



**Collaborating for Regional Food Security:
Opportunities and Challenges**

9th March 2021

Virtual Conference

BOOK OF ABSTRACTS

Organizer:



Co-organizers:





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Book of Abstracts

3rd Asia Pacific Regional Conference on Food Security

**“Collaborating for Regional Food Security:
Opportunities and Challenges”**

(ARCoFS 2021)

9th March 2021

Organizing Committee of the ARCoFS 2021

Faculty of Agro Based Industry, Universiti Malaysia Kelantan, Jeli Campus

<http://fiat.umk.edu.my>



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Official website of the ARCoFS 2021 conference:

<https://submit.confbay.com/conf/arcofs2021>

Book of Abstracts of 3rd Asia Pacific Regional Conference on Food Security (ARCoFS 2021)

Edited by Dr. Ch'ng Huck Ywih and Dr. Liew Jeng Young

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PREFACE

Welcome to the 3rd Asia Pacific Regional Conference on Food Security (ARCoFS 2021) organized by the Faculty of Agro Based Industry, Universiti Malaysia Kelantan, Jeli Campus on 9th March 2021 as a virtual conference. We would like to thank our co-organizers from Institute of Food Security and Sustainable Agriculture (Malaysia), International Institute of Plantation Management (Malaysia), Vikrama Simhapuri University (India), IPB University (Indonesia), Bangladesh Agricultural University (Bangladesh), Princess of Naradhiwas University (Thailand) for making this virtual conference a paramount and valuable event.

The ARCoFS 2021 aims to provide food security professionals in the Asia Pacific region with a platform to exchange the latest information on sustainable food production, to identify mega-trends that influence food security, and to recognize the main indicators of food insecurity and plan for proactive strategies for food security sector.

The ARCoFS 2021 will be an excellent platform and impressive experience for researchers, academicians, scientists, students, and practitioners together to participate and present the latest research findings, developments, and applications related to various aspects related to food security such as agriculture engineering, sustainable agriculture, agribusiness, animal nutrition, animal production, veterinary science, food science and technology, food safety, IT for Agriculture, climate change, environmental economics, renewable energy, and other researches.

On behalf of the organizing committee, we hope that all ARCoFS 2021 participants will have an impressive and satisfying experience during this virtual conference! Thank you.

ARCoFS 2021 Organizing Committee

**MESSAGE BY THE DEPUTY VICE CHANCELLOR OF RESEARCH & INNOVATION,
UNIVERSITI MALAYSIA KELANTAN**

Bismillahirrahmanirrahim,

Assalamualaikum Warahmatullahi Wabarakatuh
and good evening to all delegates.

First and foremost, I would like to extend a warm welcome to all the participants of the 3rd Asia Pacific Regional Conference on Food Security (ARCoFS 2021), which is held virtually this year due to pandemic Covid19. I would like to congratulate the organizer, Faculty of Agro Based Industry UMK for successfully organize this biennial event for the third time. Congratulations as well to the other 6 co-organizers for contributing towards the successful of this meaningful event for researchers.



ARCoFS 2021 is organized to provide an opportunity for all researchers to exchange latest information on sustainable food production, to identify megatrends that influence food security and to recognize the main indicators of food insecurity and plan for proactive strategies for food security sector. The four main topics highlighted in this conference include sustainable agrotechnology, food security and climate change, alternative agroproduct development, and environmental economics.

Congratulations for all research papers that have been accepted. This conference is a great venue for participants to present and discuss their recent findings related to field.

Once again, I would like to extend my sincere appreciation to everyone who has contributed to ensure the success of this event. I am confident this will be a gratifying experience for all of us. Insyallah, we'll see you again in ARCoFS 2023. Thank you.

Prof. Ts. Dr. Arham Abdullah

Deputy Vice Chancellor of Research & Innovation, Universiti Malaysia Kelantan

MESSAGE BY THE CHAIRMAN OF ARCoFS 2021

Assalamu'alaikum and welcome to the 3rd Asia Pacific Regional Conference on Food Security (ARCoFS 2021).

I would like to take this golden opportunity to welcome Prof. Dr. Nik Marzuki Bin Sidik, Dean, Faculty of Agro-Based Industry, Universiti Malaysia Kelantan, as advisor for ARCoFS 2021, respected Deputy Minister of Agriculture and Food Industries II, Malaysia, YB. Dato' Haji Che Abdullah Bin Mat Nawi who will be officiating ARCoFS 2021, keynote speaker, YBhg. Prof Datin Paduka Dr. Fatimah Binti Mohamed Arshad, plenary speakers, presenters, participants, ladies and gentlemen.



This is our first virtual conference, organized by the Faculty of Agro-Based Industry, Universiti Malaysia Kelantan. I would like to thank our Vice Chancellor YBhg. Prof Dato' Ts. Dr. Noor Azizi Bin Ismail for his support. To our co-organizers, Institute of Food Security and Sustainable Agriculture (Malaysia), International Institute of Plantation Management (Malaysia), Vikrama Simhapuri University (India), IPB University (Indonesia), Bangladesh Agricultural University (Bangladesh) and Princess of Naradhiwas University (Thailand), your commitments and contributions are highly appreciated. To our sponsors, your financial contributions have made this conference a success.

The last few months have been challenging for us, for our families, for industry, for nations and for the world due to Covid-19 pandemic. Challenges present opportunities, for a researcher, we explore our research work by providing more values for sustainable agri-food production and accelerating green innovation. Hence, the conference's theme is "Collaborating for Regional Food Security: Opportunities and Challenges," is much justified, as it reflects the urgent need to seriously address and find concrete solutions to the many issues regarding food security.



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At this conference we have gathered almost 100 participants from Malaysia and other countries in Asia Pacific such as India, Bangladesh, Indonesia, and Thailand, who will be deliberating on food security in four different scopes which are Food Security and Climate Change, Sustainable Agrotechnology, Alternative Agropduct Development and Environmental Economics.

As a chairman of the conference, I wish to record my special thanks to committee members for their tireless work to make ARCoFS2021 a resounding success. We apologize for any shortcoming.

Please enjoy the session through active participation by contributing your ideas and insight.

Thank you.

Dr. Noor Hafizoh Binti Saidan
Chairman
ARCoFS 2021

MESSAGE BY THE ADVISOR OF ARCoFS 2021

Assalamualaikum and very good day.

Dear guest of honors and delegates,

I am delighted to be given this opportunity by committee to welcome all the speakers and participants to the 3rd ARCoFS conference.

It is a little bit unfortunate that we are unable to meet physically due to pandemic. But, as we live virtually for almost a year, it should be OK by now. Everything is now online; class online, meeting online, even business is now online.



Ladies and gentleman,

This conference was created nearly 7 years ago as a platform for us to discuss anything related to food security including research, business, and management parts. I am very sure that participants will get benefits from the network that you have created.

I would like to thank our committee and co-organizers including Institute of Food Security and Sustainable Agriculture (Malaysia), International Institute of Plantation Management (Malaysia), Vikrama Simhapuri University (India), IPB University (Indonesia), Bangladesh Agricultural University (Bangladesh), Princess of Naradhiwas University (Thailand), and also to keynote speaker, invited speakers, oral and poster presenters who work very hard to make this event a success.

Thank you, terima kasih.

Prof. Dr. Nik Marzuki Bin Sidik
Advisor
ARCoFS 2021

MESSAGE BY THE OFFICIATING MINISTER

Assalamualaikum wbt. and good morning.

Distinguished Guests, Ladies and Gentlemen.
Alhamdulillah, all praises be to Allah, the Merciful,
the All Beneficent, by whose Grace and Blessings
have enabled us.

It is a great honour to be given the opportunity to
officiate the launching of the 3rd Asia Pacific
Regional Conference on Food Security (ARCoFS
2021), which is held virtually this year due to
pandemic Covid-19. The current pandemic issues
of Covid-19 does not stop us from doing research
and exchange our findings in the related topic of
food security.



My heartiest congratulations to the organizer, Faculty of Agro-based Industry, Universiti Malaysia Kelantan (UMK), and co-organizers including Institute of Food Security and Sustainable Agriculture (Malaysia), International Institute of Plantation Management (Malaysia), Vikrama Simhapuri University (India), IPB University (Indonesia), Bangladesh Agricultural University (Bangladesh) and Princess of Naradhiwas University (Thailand) for their dedication to make this conference a reality.

On behalf of Malaysia's government, I wish all conference speakers and participants a very warm welcome to the 3rd Asia Pacific Regional Conference on Food Security (ARCoFS 2021).

The ARCoFS 2021 aims to provide food security professionals in the Asia Pacific region with a platform to exchange the latest information on sustainable food production, identify megatrends that influence food security, and recognize the major food indicators insecurity and plan for proactive strategies for the food security sector. It is suitable for the four major scopes covered in this conference which are; Sustainable Agrotechnology, Food Security and Climate Change, Alternative Agroproduct Development and Environmental Economics fields.

The ARCoFS 2021 is a very useful platform to share and disseminate knowledge, create awareness, promote understanding and generate new ideas as well as opportunities for academia, researchers, entrepreneurs, policy makers, local and international experts to exchange relevant research results, innovative ideas, recent advances, as well as promote research collaborations through the plenary session and oral presentation sessions.

Distinguished Guests, Ladies and Gentlemen.

More people are becoming aware of the issues in food security nowadays, because of Covid-19. It is a global issue that causes many countries to strive in an effort to optimize natural resources. This is to ensure that the agricultural sector remains functioning as usual in supplying sufficient quality food at reasonable prices and consumers can access raw supplies at the time of movement control and loss of income sources. We need to take the opportunity of this Covid-19 crisis to increase domestic production, especially from the agricultural and food sectors. This will indirectly reduce the country's dependence on food imports and ensure the sustainability of food security.

We urgently need more producers, higher productivity per given unit, safer products for consumption and more efficient distribution. Besides, innovation, diversification and nutritional standards must be enhanced. We need to put more emphasis on the education of consumerism, especially concerning food wastage. We also need to continuously remind food growers and manufacturers to give due attention to environmental pollution and soil degradation.

I strongly believe that our collaborative efforts, as manifested in ARCoFS 2021 will bear some concrete results with strong commitment. The government of Malaysia certainly will continue to support all forms of initiatives taken by the stakeholders in food security, be it in research and development programs, technology transfer, or innovations that may lead to the strengthening of food security and minimize the threats regarding food security.

I am confident that this ARCoFS2021 will address the urgent issues at hand and significantly contribute to our understanding of food security determinants. We are



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indeed fortunate to have a distinguished list of speakers, moderators, and panelists who will provide us with the necessary information, insights, and strategies when deliberating on the conference's issues. Indeed, the conference proves beyond doubt that we can always collaborate and work towards our common goals during these very challenging times.

I wish all the organizers and participants a very successful ARCoFS 2021 and may your virtual conference be a memorable one.

With that note, I declare the 3rd Asia Pacific Regional Conference on Food Security ARCoFS 2021 open, thank you.

YB Dato' Haji Che Abdullah Bin Mat Naw
Deputy Minister of Agriculture and Food Industries II, Malaysia

ARCoFS 2021 PROGRAM SCHEDULE

9th March 2021 (Tuesday)

8:00 am – 4:00 pm (Malaysia Standard Time, GMT + 8)

Platform: Live on Official UMK Facebook

(<https://www.facebook.com/OfficialUMK>)

Time	Activities
9:00 am – 9:20 am	<ul style="list-style-type: none"> • Doa recitation • Welcoming speech by ARCoFS Chairman • Welcoming speech by ARCoFS Advisor • Opening ceremony (Officiating speech by Deputy Minister of Agriculture and Food Industries II, YB Dato' Haji Che Abdullah bin Mat Nawi)
9:20 am – 10:00 am	<ul style="list-style-type: none"> • Keynote speech by YBhg. Prof. Datin Paduka Dr. Fatimah binti Mohamed Arshad Institute of Agricultural and Food Policy Studies, Universiti Putra Malaysia (UPM), Malaysia <i>Title: Food Security During Pandemic: Opportunities and Challenges</i>
10:00 am - 3:00 pm	<p>Parallel Session 1 – Scope: Food Security and Climate Change</p> <ul style="list-style-type: none"> • Invited Speaker I: Asst. Prof. Jakkhaphan Putchayapipatkul Princess of Naradhiwas University, Thailand <i>Title: Climate change affects biodiversity and food security in livestock production</i>

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- Invited Speaker II:
Prof. Ts. Dr. Sharifudin Md Shaarani
Universiti Sains Islam Malaysia, Malaysia
Title: Trends for future food: Are we ready?

Parallel Session 2 – Scope: Sustainable Agrotechnology

- Invited Speaker I:
Prof. Dr. Ir. Suwardi M. Agr
IPB University, Indonesia
Title: Indonesian food security during the Covid-19 pandemic
- Invited Speaker II:
Prof. Dr. M. A. Rahim
Bangladesh Agricultural University, Bangladesh
Title: Sustainable Agrotechnology in Bangladesh on nutritional food security, household income, poverty reduction, biodiversity, sustainable development and environmental protection

Parallel Session 3 – Scope: Alternative Agroproduct Development

- Invited Speaker I:
Prof. Dr. Swarna Sadasivam Vepa
Vikrama Simhapuri University, India
Title: Agricultural transformation, diversification, and farm legislations in India

Parallel Session 4 – Scope: Environmental Economics

- Invited Speaker I:
Prof. Dr. Mohamad Osman
International Institute of Plantation Management (IIPM), Malaysia
Title: Food security and environmental challenges



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3:00 pm - 4:00 pm

- Closing ceremony
(Closing speech by Deputy Vice-Chancellor of Research and Innovation, Universiti Malaysia Kelantan
Prof. Ts. Dr. Arham Bin Abdullah)
- Award giving ceremony for best oral video presenter

ARCoFS 2021 ORGANIZING COMMITTEE

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Master of ceremony	<p>Mr. Mohd bin Mahmud (mohd@umk.edu.my) Mrs. Nor Dini binti Rusli (nordini@umk.edu.my)</p>
Center for Corporate Affairs UMK	<p>Mr. Mohd. Hafriez Aiman Bin Ibrahim Mr. Aiman Syazwan Bin Zainal Abidin Mrs. Noor Alizam Binti Shafi'e</p>

KEYNOTE SPEAKER

**YBhg. Prof. Datin Paduka Dr.
Fatimah binti Mohamed Arshad**

Head, Agriculture and Food Security Cluster,
Academy of Professors, Malaysia

Senior Fellow, Institute of Democratic Ideas and
Economic Ideas or IDEAS, Kuala Lumpur

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Fatimah is a research fellow at the Universiti Putra Malaysia specializing in agricultural marketing and policy analyses. She is currently a member of the country's National Agriculture Advisory Council, Ministry of Agriculture and Food Industry. She is the Head, Agriculture and Food Security Cluster, Academy of Professors, Malaysia and Senior Fellow at Institute for Democracy and Economic Affairs or IDEAS, Kuala Lumpur.

Her research areas include; agricultural marketing and economics issues, policy analyses, and agricultural market structure, conduct and performance. She has carried out various policy research studies particularly on the role of agricultural subsidies and incentives in the paddy and rice industry, farm management, food security, agricultural cooperatives, food supply chain and marketing, price analyses and forecasting and agricultural/commodity sector modelling. She has developed a vintage model for estimating oil palm production, system dynamics models on pertinent issues in agriculture such as food security, the archetypes of commodity



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sector growth (oil palm, rubber and cocoa) and modelling of the paddy and rice sector of Malaysia.

She believes that the role of the smallholders in agriculture can be further enhanced through knowledge empowerment and treading the path of collaborative commons particularly cooperatives for sustainability, equity and growth.

KEYNOTE SPEAKER

YBhg. Prof. Datin Paduka Dr. Fatimah binti Mohamed Arshad

Head, Agriculture and Food Security Cluster, Academy of Professors,
Malaysia

Senior Fellow, Institute of Democratic Ideas and Economic Ideas or
IDEAS, Kuala Lumpur

Research Fellow

Universiti Putra Malaysia

43400 UPM Serdang, Selangor, Malaysia

“Food security beyond pandemic: Towards self-reliance and sustainability”

Abstract. Food security is needed at all times, good and bad. The food sector has not progressed as fast as the industrial crops particularly oil palm despite the higher added value per ha basis of selected food commodities. As of 2020, food area accounted for only 10% of land usage but contributed about 42% of the value added while oil palm ratio is 73% (land use) and 44% (value added). Since oil palm will reach its land area ceiling of 6.5 mn ha in 2023, it is only logical for Malaysia to focus on “food first” policy in view of potential higher return, rich local resources and food security benefits. The recent pandemic has exposed the truth about the status of the food security in the country. First, food production and availability were seriously challenged (disruptive supply chain under lockdown and movement control). Second; unemployment among the poor has affected their food accessibility and affordability. Third, nutritional deficit among the poor families particularly in the urban areas, aggravated further the stunted-growth problem among children. Clearly Malaysia needs to ensure resiliency and sustainability in her food security to address future shocks. A number of policy shifts are proposed. These include; in line with “food first” policy, a higher development budget is needed for food sector development (for R&D



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and extension, food-based SMEs, start-ups and digitalization), restructuring of R&D on food among research institutions, zero food waste and recycling, urban and community farming and local input sector development (seeds, breeds, feedstock, fertiliser and machines). Other supports include: nutrition program, provision of social safety net, rural investment, early warning system, diversifying agriculture and food, and natural resource management.

INVITED SPEAKER

Asst. Prof. Jakkhaphan Putchayapipatkul

Faculty of Agriculture, Princess of Naradhiwas University,
Narathiwat 96000, Thailand

Tel: +66 887825397; E-mail: jakkhaphan.p@pnu.ac.th

“Climate change affects biodiversity and food security in livestock production”

Abstract. At the last ten year ago, the livestock production was affected from global warming and climate change. This evident were increase the high temperature, greater disease challenge and lower quality of the forage. As a consequence, it was resulting to the food security and food safety in the worldwide tropical country. Thus, the genetic resources of the indigenous topical breed animal are becoming increasingly important to animal breeding programs again. In addition, the tropical indigenous animal species were higher heat tolerance, higher resistance to insect and regional ectoparasitic diseases as well as high ability to utilize low quality forages. However, a paucity of the genetic resource of purebred tropical native animal for breeding programs in the last few decades, the numbers of the indigenous tropical animal breeds have declined steeply and more than 20% of this indigenous animal breed (cattle, goat, etc.) undergoing risk to extinctions. Thus, an urgency to preservation of purebred tropical animal species for keeping high genetic valuable before they extinction in future. In fact, the preserving live animals permits further evolution of breeds; however, in many cases, in situ conservation strategies are not practical or adequate. Therefore, an establishing genetic resource banks to conserve the current genetic status would provide a crucial interface between ex situ and in situ conservation. Hence, the cryopreservation of female gametes or oocytes was applied for the genetic conservation of the indigenous female

animal. However, the complex structure and sensitivity to chilling is the challenging of the oocyte cryopreservation. Actually, the slow freezing method were used for embryo and oocyte cryopreservation. Nevertheless, it still lower of the post-warming oocyte development because of it leads to intracellular ice crystallization and cell oocyte damage during freezing. Then, the vitrification method has been developed for oocyte cryopreservation and the post-warming oocyte were obtained from vitrification was showed higher development than slow freezing method. In conclusion, the effect of climate change and global warming to livestock production can preventing by breeding of higher heat tolerance and higher adaptation of farm animal breed. The vitrification cryopreservation of oocytes was effectiveness for establishing cryobanking to conserve of rick extinctions the tropical indigenous female animal species by ex situ conservation for livestock breeding program, in order to the food security in the future.

INVITED SPEAKER

Prof. Ts. Dr. Sharifudin Md Shaarani

Director

Research Management Innovation Centre

Universiti Sains Islam Malaysia

Email: sharifudinms@usim.edu.my

“Trends for future food: Are we ready?”

Abstract. Climate change has been known as a threat to food security. Although livestock production helps to overcome some of the food security issues but it contributes to the highest greenhouse gases. It is also the most challenging because it requires large land areas, water, energy and produces waste. Animal agriculture plays a problematic role in the negative effect of climate change. Hence the characteristic trends for future food is emphasizing on healthy, convenience, natural or organic, pleasure and sustainable. This paper is a review on the future food trends and how it will dictate the food production in future. For example, 3D food printing technology, micro-flora-based food, plant-based protein, cultured meat, and algae is being introduced and discussed briefly. Trends for future food is emphasizing on reducing significant environmental and climate impacts caused by animal agriculture.

INVITED SPEAKER

Prof. Dr. Ir. Suwardi M. Agr

Department of Soil and Land Resources, Faculty of Agriculture, IPB
University
Jl. Meranti, Dramaga Campus of IPB, Bogor-Indonesia
Email: suwardi-soil@apps.ipb.ac.id

“Indonesian food security during the Covid-19 pandemic”

Abstract. The World Food Organization (FAO) has warned of a potential food crisis during the Coronavirus Disease 2019 (Covid-19) pandemic. In response to this problem, the Indonesian government has implemented various strategies to maintain food security in order to avoid a food crisis. Even though the national food stock is still considered safe, anticipation needs to be done for maintaining food security. Efforts have been made in the form of increasing food security at the household, local, and national levels. At the household level, the movement of homestead land use in villages with integrated farming and urban areas with urban farming has helped to increase food security. At the local level, local food development movements such as maize, cassava, sago, and tubers were carried out to reduce dependence on food supplies from other areas that were disrupted by distribution during the Covid-19 pandemic. At the national level, the government continues to develop food security through the development of Food Estate in Kalimantan and Sumatra. The strategy for achieving food security is carried out through massive short-, medium- and long-term movements. The impact of Covid-19 is not only on food security but also on community innovation and creations.

INVITED SPEAKER

Prof. Dr. M. A. Rahim

Faculty of Agriculture, Bangladesh Agricultural University (BAU),
Bangladesh

Email: marahim1956@bau.edu.bd

“Sustainable Agrotechnology in Bangladesh on nutritional food security, household income, poverty reduction, biodiversity, sustainable development and environmental protection”

Abstract. Bangladesh is an agrarian country. Almost 80% peoples lies in rural areas and depending on agriculture. Population of Bangladesh increasing day by day but cultivable land is decreasing day by day. Therefore, nutritionally rich high value horticultural crops demand is increasing. Although Bangladesh is self-sufficient in cereal foods but about 40m peoples are suffering from malnutrition i.e. deficient in vitamins and minerals. Sustainable Agro technology applied in crops are now enriching the nutrition, house hold food security, household income. Moreover, horticultural production create employment, poverty reduction, and protecting the environmental disaster. About 20% women are involved in agricultural production. Through modern agaric-technology in the 24 m homestead enrich the nutritional foods, sustainable income, round the year production, women participation etc. Income from horticultural production yielded about 5-6 fold income than agronomical crops. Horticultural crops also act as windbreak in the rural villages/houses and as shelter belt in coastal areas of Bangladesh. Evergreen horticultural plants sink lots of CO₂ and releases lots of oxygen consequently clean environment.

INVITED SPEAKER

Prof. Dr. Swarna Sadasivam Vepa

Vikrama Simhapuri University, India

Email: svepa@mse.ac.in

“Agricultural transformation, diversification, and farm legislations in India”

Abstract. Agricultural Transformation, diversification, and farm legislations in India Swarna Sadasivam Vepa Farming is in trouble in many countries, both the rich and not so rich and poor countries, for a variety of reasons. In this context the three recent farm reform bills of India are widely debated in India and abroad. The purpose of the paper is not to go into the constitutional legalities of the bills, or the logic of reforms. The purpose is to analyze the implications of the bills together on the Indian economy as of today, future of farming and food security of India in the context of international trade scenario. A close look at the Indian situation highlights the following points. Sustainable agricultural growth and diversification is the key to poverty alleviation and food security in India. Minimum support price to staples is a must in India to protect farmers and consumers from International price volatility. Present legislations promote trade outside all markets (Regulated markets or mandies, commodity exchanges and E-NAM) without accountability and it is a regressive step. MSP for staples is the only meaningful support that farmers get in India compared to the massive support that farmers receive in the world, to protect food sovereignty. Food security at the national level and Individual level is important and this is possible only with agricultural diversification and productivity growth that drives rural and semi urban Indian economy. The farm reforms do not guarantee any inflow of investment into agricultural diversification and productivity growth.

INVITED SPEAKER

Prof. Dr. Mohamad bin Osman

Senior Fellow, Atri Advisory, Kuala Lumpur

International Institute of Plantation Management (IIPM), Malaysia

Email: mbopar2004@yahoo.com

“Food security and environmental challenges”

Abstract, The Covid-19 pandemic has caused such an unimaginable toll on human lives and suffering. Every economic sector would not be spared from its raging impacts across sectors ranging from tourism and hospitality, aviation and logistics, oil and gas to agriculture. In 2014, agriculture accounted for one-third of global gross domestic product, and 60% of the people in the world depend on agriculture for their livelihoods. Food security is a concern in Malaysia as it is everywhere. Indeed, food security ranks second among the 17 Sustainable Development Goals. By 2050, will Malaysia likely face a food crisis? We may be able to produce food locally at high self-sufficiency levels, but that does not mean the country has attained the desired food security status. In 2020, Malaysia’s ranking dropped from 28th to 43rd position. Statistics indicate that the country’s food import bill has risen by 6.5% per year, increasing from RM30b in 2010 to RM50b in 2018. Across all imports, RM20b or 40% were in the form of processed food. We have only 8% of arable land, and it would be a daunting task to enhance our food security. Through National Agro-Food Policy introduced in 2010, the focus is now on improving the efficiency of the agro-food value chain. Smallholders are the major players for key crops such as rice, fruits and vegetables. The use of modern technologies and agricultural practices are critical to reduce the value of national agriculture deficit of RM18.8 billion. With regard to environmental challenges, many still do not realise, or are not yet made to be aware of that the world is currently facing serious environmental challenges. Climate change and biodiversity collapse represent a double crisis for our world. Many of these impacts are already felt at the current level of warming, which is about 1.2 °C increase in temperature. Even small changes in temperature and rainfall can result in lower productivity and crop yields. Three decades have passed since the Earth Summit, but



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we are still not any closer to meeting the objectives. Natural habitats continue to disappear, vast numbers of species remain threatened by extinction from human activities, and RM2 trillion of environmentally damaging government subsidies have not been eliminated. Undoubtedly, the acceleration in climate change and biodiversity loss will have unprecedented impacts on global food security.

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005-001

Scope: Food Security and Climate Change

The involvement of young entrepreneurs in halal food products in Kelantan

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Abstract. Young people are the future of every nation and an essential asset to the economics of country development. Currently, young entrepreneurs' involvement in the halal food industry is increased due to Malaysia government policy providing incentives, continuing supports, and various strategies or programs to develop young entrepreneurs. The purposes of this research paper are to determine the level of involvement among young entrepreneurs towards halal labels and to investigate the relationship between attitude, social norms, and perceived behavior control and the involvement of young entrepreneurs in the halal food product in Kelantan. In this research, a survey was conducted, and the questionnaire was distributed using purposive sampling toward 40 entrepreneurs aged between 15 to 30 years old in halal food products in Kelantan. The data collected were then analyzed using descriptive analysis, normality test, and Pearson correlation analysis. The study found that young entrepreneurs' high involvement level and a significant relationship between social norms and perceived behavior towards involvement in halal food product labeling in Kelantan.

023-002

Scope: Food Security and Climate Change

Correlation of phenotype components with yield of promising Tungro resistant superior rice lines

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Abstract. The assembly of new high-yield and disease-resistant rice varieties is one of the efforts to increase the rice production and productivity in Indonesia. New site-specific varieties that match farmer preferences are targeted for plant breeding. The yield test is one of the activities in plant breeding to identify any promising lines that have adaptability to a specific growing environment. The purpose of this study was to determine the correlation of the phenotypic components with the yield of the promising superior rice lines which have high yield potential and are resistant to tungro disease. The research was conducted in the tungro endemic area of Lanrang South Sulawesi during the rainy season (MH) December 2017 to March 2018. A total of 20 rice slaves were arranged in an augmented design consisting of 4 blocks, each block there were 5 test lines and 2 comparison varieties namely Ciherang and Inpari 7 Lanrang. The components observed included plant height, flowering age, number of panicles, number of filled grains per panicle, number of empty grains per panicle, 1000 grain weight, and yield weight per hectare, clump shape and level of lodging. The results showed that the yields of 10 lines were higher than one or both comparators, namely BP11224F, BP12280-4F-7, BP57964F, BP11206F, BP12280-4F-4, BP12280-3F-16, BP12280-3F-2, BP122803F5, BP11208F-7, and BP12280-3f-13. The value of $R = 0.557$, which means that there is a strong correlation between the components of growth and the level of yield. The value of $R^2 = 0.310$ indicates that the ability of the six growth components were observed affects the rice yield by 31% and there are still 69% other components that affect the yield.

034-004

Scope: Food Security and Climate Change

Impact of climate change on food security of rice in Malaysia: An empirical investigation

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Abstract. The assembly of new high-yield and disease-resistant rice varieties is one of the efforts to increase the rice production and productivity in Indonesia. New site-specific varieties that match farmer preferences are targeted for plant breeding. The yield test is one of the activities in plant breeding to identify any promising lines that have adaptability to a specific growing environment. The purpose of this study was to determine the correlation of the phenotypic components with the yield of the promising superior rice lines which have high yield potential and are resistant to tungro disease. The research was conducted in the tungro endemic area of Lanrang South Sulawesi during the rainy season (MH) December 2017 to March 2018. A total of 20 rice slaves were arranged in an augmented design consisting of 4 blocks, each block there were 5 test lines and 2 comparison varieties namely Ciherang and Inpari 7 Lanrang. The components observed included plant height, flowering age, number of panicles, number of filled grains per panicle, number of empty grains per panicle, 1000 grain weight, and yield weight per hectare, clump shape and level of lodging. The results showed that the yields of 10 lines were higher than one or both comparators, namely BP11224F, BP12280-4F-7, BP57964F, BP11206F, BP12280-4F-4, BP12280-3F-16, BP12280-3F-2, BP122803F5, BP11208F-7, and BP12280-3f-13. The value of $R = 0.557$, which means that there is a strong correlation between the components of growth and the level of yield. The value of $R^2 = 0.310$ indicates that the ability of the six growth components were observed affects the rice yield by 31% and there are still 69% other components that affect the yield.

034-005

Scope: Food Security and Climate Change

Analysis of food security in Southeast Asia countries

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Abstract. The present study aims to investigate the determinants of food security in nine developing and least-developed countries of Southeast Asia. By adopting fixed effects model of panel regression with interaction terms, using yearly data (2006-2016), the results showed that all explanatory variables are significant, except agriculture land and Foreign Direct Investment (FDI). Employment in agriculture, Consumer Price Index (CPI), and Real Gross Domestic Product (RGDP) positively affect food production. Meanwhile, CO₂ emission and gross fixed capital negatively related to food production. The study also found that employment in agriculture gives negative impact on food production when it interacts with CO₂ emission and agriculture land. When RGDP interacts with CPI, it also contributes negatively to food production. However, gross fixed capital has a positive and significant relationship with food production when it interacts with CO₂ emission. The findings postulate the importance of appropriate policies and innovative programs for agriculture sector to boost food production as well as to hamper food insecurity in Southeast Asia countries.

017-007

Scope: Food Security and Climate Change

Multi-criteria decision approach with stakeholders for food waste management

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Abstract. The activities related to agri-food production and the disposal of its waste account for a large number of greenhouse gas emissions. In many cases, food waste (FW) management is established by making a single assessment for its sustainability based on economical or environmental impacts. However, social impact assessments on stakeholders are often incomplete or missing, and its efficiency is seldom measured. Decision-making in waste management strategies, such as the acquisition of appropriate waste treatment sites or methods used, frequently involves multiple stakeholders such as government, municipalities, industries, experts, or public sectors. Due to the complication of differing criteria and alternatives in FW management technology, a multi-criteria decision-making (MCDM) methodology is recommended to certify the quality of the decision-making process. This paper reviews the use of MCDM as decision supporting techniques in modelling and analysing decision making in situations with multiple stakeholders for FW management. The synthesis results obtained through the MCDM tool will be more reliable when requesting confirmation from stakeholders based on a recommended minimum range of criteria for each sustainability dimension in the FW issues. Finally, potential studies in this area have been proposed.

063-016

Scope: Food Security and Climate Change

The distribution of *Corbicula fluminea* (Muller, 1774) and its outer shell colour in Sabah and Sarawak

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Abstract. *Corbicula fluminea* is one of the freshwater bivalves, which is small in size and lives in the river or at the bottom of the lake all over Malaysia including Sabah and Sarawak. *Corbicula fluminea* comes in different outer shell colour for different sites. The differences in outer shell colour are believed to be due to substrates composition, and land uses. Thus, to determine the distribution of *Corbicula fluminea* in Sabah and Sarawak and to determine the influence of river substrates and land uses on the outer shell colour of *Corbicula fluminea*, a survey was conducted in the selected area involving Sabah and Sarawak. The method utilized was by obtaining information from the villagers through informal conversational interview, observations, and followed by collecting the samples at the river using a special tool. The coordinate of each place where the sample was taken was recorded using the Garmin model GPSmap 62. Meanwhile, the digital calliper was used to measure shell height (H) and length (L). Statistical analysis of the chi-square test has been used to determine the relationship between the considered categorical variables in this study. Results indicate that the state of Sarawak has an irrigation canal that provides irrigation to the paddy field and one river, namely Sarawak Kanan River, which contains *C. fluminea*. As for Sabah, *C. fluminea* was found in 2 irrigation canals that also provide irrigation to paddy fields and 2 rivers, namely Tempasok River in Kota Belud and Kinarut River in Papar. Meanwhile, from the chi-square test result clearly shows that the outer shell colour of the *C. fluminea* depends on the type of substrate and landuse but not influenced by the location neither by zone nor the area such as urban, suburban or rural at the significant level of 0.05. This data is expected to be used by the authorities responsible for finding the conservation and restoration methods to ensure that *C. fluminea* does not disappear from the state of Sabah and Sarawak. This study could also help to ensure that the source of income for traditional fishermen who depend on *C. fluminea* is not affected.

060-018

Scope: Food Security and Climate Change

Screening of Indonesian rice cultivars against bacterial leaf blight disease under acidic soil condition

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Abstract. Marginal lands, which often have poor soil, are largely found in North Sumatra, Indonesia. Acidic soil, one of marginal lands, become an obstacle for agriculture including rice growing. Additionally, bacterial leaf blight disease which is caused by *Xanthomonas oryzae* pv *oryzae*, is also the main problem for rice production in Indonesia and worldwide. This study was aimed to screen rice cultivars that were tolerant to acidic soils and showed resistance to bacterial leaf blight (*X. oryzae* pv. *oryzae*). This research was conducted at the Screen house in Faculty of Agriculture, Universitas Sumatera Utara from July to November 2020. This experiment was designed as factorial Randomized Block Design (RBD) by 3 factors, i.e. Factor 1: rice cultivars (Inpari 30, Inpara 5, Inpago 9 and Inpago Unsoed 1); Factor 2: soil pH (control (pH 6.8) and pH 4.0); Factor 3: isolate of *X. oryzae* pv *oryzae* (Xoo 1) with three replications. The results showed that all cultivars grown in acidic soil were susceptible to bacterial leaf blight diseases, while all cultivars grown in control soil pH were moderately susceptible. Disease incidence for all cultivars were 100% starting from the fifth week after planting. Plant growth in acidic soil was affected more severely than that of on neutral soil, while the highest disease severity was 75 % (Inpari 30).

019-021

Scope: Food Security and Climate Change

Microplastics occurrence in the commercial Southeast Asian seafood and its impact on food safety and security: A review

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Abstract. Microplastics are plastic particle with size less than 5 mm and omnipresent in the aquatic environment. The occurrence of microplastics in marine environments has been reported in many studies and recently extended to the freshwater ecosystem. To date, the increasing incidence of microplastic ingestion by various edible aquatic species has raised concern about its potential impact on food safety, food security, and human health. Therefore, this paper overviews the current knowledge on the occurrence of microplastics in edible fish and shellfish in the Southeast Asian region. The review also discussed the research findings on the adverse effects of contaminated seafood with microplastics to human health.

121-031

Scope: Food Security and Climate Change

Agro-morphological response of rice (*Oryza sativa* L.) (cv MR 284) to chronic gamma irradiation

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Abstract. An experiment to study the effect of cobalt 60 gamma irradiation on agronomic traits of Malaysian rice variety, MR284, was performed by using randomized complete block design (RCBD) with three replications in Gamma Green House (GGH) located at Malaysia Nuclear Agency. The GGH facility can produce a low dose rate of chronic gamma-ray which causes less damage to the plant cell and eliminate undesirable traits as well as produce wide mutation spectrum. Seedlings in pots at the age of 14 days were exposed to gamma rayS in GGH at different dose rate from 0.03 Gy/hour to 0.66 Gy/hour for 77 days (flowering stage). Data on survival rate and growth performance such as plant height and tiller number were recorded every 7th day. The result showed that, chronically irradiated MR284 plant exhibited various significant responses of agronomic characteristic against different doses of chronic gamma irradiation. Based on the survival curve, growth reduction (GD50) for MR284 was recoded at 318.63 Gy based on filled grain per plant trait. At cumulative doses of 68.87 Gy and 167.25 Gy (0.07 and 0.17 Gy/hour, respectively), the rice seedlings demonstrated the highest plant height with maximum tillering and highest number of filled grains. Those rates are stimulating to the growth and development of the plants. This study helps explicate the dose-response on local rice varieties through chronic radiation in a Gamma Green House facility in Malaysia.

030-097

Scope: Food Security and Climate Change

Hybrid treatment of Black Soldier Fly larvae (*Hermetia illucens*) as a sustainable and efficient protein source in poultry diets

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Abstract. The purpose of this study was to investigate the potential of BSFL meal protein hydrolysate as a sustainable alternative source of protein in poultry diets. Protein hydrolysis of BSFL meal was carried out by using sodium chloride (NaCl), potassium chloride (KCl), and Thermostable Alkaline Protease enzyme (TAPzyme) under mild conditions: moderate temperature of 50 °C and pH 9. A total of 8 treatments: 10% NaCl (T1); 10% KCl (T2); 10% TAPzyme (T3); 20% TAPzyme (T4); 10% NaCl and 10% TAPzyme (T5); 10% NaCl and 20% TAPzyme (T6); 10% KCl and 10% TAPzyme (T7); and, 10% KCl and 20% TAPzyme (T8) were performed to determine protein hydrolysate concentration (µg/mL), and percentage of protein concentration decreased (%) at the end of this research. The hybrid treatment, i.e., Treatment 6 (10% NaCl and 20% TAPzyme), had the lowest protein concentration and highest protein concentration decreased at 280.782 µg/mL and 49.20%, respectively. This result shows that salt and protease's synergistic effect managed to hydrolyse BSFL protein into smaller peptides efficiently than salt and protease alone.

148-059

Scope: Food Security and Climate Change

Factors influencing the adoption of innovation in beef cattle farming: A study in Peninsular Malaysia

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Abstract. Beef cattle plays a role as a protein source to the population of a country. However, the current demand for beef is greater than its supply making it a hot issue in food security. Moreover, the price of local beef per kilogram is higher than imported beef. The use of innovations such as artificial insemination, biosecurity and integration techniques is yet to be applied by beef cattle farmers although empirically proven to improve beef production. This situation has become more critical among beef producers in Malaysia. This study was conducted on 233 beef cattle farmers at four states of Peninsular Malaysia including Kedah, Kelantan, Selangor and Johor. Ordinal logistic regression was employed to analyse the influencing factors for adopting innovation in beef cattle farming. The result demonstrated that farmer-to-farmer extension, level of education, number of cattle, value of a business and access to information were statistically significant at 0.1, 0.01 and 0.05. However, age, experience and government extension showed an insignificant relationship with the adoption of innovation. Based on the findings, it can be concluded that farmers are still interested in adopting innovation; however, some limitations were found to drive them away from it. Hence, the collaboration among all parties is a must to ensure the success of this sector and achieve a self-sufficiency level for the Malaysian population.

148-059

Scope: Food Security and Climate Change

Influence of parity and live weight on the concentration of Pregnancy-Specific Protein B (PSPB) in Kedah-Kelantan (KK) cattle

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Abstract. The pregnancy-specific protein B (PSPB) is the protein of binucleated cells in the ruminant's placenta. It contains several antigenic variants, which contributed to the ability to detect pregnancy from day 20 of pregnancy until parturition. In this research, the main objective is to determine the concentration of PSPB in serum and urine and their relation to Kedah-Kelantan (KK) cattle's parity and live weight. Ten cattle (n=10) were selected for this study. The blood serum (2 ml) and urine samples were collected at days 0, 24, 42, and 164 post artificial insemination (AI). All the samples were centrifuged at 3000 rpm for 15 minutes at 4°C. The serum and urine were analyzed with competitive ELISA test kit and read at 450 nm wavelength speed. The standard OD value provided by the kit created the equation to calculate the concentration of PSPB in the serum and blood. Then, the correlation and multiple linear regression of parity and live weight were analyzed with a significant level of $P < 0.01$. Through the finding, the live weight and parity were positive correlate with PSPB in serum. The relationship between live weight and PSPB concentration in urine showed a negative correlation but there no correlation between parity and PSPB concentration in urine. The regression analysis result was 35% and 36% for PSPB concentration in serum and urine, respectively. This study suggests that cattle parity and live weight did not significantly affect the PSPB concentration.

081-110

Scope: Food Security and Climate Change

Effects of pretreating in vitro matured of native Thai cattle oocyte with docetaxel before vitrification on their viability

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Abstract. The present study was to investigate the efficacy of docetaxel (DT) at reducing microtubule damage during vitrification and maintaining the developmental competence of vitrified-warmed oocytes in native Thai cattle. Native Thai cattle cow oocyte from ultrasound-guided transvaginal follicular aspiration (UTFA) were subjected to in vitro maturation (IVM). Then, the IVM oocytes were pretreating with DT in various concentration (0.0, 1.0, 2.0 and 3.0 μ M) and subjected to cryopreservation by Cryotop vitrification method. The survival rate of vitrified-warmed oocyte, cleavage and blastocyst formation rate after in vitro fertilization (IVF), and blastocyst nucleic cell numbers were evaluated in this study. Pretreatment of IVM native Thai cattle oocytes with 0.05 μ M DT before vitrification resulted in significantly higher ($P < 0.05$) rates of oocyte survival and cleavage after IVF, and subsequent blastocyst formation on Days 7-8, hatching and hatched on Days 8-9, compared with oocytes pretreated with 0.5 and 1.0 μ M DT before vitrification or those vitrified and the control group. Pretreatment of IVM native Thai cattle oocytes with 0.05, 0.5 and 1.0 μ M DT before vitrification without side effects on blastocyst nucleic cell numbers. In summary, pretreatment of IVM native Thai cattle oocytes with 0.05 μ M DT before vitrification improved survival of vitrified-warmed oocytes, fertilization and developmental competence.

013-045

Scope: Food Security and Climate Change

An exploration of the key factors affecting consumer buying behaviour of instant food products: A case study of Kota Bharu

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Abstract. With modernization and lifestyle changes, instant food emerges as a fast-growing food product in the food industry worldwide, and Malaysia makes no exception. Most people like to eat food that can be prepared quickly, thereby saving time and energy. Instant food satisfies the convenience seekers' demand since it is a convenient food that requires minimal preparation before consumption. To dominate the competitive handicap in the marketplace, marketers must have a good grasp on consumer behaviour and preferences that prevail buying decisions. However, information on what constitutes buying behaviour of consumers from Kota Bharu, Kelantan towards instant food products is relatively limited. In this context, a survey study is presented to explore the key factors affecting consumer buying behaviour of instant food products in Kota Bharu. The questionnaire validated by the Cronbach's Alpha test had been distributed to 384 Kota Bharu respondents who were sampled by convenience sampling. Demographic characteristics of respondents are summarized by the descriptive analysis. Exploratory factor analysis unveiled eight underlying factors prompting consumers to buy instant food products. These eight factors accounted for around three-fifths of the total variance explained. It was found that the factor "marketing and branding attributes" had the most decisive influence on consumers.

134-044

Scope: Food Security and Climate Change

Livestock shortage amidst COVID-19: A Case of Brunei Darussalam

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Abstract. The Covid-19 pandemic has increased food security risks in many parts of the world due to strict quarantine measures and lockdowns which have affected all stages of food supply chains. Brunei is not an exception. Prior to the pandemic, the poultry sub sector has performed better than others in the agriculture sector and was reportedly able to meet close to 100% of local demand for eggs and chicken. However there have been shortages of meat products such as chicken, lamb and processed meat in Brunei amidst the pandemic. This paper aims to review the contributing factors of these shortages. Some of the factors identified were increased of demand, cost of logistics, and cost of feed and unstable weather caused by climate change. The government has a big task ahead in not only resolving the immediate shortages but also to manage future risks. Farmers and local livestock producers require greater policy support in order to boost local production and effectively address obstacles along the supply chain in a coordinated manner. Local livestock producers must also continuously improve their competitiveness by learning and adopting new technologies in the field of agriculture not just to meet current demands but also for time to come.

138-043

Scope: Food Security and Climate Change

Poverty of Malaysian rice farmers in a changing climate: An empirical investigation in Kedah, Malaysia

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Abstract. This research aims to assess the economic impact of climate change on the poverty of rice farmers in Kedah. A personal interview was conducted in a sample of 400 farm households in Kedah, Malaysia. To achieve the goal of the analysis, a logit model was used. The findings indicate that education and non-farm have major positive effect on the probability of being poor for the rice farmers. For Malaysian policymakers, the evidence from this study may be useful in promoting greater preventive measures during the key and off-seasons to counteract climate instability and vulnerability.

015-113

Scope: Food Security and Climate Change

Effect of soaking time and fermentation on the nutrient and antinutrients composition of *Canavalia ensiformis* (Kacang Koro)

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Abstract. The increasing demand in developing countries for alternative protein sources, coupled with the relatively high cost of importing protein, has led to the search for alternatives, particularly for novel legumes native to the tropics. *Canavalia ensiformis* or Jack Bean (Kacang Koro) could provide adequate protein sources for human consumption if the presence of various antinutrients can be reduced. The most cost-effective processing technique for the detoxifying method is the soaking process. Therefore, the aim of this study was to determine the effect on the nutritional, antinutritional and mineral content of *C. ensiformis* of soaking time and fermentation. The samples were treated by soaking in 1% sodium bicarbonates (NaHCO₃) solutions for 12 h, 24 h and 36 h (at chilled temperature, 10°C) and fermented (40°C). The treated samples were analysed for their proximate values and antinutrient factors (hydrogen cyanide (HCN), phytic acid, tannin, saponin and oxalate content). The results showed that proximate values were not significantly affected by soaking treatment and fermentation. After 36 h of soaking in 1% of NaHCO₃ solution, the HCN level in *C. ensiformis* and fermentation process, the HCN level to be reduced to 7.43 ± 0.76 mg/kg while phytic acid was reduced to 0.64 ± 0.00 , saponin to 1.27 ± 0.01 , tannins to 0.01 ± 0.001 and oxalate to 39.96 ± 5.85 . These results suggest good prospects for substituting *C. ensiformis* for any existing protein source as the antinutrient factors could be reduced to an acceptable level. The soaking of *C. ensiformis* in 1% NaHCO₃ coupled with fermentation would also allow the use of *C. ensiformis* in food production.

046-095

Scope: Food Security and Climate Change

Levels of trace metals in edible fish species of Permanent Forest Reserve (PFR), Merapoh, Pahang: A threat to Batek tribe

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Abstract. Monitoring metals in fish can give concise information on the water quality status than only monitoring of sediments and water column. The evaluation of metals in the fish can be used as an indicator to know the metals transfer to the human body through fish consumption. This study was carried out to evaluate the distributions of metals elements (Ni, Cu, Zn, and Cd) in fish species *Cyclocheilichthys apogon*, *Rasbora elegans*, and *Barbodes lateristriga* sampled from two rivers in Permanent Forest Reserve, Merapoh, Pahang. Metal elements were analysed using atomic absorption spectrometry and consumption rates advisory were estimated to assess the safety of fish consumption within Batek tribe were estimated. In risk and safety assessment, the metal concentrations in the edible muscles of fish samples were found to be below the established limits (Malaysian Food Act, 1983), except for Zn and As. However, target hazard quotient (THQ) values suggested avoiding consumption of *C. apogon* from Sungai Jalang and Sungai Kalong to reduce the potential risk to Batek tribe as the values of arsenic and cadmium approached unity. It is suggested that Cd and As are the best describers in characterising the potential of *C. apogon* as a bioindicators of metal pollution in aquatic ecosystem.

112-028

Scope: Food Security and Climate Change

Consumers' purchase decision based on intrinsic and extrinsic factors related to food safety issues: A review

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Abstract. Food Safety issues have been arising around the world and have led to many adversarial effects to consumers. Purchasing decisions has become more complex as it is impacted by many intrinsic and extrinsic factors that triggered changes in consumers' behaviour. Few reviews have been conducted on the intrinsic and extrinsic factors related to food safety on consumers' purchasing decisions. According to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA Statement) procedure and Web of Science (WoS) as the main database, 25 related studies were identified. Furthermore, these articles resulted with two main types of consumers' purchasing decisions that lead towards consumer satisfaction which are willingness-to-pay and purchasing intention. These two themes were further analysed to identify food safety factors which produce several intrinsic and extrinsic factors including consumers' characteristics, role of media, product characteristic, credence attributes and supply chain actors. Several recommendations are suggested for future in qualitative and quantitative studies, to produce a standard methodology for review in research synthesis in the context of consumers' purchasing decision and food safety such as tracking of citation and reference searching techniques.

143-052

Scope: Food Security and Climate Change

Meat and meat-based products: Challenges and opportunities in halal food security

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Abstract. The demand for halal meat and meat-based products among the Muslim population in Malaysia has been increasing as meat is an essential food. Meanwhile, the non-Muslims are also becoming aware of the quality of halal meat, hence the access towards halal meat and meat-based products are increasing as well. However, the local production of halal meat is insufficient to cater the demand and this leads to the dependency on imported meat to ensure that halal meat is made available and accessible to the society in Malaysia. This paper discusses the challenges and opportunities of halal meat and meat-based products for the sustainability of the halal food security in Malaysia. Document searching technique based on the available literature was used to fulfil the objectives of the study. The study found that the complex halal meat chain with several government agencies concerning halal matters lead to the inefficient treatment of maintaining the halal integrity. For this reason, focusing on the viable opportunities to increase the local meat production is significant in ensuring that the supply of meat is sufficient and halal tayyibban.

037-053

Scope: Food Security and Climate Change

Fatty acid profile of meat goats fed pre-treated oil palm frond

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Abstract. The main factor affecting the fatty acid (FA) profile of ruminant-derived products is diet composition. In order to determine the effect of pre-treated oil palm frond (OPF) on FA profiles of muscle tissues and subcutaneous fat, twenty crossbred male Boer goats were used for the animal feed trial. Five treatment diets were dietary control consisted of Napier grass (CON); Napier grass with non-treated OPF (NON); Napier grass and physically pre-treated OPF (PHY); Napier grass and biologically pre-treated OPF (BIO) and Napier grass and combined pre-treated OPF (COM). All groups were supplemented with 30% commercial goat pellet. The animals were slaughtered for sampling meat tissues after 130 days of feeding. The saturated fatty acid (SFA) (% of the total in FA) the longissimus dorsi muscle and subcutaneous fat of the CON group were significantly ($p < 0.05$) higher than the pre-treated OPF groups, but no significant difference in biceps femoris muscle. In biceps femoris, stearic acid (C18:0) was higher in CON and NON groups than PHY, BIO and COM ($p < 0.001$). In longissimus dorsi, C18:0 was found higher in NON ($p < 0.05$), while in subcutaneous fat, C16:0 was found higher in CON and NON groups. For UFA, biceps femoris, longissimus dorsi and subcutaneous fat had higher UFA in BIO and COM groups ($p < 0.05$). In addition, biological and combination pretreatments of OPF increased the PUFA: SFA ratio significantly compared with CON, NON and PHY groups ($p < 0.05$). This finding suggested that biological pretreatment with enzyme extract from *Ganoderma lucidum* effectively enhances the nutritional value of OPF promoting the UFA in meat.

104-078

Scope: Food Security and Climate Change

Effects of substituting *Leucaena* (*Leucaena leucocephala*) as roughage source on digestibility, blood metabolites and ruminal fermentation in growing goat

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Abstract. This study aimed to assess the effects of three levels of inclusion (0, 50, and 100%) of *Leucaena* (*Leucaena leucocephala*) as roughage sources on growing goats. Feed nutrient digestibility, blood urea nitrogen (BUN), blood glucose (BG), and ammonia nitrogen concentration (NH₃-N) of goats were measured. The results showed that the control and the 50% *Leucaena* in roughage groups had higher DM, OM, NDF, and ADF digestibility than the 100% *Leucaena* group. The digestibility of CP in goats fed with 50 and 100% of *Leucaena* in roughage was significantly ($P < 0.05$) higher than goats in the control group. The values of pH, NH₃-N, and BG of all treatments were not significantly different. The ruminal NH₃-N concentration did not change with different proportions of *Leucaena* leaf, ranged between 24.98-26.52 mg/dL. The BUN and BG concentrations in this trial were within the physiological range of goats. Results of this study concluded that substitution of grass by *Leucaena* up to 50% enhanced DM, CP and fiber digestibility but total substitution reduced nutrient digestibility (except CP). However, substitution at both levels did not affect blood metabolites and ruminal fermentation of growing goat.

153-090

Scope: Food Security and Climate Change

Technology acceptance and service convenience on repeat purchase decision of food delivery business in Thailand

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Abstract. The purpose of this research is to explore the impact of technology acceptance and service convenience on the repeat purchase decisions of the food delivery business. Data were collected from consumers 400 using food ordering services through mobile application in Thailand. Questionnaires were used as data collecting tool. Descriptive Statistic, Multiple Correlation Analysis and multiple regression analysis were applied to analyze data. The results show that consumers who use food delivery service via mobile application express strong perception on technology acceptance includes benefits of use, ease of use and intention to use. Moreover, there are strong perception on service convenience includes access convenience, transaction convenience, and post-purchase convenience. Technology acceptance in the aspect of perceived benefits of use, ease of use, and the intention of use have positive impact and are related to repeat purchase decisions. Service convenience variables, include access convenience, transaction convenience, and after the purchase convenience also hold positive and strong relation toward repeat purchase decision. It is therefore essential for food delivery business to develop their applications that maximize the ease of use, transaction convenience, and access convenience which will optimize customer satisfaction and enhance repeat purchase decision.

130-051

Scope: Food Security and Climate Change

Understanding international tourists' attitudes towards street food in Malacca, Malaysia

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Abstract. Street food is understood as food that is prepared or cooked, which is then sold by vendors in streets or other public locations for immediate consumption. Many locals or international tourists prefer street food rather than food served at a restaurant. This is because street food offers quality food at an affordable price. Thus, this study aims to identify and examine the factors that influence the international tourists' attitudes towards street food in Malacca. Ajzen's Theory of Plan Behaviour (TPB) adapted as a conceptual framework presented four variables which are affection, hygiene, food quality and service quality. The research instrument being used to collect the data is through an online questionnaire from 384 respondents among the international tourists in the city of Malacca. This study also used the 5 point Likert Scale. Descriptive analysis, a reliability test and a correlational coefficient test were used to analyse the findings. The result of this study provided information on factors that influence the international tourists' attitude towards street food in Malacca and their intentions to revisit the city.

162-136

Scope: Food Security and Climate Change

Indonesian food security during the Covid-19 pandemic

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Abstract. The World Food Organization (FAO) has warned of a potential food crisis during the Coronavirus Disease 2019 (Covid-19) pandemic. In response to this problem, the Indonesian government has implemented various strategies to maintain food security in order to avoid a food crisis. Even though the national food stock is still considered safe, anticipation needs to be done for maintaining food security. Efforts have been made in the form of increasing food security at the household, local, and national levels. At the household level, the movement of homestead land use in villages with integrated farming and in urban areas with urban farming has helped to increase food security. At the local level, local food development movements such as maize, cassava, sago, and tubers were carried out to reduce dependence on food supplies from other areas that were disrupted by distribution during the Covid-19 pandemic. At the national level, the government continues to develop food security through the development of Food Estate in Kalimantan and Sumatra. The strategy for achieving food security is carried out through massive short-, medium- and long-term movements.

016-015

Scope: Sustainable Agrotechnology

An overview of the internet of things (IoT) and irrigation approach through bibliometric analysis

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Abstract. This study evaluates the status of the internet of things (IoT) application in irrigation practices by focusing on the research direction, leading countries and productive researchers. The data from this study was extracted from the Scopus database and analysed using a Publish or Perish and a VOSviewer software for citation analysis and bibliometric map, respectively. The present study reveals that rapid increment of the articles in the subject area began in year 2016 and continues growing until today. India become the most productive country ($n = 271$), followed by China ($n = 88$), Indonesia ($n = 41$) and Malaysia ($n = 32$) in this topic. The most three prolific authors in this subject area are Wenyan Wu (Birmingham City University, UK), Steve Attard (AgriTech Solutions, Australia), and Yvette Everingham (James Cook University, Australia). This study gives insights into an overview of current and frontier research in the application of the IoT in irrigation related approach. It provides an idea to researcher to contribute the knowledge in under explored research domain.

068-019

Scope: Sustainable Agrotechnology

Study of growth and production test of soybean varieties on shade coconut trees in Aceh

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Abstract. Conversion of agricultural lands have a significant effect on decreasing of soybean production, so that, coconut land have been used with multiple cropping system to increase national soybean production. Soybean cultivation in agroforestry system could be applied with the under shade soybean cultivation system with shade resistant varieties. This study aims to determine the growth and yield of soybean varieties at various levels shade of coconut trees. The study was conducted at Paru Keude Village, sub-district of Bandar Baru, Pidie Jaya, Aceh, on April – September 2019, with Split Plot Design. The main plot is shade (N) consisting of no shade (N1), 25% of shade (N2) and 50% of shade (N3), and varieties plot (V) consists of Dena 1 (V1), Anjasromo (V2) and Kipas Merah (V3). The research were analyzed by ANOVA, if p value is larger than value in the p table, followed by Duncan Multiple Range Test at 95% level of significance. The results showed that Kipas Merah variety was higher in plant height than Dena 1 and Anjasromo, but Dena 1 had higher production at each shade level compared to Anjasromo and Kipas Merah. Thus, Dena 1 variety is able to maintain production at all shading levels condition.

011-022

Scope: Sustainable Agrotechnology

Screening of antagonistic fluorescent *Pseudomonads* from rice rhizosphere for growth suppression of *Magnaporthe oryzae* and their molecular identification

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Abstract. Isolation and identification of native fluorescent *Pseudomonads* from the rice rhizosphere were evaluated for their growth suppressing ability against blast disease of rice causing pathogen (*Magnaporthe oryzae*). Twenty strains of fluorescent *Pseudomonads* were isolated and identified initially based on their cultural and in vitro growth suppressing ability against *M. oryzae*. Among them BdPf-4, BdPf-8, BdPf-9 and BdPf-10 exhibited complete *in vitro* growth suppression (100%) against *M. oryzae* following dual culture in growth medium. Molecular identification of the antagonistic *Pseudomonas fluorescens* was done using 16S rDNA primers. Gel-electrophoresis of PCR products of all the isolates confirmed the fluorescent *Pseudomonads* showing band at 1500 bp. Phylogenetic analysis of the sequenced data revealed that BdPf-8 (MN256392.1), BdPf-9 (MN256393.1), BdPf-10 (MN256394.1) have 100% homology with *Pseudomonas putida* (MT184822.1) from India, *Bacterium* sp. (MK823484.1) from China, *Pseudomonas* sp. (KY324900.1) from Brazil respectively. Seed priming by different strains of *P. fluorescens* significantly increased vigor index of rice seedlings. The highest vigor index (2274.8) and (2211.6) which was 184.42% and 176.53% higher over control treatment was found in BdPf-16 (MN256399.1) and BdPf-10 (MN256394.1) respectively. These results revealed the possibility of potential use of some of the strains of native *P. fluorescens* for management of blast disease of rice.

032-111

Scope: Sustainable Agrotechnology

Viability of bovine opu-derived oocytes to honeybee as cryoprotectant

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Abstract. This study designs to determine the effectiveness of Honeybee (HB) as cryoprotectants (CP) on viability vitrified-thawed bovine oocytes derived from OPU using Trehalose as control. Cattles were subjected to superstimulation protocol, per session conducted five days where three days both cattle were administrated 100 mg follicle stimulation hormone (FSH) within 24 h once and two days of “resting period” totalling two sessions. The “coasting period” (FSH starvation) between sessions was four days (96 h). Oocytes collection via OPU were performed at fifth day (120 h). The ovarian growth was observed via ultrasonographic before OPU. Prior to vitrifying oocytes with treatment Trehalose (T1) and HB (T2) followed by warming protocol, oocytes subjected to in vitro maturation (IVM). Oocytes viability were evaluated by fluorescein diacetate staining. Results showed ovarian growth for first session was larger size follicles than the second session for both cattle. Total number of oocytes obtained were 60. Oocytes viability treatment T2 was significantly higher (90.9%) than T1 (70.4%). This study concludes that HB as CP in vitrification protocol was able to achieved high oocytes viability with oocytes derived via OPU suggesting Honeybee as an alternative CP for oocytes vitrification.

066-046

Scope: Sustainable Agrotechnology

The potential of dairy farm development in coastal area, Bangka Botanical Garden, Pangkalpinang, Indonesia

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Abstract. This research aims to analyse potential development dairy farming in the lowlands and to be carried out as an evaluation to increase productivity. This study can be a case study for other areas that will establish dairy farms especially coastal area. Design of research is a descriptive study with data collection procedures using data collection, sample testing, data sorting, data tabulation, and data discussion. The parameters evaluated consist of cattle, physiological status, cow's productivity, microclimate pen environment, physiological response of cows, digestibility of feed, and quality of milk products. The data calculated with average and standard deviation to determine the data-centered and will provide with each test indicator's conclusion value.

079-075

Scope: Sustainable Agrotechnology

Biomimicry in agrotechnology: Future solution of water problem for the agriculture industry?

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Abstract. Agriculture main issues are the reduction in water availability and the loss in water quality. If the population is increasing, the demand for food will increase, but the amount of water available to produce food does not increase. It would be a huge problem for the future. This study explores the alternative method in biomimicry to provide sufficient water supply for agriculture by reviewing challenges in agriculture and identifying biomimicry approach on previous research. The designers can use these technologies to solve water problems in agriculture, for example, Watercone and Warka Water. Both of these designs are inexpensive and can extract gallons of fresh water from the air and designed to be environmental friendly by not causing any pollution or harm to the ground they are built on. By studying nature people learn to respect it and understand the importance of conservation, in other words, the more people, especially for designer, are aware of the potential of biomimicry. Biomimicry expected to be a promising approach, effective in improving well-being and its environmental efficiency at both agriculture and technology. Based on this study at the agriculture in particular, it is possible to see biomimicry as a driver to change urban environment.

152-085

Scope: Sustainable Agrotechnology

Effects of salinity and light conditions on the survival of brown seaweed *Sargassum ilicifolium* (Turner) C. Agardh during early development

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Abstract. The present study was carried out to investigate the survival of *Sargassum ilicifolium* from zygote to germling under laboratory conditions. Zygotes were cultured at 3 different salinity conditions (30-35 PSU, 20-25 PSU and 10-15 PSU), and under the illumination of 3 different light sources (natural, fluorescent, and LED lights) with varying intensities. Results showed that *S. ilicifolium* germlings has a relatively higher tolerance to lower salinities that ranged from 10 to 30 PSU and optimal growth occurred in salinity ranges from 30–35 PSU. There was no significant effect of light source on zygote survival and germination of this species. Fluorescent lighting was effective in obtaining high survival and germination rates of zygotes and in driving the development of morphologically normal germlings compared to LED lighting. This study also demonstrated the potential using zygote-derived germlings as a source of nursery seedlings. Salinity and light conditions were therefore found to be important variables affecting the survival, germination, and growth of *S. ilicifolium* which are useful data in developing streamlined practices for aquaculture production and management.

010-114

Scope: Sustainable Agrotechnology

Effect of selected substrates and chitosan on growth performance of orchid tissue culture seedling under net house

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Abstract. Orchids are considered as the most beautiful and significant cut blossom and pruned plants throughout the world. Therefore tissue culture technique was used as one of the alternative to mass propagate the orchids to fulfil the demand. This study was conducted to find out the effect of chitosan and different substrates on growth performance of *Dendrobium Shavin* White orchid seedling from tissue culture environment to net house. The tissue cultured plants went through prehardening stage to reduce mortality after the switch to ex vitro conditions. Five (5) treatments consist of combination substrates were tested which were T1: rice husk + chitosan, T2: peat moss + chitosan, T3: EFB + chitosan, T4: rice husk + peat moss + chitosan and T5: rice husk + peat moss + EFB + chitosan whereas charcoal as a control (T0). The result showed that the highest plant height and leaf length which did not significantly different were T3(6.20cm plant height, 4.83cm leaf length), and T5(6.55cm plant height, 4.51cm leaf length). Meanwhile, T3 was an effective for number of leaf production with 4.14 leaf count. Hence, this data will be used to acclimatize tissue cultured of *Dendrobium Shavin* White orchid for commercial used.

054-107

Scope: Sustainable Agrotechnology

Residual effects of calcium amendments on oil palm growth and soil properties

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Abstract. Residual liming is one of the measures of the efficacy of liming materials. This experiment's main aim was to determine the residual liming effect of Ca-amendments' application to highly acidic soils. The investigation on highly acid soils (Jeram series and Bungor series) initially incubated with selected Ca-amendments for 360 days previously planted with oil palm seedlings. The Ca-amendments used was $\text{Ca}(\text{OH})_2$, calcium hydroxide, CaO , calcium oxide, and CaCO_3 , calcium carbonate) comparing with Mg-amendments such as $\text{CaMg}.\text{CO}_3$, dolomite (unamended soil was 2X of Al exchangeable). Soils incubated for an additional 180 days before planting for a total of 540 days in a greenhouse environment. The soil chemical properties, plant growth response measured, and the possible mechanisms responsible for the Ca-amendments liming effects identified in this experiment. The soil chemical properties results showed that Ca-amendments residues potentially used as soil acidity amendments significantly better than Mg-amendments. $\text{Ca}(\text{OH})_2$ was the most prominent Ca-amendments to increase soil-water pH, soil solution pH, and concentrations of soluble Ca and K. Ca-amended soils may contribute to plant growth response in plant height and total dry matter yield of oil palm seedlings. The soil pH increment resulted in low concentration and activity of soluble Al. The increasing of other essential elements such as Ca and K, that is crucial to growth resulted from the release of Ca from amended soil and cation interaction with K. This finding concluded that the possible mechanisms of Ca-amendments from residual liming might be: a) complexation interaction between Al and Ca; (b) capacity of Ca-amendments to increase the concentration of Ca to maintain soil desired pH; (c) alleviation effect of Ca-amendments to reduce Al toxicity concentration in the soil. Last but not least, this finding showed that dry matter yield and plant height positively associated with the presence of Al_3^+ in both soil conditions.

062-108

Scope: Sustainable Agrotechnology

Nutrient digestibility of dairy cows fed with chopped and ensiled elephant grass

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Abstract. Forage scarcity hinders the development of the dairy farm. Developing measures for preserving and optimizing forage supply are among the solutions to cope with this problem. This research aimed to evaluate nutrient digestibility of dairy cows given different forage treatments. The forage used was elephant grass (EG, *Pennisetum purpureum*) and subjected to four dietary treatments, i.e., intact EG (FW), chopped EG (FC), ensiled EG (SW), and ensiled and chopped EG (SC). Proximate analyses were performed on the respective treatments. The *in vivo* evaluation was then conducted by feeding the diets to dairy cows with a 4 × 4 Latin square design set (n=4 replications). Each period's length was 21 days, in which the first 14 days was for feed adaptation, and the last seven days was for collecting data. Results showed that chopping and ensiling treatments improved daily feed consumption. Ensiled EG (SW and SC) resulted significantly ($p<0.05$) higher in dry matter, organic matter, and crude fat digestibility compared to non ensiled EG (FC and FW). Crude protein digestibility for SC treatment was significantly higher ($p<0.05$) among all treatments. Crude fiber digestibility for SC treatment was also significantly ($P<0.05$) higher among all treatments with an exemption of SW. The effectiveness of treatments on feed consumption and nutrient digestibility can be sorted, as follows SC>SW>FW>FC. It can be concluded that combination of chopping and ensiling (SC) proved the best result and thus may be implemented to preserve and optimize forage supply.

105-109

Scope: Sustainable Agrotechnology

**Dietary methyl farnesoate, a potential growth inducer in male crab
*Oziothelphusa senex senex***

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Abstract. Insect juvenile hormone-like compound methyl farnesoate (MF), identified through 'reverse endocrinology' in crustaceans is a sesqui-terpenoid and plays crucial role in growth well proved by direct administration into the animals at laboratory conditions. However, these studies are not reached to the cultural ponds. Moreover, dietary supplementation of MF and its effects on growth in crustaceans is still at infancy. The present study tested MF (concentration of 10^{-9} , 10^{-8} and 10^{-7} moles/crab added to commercial shrimp pellet diet) in the growth of male crab *Oziothelphusa senex senex* (*Oss*) supplemented every alternative day for about 40 days. Along with experimental group control and eyestalk removed (ESX) groups are maintained. Dietary MF induced significant enhancement in the growth of male crab. The most effective group MF 10^{-8} moles/crab supplemented. The frequency of growth induction found in this study is MF $10^{-8} > 10^{-9} > 10^{-7}$ moles/crab \leq ESX and molted percentage is 27.5%, 17.5%, 10%, 10% in each group, respectively. The dietary supplementation of MF effective in inducing growth in cultured crustaceans thereby increases the yield of crustacean protein.

125-037

Scope: Sustainable Agrotechnology

Seed priming for increased seed germination and enhanced seedling vigor of winter rice

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Abstract. Low seed emergence rate, poor seedling growth and low survival rate of winter rice due to cold spell are very common in Bangladesh. Pre-sowing seed priming could be a viable approach to overcome this problem. A laboratory screening of different priming agents was conducted at the Agro Innovation Laboratory, Department of Agronomy, Bangladesh Agricultural University in November 2018. The experiment comprised two factors. Factor A includes five rice varieties, namely i) BRRI dhan28 ii) BRRI dhan29 iii) BRRI dhan36 iv) BRRI dhan55 and v) Hybrid SL-8H; factor B includes 22 seed priming methods comprised different concentrations of NaCl, KCl, CaCl₂, CuSO₄, ZnSO₄, Na₂MoO₄, PEG and control (no priming). The experiment was laid out in a completely randomized design (CRD) with four replications. A positive influence of seed priming on seed emergence rate (%), germination time, seedling vigor and seedling growth (length and dry matter) was evident from this study. Among the priming agents, KCl and CaCl₂ performed best; while priming with NaCl, Na₂MoO₄ and PEG showed no advantages over no priming for germination rate and seedling vigor & growth indices. In conclusion, pre sowing seed priming approach can be explored as a viable tool for increased seed germination and better seedling growth of winter rice under stress condition.

145-074

Scope: Sustainable Agrotechnology

Growth of chilli plant (*Capsicum annuum* L.) treated with combined organic and inorganic fertilizer with *Saccharomyces cerevisiae*

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Abstract. Biofertilizers are highly recommended, and widely explore its potential in agriculture. Combinations of fertilizers were treated on chili (*Capsicum annuum* L.). An experiment was conducted at Sik, Kedah, to study the growth performance of chili plants by combined application of organic and inorganic fertilizer with biofertilizer. Eleven different fertilization treatments were conducted on Cili Kulai 1033, where *Saccharomyces cerevisiae* was incorporated as biofertilizer in nine of the treatments. The fertilization treatments were T1 (Control): (No manure + No fertilizer); T2 (NPK[12-12-17] + Poultry Manure [PM]): (5 g + 10 t/ha); T3 (NPK + PM + *S. cerevisiae*): (2.5 g + 10 t/ha + 1 g/L); T4 (2.5 g + 10 t/ha + 3 g/L); T5 (2.5 g + 10 t/ha + 5 g/L); T6 (3.75 g + 10 t/ha + 1 g/L); T7 (3.75 g + 10 t/ha + 3 g/L); T8 (3.75 g + 10 t/ha + 5 g/L); T9 (5 g + 10 t/ha + 1 g/L); T10 (5 g + 10 t/ha + 3 g/L); and T11 (5 g + 10 t/ha + 5 g/L). It was found that T11 significantly increased the plant height, number of leaves and leaf area of chili. Similarly, T11 gave the highest mean value in terms of plant height at 15, 45, and 75 days after transplanting (DAT) with 7.87, 22.66, and 57.39 cm. Meanwhile, at the same concentration and DAT, the mean value of the leaves number was 5.6, 21.6, and 56.6, respectively. However, T10 showed the maximum leaf area at 75 DAT with 59.40 cm². Overall, T11 consistently enhanced the chili growth compared to the standard treatment, T2. It suggests that T11 incorporated with *S. cerevisiae* can be applied as a biofertilizer in chili cultivation.

049-076

Scope: Sustainable Agrotechnology

Leveraging LoRaWAN technology for Smart Agri-monitoring of Malaysian palm oil plantation

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Abstract. Palm-oil is a vital cash crop in tropical Asia. Implementation of technology in palm oil industry not only increase production but also it reduces the plantation management cost significantly. Affordability of smart devices of the farm owners is the major concern behind not using technologies in production and process. There are a lot of technologies are being used in agriculture sectors to ease the manual labour with reduced cost. Study on the challenges faced by the plantation owners is needed to introduce new technological solutions for the plantation management in Malaysia. This article reviews some problems on technology-based monitoring. A qualitative research has been conducted to address the problems faced by the authority of Palm oil plantation. Based on the problem statement researcher introduced a conceptual study of LoRaWAN (Low power wide area network) embedded system suitable for low cost energy efficient Palm oil plantation monitoring. Installation of IoT based device will ensure smart monitoring as well as handling the agriculture activities of the Palm oil plantation with reduced manpower resources.

022-003

Scope: Sustainable Agrotechnology

Effect of ensiling duration on nutritional composition and oxalate content in dwarf Napier grass silage

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Abstract. Napier grass (*Pennisetum purpureum*) is a common forage plant that is usually given to ruminant animals. Besides moderate nutritive values, this grass also contains anti-nutrients such as oxalate. Dietary soluble oxalate can combine with blood calcium (Ca) or magnesium (Mg) and form insoluble crystals, which can give negative effects on animal health. This study was conducted to assess the effects of ensiling durations on fermentation characteristics, nutritional composition and oxalate content of dwarf Napier grass silage. Plants were cultivated under standard level of fertiliser application, harvested at 45 days of plant maturity, and then chopped into 2-3 cm manually. Chopped grasses were mixed with 5% molasses (w/w), and filled in plastic bags, compressed and kept it in air-tight conditions in room temperature at five different ensiling durations (0, 15, 30, 60 and 90 days). Three replicates were made for each of the treatment durations. The fermentation characteristics, chemical composition and oxalate content, were evaluated. Silage at 30 day fermentation showed the highest lactic acid (10.02%) and NH₃-N (1.79%) contents, while silage at 90 d fermentation showed the lowest lactic acid (3.47%) and NH₃-N (1.50%) contents. The initial pH value (pH 5.01) and dry matter content (22.8%) declined to pH 4.36 and 20.2% at the end of 90 d ensiling period. Ensiling significantly improved the crude protein, ether extract and ash contents of Napier grass silage. The soluble, insoluble and total oxalate contents in silage decreased as ensiling durations increased. Ensiling also significantly improved the sodium contents of Napier grass silage, while no consistent trend was observed on Ca, Mg and potassium contents. The results suggest that at least 30 days of ensiling duration can be recommended for Napier grass silage to get the optimum nutrients and oxalate content.

137-092

Scope: Sustainable Agrotechnology

Effects of zinc on the growth and yield of maize (*Zea mays* L.) cultivated in a tropical acid soil using different application techniques

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Abstract. In Malaysia, the application of micronutrients fertiliser is not a standard practise although several previous studies have indicated that the procedure contributes to a major impact on plant growth and development. The aim of this study is to investigate the effect of the concentration and application of zinc (Zn) on maize growth and yield. There were nine treatments including; no fertiliser applied as control (T0), NPK 16:16:16 only (T1), NPK + 5kg/ha Zn (T2), NPK + 10kg/ha Zn (T3), NPK + 15kg/ha Zn (T4), NPK + foliar Zn (T5), NPK + 5kg/ha Zn + foliar Zn (T6), NPK + 10kg/ha Zn + foliar Zn (T7), NPK + 15kg/ha Zn + foliar Zn (T8). Plant height was recorded during 30, 45 and 60 days of plant ages. Maize ear length, diameter and numbers of kernel's row were recorded on harvesting day (100 days). The findings suggest a significant difference in maize ear length, diameter and kernel row at $p < 0.05$ for most treatment groups compared with control A and B. Ear length and diameter increased up to 20% with Zn application while kernel rows improved by 12% on the highest. The foliar application results showed significant increase of 0.6 cm diameter and 2.4 cm length of maize ear. However, there were no significant differences among treatments on plant height. Foliar and combination technique of Zn application also showed indecisive result on maize ear kernel's row. Application of Zn shows increased diameter, length and kernel row of maize ear though plant height is unaffected. The combination of the application techniques obtained the optimum yield of maize.

110-093

Scope: Sustainable Agrotechnology

Commercial herbicides trial against *Alocasia* sp. (Wild Yam) at oil palm plantation, Borneo, Malaysia

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Abstract. Weeds in oil palm plantations include any plant or vegetation that in any way interferes with the production of palms, resulting in a reduction in yield or quality. *Alocasia* sp. (wild yam) is a common weed at oil palm plantation in Borneo, Malaysia. This study was conducted to evaluate commercial herbicides' effectiveness (amine, ally, glyphosate, and paraquat) against *Alocasia sarawakensis*, *Alocasia robusta*, and *Alocasia macrorrhizos*. Cocktail herbicide shows faster wilting, scorching and rotten and least/late regeneration within 30 days of monitoring. Combination of two chemicals reacts better and potentially long-lasting, and further observation can provide info on the difference between (systemic+contact), (contact+contact) and (systemic+systemic). Cost-effectiveness analysis shows herbicides cocktails Treatment 9 (amine + ally + surfactant), Treatment 11 (amine + paraquat + surfactant), and Treatment 12 (ally + paraquat + surfactant) are most cost-effective (\pm RM0.58 cent/16 L) to control *Alocasia* sp.

091-125

Scope: Sustainable Agrotechnology

Potential application of actinomycetes as natural fungicide

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Abstract. Fungal diseases in green leafy vegetables are commonly under-estimated. However, the application of agrochemical fungicide has raised multiple drawbacks such as the higher amount of chemical residues and intensified microbial community stress. There is an urgent need to establish a bio-control antifungal agent with minimal toxicity threat, which sourced from natural environment. This study aimed to isolate soil-borne fungi from soil underneath infected green leafy vegetables and identify the antifungal activities of actinomycete strains on the isolated fungi strain. Fungi were isolated from 3 soils collected underneath the infected green leafy vegetables. Actinomycete strains were screened for antifungal potential against selected fungi strains using agar plug assay. Forty-one fungal strains were isolated from the soil samples. Actinomycetes strain C.D6.5 exhibited the largest inhibition zone on 5 selected fungal strains, whereas actinomycetes strain C.KSJ 13.3 produced the broadest spectrum of antifungal activities. It can be concluded that actinomycetes strain have significant antagonistic activity against fungi and pure antifungal component can be extracted as an effective and environmentally friendly bio-control agent on plant fungi.

025-033

Scope: Sustainable Agrotechnology

Factors impinging fruit farmers adoption of organic farming practices in Johor, Malaysia

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Abstract. A Malaysia Organic (myOrganic) Program is being promoted in Malaysia as a strategy to raise small-scale producers' income, protect the environment, and reduce food imports. However, from almost 144, 843 fruit farmers in Malaysia, only 63 farms received myOrganic certification. Unfortunately, Johor is the second-lowest state of myOrganic recipients even though they have the highest number of fruit farmers. Thus, this study aims to determine the factors impinging the organic farming practices adoption by fruits farmers in Johor, Malaysia. The quantitative research design was employed, and the questionnaire is structured based on a combination of Theory Planned Behavior (TPB) and Technology Acceptance Model (TAM). The probability sampling was employed by using simple random sampling technique that involves fruits farmers in Johor. SPSS version 25.0 has been used to analyse the data using descriptive analysis. Findings of this study indicate the moderate mean score for organic farming practices adoption ($M=2.597$), perceived behavioural control ($M=3.212$) and perceived usefulness ($M=3.499$), while the high mean score has indicated attitude ($M=3.711$) and perceived ease of use ($M=3.860$). This study is significant to the government, researchers and farmers to understand the factors and importance of organic farming practices adoption.

026-036

Scope: Sustainable Agrotechnology

Study of microbial inoculants effect on the quality of corn stover silage planted in different areas in Kelantan

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Abstract. Corn stover silage serves as high-energy forage for the ruminant animal as it consists a relatively high energy content, good digestibility and palatable. The microbial inoculants applied to silage will increase the good bacteria concentration, resulting in a higher lactic acid level, resulting in a quicker drop in the pH. The present study aims to investigate microbial inoculants' effects on the quality of corn stover silage planted in different areas in Kelantan. The samples of corn plant collected from PPK Tanah Merah and Agropark, UMK Jeli Campus. Each sample was treated with an effective microorganism (EM) as the treatment with the ratio used is 1: 1: 1/2: 4: 1, for molasses, salt, urea, water and EM. In contrast, the sample with no inoculation of EM serves as the control. All samples were ensiled for 21 days to obtain complete fermentation. The chemical composition of the silage determined by proximate analysis. The pH value and physical characteristics of the silage were recorded. All collected data were subjected to analysis of variance. After 21 days, moisture (66.47% and 69.70%) and crude protein (13.8% and 21.2%) content were significantly higher ($p < 0.05$) for both treatment samples from AGPK and PPK compared to the control. The results show a significantly lower pH value (3.76 –3.81) ($P < 0.05$) for samples treated with EM compared to control. All samples' physical characteristics expressed a good ranging of quality silage as the texture is firm and not slimy with greenish-brown and yellowish-brown colour with a pleasant odour. There was no presence of mould observed for all samples except control from AGPK. As a conclusion, the microbial inoculants applied to corn stover silage and fermented for 21 days had improved the moisture and crude protein content and decreased the contamination level, thus improved the quality of corn stover silage.

144-054

Scope: Sustainable Agrotechnology

Assessment of CO₂ flux from peat soil under simulated groundwater level and monthly rainfall for sustainable water management in a tropical oil palm plantation

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Abstract. Sustainable production of oil palm plantation in tropical peat land is determined by ground water level and rainfall as the important factors controlling the carbon balance. It is not easy to set up a stable groundwater level (GWL) in the field and even more impossible for the monthly rainfall (MRF) to get CO₂ flux data as the basis for determining technical aspects of water management. This research was aimed to obtain basic CO₂ flux data under simulated stable GWL and MRF from tropical peat materials of an Indonesian oil palm plantation. The experiment was conducted by applying CRD with those 2 factors as the treatments for 3 months period of greenhouse experimentation. There was no significant interaction effect of the GWL and MRF treatments. The single effect of GWL treatment at -40 cm produced the significant lowest monthly CO₂ flux with an average of 18.26 t.ha⁻¹.year⁻¹ after 3 months experimentation, while that of MRF at 300 mm.month⁻¹ resulted in the significant lowest CO₂ flux of 24 t.ha⁻¹.year⁻¹ after 2 months experimentation. It can be recommended that the GWL should be set up in the field at around -40 cm to get the best control on CO₂ flux.

075-115

Scope: Sustainable Agrotechnology

Utilization of fly ash - bottom ash, compost and arbuscular mycorrhizal fungi on growth of crops

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Abstract. This study examines the effectiveness of fly ash-bottom ash (FABA) from Suge Steam Power Station, Belitung Island, Indonesia. FABA will formulated with compost and arbuscular mycorrhizal fungi (AMF), as Komfaba an ameliorant for a source of nutrition for the growth of corn, eggplant, and tomato. The study was carried out in a greenhouse experiment by applying compost and FABA in three comparisons, ie 75:25, 50:50 and 25:75; two doses of Komfaba 1250 g/pot and 2500 g/pot; and two doses of AMF 2.5 g/pot and 5 g/pot. Plants growth were observed until the vegetative phase and analyzed the number of mycorrhizal infections in plant roots. In general, Komfaba composed of compost:FABA=75:25, at a dose of 2500 g/pot and AMF 2.5 g/pot produced significant increase in few growth parameters (plant height, shoot fresh weight, root fresh weight, and root length) of corn, eggplant and tomato. Fly ash-bottom ash can be used as a soil amendment agent and provides better results when combined with compost and arbuscular mycorrhizal fungi.

088-135

Scope: Sustainable Agrotechnology

Relationship among yield and quality traits in *Sorghum bicolor* L. Moench. for biomass and food utilisation

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Abstract. Fifteen genotypes of sorghum derived from four different sources of population were evaluated for quality and yield related components. The experiment was conducted at Field 10, Universiti Putra Malaysia in a Randomized Complete Block Design with three replications. The objectives of this study were to evaluate the performance and genetic variation for eight yield and quality traits on selected genotypes sorghum, to estimate the phenotypic correlation between yield and yield related components in sorghum. Genotypes 1-3-5 and 1-4-4 were identified to have high yield for most of the biomass (904.0 g/plant and 880.7 g/plant respectively) and grain yield components (98.1 g and 88.97g respectively). Genotypes 1-1-1, 1-4-1 and 5-3-6 were found to have total soluble solid of more than 16%, which make them suitable for food purposes. Mean for all genotypes for all measured traits, together with the significant genotypic variance indicated substantial amount of genetic variability towards the improvement for fresh biomass weight, stem diameter and total soluble solid content. Biomass and grain yield traits namely plant height, fresh biomass yield, stem diameter and panicle weight indicated significant positive correlation. Thus, selection on any one of these traits will increase in the other traits, thereby improving biomass and grain yield in sorghum for mentioned purpose.

069-099

Scope: Sustainable Agrotechnology

Development of mobile-based apps towards smart farming technology in Agro Innovation Park (Tagrinov) management

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Abstract. As an effort to optimize the use of smart farming technology aimed at increasing efficiency in agriculture, a study was carried out at Agro-Innovation Park (Tagrinov), a place for education and learning of innovative home yard utilization concept. The smart farming applied in Tagrinov were irrigation control systems, pH and nutrition control systems of hydroponic plant, and temperature and humidity control in aeroponic systems. The deployment of control mechanism involved some systems, i.e communication testing of android application using firebase server for irrigation; the Arduino Mega 2560 for pH level and nutrition control of hydroponic plant, and the Arduino Uno, DHT22 and DS18B20 sensors for temperature and humidity control of the aeroponic system. The test results showed some advantages of smart farming application in Tagrinov. Irrigation control system using internet network can be easily carried out by users. Arduino makes the system automatic, the pH sensor works as pH meter, the nutrients turn on and off when the pH value and nutrients are appropriate. The aeroponic sensor system read the temperature and humidity in the parent seed nursery, to activate the sprayer and makes the water become mist. All smart farming technologies were operated through mobile apps making these systems more efficient.

120-120

Scope: Sustainable Agrotechnology

Effect of crude glycerin as energy source in diets on growth performance, ruminal pH and blood metabolites of Kamphaeng Saen steers

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Abstract. The objective of this study was to determine the effects of varying levels of crude glycerin (CG) in diets on feed intake, growth performance, ruminal pH and blood metabolites of Kamphaeng Saen steers. Twenty Kamphaeng Saen steers (429.1 ± 44.93 kg of initial BW with 18 months of age) were randomly assigned to one of 4 experimental diets (n = 5 each) using completely randomized design with the feeding period of 180 days. The Kamphaeng Saen steers individually received dietary treatments containing 10% rice straw plus 90% concentrate comprised of 0, 4, 8 and 12% CG in the diets on dry matter basis. Feed was offered twice daily and water was provided at all times. The experimental animals were weighed monthly and blood samples and ruminal fluid were collected at the end of the experiment. No significant effect of different levels of CG inclusion was observed on dry matter feed intake and ADG. Moreover, there were no significant differences in ruminal pH. Blood urea nitrogen and glucose concentrations were not significant different and within normal ranges. The study suggested that CG could be used as alternative feedstuff for energy sources to replaced cassava chips up to 12% of DM in diets of Kamphaeng Saen steers without any effect on DM intake, growth performance, ruminal pH and blood metabolites.

124-038

Scope: Sustainable Agrotechnology

Weed suppressive ability of Bangladeshi monsoon rice varieties

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Abstract. The study was conducted during July to December 2018 at the Agronomy Field Laboratory of Bangladesh Agricultural University to evaluate the weed competitiveness of selected monsoon rice varieties released from Bangladesh Rice Research Institute. Thirty-three rice varieties were grown under weedy and weed-free conditions. Plots with no rice were also maintained to observe the natural growth of weed in absence of rice. The experiment was conducted following randomized complete block design with three replications. Results showed that rice varieties varied widely in yielding ability and weed competitiveness. Among rice varieties, BRRI dhan31 allowed the minimum weed growth (32.5 g m^{-2}) while BRRI dhan51 allowed the maximum weed growth (155.3 g m^{-2}). Grain yield ranged between 3.6 t ha^{-1} (BRRI dhan49) and 7.5 t ha^{-1} (BR10) under weed-free condition and between 2.2 t ha^{-1} (BRRI dhan70) and 3.9 t ha^{-1} (BRRI dhan34) under weedy condition. Weed inflicted relative yield loss ranged from 10.2 to 66.9% among the varieties. BRRI dhan34 allowed the least yield penalty (10.2%) while BRRI dhan70 had the maximum yield penalty (66.9%) due to competition with weeds. Although BR10 appear as the most productive variety (7.5 t ha^{-1}) its weed inflicted relative yield loss was higher (51.3%) than many other varieties with low yield potential. On the other hand, BRRI dhan34 appeared as the most weed competitive variety (only 10.2% relative yield loss) with productivity of 3.9 t ha^{-1} . Considering the yield, BR10 was the best but for weed suppressive ability BRRI dhan34 performed well.

009-008

Scope: Alternative Agroproduct Development

Anti-MRSA activity of ethyl acetate crude extract from endophytic fungus *Ceratobasidium ramicola* IBRLCM127 isolated from rhizome of *Curcuma mangga* Valeton & Zijp

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Abstract. The study was conducted to investigate the effects of ethyl acetate crude extract of *C. ramicola* IBRLCM127, an endophytic fungus which was previously isolated from rhizome of *C. mangga* against a common human bacterial pathogen, methicillin-resistant *Staphylococcus aureus* (MRSA) in order to develop a new MRSA treatment. The efficiency of antimicrobial compounds in inhibiting or killing the bacterial cells was evaluated by adopting minimal inhibitory concentration (MIC) and minimal bactericidal concentration (MBC). The effect of ethyl acetate crude extract on the growth profile of MRSA was examined using time-kill assay. Scanning electron microscope (SEM) observation was opted to investigate the ultrastructural effect of MRSA cells. The results revealed that fungal extract demonstrated a bactericidal effect on MRSA with the ratio of MBC/MIC was 1. Both MIC and MBC values of the extract were 0.5 mg/mL. The result obtained from the time-kill study disclosed that the bactericidal activity of fungal extract under investigation was both time and concentration-dependent. After 12 hours of exposure to the extract, the formation of cavities and a few cell debris can be observed on the bacterial cells, indicating the failure of cell wall and cell membrane to maintain their rigid structure due to the rupture caused by the extract. Prolonged exposure to the extract for up to 48 hours caused the bacterial cell wall to lyse and release its cytoplasmic content into the surrounding which led to cell death. Based on the SEM observation, the fungal ethyl acetate extract of *C. ramicola* IBRLCM127 exhibited a prominent anti-MRSA activity particularly against cell membrane of MRSA cells. This report was the first report concerning the antimicrobial potential of endophytic fungus *C. ramicola* recovered from local medicinal plant, *C. mangga*.

103-026

Scope: Alternative Agroproduct Development

Elucidation of total phenolic content and antioxidant activity in medicinal Aroid, *Alocasia longiloba* Miq.

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Abstract. *Alocasia longiloba* Miq belongs to Araceae family, believed to have the medicinal potential. However, the scientific evidences on this plant were limited. Therefore, this study aimed to evaluate the total phenolic content (TPC) and antioxidant activity of the different extracts (methanol, ethyl acetate and hexane) of *A. longiloba* leaf blades. The TPC was investigated by Folin-Ciocalteu method and antioxidant activity was determined by DPPH scavenging assay. The results showed ethyl acetate extract had the highest content of phenolic with 46.013 mg GAE/g followed by methanol extract (32.936 mg GAE/g) and hexane extract (31.782 mg GAE/g). The hexane extract exhibited the highest DPPH antioxidant activity, followed by ethyl acetate and methanol with IC₅₀ values 2.519 µg/mL, 2.758 µg/mL and 9.542 µg/mL respectively. The results indicate *A. longiloba* has natural sources of antioxidant that can be used for the medicinal purposes.

003-094

Scope: Alternative Agroproduct Development

Preliminary studies on isolation of lipid-degrading bacteria from contaminated water

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Abstract. The increase in human activities has caused water pollution, where more pollutants are released into the water. Lipid is one of the common substances that can be found in contaminated water. Lipid-degrading bacteria refer to bacterial strains that can produce lipase and break down the lipid. This study was conducted to isolate and screen lipid-degrading bacteria from contaminated water samples. Four potential lipid-degrading bacteria were isolated from contaminated seawater and pond water. The ability of bacteria strains in degrading lipids was tested by growing the bacteria on Rhodamine B agar. The colony that emits orange fluorescent indicates the presence of lipase activity. The rate of lipid degradation by the bacterial strain on olive oil and motorcycles oil was carried out using the liquid-liquid extraction method with chloroform and methanol as solvents. Strain T1 isolated from Teluk Batik, Malaysia seawater showed lipid-degradation activity and capable of degrading commercial olive oil and motorcycles oil at 75.59% and 85.43%, respectively.

033-029

Scope: Alternative Agroproduct Development

Influence of dark and light colours of *Carica papaya* Leaves on physical properties and sensory acceptability in crackers

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Abstract. Papaya (*Carica papaya*) leaves have been used traditionally in treating a wide range of ailments. The leaves contain appreciable amount of nutritional components (protein, fibre, carbohydrate, minerals) and phytochemical compounds. This study was conducted to determine proximate compositions, texture, and sensory properties of crackers as influenced by dark and light colours of papaya leaves. The dark and light colour of leaves were incorporated separately in crackers at 0.5%, 1.0%, and 1.5% of flour substitution. The cracker without papaya leaves powder served as control. The colour attributes that were lightness (L^*), redness (a^*), and yellowness (b^*) were determined using chromameter, while texture properties were determined using a texture analyser. The proximate compositions of crackers (moisture, ash, fat, protein, and carbohydrate content) were determined using AOAC methods. The results showed that the proximate compositions of crackers were not significantly different between crackers containing dark and light colour leaves. The L^* , a^* , and b^* values of crackers containing dark or light colour leaves decreased during storage. Similarly, the hardness and fracturability of crackers were decreased during storage. Hardness and fracturability values of crackers containing dark leaves were found higher than crackers with light leaves. In sensory evaluation, there was no significant differences in flavour, bitterness, crispiness, hardness, and overall acceptability among control and crackers with dark or light color leaves. In conclusion, the incorporation of dark and light colours of papaya leaves in crackers within 0.5% to 1.5% level did not significantly influence physical and sensory properties of the crackers while but improved some nutritional compositions in the crackers.

157-130

Scope: Alternative Agropduct Development

Chemical analysis of compost using pineapple leaves and cow dung as bio-activator

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Abstract. The number of area planted with pineapple at Malaysia is now increasing, especially after the fruit was recognized as one of the key crop under National Key Economic Area (NKEA). In practice, the pineapple plant remains only for one round of harvest cycle. After the fruit harvest, the leaves is usually pruned in order to stimulate the growth of suckers for the subsequent planting cycle. The pineapple leaves contained immense potential to be developed into products such as compost. In this study, the pineapple leaves were developed into compost by using the cow dung as the bio-activator and its chemical composition was then compared with the commercial organic fertiliser by using the proximate analysis. The composting process was performed in a styrofoam box and the decomposition process took 24 days for the compost to reach the constant ambient temperature at around 35°C. At the end of the composting, the pile turned to darker black colour, and has inert earthy odour. The result showed that the compost produced using the pineapple leaves with the cow dung has 2.86% nitrogen content, 0.93% ash content, and 33.47 moisture level. These values are significantly lower in comparison to the commercial organic compost. The study signified the potential of the pineapple leaves to be developed into compost to improve the soil condition. Nevertheless, the method and its composition need to be expanded in order to improve its elements availabilities suitable as organic compost.

092-122

Scope: Alternative Agropduct Development

Evaluation of sunscreen cream incorporated with astaxanthin from *Haematococcus pluvialis* in different storage conditions

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Abstract. The use of sunscreen is highly recommended to protect the skin from ultraviolet radiation (UV) from the sun. Natural substances from natural source, such as astaxanthin, have been considered as potential sunscreen resources due to high UV ray absorption and antioxidant activity. However, substances originated from nature usually has low stability especially when incorporated into a mixture of ingredients with different physicochemical properties. Thus, this study aims to investigate the physicochemical properties of astaxanthin sunscreen cream from *Haematococcus pluvialis* extract at different storage conditions (25°C, 4°C, and 40°C). The developed astaxanthin sunscreen cream formulations (F1=0%, F2=0.5% and F3=1.0% astaxanthin) were evaluated for SPF, pH and viscosity. Inclusion of astaxanthin in the sunscreen cream formulations significantly increase the SPF value at all storage conditions with higher SPF were observed at room temperature (25 °C). Astaxanthin significantly lower the pH of the base cream (F1) when stored at lower and higher temperatures (4 °C and 40 °C) but had no effect on pH at room temperature (25 °C). Viscosity was affected when stored at higher temperature (40 °C). This study shows that astaxanthin is an excellent natural UV filter that can improve the efficacy of the sunscreen and stable at room temperature (25 °C) with higher SPF observed and no significant change in pH and viscosity. In summary, the results will benefit the cosmetics industry and provide an alternative natural sunscreen cream to consumers.

074-068

Scope: Alternative Agroproduct Development

Storage stability of sweet corn (*Zea mays* var *saccharata* Bailey) jam: effect of sugar to inulin ratios on physicochemical, ascorbic acid, β -carotene and sensory characteristics

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Abstract. This study aimed to investigate the effect of different concentrations of inulin on the properties of sweet corn jam from *Zea mays* var *saccharata* Bailey during storage. Six different formulations of sweet corn jam (4.5%, 9%, 13.5%, 18% and 22.5% inulin) along with control samples (0% inulin) were prepared. Physical properties including water activity, total soluble solids, pH, firmness, spreadability and colour analysis together with proximate analysis, ascorbic acid and β -carotene composition were evaluated in 4 weeks of storage. Sensory acceptability test of the samples on colour, spreadability, taste and overall acceptability was carried out. Results showed that addition of inulin in sweet corn jam significantly affecting ($p < 0.05$) the water activity, L^* value and texture quality. Inulin could be added up to 9 % without significantly affecting ($p < 0.05$) the acceptance of colour and taste of sweet corn jam. Comparative study was done on control and 9 % of inulin added sweet corn jam. Sample with 9.0% of inulin gave significantly higher ($p < 0.05$) moisture and ash content. However, samples with 9.0% of inulin gave significantly lower ($p > 0.05$) carbohydrate and β -carotene content. This study shows that inulin is not only good as prebiotic but has the potential to replace sugar added into healthy food products such sweet corn jam, since it could improve the nutritional quality of sweet corn jam with satisfying sensory acceptance.

115-064

Scope: Alternative Agroproduct Development

Effects of pickling steps on antioxidant activity of guava

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Abstract. Pickling has been used for centuries to increase the shelf life of foods. Pickling of fruit involves several steps including washing and salting. This processing may affect the retention of antioxidant compounds. The consumption of antioxidant-rich fruits has been associated with reduce the risk of oxidative stress-related diseases. However, there is limited information available on the antioxidant activity of fruits during the pickling steps. Therefore, the study is conducted to determine the ascorbic acid content (AA), total phenolic content (TPC), total flavonoid content (TFC), and antioxidant properties using ferric reducing power (FRAP) and 1,1-diphenyl-2-picrylhydrazyl radical scavenging activity (DPPH) assays during the pickling process (salting, washing, and pickling) of guava. The results showed that guava pickle showed a higher amount of TPC and TFC, but lower AA ($p < 0.05$) in comparison to the fresh guava. There were no differences in the antioxidant activities of pickled and fresh guava. Similarly, salting and washing did not significantly change the AA, TPC, TFC, and antioxidant properties of the samples ($p > 0.05$). Findings from the present study revealed that guava pickle could be a good source of antioxidant polyphenols. Further study is needed to identify the phenolic compounds responsible for antioxidant activity.

142-134

Scope: Alternative Agroproduct Development

Sensory evaluation of Robusta coffee under various postharvest technologies and roasting processing parameters

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Abstract. This study aimed to sensory evaluate the robusta coffee product as the result of the L₉ (3⁴) Taguchi orthogonal array treatment with four factors which were the post-harvest technology, roasting temperature and time, and milling. The sample was hedonically (1-5 scales) assessed with 36 panellists using an evaluation sheet instrument for the question attributes. The color and aroma of ground coffee, color, aroma, taste, bitterness, viscosity and overall acceptance of brewed coffee showed significant difference. The fineness, acidity, and sweetness of brewed coffee had no significant difference in sensory evaluation. The treatment of honey process, roasting temperature of 175°C, roasting time of 15 minutes, and mesh 80 had the highest scores in coffee ground color, brewed coffee aroma, and bitterness. The treatment of honey process, roasting temperature of 150°C, roasting time of 12.5 minutes, and mesh120 showed highest score in brewed coffee color. The treatment of natural process, roasting temperature of 200°C, roasting time of 12.5 minutes, and mesh 80 had the highest score in brewed coffee aroma and taste. The treatment of honey process, roasting temperature of 200°C, roasting time of 10 minutes, mesh 100 scored the highest in coffee ground fineness, acidity, sweetness, viscosity and overall acceptability.

150-067

Scope: Alternative Agroproduct Development

***Piper sarmentosum* (Kaduk) leaves extract**

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Abstract. Plant based medication is known as one of the alternative methods in wound management with no or less side effects, as well as less expensive. Various products related to wounds are on the market mostly consist of various unnatural chemicals. Previous preliminary study and ethnopharmacological evidence of *Piper sarmentosum* (Kaduk) also showed that the plant is a good candidate to treat wounds. Thus, this project aims to evaluate an ointment incorporated with the *P. sarmentosum* aqueous extract as an alternative to treat wounds. Two type of ointments; hydrocarbon (oleaginous; ointment 1) and water removeable (oil-in-water; ointment 2) that incorporated with the plant extract were further assessed for its organoleptic, physicochemical properties, as well as its stability at different storage conditions. The findings showed that ointment 1 exhibited good physicochemical properties with a strong scent of extract. However, this ointment did not inhibit *E. coli*, *S. aureus* and *B. subtilis* in the antimicrobial test. The stability study that carried out for three weeks consecutively showed that ointment 1 (hydrophilic) was stable under chill storage condition (5 °C) and room temperature (25 °C) without phase separation, as well as insignificant change of odour, texture and pH value. However, the formulation was physically unstable at high temperature (45 °C). Meanwhile, ointment 2 (oil-in-water) significantly inhibited *E. coli*, *S. aureus* and *B. subtilis* possibly due to presence of parabens in the formulation., not melted at high temperature (45 °C), stable in pH, non-greasy and water-washable. However, the formulation was physically unstable, that it showed phase separation after heating, and harden in texture when compared to the commercial healing ointment (Brand: Zam Buk). Findings from this study could be an initial step for the future development of the effective, affordable and safe wound healing medication by related industries.

096-042

Scope: Alternative Agroproduct Development

Potential of *Goniothalamus velutinus* wood for agri-food industry

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Abstract. *Goniothalamus velutinus* is from the family of annonaceae and it is native to Borneo. It is also known as “kayu tas” or “kayu hujan panas”. This type of wood is rarely encountered and also hard to find in the forest. It grows in the shady primary rainforest of tropical Asia, and approximately 160 species of this genus have been discovered. This plant is also known to have anti-cancer, anti-tumour and many other bioactivities. In this study, the *Goniothalamus velutinus* wood's potentials were explored for the agri-food industry. The objectives of this study are to determine chemical composition of *Goniothalamus velutinus* and the functional group of two samples which are male tas (MT) and female tas (FT). The chemical compositions were determined by the Technical Association of the Pulp and Paper Industry (TAPPI) method, and the functional group analysis were determined by Fourier Transform Infra-red Spectroscopy (FT-IR). The results shows that male tas (MT) showed a higher chemical composition compared to the female tas (FT) such as for extractive; 4.73% and 2.21%, Holocellulose; 92.19% and 88.96%, Cellulose; 57.02% and 55.88%, Hemicellulose; 35.16% and 33.08%, Lignin; 27.48% and 34.46%, respectively. These chemical compositions have good potential for the food sector. For FT-IR analysis, the results revealed five different functional groups related to which chemical composition in the sample, especially cellulose.

093-080

Scope: Alternative Agroproduct Development

Development of *Orthosiphon stamineus* ethanolic solid dispersions for solubility improvements of lipophilic flavones

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Abstract. This study was conducted to develop an ethanolic solid dispersion of *Orthosiphon stamineus* (ESD) using polymers as carriers, namely polyvinylpyrrolidone (PVP), poloxamer 188 (P188), and poloxamer 407 (P407) *via* the solvent evaporation method. The purpose of preparing the formulation is to improve the solubility of the lipophilic flavones, namely sinensetin (SIN), eupatorine (EUP), and 3'-hydroxy-5, 6, 7, 4'-tetramethoxyflavone (TMF) and caffeic acid derivatives, namely rosmarinic acid (RA). The optimized ESD was characterized using High-Performance Liquid Chromatography (HPLC), Attenuated Total Reflection Fourier Transform Infrared (ATR-FTIR) fingerprints, and physicochemical methods (particle size, zeta potential, TEM, and SEM). The effect of pH on stability and solubility in buffer and water, *in-vitro* release, and antioxidant properties (DPPH assay) indicated that the nano-formulation ESD using polymers (PVP/P407) with a ratio of extract to polymers (1.0:1.1:0.3 w/w) enhanced the lipophilic flavones (TMF=3.56 ± 0.01% w/w, SIN=2.46 ± 0.01% w/w and EUP=7.87 ± 0.01% w/w) and RA (20.66 ± 0.01% w/w) compared to the same compounds in ethanolic extract ($P < 0.0001$) with particles size less than 200 nm. In conclusion, the successful development of ESD using water-soluble copolymers (PVP/P407) has enhanced the solubility of lipophilic flavones and other compounds (RA), thereby further improving its pharmacological properties.

084-034

Scope: Alternative Agropduct Development

Waste water of various boiled legumes as potential of radical scavenging agents

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Abstract. Peanut, soybean and chickpea important source of macronutrients and considered as important foodstuff in Malaysia. Boiled legumes are usually sold by hawker on street. The water used for boiling the legumes commonly been thrown away without considering the radical scavenging potential of this so-called waste. Besides, there is lacking of awareness among the public about its nutritional benefits as part of sustainable food production aimed towards food security and nutrition. Furthermore, food antioxidants might play a significant role as physiological and dietary antioxidants which also could be a substitute for synthetic antioxidants and preservatives. Hence, this study aimed to evaluate the radical scavenging activity of the waste water from the three types of boiled legumes. The legumes were boiled in hot water and the waste water were collected. In this study, the waste water is converted into powder by means of freeze-drying technique. Radical scavenging activity was investigated using 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay, while its phenolic and flavonoid contents were determined using Folin-Ciocalteu assay and aluminum chloride colorimetric assay. The waste water of peanut showed the highest percentage of DPPH inhibition at $85.03 \pm 6.91\%$, followed by chickpea and soybean waste water at $79.89 \pm 3.69\%$ and $69.10 \pm 6.19\%$, respectively. Furthermore, the waste water of peanut also showed the lowest IC_{50} value of 0.50 ± 0.05 mg/mL, followed by soybean and chickpea of 0.55 ± 0.01 mg/mL and 0.70 ± 0.04 mg/mL. On a side note, peanut waste water extract showed the highest phenolic and flavonoid contents which are 1.8773 ± 0.36 mg GAE/g and 0.74 ± 0.01 mg CE/g, respectively, whereas chickpea showed the lowest content of both which are 0.52 ± 0.01 mg GAE/g and 0.23 ± 0.01 mg CE/g, respectively. As a conclusion, the waste water of boiled legumes is worth to be further investigated on their radical scavenging activity using other assays and could be potentially developed into functional foods.

061-040

Scope: Alternative Agroproduct Development

Comparative studies of physicochemical properties of sweet potato (*Ipomoea batatas*) cookies from different variations of sweet potato

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Abstract. Sweet potato possesses superb nutritional values and it grows easily in a hot and humid climate. In Malaysia, sweet potatoes are commonly used in making traditional snacks and sweet desserts despite that sweet potato has greater potential for utilization in other new food products. This study was conducted to formulate cookies with partial substitution of wheat flour with orange-flesh (*VitAto*) or purple-fleshed (*Anggun*) sweet potatoes. The cookies were prepared from the formulation blend of sweet potato and wheat flour in the substitution levels of 20% and 40%, respectively. The proximate composition and physicochemical properties of the formulated cookies were studied. The proximate analysis results depicted that, compared to the control cookies, sweet potato incorporated cookies had higher moisture, ash, and carbohydrates contents but lower crude protein and crude fat. The cookies incorporated with sweet potato presented a significantly greater spread ratio and diameter than the control. The results of texture profile analysis indicated that partial substitution of sweet potato for wheat flour significantly decreased the hardness of cookies though it had zero effect on the attribute of springiness. These findings revealed that the sweet potato has positive potential uses in the development of cookies or other bakery products with enhanced nutritional quality.

117-116

Scope: Alternative Agroproduct Development

Carotenoids, phenolics and antioxidant properties of different sweet potatoes (*Ipomoea batatas*) varieties

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Abstract. Sweet potato (*Ipomoea batatas*) is one of the most important tuber crops for fresh consumption in Malaysia. However, it is not fully utilized with an approximately 30 % of the whole part sweet potato especially its skin is disposed upon consumption. Sweet potato contains abundant of valuable compounds such as carotenoids and phenolics with pharmaceutical values. This research was conducted to extract, quantify and determine the carotenoids, phenolics and antioxidant activity of skin and flesh from varieties of sweet potatoes. Extraction using acetone was carried out due to its ability to dissolve both polar and non-polar substances. Results exhibited that orange flesh sweet potato consisted of the highest total carotenoid content ($187.88 \pm 3.27 \mu\text{g/g}$) while purple flesh comprised the highest total phenolic content ($96.00 \pm 1.3 \text{ mgGAE/g}$). Dark purple skin sweet potato was determined to exhibit the highest antioxidant activity ($93.21 \pm 1.33 \%$) when compared to others. Sweet potato particularly its skins could be utilised for value-added purposes such as food fortification, food additives, and animal feed enhancers instead of wasting them. Environmental problems due to food waste accumulation could be greatly reduced and data obtained could aid in future research.

033-123

Scope: Alternative Agroproduct Development

Properties and sensory evaluation of green and red spinach crackers

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Abstract. Green and red spinach are leafy vegetables prepared in varieties of Malaysian dishes. Utilisation of vegetables or fruits in baked foods such as crackers could increase nutritional values besides creating new flavour of the food. The objectives of this study were to determine the physicochemical properties and sensory acceptability of crackers incorporated with green spinach (*Spinacia oleracea*) and red spinach (*Amaranthus dubius*). The crackers were prepared by substituting 5%, 10% and 15% of green or red spinach with flour in the formulations. The formulated crackers were analysed for proximate compositions according to AOAC Methods, hardness and colour properties were determined using Texture Analyzer and chromameter respectively. Descriptive sensory evaluation was performed using 7-scale hedonic method to determine products preferences. The results showed that flour substitution with green or red spinach powder had decreased the moisture (3.35 to 10.48%) but increased the ash (2.34 to 3.23%), fat (11.2 to 13.93%) and protein (8.61 to 9.79%) content of crackers. Hardness values of both crackers were increased (4500 N to 5461 N) with increasing percentage of spinach powder used. The hardness decreased as longer time of storage applied. Lightness, redness and yellowness of crackers decreased with increased percentage of spinach used. Similarly, the colour intensities were decreased during four weeks of storage. In sensory evaluation, the lowest percentage of spinach in crackers (5%) received higher sensory acceptability than control and other formulations. In conclusion, the incorporation of green or red spinach in crackers at all percentages had increased nutritional values. The incorporation of 5% of green or red spinach received higher consumers' acceptability among all formulations. It is recommended that green or red spinach powder could be incorporated in crackers up to 5% level for commercialization.

040-073

Scope: Alternative Agroproduct Development

Plant parts and preparation of edible plants by indigenous Sama-Bajau and Dusun people in Kota Belud, Sabah

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Abstract. This work presents plant parts and preparation of edible plants by indigenous Sama-Bajau and Dusun people in Kota Belud district, Sabah. A total of ten plant parts were used for the food plants by indigenous Sama-Bajau in Usukan, Kota Belud, Sabah. The most used part of plants is leaves (29.6%), followed by fruit (20.4%) and young leaves (14.8%). Meanwhile, a total of seven plant parts were used for traditional vegetables by indigenous Dusun people from the same district. The most used part of plants by Dusun people in Kadamaian, Kota Belud are leaves (48.1%), tuber (14.8%), stem (14.8%) and fruit (11.1%). There are five types of preparation for plants that were consumed as traditional vegetable; eaten fresh, blanched, boiled, grilled, and stir fry. The findings could provide the baseline data of Dusun and Sama-Bajau sustainable usage of plant resources that are readily available from their surroundings. A study on traditional knowledge on uses of wild edibles and food plants is a necessity to preserve the knowledge and extend the application of its beneficial properties for future ethnopharmacological related research.

064-035

Scope: Alternative Agroproduct Development

Organic content and the number of *Corbicula fluminea* (Muller, 1774) in Lubok Tani irrigation canal, Tumpat, Kelantan

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Abstract. *Corbicula fluminea* can be found at the bottom of lakes, rivers and irrigation canal in Kelantan. *C. fluminea* is located receive nutrients that are carried along with the runoff and these nutrients are considered pollutants to the water, but it is a food source for *C. fluminea*. Plus, the number of *C. fluminea* present is believed to be influenced by organic content in the sediment. Hence, the objective of this study is to determine the concentration of organic matter in the sediment and the number of *C. fluminea* at Lubok Tani Irrigation Canal, Tumpat, Kelantan. Samples were collected from two points, with six composites sampling of sediment and six samples of *C. fluminea*. Thus, organic matter in sediment was carried out by using Loss on Ignition analysis. The results indicate that average of 55 clams was collected at the left bank, 57 clams at the middle and right bank. The average organic matter at the left bank was recorded at 1.61%, centre at 1.37%, and right bank at 2.42%. The results showed that the higher organic matter the higher composition and size of *C. fluminea* found in Lubok Tani Irrigation Canal, Tumpat. However, more data collection is required to obtain a significant correlation.

149-084

Scope: Alternative Agroproduct Development

Effect of different drying methods on the antioxidant properties of leaves of *Centella asiatica*

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Abstract. *Centella asiatica* is one of the vital plant sources of antioxidants properties for consumption or medicinal purposes. This study is aimed to determine the effect of three different drying methods (freeze drying, oven drying and dehydration drying) on the antioxidant of leaves of *C. asiatica*. The antioxidant properties and IC₅₀ value of different concentration of methanolic extract solution (0.5 mg/ml, 0.25 mg/ml, 0.125 mg/ml and 0.062 mg/ml), were evaluated using 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay. The drying conditions and time required for freeze drying, oven drying and dehydration drying were -45°C for 3 days, 60°C for 5 hours and 35-43°C within 1-3 hours, respectively. Lower IC₅₀ value indicated a stronger antioxidant activity of samples. The freeze-dried of *C. asiatica* sample at 0.05 mg/ml concentration exhibited the highest scavenging activity ($93.97 \pm 0.45\%$) with the lowest IC₅₀ value (0.05 mg/ml) whereas the lowest scavenging activity was shown by dehydration dried of *C. asiatica* sample at 0.05 mg/ml concentration ($55.08 \pm 0.03\%$) with the highest IC₅₀ value (0.36 mg/ml). This indicates that as the concentration increases, the radical scavenging activity increases. Thus, freeze drying is the most recommended method to conserve the highest amount of antioxidant properties in *C. asiatica* leaves.

103-027

Scope: Alternative Agroproduct Development

Total phenolic content and antioxidant activity of an edible Aroids, *Colocasia esculenta* (L.) Schott

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Abstract. *Colocasia esculenta* (L.) Schott is an edible aroid from the family of Araceae. It is a tuber crop which is known for its variety of cooking preparation. This study aimed to evaluate the Total Phenolic content (TPC) and antioxidant activities by using 2,2-diphenyl-1-picrylhydrazyl radicals (DPPH) scavenging assay. Methanol fraction showed the highest TPC, whereas the extract obtained using 95% ethanol showed the highest inhibition in DPPH scavenging assay and IC₅₀ values of 308 µg/mL. These results indicate that *C. esculenta* has antioxidant activity with high phenolic contents which can be consumed as a functional food to increase health benefits and lower the risk of diseases.

031-049

Scope: Alternative Agroproduct Development

Study and quality evaluation of candy prepared by using bottle gourd

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Abstract. Bottle Gourd (*Lagneria siceraria*) is having a variety of uses throughout world. Recently the interest in bottle gourd has been growing amongst consumers because it contains several nutritive and medicinal constituents which are required for good health and wellbeing. The nutritive value of bottle gourd makes it a popular diet ingredient in making sweet curries, soups, jams, juices, beverages, cakes, for value addition. Keeping in view its nutritional and therapeutic values, bottle gourd candy was prepared by incorporating (65, 70 and 75 °Brix) of sugar syrup into them. Product quality was evaluated based on physicochemical (moisture, ash, pH, TSS, browning index), characteristics of the samples. It was studied that the physicochemical attributes of the bottle gourd candy samples were improved by adding the sugar syrup as compared to with control which is 2% CaCl₂ treatment. There was increased ash content, reduction in moisture content and browning index due to the sugar syrup incorporation. On 28th day the moisture content of the of the bottle gourd candy sample with (65, 70 and 75 °Brix) concentration was 7.49, 7.19 and 7.07 % respectively. The ash contents of the bottle gourd candy samples were found 0.385, 0.506, and 0.590 % respectively on 28th day and pH were 3.82, 3.89 and 3.49 respectively at the end of storage. The products were found to be safe for consumption and was in pristine state even after 28 days. Hence the study suggests the uses of bottle gourd candy for taste and health benefits.

067-081

Scope: Alternative Agroproduct Development

Physicochemical properties of products and waste of black seed produced by cold press method

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Abstract. Black seed or black cumin has the scientific name *Nigella sativa* (NS) is an herbal plant that is widely used to treat various diseases. The extraction of oil from NS seeds produces a byproduct called NS waste. This study aims to evaluate the physicochemical properties of products and NS waste produced by the cold press method. Analysis of physical properties was carried out using a completely randomized design (CRD) with 3 treatments and 5 replications. The thymoquinone test was carried out using high-performance liquid chromatography (HPLC). The moisture content of seed and NS waste were 6.21 and 7.91%, respectively. The crude protein content in NS seeds and waste reached 19.34 and 27.78% and crude fat contents were 23.99 and 16.93%. The TQ content in NS seeds, oil, and waste were 1680, 2701, and 350 ppm, respectively. Other active compounds in NS seeds are saponins, tannins, flavonoids, triterpenoids, and glycosides. Extraction rate of NS using cold press method is 34.46% and produces NS oil products and waste with the desired physicochemical properties, so the product can be used as material for the pharmaceutical or medicinal purposes.

151-069

Scope: Alternative Agroproduct Development

Gluten free brownies made with composite rice flour

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Abstract. This study was conducted to determine the effect of composite rice (Riceberry and Red jasmine rice) flour ratio and germination process on the physical and chemical properties and sensory characteristics of brownies. The ratios of Riceberry and Red jasmine rice flour at 75:25, 50:50, and 25:75 were investigated. As the amount of red jasmine rice flour increased, affected physical properties by increasing in the specific volume and L*, a*, b* values but decreased the hardness. However, there was no influenced on chemical composition. The sensory characteristics were found to increase with increasing ratio of red jasmine rice flour. However, there were no significance ($p>0.05$) different on sensory characteristics except the taste attribute score. Thus, the selected ratio was 50:50 Riceberry and Red jasmine rice flour. The effect of germination was found to increase specific volume, and L*, a*, b* values but decreased reducing sugar. There was no significance ($p>0.05$) different of sensory characteristics between brownies made from raw and germinated rice flours. Therefore, rice grains should be germinated before utilization of rice flour as substitution of wheat flour to produce gluten free product.

106-100

Scope: Environmental Economics

Willingness to carbon offset: Value of Malaysian air travellers' experience, general and specific environmental knowledge

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Abstract. Greenhouse gas emissions from the aviation sector contribute significantly to global warming. Air transportation contributed 4% to 9% of total CO₂ emissions in Malaysia. Several approaches have been done by aviation industries in Malaysia to reduce carbon emissions from airlines, but still unsuccessful to implement carbon offset program. This study investigated experience, understanding of carbon offsets and the information passengers have concerning environmental issues and the ability to evaluate and understand impact on society and the environment among Malaysian airlines passengers. A descriptive statistic is reported as data collected from 407 Malaysian airlines passengers. The result shows only 1.5% of passengers experienced bought carbon offset schemes in past flight, more than 83% are knowledgeable with environment knowledge and more than 75.7% enlightened with understanding of carbon offsets. The finding obtained will help in providing insightful understanding about Malaysian airlines passengers' acceptance on carbon offsets and willingness to contribute with carbon offsetting.

141-050

Scope: Environmental Economics

Study on sweet potato market behavior in supporting food security

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Abstract. Sweet potato has an important role in food security. In the future, the demand for sweet potatoes will become higher. However, there has not been any significant awareness of sweet potatoes' importance; moreover, it is considered an inferior commodity. New improved varieties of sweet potato having high beta-carotene, namely Beta 1 and high anthocyanins, Antin 2 and Antin 3 are already available. Besides, Pating 2 has high starch and dry matter ($> 30\%$) as well as high potential yield ($30\text{-}40\text{ t ha}^{-1}$). Sweet potato condition is indicated by its market behavior described by market elasticity and integration. Sweet potato demand is inelastic, and the price level is inversely proportional to demand quantity. The cross elasticity showed rice was the strongest substitute for sweet potato. The negative value of income elasticity meant the decrease of sweet potato consumption would follow the increase in income. Similarly, the integration of production centers inter-regional market has not been well ordered, distorting product distribution. Suggestions for the sweet potato market included exploiting its potential as a functional food by promoting and community education, diversifying the products, structuring the market for distributional purpose, creating market regulation, issuing price stabilization policy, and improving marketing infrastructures.

039-062

Scope: Environmental Economics

Application of herbal plants in giant freshwater prawn: A review on its opportunities and limitation

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Abstract. Sweet potato has an important role in food security. In the future, the demand for sweet potatoes will become higher. However, there has not been any significant awareness of sweet potatoes' importance; moreover, it is considered an inferior commodity. New improved varieties of sweet potato having high beta-carotene, namely Beta 1 and high anthocyanins, Antin 2 and Antin 3 are already available. Besides, Pating 2 has high starch and dry matter ($> 30\%$) as well as high potential yield ($30\text{-}40 \text{ t ha}^{-1}$). Sweet potato condition is indicated by its market behavior described by market elasticity and integration. Sweet potato demand is inelastic, and the price level is inversely proportional to demand quantity. The cross elasticity showed rice was the strongest substitute for sweet potato. The negative value of income elasticity meant the decrease of sweet potato consumption would follow the increase in income. Similarly, the integration of production centers inter-regional market has not been well ordered, distorting product distribution. Suggestions for the sweet potato market included exploiting its potential as a functional food by promoting and community education, diversifying the products, structuring the market for distributional purpose, creating market regulation, issuing price stabilization policy, and improving marketing infrastructures.

095-063

Scope: Environmental Economics

Public satisfaction and willingness to pay (WTP) for better solid waste management services in rural area of Kelantan, Malaysia

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Abstract. In Malaysia rural area, the fixed-rate method is the waste charging approach adopted by the local authorities because of low administration cost, but it is ineffective and has caused many environmental issues. Therefore, this study was conducted to explore the public willingness to pay on better solid waste management services at rural area of Kelantan. A total of 911 respondents from three (3) districts (Jeli, Kuala Krai, Gua Musang) participated in this study. The results showed that most respondents ($\pm 75\%$) expressed their satisfaction on current solid waste management services provided. This study indicated that nearly 62% of respondents were willing to pay more for better solid waste management services. This study revealed that the estimated mean willingness to pay (WTP) for better solid waste management service is RM12.05 per household. Logistic regression model suggested that satisfaction on solid waste management services affected the WTP amount, apart from socio-economic factors such as educational level, type of houses, occupation and household income. The results can be useful for understanding the rural resident's attitudes and WTP for solid waste management services.

099-079

Scope: Environmental Economics

Agro Farmer's implementation towards the application of kitosanplus in Terengganu

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Abstract. Agriculture sector remains as one of the important sectors that contribute to Malaysia's economy. The usage of Kitosanplus could represent an innovative eco-friendly strategy for managing plant diseased and replacing copper as it is consisting with an active molecule which could provide variety of application towards agriculture sector. The Kitosanplus is an active molecule that finds many possible applications in agriculture to reduce or replace more environmentally damaging chemical pesticides. The purpose of this study is to determine the most influential factor of agrofamer towards Kitosanplus applications in Terengganu, Malaysia. The most popular agriculture activities in this area are paddy plantation followed by chilies. A survey conducted towards 50 respondent by distributing the questionnaires using purposive sampling technique which have the background of agrofamer including the owner and the manager of the farms. The data then were analysed using SPSS Software. Based on the result, the implementation of agrofamers towards Kitosanplus applications are influenced by their attitude.

133-039

Scope: Environmental Economics

Economic feasibility of soybean cultivation using bio-pesticide technology

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Abstract. Pests and diseases are one of the obstacles to increase soybean productivity in Indonesia. Pests controlling using chemical pesticides need high production cost resulted in a low profit of soybean farming; therefore, less attractive to farmers. The study aims to evaluate the economic feasibility of soybean farming using bio-pesticide in rainfed rice fields. The research was conducted in Banyuwangi Regency, East Java during the second dry season of 2018. The survey involved forty respondents. Three improved soybean varieties (Anjasmoro, Argomulyo, and Devon) and one local variety (Martoloyo) were evaluated on two cultivation technologies, namely bio-pesticide and existing. The results showed that the average yield of existing technology was 2.18 t ha⁻¹ or 5.8% higher than the bio-pesticide (2.06 t ha⁻¹). The highest seed yield was obtained by Anjasmoro, i.e. 2.31 and 2.38 t ha⁻¹; while, the lowest was Argomulyo, i.e. 1.85 and 1.96 t ha⁻¹, respectively for bio-pesticide and existing technologies. The application of soybean cultivation using bio-pesticide technology and improved varieties provided profit of IDR 8,785,300. The profit was 125.88% higher than the existing. Bio-pesticide as well as existing technologies (both for improved and local varieties) showed the R/C ratio >1, suggested that both technologies were feasible to be developed.

113-077

Scope: Environmental Economics

Estimation of consumer's willingness to pay for biodegradable food container in Kota Bharu, Kelantan

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Abstract. Rapid rising population and regional urbanisation in Malaysia has led to rising demand and a more convenient disposable way of non-biodegradable food containers. The amount of mismanaged plastic waste in Malaysia keep increasing every year. This study is conducted to identify the consumers' willingness to pay for biodegradable food containers in Kota Bharu, Kelantan. This study employed a simple random sampling method, and 270 respondents have participated in a face-to-face interview technique. The Contingent Valuation Method was used to estimate the consumers' willingness to pay for biodegradable food container products. The study has found that the three factors, age, marital status, and monthly household income, influence their willingness to pay for biodegradable food containers. The result indicates that the consumers in Kota Bharu, Kelantan, are willing to pay RM0.78 for every biodegradable food container, which is 28 cents more than the current rate. The finding can become a guide or tool for improving biodegradable food containers and reducing non-biodegradable food containers' usage to create a better living environment.

101-117

Scope: Environmental Economics

Diversity and ecology of Araceae in the water catchment area of Ulu Sat, Kelantan, Peninsular Malaysia

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Abstract. Araceae or aroid is familiarly known as *keladi* to the locals. The purpose of this study is to assess the diversity and ecology of Araceae in the Water Catchment Area of Ulu Sat, Kelantan, Peninsular Malaysia. The random sampling method was applied. A total of 26 species from 13 genera of Araceae were recorded from the water catchment area of Ulu Sat, Machang, Kelantan, Peninsular Malaysia. This represents about 18.6% out of an estimated 140 species and 46.2% of the 28 genera of Araceae reported for Peninsular Malaysia. The result also shows that 24 species or 92.3% of the collection are the common Araceae species found in lowland dipterocarp forest in Peninsular Malaysia. However, the collection include the species recently recorded, *Aglaonema cochinchinense* Engl. and the endemic species, *Alocasia puber* (Hassk.) Schott for Peninsular Malaysia. The paper will also discuss the distribution and ecology of some important Araceae collected from this area.

111-082

Scope: Environmental Economics

Factors influencing the public park use in Kuala Lumpur, Malaysia

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Abstract. Urban public parks provide a recreational space for urban residents. However, some peoples claimed that Malaysia has yet to reach a satisfactory degree of urban public parks design and development to facilitate residents with a healthy environment. Therefore, there is an essential need to identify a public park's characteristics that can satisfy and fulfill urban residents' needs for a healthy and high quality environment. This study aimed to examine the influencing factors of urban public park usage in Kuala Lumpur. A questionnaire is designed based on the socio-ecological model and previous empirical findings was distributed to 400 respondents at 12 public parks in Kuala Lumpur through a purposive sampling method. Multiple linear regression was used to analyze the data. The results found that the physical environment was the strongest factor influencing the use of public parks in Kuala Lumpur. Social and individual factors followed this. The results found extensive input and contributed to new literature related to the use of urban public parks. This study recommends several policies to be considered, particularly on urban landscape management. The local authorities should play an important role in protecting the existing public park's physical environment to achieve the best quality continuously.

071-103

Scope: Environmental Economics

Weeds diversity in oil palm plantation at Segamat, Johor

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Abstract. This research was conducted to study weeds composition and diversity with regards to management practices at three oil palm plantations in Segamat, Johor. Using nested quadrat sampling approach a total of 19 families, 35 genera, 43 species and 4465 number of individuals of weeds species were found and recorded from the three plantations. The Shannon diversity index, H' was 3.45 whereas the Evenness index, EH for the overall weeds species was 0.92. The highest weed diversity was observed at Kg. Sri Rahmat oil palm plantation ($H'=3.11$) located at the lowest elevation with the least herbicide application and pruning practices followed by Kg. Logah ($H'=3.07$) and Felda Medoi ($H'=2.83$). The overall species evenness for this study area was 0.92 indicating that the species distribution was relatively high in monoculture system. At Kg. Logah, the species evenness was almost totally even ($EH=0.98$) followed by Kg. Sri Rahmat ($EH=0.97$) and Felda Medoi ($EH=0.93$). Both family Poaceae and Rubiaceae contributed to the highest species richness within the study area. Therefore, the composition and diversity of weeds recorded from this research was relatively high. There were several factors that could potentially affect the weeds diversity such as farming system, age oil palm plantation, pruning treatment (canopy), management through usage of herbicide, type and usage of fertilizer and location of oil palm plantation based on different elevations. This study is essential for sustaining oil palm production through successful weed control using diversity data and management histories as an indicator.

090-102

Scope: Environmental Economics

Species diversity of pteridophytes in oil palm plantations at Segamat, Johor

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Abstract. Species composition, diversity and richness of pteridophytes were observed in three oil palm plantations of different age and management histories at Segamat, Johor using random sampling method. A total of 3762 individuals of pteridophytes consisting of 32 species belonging to 13 families from 20 genera were identified and recorded. Family Polypodiaceae, genera *Microsorium* and family Davalliaceae, genera *Davallia* contributed to the highest richness of species and were commonly found within the study area. The diversity index represented by Shannon Index, H' , is 2.51 whereas the computed evenness index is 0.72 for the overall pteridophytes species indicating a relatively high species distribution within the monoculture system. The species richness in Kg. Sri Rahmat oil palm plantation was found higher than Kg. Logah and Felda Medoi oil palm plantation with 2.15, 2.10 and 2.09 respectively. From the total recorded species of pteridophytes, the highest diversity is observed at the Kg. Sri Rahmat ($H'=2.07$) followed by Kg. Logah ($H'=1.81$) and Felda Medoi ($H'=1.79$). At Kg. Sri Rahmat, the species evenness is nearly even ($E_H=0.73$) whereas at Kg. Logah and Felda Medoi, the species evenness was less significant different ($E_H=0.66$ and $E_H=0.65$). The type of fertilizer used, frequency of herbicide application and pruning activity at Kg. Sri Rahmat could potentially affect the diversity of pteridophytes species in the plantation. This highlights the potential of oil palm plantations owned by smallholders as an ecosystem support for the diversity of pteridophytes species. However, this may vary with different plantation age and management history.

094-104

Scope: Environmental Economics

Heavy metals concentration in spotted Babylon snail, *Babylonia areolata* from Kemasin Coast, Kelantan

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Abstract. Bioaccumulation of toxic metals in marine gastropods, including spotted babylon snail may cause a serious treats to human via food chain. Therefore, the present study investigates the metal contents in the spotted babylon snail, *Babylonia areolata* based on two sample groups, which are the whole sample and sample without the digestive system using Inductively Coupled Plasma with Atomic Emission Spectrometry (ICP-MS). The concentration pattern of the metals in sample with digestive system was As > Fe > Cu > Zn > Cd > Hg > Sn > Cr and As > Fe > Zn > Cu > Cd > Cr > Hg for sample without digestive system. Overall, the concentrations of these heavy metals were lower in samples without digestive system. Meanwhile, lead (Pb) and antimony (Sb) were not detected in both sample groups. Maximum permissible limits of toxic metals in food were compared and indicated that the heavy metals in *B. areolata* were within the safety levels except for As (sample with and without digestive system) and Cd (sample with digestive system). The exposure risk of heavy metals in *B. areolata* at the Kemasin coast, Kelantan is at a permissible level for the consumer provided that the digestive system is removed from the flesh.

078-089

Scope: Environmental Economics

Relation subsidence and water level of peatland cultivated with oil palm in Riau, Indonesia

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Abstract. This study was aimed to determine the relation changes in the subsidence and the depth of water level of peatlands cultivated with oil palm. The research site is the oil palm plantations in Koto Village, Gasib District, Siak Regency, Riau, Sumatera. The observations were in 4 blocks, namely block L1 (shrubs), Block D1 (oil palm aged 15 years), D8 (oil palm aged 10 years), and D31 (oil palm aged 20 years). Research parameters include peat subsidence and groundwater level. The results showed that the value of peat subsidence was fluctuative. This fluctuation was due to the rise and fall of the groundwater level. The highest rate of decline is shown in block L1 with 0.75 cm y⁻¹ with SD 1.03 and the groundwater level in D1 with 52 cm. The water level is influenced by the condition of the monthly rainfall. The correlation between land subsidence and peat water level shows a close and significant relationship ($p < 0.01$, $r = 0.871$).

036-119

Scope: Environmental Economics

Application of Digital Terrain Model in Identifying Potential Conservation Area (PCAs) of Subtropical Forest in Okinawa, Japan

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Abstract. Conserving the Northern forest of Okinawa Main Island is very crucial and the selection of significant areas to be protected is a complex and challenging process. The altitudinal gradients provide ideal settings to determine priority area for conservation hence improving our understanding of species richness and distribution pattern. The study sought to identify potential conservation areas (PCAs) in the subtropical forest of Okinawa Island based on the Digital Terrain Model (DTM). Different elevation levels range from were overlaid with forestland owner boundary data, vegetation, protected parks and accessible forest road. Results showed that the available PCAs decreased with an increase of elevation gradient. Protected sites require a small area as possible to allow competing demands for development and other human activities. Considering the influence of the qualitative factors for site selection, the middle-peak elevation region in the study area was chosen as the priority area for protection and conservation sites. This finding was also compared to the preceding studies which influenced the diversity of flora, fauna, climate, and geographical factors at different altitudinal levels.

059-124

Scope: Environmental Economics

Determinants of household's intention of practicing sustainable food waste management in Malaysia

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Abstract. The issue of food waste continues to be a challenge especially when it comes to practicing sustainable food waste management in Malaysia. Much attention is needed to overcome the issue of food waste in order to make changes towards the current situation. Therefore, this study aims to analyze the factors which are related to the urban households' intention towards sustainable food waste management in Malaysia. Data from 200 respondents was collected using an online survey using purposive sampling method. Thereafter, factor analysis was adopted to analyze the relationship between the factors influencing the intention of households to practice sustainable food waste management. The descriptive analysis showed that respondents from the survey indicated high intention of practicing sustainable food waste management and majority of the respondents claimed that it would be able to reduce environmental harm. Based on the factor analysis, the determinants related to the households' intention of practicing sustainable food waste management are attitude, subjective norm, perceived behavioural control, and intention of reducing food waste. To curb the growing issues of food waste, local authorities have implemented various strategies and campaigns to create awareness as well as ensuring practices to reduce local food waste, such as waste segregation laws, building anaerobic digesters for food courts, composting facilities, the MY Save Food initiative, and others.

127-132

Scope: Environmental Economics

The contribution of forests on food security and rural poverty: A current status in Johor

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Abstract. In recent years, the issue between forest resources, food security and rural poverty has emerged and globally become a fundamental problem. Forests provide food, fodder and fuel, and somehow the forest goods and services itself provide a means of earning income, especially in rural communities. In understanding the contribution of forests to food security, it is essential to look at the current socioeconomic status of the rural communities especially forest-dependent communities and determine the linkages between them. Therefore, a 2020 study was conducted to analyse the contribution of forests and its related activities to food security and rural poverty within rural households including indigenous people. The study employed rapid rural appraisal and socioeconomic survey on the rural households live within and the adjacent of forest specifically Permanent Reserved Forest. Generally, this study was conducted throughout Peninsular Malaysia. However, this paper only focuses on the state of Johor as an example for this study. A case study in Johor found that forests and its resources provided significant contribution on food security and rural poverty. Where, it contributes up to 21.5% of monthly cash income of rural communities and if there is no income generated from the forests the poverty incidence of these communities will increased up to 13.7% from current incidence.

065-087

Scope: Environmental Economics

Projected conservation of agricultural land to prevent detrimental effects of land-use changes upstream Brantas Watershed in Indonesia

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Abstract. This research aims to project the conservation of agricultural land due to land-use changes in 2029 in the upstream Brantas watershed, in avoiding agricultural land degradation to realize sustainable agriculture. This study applies the Cellular Automata (CA)-Markov combined model to quantitatively predict and spatially simulate the trend of land-use change in 2029. Analysis of total sediment and flow out uses Soil Water Assessment Tools (SWAT) analysis applied to land use in 2019, and land use in 2029 the CA-Markov prediction result. After that, a technical vegetative and civilian conservation projection model was carried out using SWAT. The results of the observation-model sediment validation resulted in a Nash-Sutcliffe Efficiency (NSE) value of 0.87. The projection results of agricultural land conservation in land-use in 2029 resulted in a total sediment value of 1500,483 tons/ha/year, indicating a decrease in total sediment of 55 % compared to the total sediment in 2029 without conservation, and and 8% compared to the total sediment in 2019.

028-071

Scope: Environmental Economics

Understanding the relationship factors of youth's inclination towards agro food entrepreneurship in Kelantan

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Abstract. Many researchers have explored the inclination of performance in manufacturing and services industries but such studies in agro-food SMEs are scarce. The aim of this paper is to understand the relationship between attitudes, subjective norm and perceived behavioural control with the inclination involvement of youth in an agro-food entrepreneur. Quantitative research was designed based on the Theory of Planned Behaviour (TPB). The questionnaire distributed among 100 youths at Kelantan by using a non-probability sampling technique. A descriptive analysis was done by using SPSS 25.0. Finding on this research based on Spearman correlations indicates that there is a positive relationship between attitudes (0.595), subjective norms (0.600) and perceived behavioural (0.500) of youth's inclination towards agro-food entrepreneurship. This study is significant to the government, researchers and youths to understand the factors and relationship of the youth's inclinations towards agro-food entrepreneurship.

155-131

Scope: Environmental Economics

**Pollination services contribution values benefits for food security.
Case study: Gunung Tebu Forest Reserves, Besut, Terengganu**

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Abstract. Pollination is one of ecosystem services provided by tropical forest as addressed in The Millennium Ecosystem Assessment. Roughly, two-third of the world's agriculture species cultivation required pollination. Studies shows that 70% of tropical crops seem to have at least one variety for which production is improved by animal pollinators. Most common pollinators live naturally in the ecosystem or wild pollinators. The objective of this study was to quantify the economic value of pollination services by wild pollinators of Gunung Tebu Forest Reserves, Besut, Terengganu. Agricultural data was obtained from Department of Agriculture Terengganu. Data incorporated the list of farmers/villages, types of crops planted, annual area planted (ha), annual area harvested (ha) annual production (kg) and annual production value (RM). The economic value of pollination services was estimated by multiplying production value of each crops with its pollinator dependence ratio. This paper considered four types of crops, namely durian, watermelon, melon and rambutan. Results of analysis on economic value of natural pollinator services based on pollinator dependence ratio was RM 5, 964,631. These accounted for 51% of the total production values for the region. It demonstrated that the natural pollinators have important impacts and benefits to agricultural sectors through pollination services provided by the nearby forest. With improved pollination services, crop yields could be further increased, successful agricultural production, pollination would contribute significantly to world food security.

119-083

Scope: Environmental Economics

Participation towards agro-entrepreneur among RISDA rubber smallholders in Kelantan

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Abstract. As their income was under the poverty line income (PLI), most of the rubber smallholders were listed as hard-core poor with the average earning of below RM800 per month. Regarding this issue, the government and private sector have provided several entrepreneurial programs to improve their better lives but however the participation among rubber smallholders are still low according to RISDA report. Therefore, a study is conducted to evaluate the variables affecting the involvement of RISDA rubber smallholders in Kelantan in agro-entrepreneurship program. Theory of Planned Behaviour (TPB) used to observe attitudes towards people behaviour which is important to determine the factor of participation of rubber smallholders in agro-entrepreneurship program conducted. Attitudes influence behaviour by their impact on intentions while intentions and attitudes depend on the situation and person. Thus, TPB model on data derived from Kelantan rubber smallholders with independent variables such as attitude, subjective norm, and perceived behavioural regulation is applied. The questionnaires were distributed among 100 RISDA rubber smallholders using a simple random sampling technique and the data was analyzed using a descriptive and correlation analysis. Results have shown that the all factors influencing participation have high mean score and was significant to the participation towards agro-entrepreneurship program.

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