleviation

k.LAB Special Session

EM-14-55

Utilization of k.LAB Data Base Functions for Hydrological and Crop Growth Model Development

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Abstract
k.LAB is a web-based GIS platform developed by the Artificial Intelligence for Environment & Sustainability (ARIES) project of Basque Centre for Climate Change (BC3, Spain). It is a web-based GIS platform, which can be easily used for ecosystem service-based assessments by using semantics and ontology. There are three main interfaces, such as, k Explorer, ARIES-for-SEEA-Explorer, and k.Modeler. Various assessment models, carbon storage, flood control, forest management, recreational functions, sediment transport etc., have already been incorporated into k.Explorer and ARIES-SEEA-for-Explorer that are user-friendly interfaces for k.LAB equipped models. k.LAB platform has already stored various type of data sets such as weather, soil, topography, and land cover. Additionally, k.LAB automates various modeling calculation through its Artificial intelligence system, making analysis easy and fast. in this report, development and use of hydrological and crop growth models using k.LAB database functionality is introduced. for assessing water use, small hydropower generation or flood control hydro-meteorological data such as precipitation and evapotranspiration are required in addition to geographical data. in Japan, geographical data is available in the National Land Database, but obtaining data is time consuming and labor intensive. With k.LAB, the distribution of hydro-meteorological data has already been equipped into this system, which are essential for hydrological modelling. With increase in the world population, there is a necessity to assess crop production and food security. Aqua Crop Model (ACM) developed by FAO, addresses food security and the effect of environment and management on crop production The aim here is to construct a simplified) ACM by combining and utilizing various data sets already built into k.LAB, such as meteorology, NDVI, LAI etc., and build a system that allows users to operate simplified ACM in KLAB platform easily.

keywords: web-gis, semantic, hydrological model, crop growth model

EM-14-56

Introduction of a Model for Evaluating the Potential of Small Hydropower Generation in k.LAB

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Abstract
Recently, we have used smartphone and computer applications daily to find out where we are and how to get to our destination. The system that supports the digital maps on these applications is called geospatial information system (GIS). GIS can analyze spatial characteristics such as the topography, land use, weather, and natural environment of the area where you live, which can be used to create hazard maps for disaster prevention and to evaluate ecosystem services, including, carbon sequestration, biomass supply, air regulation, water regulation, cultural services.

on the other hand, GIS requires expensive software and specialist knowledge and has been used in minimal places, such as research institutions. for example, if GIS could be used with simple operations, such as internet searches on a smartphone, it would be possible to understand better the regions in which you live and create a sustainable society at the level of local government and residents.

in this side event, we will introduce a model for evaluating the potential of small hydropower on k.LAB. Small hydropower is attracting attention as a renewable energy source. Moreover, in a disaster-prone country like Japan, it is expected to have disaster prevention and resilience functions as a locally distributed energy source. This side event describes a system of small hydropower potential estimation models that can be analyzed by local governments and community members, taking advantage of the features of k.LAB.

Keywords: k.LAB, ARIES, Web-GIS, ecosystem services, small hydropower potential, crop model

EM-14-57

ARIES Customized Model for Energy and Environmental Assessment

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Abstract
ARIES (Artificial Intelligence for Environment & Sustainability) is a project of assessing environment and sustainability by using autonomous web based mapping system. ARIES is conducted as an international cooperation project with Basque Centre for Climate Change (BC3, Spain), USGS (United States Geological Survey, USA) and others. k.LAB is a web based platform including mainly, three interfaces, k.Explorer, ARIES-for-SEEA-Explorer and k.Modeler. All these k.LAB systems have already been publicly available for every body for non-profit purposes. Under this circumstances, in Japan, k.LAB Japan, as a study group, was developed by several researches and is doing model development with Japanese specific data collection to store into k.LAB system. in this presentation, model development by k.LAB Japan will be presented including crop, carbon stock and renewable energy site collection models with basic ARIES-for-SEEA- Explorer and k.Explorer demonstration. Regarding the crop model, simplified Aqua Crop Model (ACM) developed by FAO was presented. The crop model was developed both for global and Japan models separately. for Japan model 10m-grid high resolution land use and land cover map by JAXA was used for this assessment in 10m grid analysis. for the global crop model, the sets of data which have already equipped in k.LAB system with several outsource data sets were utilized. Then several parameters were set to be interactive variables for user selection. Also, several energy and environment models including carbon and renewable energy models will be presented in this special session.

Keywords: energy, environment, semantic, ARIES