MALAYSIAN SOCIETY OF AGRICULTURAL AND FOOD ENGINEERS
Est. 1982

Programme and Abstract Book

NATIONAL AGRICULTURAL AND FOOD ENGINEERING CONVENTION (NAFEC) 2021

'EMBRACING THE FUTURE THROUGH ADVANCED AGRO-FOOD ENGINEERING'

- **23 – 24 March 2021 (Tuesday – Wednesday)**
- **MARDI Headquarters, Serdang**

VIRTUAL CONFERENCE

CO-ORGANISER:

PAGE	CONTENTS

LIST OF SPONSORS:

MKR HARTAMAS

STAR EXCELLENCE

WORLDSTAR

WONG AGRICULTURAL ENGINEERING SDN BHD

MESSAGE FROM THE MINISTER

MINISTRY OF AGRICULTURE AND FOOD INDUSTRIES (MAFI)

It is my great pleasure to welcome all distinguished speakers, guests and participants to the National Agricultural and Food Engineering Convention (NAFEC) 2021.

The recent COVID-19 pandemic affects global food and energy crisis, in many ways, has changed the worldview on food production and supply. However, this global issue has opened the door for the mechanization and smart farming approach in the agricultural sector when the workforce becomes a crisis in the light of preparing food for the world. It is therefore imperative that the Malaysian agricultural and food industry learns from the crisis and becomes an energy efficient food producer through the use of innovative technologies. Technology-driven Malaysian agricultural and food sector is the best bet. Apart from reducing dependency on conventional inputs and labour, modernization in agro-food brings us towards increased production, improved income and standard of living for farmers and enhanced food security in the agro-food sector.

On that note, I would like to extend my sincere appreciation and congratulation to Malaysia Agricultural Research and Development Institute (MARDI) and the Malaysian Society of Agricultural and Food Engineers (MSAE) for organizing NAFEC 2021. Not to forget all the co-organizers that have supported this event from the beginning of the plans, namely LPP, DOA, UPM, MPIB, MPOB, MADA, KADA, DOF, JPPKK, PKB, Universities, MRB and LPNM for their efforts to organize this event in these challenging times.

The government is gearing towards leveraging the potential of mechanization to support and improve the efficiency of agro-food production in Malaysia. I hope this conference can serve as a platform for the participants to interact and exchange ideas on innovations, products, information and the latest progress in agricultural and food technologies.

I wish all participants a very productive deliberation.

DATUK SERI DR. RONALD KIANDEE

MESSAGE FROM THE DIRECTOR GENERAL

MALAYSIAN AGRICULTURAL RESEARCH & DEVELOPMENT INSTITUTE (MARDI)

Assalamualaikum w.b.t. and Greetings to all participants of National Agricultural and Food Engineering Convention (NAFEC) 2021. NAFEC 2021 is the first conference jointly organized by Malaysian Agricultural Research and Development Institute (MARDI) with the Malaysian Society of Agricultural and Food Engineers (MSAE). This convention has been themed as `Embracing the Future Through Advance Agro-Food Engineering'. The theme is suitable with its objectives in highlighting promising advanced technologies and mechanization approaches to enhance the sustainability of agro-food production. The COVID-19 pandemic had brought new perspectives on producing food through modernizing agriculture technology. NAFEC 2021 envisaged to address the issues, challenges and gaps in all aspects of agricultural and food engineering applications to enhance production, distribution and usage of modern technology including mechanization and automation as well as smart farming which involves the internet of things (IoT), artificial intelligence (AI), and big data.

The organizers have already taken a step in the right direction to bring about a new agricultural technology for the country. Modern technology and innovation were vital to ensure the agricultural industry evolved, not only to improve productivity, but also to address labour shortage concerns in this industry.

This convention is specially organized to provide an avenue for the industry, research institutions, institutes of higher learning, government agencies, agricultural extension, individuals to exchange ideas and experiences on different but important subjects of national interests. This convention is the perfect platform to facilitate the transfer of new and practical technologies to the agricultural sector.

I would like to take this opportunity to congratulate the organizing committee for the persistent efforts in ensuring the success of NAFEC 2021.

DATUK DR. MOHAMAD ROFF MOHD NOOR

MESSAGE FROM THE CHAIRMAN

NATIONAL AGRICULTURAL AND FOOD ENGINEERING CONVENTION (NAFEC) 2021 MAIN ORGANIZING COMMITTEE

In the Name of Allah, the Most Beneficent, the Most Merciful. Assalamualaikum w.b.t and Salam Sejahtera.

Welcome to the National Agricultural and Food Engineering Convention (NAFEC) 2021. Malaysian Agricultural Research and Development Institute (MARDI) is tremendously privileged to organize this convention together with the Malaysian Society of Agricultural and Food Engineers (MSAE).

In this unprecedented era of COVID-19, we have to embrace the new norm for conferencing and adapt the Standard of Procedure in gathering all speakers and participants. The theme 'Embracing The Future Through Advanced Agro-Food Engineering', shows that leveraging modern technology in food and agricultural industry through mechanization, automation and smart farming is no longer just an option. Today it is an absolute imperative in sustaining high agro-food productivity with efficient use of input.

The main objective of this convention is to provide a forum for the mutual sharing of information on the current status of agricultural and food engineering technology in the country. It is a platform for local experts to deliberate and share their experiences, research outputs and latest technologies to deal with the issues of food security, sustainable production, competitiveness and new growth areas in agro-industries. The conference will feature about 30 oral papers and more than 31 poster papers on wide ranging topics on agricultural and food engineering.

I would like to take this opportunity to extend my appreciation and gratitude to YB Datuk Seri Ronald Kiandee for officiating this conference and the Director General of MARDI for his support and encouragement in organizing this conference. We are grateful to all the committee members who worked hard to make this event happen successfully. We are fortunate to have the support of great co-organizers and sponsors to make this event excellent.

Finally, I wish everyone a successful and fruitful deliberations.

DR AZMAN HAMZAH

MESSAGE FROM THE PRESIDENT

MALAYSIAN SOCIETY OF AGRICULTURAL AND FOOD ENGINEERS (MSAE)

MSAE was established in 1982 with the aim to promote the role and profession of agricultural and food engineer as a catalyst for technological advancement in the agricultural sector. As such, the society has become a platform for engineers, scientists and technologists to establish a closer working relationship among public and private institutions and the community.

In approaching fully developed nation status by 2020, our Malaysian Government has emphasized the issue of Food Security and Sovereignty. This has triggered an immense paradigm shift in conventional agricultural practice. Labor availability is no longer a luxury, resources must be used wisely and the environment must be conserved for future sustainability. MSAE, as a national level NGO, has supported this vision and also believes that this society will be the leading organization that promotes transformation of agro-food industry into a higher productivity and income.

All this while, MSAE has strived in promoting advanced technological approach in Malaysia. Our members have introduced various solutions from SMART Farming Technology whereas farms are managed systematically by the aids of sensors and satellite imaging to mechanization and automation system to embattle the drudgery of work. Meanwhile, food engineering is a specialized subfield within agricultural engineering and focuses on the application of engineering to the production and distribution of food. Today, as the food engineering field develops further downstream of agricultural processing, it is important, therefore, to emphasize that MSAE is involved in not only agricultural engineering but also in food engineering.

MSAE is pleased to welcome all participants to the National Agricultural and Food Engineering Convention (NAFEC) 2021. Regardless of the COVID-19 outbreak, I wish all participants a rewarding and successful experience. Stay safe and take care.

PROF. TS. DR. ROSNAH SHAMSUDIN

CORPORATE PROFILE

MALAYSIAN AGRICULTURAL RESEARCH AND DEVELOPMENT INSTITUTE (MARDI)

Vision

The preferred provider of innovative technologies for sustainable and competitive agricultural industry by 2030

Mission

- Driving agricultural productivity and sustainability through transfer of modern, efficient and cost-effective technologies.
- Strengthening financial resources, talent, facility and infrastructure for research and development.
- Enhancing organisational visibility and good governance through effective, efficient, transparent and accountable management.

Our Goals

- Disseminating scientific information and transferring technologies.
- Fostering scientific and ethical culture.
- Nurturing entrepreneurs to become successful.
- Developing appropriate and modern technologies.
- Conserving and sustainable use of agriculture biodiversity

Thrusts

- Increasing productivity of food crops and livestock through innovative research.
- Generating and adopting new and modern technologies to transform agriculture and agrofood industry to become more sustainable and competitive.
- Exploration, conservation and utilisation of biodiversity and natural resources for sustainable agriculture and wealth creation.
- Strengthening the dissemination, transfer and adoption of MARDI's technologies to target groups.
- Strengthening organisational visibility and governance.

MALAYSIAN SOCIETY OF AGRICULTURAL AND FOOD ENGINEERS (MSAE)

The Malaysian Society of Agricultural and Food Engineers or MSAE was established in 1982. It is a professional and technical organization of members who are interested in engineering knowledge and technology for food, agriculture, and associated industries and resources. The founding members were mainly lecturers of the Faculty of Agricultural Engineering, University Pertanian Malaysia (UPM) who mostly have obtained their highest degrees from the US universities. Hence, they are very familiar with the American Society of Agricultural and Biological Engineers or ASABE, which is an active professional engineering organization internationally with more than 8000 members worldwide.

Agricultural engineering education in Malaysia started as far back as 1961. However, it was only in 1975 that a full bachelor degree program in agricultural engineering was introduced in the Faculty of Agricultural Engineering (now Faculty of Engineering), Universiti Pertanian Malaysia (now Universiti Putra Malaysia, UPM). The first batch of agricultural engineers graduated in 1979. The diploma program in agricultural engineering was introduced in the Faculty in 1980.

Since then, agricultural engineering professionals (i.e agricultural engineers and agricultural engineering technical assistants) have significantly contributed to the development of agriculture in the country. To date there are about 1500 agricultural engineers and agricultural engineering technical assistants who are involved in agricultural and non-agricultural fields in Malaysia. Today, as the food engineering field develops further downstream of agricultural processing, it is important, therefore, to emphasize that MSAE is involved in not only agricultural engineering but also in food engineering.

MSAE members are employed in government departments and agencies, universities and colleges, palm oil mills and plantations, agricultural machinery companies, irrigation companies, and agricultural and food processing plants. In government departments and agencies, they are focused either on research such as in the Malaysian Agricultural Research and

Development Institute (MARDI), Malaysian Palm Oil Board (MPOB), Malaysian Rubber Board (LGM), Malaysian Cocoa Board (LKM), Malaysian Pineapple Industry Board (MPIB), and (Forrest Research Institute Malaysia (FRIM) or on service fields such as in the Department of Agriculture (DOA), Department of Environment (DOE), and Farmers' Organization Authority (LPP).

The activities of MSAE include establishing rapport and mutual cooperation with government bodies and private sectors in research and development; promoting the importance of agricultural and food engineers' involvements in organizations whose activities are related to agriculture and food; organizing international and national conferences, workshops, seminars and short courses; publishing; establishing and maintaining working relationship with agricultural engineering societies of other countries, especially, those in the ASEAN region, eastern Asia and North America (particularly the USA and Canada); organizing technical competitions and visits; and organizing social, sports and recreational activities and technical visits especially for members of the MSAE- Student Chapter.

In 2016, in conjunction with 41 years of teaching, research, consultancy and extension in agricultural engineering in Malaysia and 34 years of the establishment of the professional engineering society in Malaysia, a prominent national landmark was erected and launched at the Faculty of Engineering, UPM to commemorate the founding of the first agricultural engineering curriculum and of the MSAE.

Objectives

1. To promote the disciplines of agricultural engineering and food engineering and their professions in Malaysia
2. To encourage professional development among members of the Society
3. To promote the association of members of the Society with engineers, scientists and technologists from other disciplines both within the country as well as abroad
4. To promote the inculcation of agricultural engineering inputs in the issues of food security and food safety in the country.

THE MAIN ORGANIZING COMMITTEE

MAIN ORGANIZING COMMITTEE

Patron	:	Datuk Dr. Mohamad Roff Mohd Noor Director General, MARDI
Advisor	:	Hasimah Hafiz Ahmad Deputy Director General (Research), MARDI
		Tapsir Serin Deputy Director General (Services) MARDI
Chairman	:	Dr. Azman Bin Hamzah Director of Engineering Research Centre, MARDI
		Prof. Ts. Dr. Rosnah Shamsudin President of Malaysian Society of Agricultural Engineers (MSAE)
Members	:	Ts. Dr. Masniza Sairi (MARDI) Dr. Teoh Chin Chuang (MARDI) Ts. Dr. Ahmad Safuan Bujang (MARDI) Dr. Zainun Mohd Shafie (MARDI) Amir Syariffuddeen Mhd Adnan (MARDI) Ir. Ahmad Syafik Suradi Sulaiman (MARDI) Muhd Akhtar Mohamad Tahir (MARDI) Norhafizah Mohamad Yusof (MARDI) Jafni Johari Jiken (MARDI) Seri 'Aisyah Hassim (MARDI) Afiqah Aina Rahim (MARDI) Wan Mohd Fariz Wan Azman (MARDI) Ir. Ts. Mohd Fazly Mail (MARDI/MSAE) Dr. Siti Hajar Ariffin (MSAE) Ir. Dr. Mohammad Effendy Yaakob (MSAE) Dr. Mohd Nazren bin Radzuan (MSAE) Nor Aziatul Azidah Azhari (MSAE)
Agency representatives	:	Ts. Mohd. Sumazlin Mahamed (Politeknik Jeli) Prof. Madya Dr. Norhashila Hashim (JKBP, UPM) Prof. Madya Dr. Farah Saleena Taip (JKPM, UPM) Siti Mariam Samsi (UiTM Jasin) Engku Mazlin Engku Halin (MADA) Ts. Mohamad Faisal Mohamad Taib (LPP) Rusnani Abd. Majid (MPOB)

Chong Seng Kiat (DOA)
Dr. Goh Sou Sheng (LGM)
Ir. Ts. Mazelan Ramli (DOF)
Zuhairy Zahari (Politeknik Kota Bharu)
Hamzah Fawwas Abd Rani (LPNM)
Nur Hazreen Ithnin (LPNM)
Shazlan Sekari @ Shukri (KADA)
Zulhairie Adni Abdul Halim (JPPKK)

Sub-committee

TECHNICAL
Ir. Ts. Mohd Fazly Mail (MARDI/MSAE) - (Chairman)
Hafidha Azmon (MARDI)
Norahshekin Abd Rahman (MARDI)
Siti Ashah Ab Rahim (MARDI)

FINANCE
Ir. Dr. Mohammad Effendy Yaakob (UPM/MSAE) - (Chairman)
Dr. Zainun Mohd Shafie (MARDI)
Nadirah Roslan (UPM)

SCIENTIFIC
Dr. Arina Mohd Noh (MARDI) - (Chairman)
Dr. Badaruzzaman Mohamad Noh (MARDI)
Dr. Siti Noor Aliah Baharom (MARDI)
Dr. Ten Seng Teik (MARDI)
Rohazrin Abdul Rani (MARDI)
Sharifah Hafiza Mohd Ramli (MARDI)
Eddy Herman Sharu (MARDI)
Nur Afiqah Hani Abdul Rashid (UPM)

PUBLICATION
Dr. Nazren Radzuan (UPM/MSAE) – Chairman
Nur Afiqah Hani Abdul Rashid (UPM)

ADVERTISMENT & SPONSORSHIP
Ir. Ahmad Syafik Suradi Sulaiman (MARDI) - Chairman
Mohd Ikmal Hafizi Azaman (MPOB)
Mohamad Hafiz Hashim (MARDI)
Muhamad Syahiran Afieff Azman (MARDI)

LOGISTIC & SPECIAL TASKS
Muhd Akhtar Mohamad Tahir (MARDI) - Chairman
Marina Ahmad (MARDI)
Syaril Azizi Shuib (LPP)
Mohammad Faizzuddin Mohammad Baki (LPP)
Ts. Mohamad Faisal Mohamad Taib (LPP)
Mohd Daniel Haziq Abdul Rashid (MARDI)
Mohamad Saiful Nizam Azmi (MARDI)
Shahrul Afandi Shahrudin (MARDI)
Hasri Juhari (MARDI)
Najwa Abdul Latif (MARDI)
Mohd Naqiuddin Rahim @ Ibrahim (MARDI)
Muhammad Sufian Norasid (MARDI)

REGISTRATION & GIFTS
Norhafizah Mohamad Yusof (MARDI) - Chairman
Zamzuri Zabidin (UPM)
Mariana Mat Yasin (MARDI)
Hanisah Abu Hasan (MARDI)
Ruslina Roslan (MARDI)
Nor Akma Mohd Yusof (MARDI)
Nor Izzati Yahya (MARDI)

PROTOCOL, PUBLICITY & LAUNCHING
Dr. Mohd Syaifudin Abdul Rahman (MARDI) - Chairman
Jafni Johari Jiken (MARDI)
Abdul Rahman Abdul Razak (MARDI)
Hasmin Hakim Hasbullah (MARDI)
Hazrul Amry Mohd Noor (MARDI)
Zarif Zulkefli (MARDI)
Azizi Md Said (MARDI)
Mohd Faizuin Abd Hamid (MARDI)
Jazzmi Shah Dawood Maiden (MARDI)
Musalmah Abdul Ghani (MARDI)
Muhammad Firdaus Mohamed Yusof (MARDI)
Siti Aishah Mohd Shari (MARDI)
Haikal Azhari Haliza (MARDI)
Rosnina Rosli (MARDI)
Siti Sri Intan Nor Fharis Mohd Ani (MARDI)

FOODS
Seri 'Aisyah Hassim (MARDI) - Chairman
Dr. Siti Hajar Ariffin (UPM)
Nuraini Ahmad Ariff Shah (MARDI)
Dr. Faiqa Shaezaa Mohd Salleh (UPM)

CERTIFICATE
Afiqah Aina Rahim (MARDI) - Chairman
Rosnani Hassan (PKB)
Faewati Binti Abdul Karim (MARDI)
Noriah Abdullah (PKB)
Julia Binti Jamaluddin (PKB)

AWARDS & PRIZES
Wan Mohd Fariz Wan Azman (MARDI) – Chairman
Prof. Madya Dr. Hasfalina Che Man (UPM)
Dr. Jasmin Arif Shah (UPM)
Dr. Nur Bahiah Mohamed Haris (UPM)
Mohd Shahrir Azizan (MARDI)
Saiful Azwan Azizan (MARDI)

NATIONAL AGRICULTURAL AND FOOD ENGINEERING CONVENTION (NAFEC) 2021

INTRODUCTION

The global is experiencing crisis of food and depletion of energy resources that have changed the world's actions on food production and security.

Various efforts need to be made to ensure the agriculture and food industries are globally competitive and remain relevant at every age. Malaysia has worked hard to maintain and strengthen the global market by giving priority to the production of quality and sustainable agricultural products. New ideas and innovations are mobilized in the agricultural sector so that the country's production can be highlighted to capture the competitive global market.

The National Agro-Food Policy (NAP4) has been formulated to address the challenges in ensuring food security both locally and globally. This includes the implementation of more advance and smart farming methods to reform and transform the agriculture and agro-food industries to be more dynamic and sustainable. Strategies outlined in NAP4 through the implementation of modern technology and mechanization can reduce dependence on manpower in agriculture.

Thus, in accordance with NAP4, the National Agricultural and Food Engineering Convention (NAFEC) jointly organized by MARDI and MSAE will introduce and discuss in depth the application of agricultural and food engineering in Malaysia. The application of engineering in the field of agriculture and food will use holistic approach to ensure the sustainability of the advance and smart agricultural systems. Through this 2-day convention, technical papers focusing on the latest engineering-related applications and research in agriculture and agro-food will be presented by groups of experts and researchers from local higher institutions, government agencies, and industries. In addition, presentation sessions and exhibitions by stakeholders and entrepreneurs will also be given the priority.

OBJECTIVES

- Empower the application of agricultural and food engineering through a holistic approach in each agricultural value chain.
- Provide a platform for information and technology sharing as well as debate on government policies related to agricultural and food engineering in a more detailed and holistic manner between the government and the parties involved.
- Expanding the community network of agricultural and food engineering movers with stakeholders

TOPICS

- Postharvest and Food Engineering
- Agriculture Machinery and Automation
- IR 4.0 in Agriculture
- Water, Land and Natural Resources
- Waste Management
- Environment
- Agricultural Extension

PROGRAMME

NATIONAL AGRICULTURAL AND FOOD ENGINEERING CONVENTION (NAFEC) 2021

'EMBRACING THE FUTURE THROUGH ADVANCED AGRO-FOOD ENGINEERING'

23 – 24 March 2021 (Tuesday – Wednesday)
MARDI Headquarters

DAY 1 **March, 23 2021 (Tuesday)**	0830	Registration
	Planery Session **Chairman: YBhg. Datuk Dr. Mohamad Roff Bin Mohd Noor** **(Director General of MARDI)**	
	0900	Keynote 1: **Driving Modernization in Agro-Food** *Dato' Haslina Binti Abdul Hamid* *Secretary General* *Ministry of Agriculture and Food Industries (MAFI)*
	Opening Ceremony **National Agriculture and Food Engineering Convention (NAFEC) 2021**	
	1000	Recitation of Doa
		Welcoming speech *Datuk Dr. Mohamad Roff Bin Mohd Noor* *Director General* *Malaysian Agricultural Research and Development Institute (MARDI)*
		Speech *Prof. Dr. Rosnah Shamsudin* *President* *Malaysian Society of Agricultural and Food Engineering (MSAE)*
		Opening Speech *Datuk Seri Dr. Ronald Kiandee* *Minister of Agriculture and Food Industries (MAFI)*
		Launching •Book of 'Teknologi Kejuruteraan Agromakanan MARDI' •First edition of 'Advanced Agriculture and Food Research Journal (AAFRJ)'
		Memorandum of Understanding (MoU) document exchange between Malaysian Agricultural Research and Development Institute (MARDI) and Malaysian Society of Agricultural and Food Engineers (MSAE)
	1115	Break & Virtual poster showcase
	Session 1 **Chairman: Prof. Dr. Rosnah Shamsudin** **(Presiden of Malaysian Society of Agricultural and Food Engineers (MSAE))**	
	1130	Invited Speaker 1: **Enhancement of Food Security through Engineering** *Datuk Mohd Nasir Warris* *Director General of Department of Agriculture (DOA)*
	1200	Invited Speaker 2: **Role of Engineers in Agriculture Industry** *Assoc. Prof Ir. Dr. Norhashila Hashim*

		Head of Department *Biological and Agricultural Engineering UPM*
	1230	Invited Speaker 3: **Agriculture Waste Management in Malaysia: How Far We adapt with Technology** *Mr. Mohd Reza Dzulkiflee* *Head of Renewable Energy Division, FGV Holdings BHD*
	1300	Break & Virtual poster showcase
	Parallel Session (Oral Presentation)	
	1430	Topic 1: Postharvest & Food Engineering Topic 2: Agriculture Machinery & Automation Topic 3: IR 4.0 in Agriculture Topic 4: Water, Land & Natural Resources Topic 5: Waste Management Topic 6: Agricultural Extension
	1700	End of day 1
DAY 2 **March, 24 2021 (Wednesday)**	**Planery Session 2** **Chairman: Dato' Azulita Binti Salim** **(Director General of Farmers Organization Authority (LPP))**	
	0830	Keynote 2: **Advancement of National Agrofood Sector towards Agriculture 4.0** *Datuk Dr. Mohamad Roff bin Mohd Noor* *Director General MARDI*
	Session 2 **Chairman: Dato' Zahimi bin Hassan** **(Deputy Director General of Department of Agriculture (DOA)**	
	0915	Invited Speaker 4: **Empowering the Agriculture Sector with Digital Agtech** *Mr. Navin Sinnathamby* *Senior Principal Lead, Malaysia Digital Economy Corporation Sdn. Bhd (MDEC)*
	0945	Invited Speaker 5: **Success Story: Challenges and Experiences in Adopting IR4.0 Technology.** *Mr. New Jinn An* *Hexa IoT Sdn. Bhd.*
	Parallel Session (Oral Presentation)	
	1045	Topic 1: Postharvest & Food Engineering Topic 2: Agriculture Machinery & Automation Topic 3: IR 4.0 in Agriculture Topic 4: Water, Land & Natural Resources Topic 5: Waste Management Topic 6: Agricultural Extension
	1245	Closing Ceremony Awards session
	1315	Break
	1430	MSAE Annual General Meeting
	1630	End of day 2

PARALLEL SESSION I (A)

i. POSTHARVEST AND FOOD ENGINEERING
ii. AGRICULTURE MACHINERY AND AUTOMATION
iii. IR 4.0 IN AGRICULTURE

DATE (DAY) **: 23 MARCH 2021 (TUESDAY)**
TIME **: 14.30 PM – 16.35 PM**
SESSION CHAIR **: TS. DR. AHMAD SAFUAN BUJANG**

Time	ID	Presenter / Author	Paper Title
1430 - 1445	159	Norli Binti Ismail *Politeknik Kota Bharu*	**Merekabentuk, Membangunkan Dan Mengujilari Mesin Pelerai Biji Jagung**
1445 – 1500	145	Nurazwin Binti Zulkifli *Universiti Putra Malaysia*	**Reliability of Finite Element Analysis to Determine the Mechanical Damage in Fruits and Root-Vegetables**
1500 – 1515	144	Maimunah Binti Mohd Ali *Universiti Putra Malaysia*	**Quality Inspection of Food and Agricultural Products using Artificial Intelligence**
1515 - 1530	160	Zaleha binti Ya'akub *Politeknik Kota Bharu*	**Membina Mesin Angkat Mudah Alih 'Fastwork Lifter' Untuk Kegunaan Industri Pembinaan Kecil**
1530 - 1540		**Q&A Session**	
1540 – 1555	146	Sudau Eh Teet *Politeknik Jeli*	**Potential of Pennisetum Purpureum Weed Extract on Inhibition of Anthracnose Pathogen, Colletotrichum Gloeosporioides on Mango Fruits**
1555 – 1610	161	Roslehaini Binti Hamzah *Politeknik Kota Bharu*	**Merekabentuk Agro Easy Trolley Untuk Mengangkut Hasil Pertanian**
1610 – 1625	197	Mohd Najib Bin Ahmad *MPOB*	**Oto-BaC™: An Automated Artificial Intelligence (AI) Detector & Counter for Bagworm (Lepidoptera: Psychidae) Census**
1625 – 1635		**Q&A session**	
		End of Day 1	

PARALLEL SESSION I (B)

i. WATER, LAND AND NATURAL RESOURCE
ii. WASTE MANAGEMENT
iii. AGRICULTURAL EXTENSION

DATE (DAY) : 23 MARCH 2021 (TUESDAY)
TIME : 14.30 PM – 16.35 PM
SESSION CHAIR : DR TEOH CHIN CHUANG

Time	ID	Presenter / Author	Paper Title
1430 - 1445	181	Muhammad Haniff Bin Ahmad *MARDI*	**Water Recycling System: Sustainable Water Management Approach for Paddy Production**
1445 – 1500	153	*Siti Nor Fatihah Binti Zakaria* *Politeknik Jeli*	**Effect of Mulberry Leaves Extract (Morus Alba) on Growth for Giant Freshwater Prawn (Macrobrahium Rosenbergii)**
1500 – 1515	215	Mohamad Ariff Fikri Bin Ali *Universiti Putra Malaysia*	**Program Development Skills towards Work Performance of Extension Agent during MCO in Central Region (Peninsular Malaysia)**
1515 - 1530	152	Masitah Binti Mohamad *Politeknik Jeli, Kelantan*	**Natural Growth of Plant by Bio-Organic Input**
1530 – 1540		**Q&A Session**	
1540 – 1555	176	Noor Azme Omar *NAHRIM*	**Sewerage Water Treatment Using Phytoremediation**
1555 – 1610	157	Nor Hayati Binti Mat Nor *Politeknik Kota Bharu*	**Kajian Rekabentuk Eco2GC Drain Cover**
1610 – 1625	213	Nurul Amiera Binti Khalid *Universiti Putra Malaysia*	**Kesediaan Petani Menghadapi Cabaran Pasca PKP di Zon Tengah Malaysia**
1625 – 1635		**Q&A session**	
		End of Day 1	

PARALLEL SESSION II (A)

i. POSTHARVEST AND FOOD ENGINEERING
ii. AGRICULTURE MACHINERY AND AUTOMATION
iii. IR 4.0 IN AGRICULTURE

DATE (DAY) : **24 MARCH 2021 (WEDNESDAY)**
TIME : **10.45 AM – 12.50 PM**
SESSION CHAIR : **ASSOC. PROF. DR SAMSUZANA ABDUL AZIZ**

Time	ID	Presenter / Author	Paper Title
1045 – 1100	162	Suraya Binti Mustaffa *Politeknik Kota Bharu*	**Pembinaan Mini Inkubator Untuk Pengeraman Telur**
1100 – 1115	156	Siti Nurumairah Binti Mohamed Razali *Universiti Putra Malaysia*	**Converting Durian-Based Traditional Dessert into Ready-To-Eat Food by Adopting the Sausage Technology**
1115 – 1130	166	Noriah Abdullah, *Politeknik Kota Bharu*	**Merekabentuk Dan Membina Mesin Pemisah Selaput Lendir Biji Koko**
1130 - 1145	163	Hui Yi Eng *Universiti Sains Malaysia*	**Physicochemical, Textural and Thermal Properties of Rice Bran Oil Spread as Alternate Shortening for Bakery Products**
1145 – 1155	**Q&A Session**		
1155 – 1210	189	Nur Syamimi Najihah Binti Rozelan *Universiti Putra Malaysia*	**Physical Properties of Pineapple Leaves for Chopping Machine**
1210 – 1225	191	Puteri Nurain Binti Megat Ahmad Azman *Universiti Putra Malaysia*	**Effects of Flowing Water on Soaking Water Quality During the Retting Process of Pepper Berries (Piper Nigrum L.)**
1225 – 1240	192	Nor Aziatul Azidah Binti Azhari *Universiti Putra Malaysia*	**Binding Effect of Physico-Technical Properties of The *Azolla Pinnata* Granules and Tablets as Soilless Growth Media**
1240 – 1250	**Q&A session**		
1250	**Closing Ceremony**		

PARALLEL SESSION II (B)

i. WATER, LAND AND NATURAL RESOURCE
ii. WASTE MANAGEMENT
iii. AGRICULTURAL EXTENSION

DATE (DAY) : **24 MARCH 2021 (WEDNESDAY)**
TIME : **10.45 AM – 13.00 PM**
SESSION CHAIR : **TS DR. MASNIZA SAIRI**

Time	ID	Presenter / Author	Paper Title
1045 – 1100	177	Muhamad Huzaifah Wahap *NAHRIM*	**Implementing Constructed Nature Based System Solution as Alternatives Water Treatment**
1100 – 1115	158	Nor Sazlina Binti Ismail *Politeknik Kota Bharu*	**S-ECO Furnace: Relau Pembakar Sampah Kering Jenis Mini**
1115 – 1130	164	Rosnani Hassan *Politeknik Kota Bharu*	**Effect of Mixing Ratio to Tensile Strength of Sugarcane Bagasse and Polypropylene Composite**
1130 - 1145	165	Ahmad Shamsul Wadi Ahmad @ Ahmad Sowi *Politeknik Kota Bharu*	**Development A Natural Filtration of Concentrated Conductivity from Industrial Reverse Osmosis at Pharmaceutical Company for Conductivity Reading**
1145 – 1155		**Q&A Session**	
1155 – 1210	172	Sofiah Hanim Binti Hamzah *Politeknik Jeli*	**Kajian Penggunaan Efluen Minyak Kelapa Sawit (POME) Sebagai Media Tanaman**
1210 – 1225	205	Philip Yap *MPOB*	**Factors Influencing the Certification Process of Malaysian Sustainable Palm Oil (MSPO) During Certification Phase for Independent Smallholders**
1225 – 1240	151	*Wan* Nor Afzan Binti Mohd Azmi *Politeknik Jeli*	**Effects of Azolla Medium to Mustard Growth**
1240 – 1255	190	Norizatulshima Binti Ibrahim *Malaysian Rubber Board*	**Revolution of Data Collection Using Arcgis Survey123 Application**
1255 – 1305		**Q&A session**	
1250		**Closing Ceremony**	

LINK FOR NAFEC 2021 MATERIALS

Please scan the QR Code to have access to the NAFEC 2021 materials

https://drive.google.com/drive/folders/13ZjUTgXcBG6QmcFMRFaLLrx5KEYnUSIR?usp=sharing

ACKNOWLEDGEMENT

The Main Organizing Committee for the

NATIONAL AGRICULTURAL AND FOOD ENGINEERING CONVENTION (NAFEC) 2021

Wishes to thank the following for their support and commitment:

- The Hon. Minister of Agriculture and Food Industries, Malaysia
- The Director General of the Malaysian Agricultural Research and Development Institute (MARDI)
- Malaysian Society of Agricultural and Food Engineers (MSAE)
- Ministry of Agriculture and Food Industries, Malaysia (MAFI)
- Department of Agriculture Malaysia (DOA)
- Department of Fisheries (DOF)
- Farmers' Organization Authority of Malaysia (LPP)
- Malaysian Palm Oil Board (MPOB)
- Kemubu Agricultural Development Authority (KADA)
- Muda Agricultural Development Authority (MADA)
- Malaysian Pineapple Industry Board (MPIB)
- Malaysian Rubber Board (MRB)
- Univeristi Putra Malaysia (UPM)
- Universiti Teknologi MARA (UiTM)
- Jabatan Pendidikan Politeknik dan Kolej Komuniti (JPPKK)
- Politeknik Malaysia Kota Bharu
- Politeknik Malaysia Jeli
- Distinguished session chairmen, speakers, poster presenters, participants, participating agencies and institutions
- Sponsors, exhibitors and advertisers:
  - Wong Agricultural Engineering Sdn. Bhd
  - Worldstar Sdn Bhd
  - Star Excellence Resources
  - MKR Sdn Bhd
- All subcommittee members for their time and efforts
- and all those relevant parties and individuals who have contributed to the success of this event in one way or another.

We look forward to meet you again.

ABSTRACTS

KEYNOTE AND INVITED SPEAKER PAPERS

ID	Presenter	Paper Title
K1	*Dato' Haslina Binti Abdul Hamid* *Secretary General* *Ministry of Agriculture and Food Industries (MAFI)*	Driving Modernisation in Agro-Food
K2	*Datuk Dr. Mohamad Roff bin Mohd Noor* *Director General* *Malaysian Agricultural Research and Development Institute (MARDI)*	Advancement of National Agrofood Sector Towards Agriculture 4.0
P1	*Datuk Haji Mohd Nasir Warris* *Director General of Department of Agriculture (DOA)*	Enhancement of Food Security through Engineering
P2	*Assoc. Prof Ir. Dr. Norhashila Hashim* *Head of Department* *Biological and Agricultural Engineering UPM*	Role of Engineers in Agriculture Industry
P3	*Mr. Mohd Reza Dzulkiflee* *Head and Senior General Manager,* *Renewable Energy Division,* *Plantation Sector* *FGV Holdings BHD*	Agriculture Waste Management in Malaysia: How Far We adapt with Technology
P4	*Mr. Navin Sinnathamby* *Senior Principal Lead, Malaysia Digital Economy Corporation Sdn. Bhd (MDEC)*	Empowering the Agriculture Sector with Digital Agtech
P5	Mr. New Jinn An HEXA IoT Sdn Bhd	Success Story: Challenges and Experiences in Adopting IR4.0 Technology.

KEYNOTE PAPER

K1

Driving Modernisation in Agro-Food

YBhg. Dato' Haslina Abdul Hamid
Office of the Secretary General
Ministry of Agriculture and Food Industries (MAFI)
Level 15, 4G1 Tower, Wisma Tani, 62624 Putrajaya
haslinaabdhamid@mafi.gov.my

The agro-food subsector assumes an important role in the agriculture sector towards achieving the agenda of improving food security to the nation. However, land scarcity, aging farmers and conventional method of farming coupled with the sub-industries' challenges in reduced yield due to diseases and climate changes as well as lopsided pricing in produces hampers the potential generation of higher income for farmers in a sustainable manner. To address this phenomenon, in the next 5 to 10 years, the agro-food subsector will be modernized not only in gearing towards food security but also to improve productivity through technology, automation, and mechanisation. These will be enabled through increasing R&D efforts, strengthening the food supply chain, improving support and delivery services, enhancing farmers knowledge and skills especially in entrepreneurship as well as compliance to standards and good agricultural practices. The transformation is in line with the Malaysia's Shared Prosperity Vision 2030 especially with Key Economic Growth Activities (KEGA): KEGA 3, Industrial Revolution (KEGA) 9, Coastal and Maritime Economies and KEGA 13, Smart and High Value Agriculture. The overarching goals also includes achieving Goal 2: Zero Hunger of the Agenda for Sustainable Development Goals (SDG 2030). Modernisation will be the game changer in agro-food sector's reform towards a fair and equitable distribution of income for farmers and equally important to increase the contribution of total agriculture value added to gross domestic product (GDP).

Keywords: agro-food, modernisation, income

K 2

Advancement of National Agrofood Sector Towards Agriculture 4.0

Y.Bhg. Datuk Dr. Mohamad Roff Bin Mohd Noor
Director General
Malaysian Agricultural Research and Development Institute (MARDI)
Ibu Pejabat MARDI, 34300 Serdang, Selangor, Malaysia
roff@mardi.gov.my

In line with the Industrial Revolution 4.0 (IR4.0) launched in the country in October 2018, the agro-food production sector also gave the same emphasis to the term Agriculture 4.0. The nine key pillars found in IR4.0 also apply in Agriculture 4.0. In Agriculture 4.0, the use of drones, intelligent robotic systems, Artificial Intelligence (AI), Internet of Things: IoT, blockchain and big data analysis with the help of increased use of mechanization and automation, quality seeds that disease resistance and high resilience to climate change as well as sustainable agronomic practices, are expected to change the landscape of the country's agri-food sector in the next 5 to 10 years. Research and development activities in the previous Malaysian plan have successfully developed several technologies towards Agriculture 4.0 which include the production of agricultural products in the field, controlled environment, and livestock. These include precise paddy farming technologies, crop plant systems, agro-robotics development, and the development of public data systems in agricultural production chains including livestock. The technologies that have components among the nine main pillars of IR4.0 have been proven to successfully improve production efficiency compared to conventional methods. However, the systems developed for each stage of production were separate and the data collection was not parallel. On this basis, planning to specialize in the development and integration of cyber-physical technologies along the value chain of agricultural product production is a priority. This effort is expected to transform agriculture into a modern and competitive sector to provide lucrative returns to farmers and entrepreneurs who are actively involved in the agro-food industry.

Keywords: IR4.0, Agriculture 4.0, cyber-physical technology, smart agriculture, digital agriculture

INVITED SPEAKER PAPER
P1

Enhancement of Food Security through Engineering

Mohd Nasir Bin Warris
Director General,
Department of Agriculture Malaysia, Putrajaya
nasirwarris@doa.gov.my

Food security is generally stated in four dimensions: food availability, access to food, food use/utilization and food stability. Some of the food security challenges include increasing population, climate changes, changing consumption patterns and topographical features changes. Therefore, new technology and innovative techniques are required across the food value chain, addressing food security dimensions. Thus, agricultural engineering plays an important role in food security by designing and improving farming machinery and equipment. These include design and testing agricultural machinery; planning and supervise agriculture projects; give consultation to farmers and agriculture industry players. They need to integrate new technology with farming such as design new and improved farming equipment that may work more effectively, improve the efficiency and perform new tasks. Agriculture engineer needs to adapt and innovate new mechanization technology to overcome workers shortage and improve labour productivity. Besides, agriculture engineers may use problem-solving and analytical skills to solve problems found along the agriculture supply chain. The Department of Agriculture Malaysia has various programme to promote food security and food safety through Malaysian Good Agricultural Practice (myGAP). This system can improve farm productivity and produce safe and quality food which are safe to eat. Besides, the myGAP products can compete in domestic and international markets, ensuring that the agriculture environment is preserved and sustainable.
Keywords: food security, agricultural engineering, food safety

P2

Role of Engineers in Agriculture Industry

Norhashila Hashim
Department of Biological and Agricultural Engineering
Faculty of Engineering, Universiti Putra Malaysia.
norhashila@upm.edu.my

Engineers, as engineering practitioners, are professionals who create, plan, analyse, build and test complex machines, systems, structures, processes and materials to protect life, health and property, and to promote public well-being. Like other engineering practitioners,the role of agricultural engineersis diverse from making agriculture sustainable, safe and environmentally friendly to producing agricultural products as well as conserving resources and protecting the environment. Besides, agricultural engineers are also responsible in conducting research andeducating farmers and agriculturalistson the latest trends in agricultural engineering and farming aspects. Agricultural engineers play a significant role in the development of the agricultural industry. This is translated through the revolution of agricultural productivity from solely dependent on human and animal power in agricultural revolution 1.0 to digitization technology featured via artificial intelligence (AI) and internet of things (IoT) in the recent agricultural revolution 4.0. However, as agricultural industries evolved, there are increasing pressures and challenges such as climate change, increasing world population, expansion of urbanization, etc. While continuous efforts are needed from every sector to overcome the challenges, agricultural engineers certainly play a critical role to make the agricultural industry on the threshold revolution that offers a sustainable form of production.
Keywords:agricultural engineers, agricultural industry, agricultural revolution,agricultural engineering

P3

Agriculture Waste Management in Malaysia: How Far We Adapt With Technology

D. Mohd Reza
Head and Senior General Manager,
Renewable Energy Division, Plantation Sector,
FGV Palm Industries SdnBhd, Level 16 West, Wisma FGV,
50350 Kuala Lumpur, Malaysia
mohdreza.d@fgvholdings.com

In this era of global warming, most business organizationsor giant corporations are involved or focusing into the area of ESG which are the Environment, Sustainability and Governance. With the push and criteria focused by fund managers, investors and shareholders, companies are looking into ways and technologies turning biomass from wasteto wealth and into circular economy.
With regards to the oil palm industry, there are many palm byproducts generated from the production of crude palm oil namely, EFB (empty fruit bunch), shredded EFB, mesocarp fiber, PKS (palm kernel shells), palm sludge oil, scum, black soil, compost, POME, palm trunk, palm fronds, bunch ash and many other byproducts. Many technologies have been tested and tried but faced challenges in terms of product commercialization, high capex &opex with frequent wear and tear, to some level crude level of engineering, which to some are not efficient and effective.

Keywords: ESG, palm byproducts, technologies

P4

Empowering the Agriculture Sector Via Digital Agtech

Navin Sinnathamby
Digital Agtech & Sectorial Pilot Projects,
Data Ecosystem Development Department,
Malaysia Digital Economy Corporation (MDEC)
eladang@mdec.com.my

As we progressively battle the unprecedented challenges brought about by the pandemic, the agriculture sector was heavily affected with the decreasing GDP contribution which stands at 7.1% (RM101.5 billion) as of 2019, decreased toll of overall productivity, income, and employment and unfortunately increased toll of food imports which amounts over RM 60 billion. Long running issues such as uneconomic land holdings, high operational cost, lack of economic of scale, low returns, majority of ageing farmers over 60 years old and other pressing factors continues to dull the agriculture sector.
The various challenges are evident but the big question right now is how to address these challenges. Well, the response is straightforward; digitalization is now more than ever, highly crucial to empower the agriculture sector and ensuring significant relevance to the growth of the digital economy. And more than ever, there is now a dire need for a mindset shift, away from perceiving agriculture as dirty, dangerous and difficult (3D), when the true fact is that agriculture is indeed getting more 'attractive' and 'lucrative' with the injection of digital agriculture technologies (Agtech), i.e. Internet of Things (IoT), Big Data Analytics (BDA) and even Artificial Intelligence (AI).
The days of farmers toiling for long hours in their fields in the sweltering heat are now numbered. Emerging Digital Agtech solutions have progressively started serving the agriculture sector, helping farmers to operate their farms more efficiently based on real-time data for key farming parameters, towards increase overall productivity/yield and quality, income, reducing operation costs, increasing interest/participations and ultimately improving the livelihood of the many across the agriculture sector.

P5

Success Story: Challenges and Experiences in Adopting IR4.0 Technologies

New Jinn An
HEXA IoT Sdn Bhd
new@hexaiot.com.my

Industrial Revolution (IR 4.0), IoT and digitalisation are technologies that company and farmer had to embrace sooner sooner or later to make its processes more efficient and accurate, but what are the challenges that affecting the adoption level? Technology can be very expensive but learning and understand technology are free. The connected infrastructure of the Internet of Things (IoT) in IR 4.0 will be able to help manufacturers and farmer to provide increased process automation, improved machine communication and monitoring, along with automated data logging and process digitalization to enable new levels of analysis to provide a truly productive future, particularly in the business sector. However, the IoT is not the only thing driving the IR 4.0. Data collected need to be efficiently interpreted to contribute towards significant industry change. Machine learning, artificial intelligence and big data analytics are to turn collected data functional. In addition, cloud computing is playing a vital role, ensuring that industries can access and store their information remotely. So far, our company has benefited from using the technology in various ways. A misconception that people have about IR4.0 and IoT is that they can save 30% to 40% in costs from one single category. But IoT actually brings benefits to various processes. For instance, it increases efficiency by 10%, reduces wastage by 10% and increases profitability by 10%.

ABSTRACTS

ORAL & POSTER PAPERS

LIST OF ORAL PAPERS

ID	Presenter / Author	Paper Title
144	Maimunah Mohd Ali, Norhashila Hashim, Samsuzana Abd Aziz, Ola Lasekan *(UPM)* norhashila@upm.edu.my	**Quality Inspection of Food and Agricultural Products using Artificial Intelligence**
145	Nurazwin Zulkiflia, Norhashila Hashima, Hazreen Haizi Haritha and Mohamad Firdza Mohamad Shukery Daniel I. Onwude *(UPM)* norhashila@upm.edu.my	**Reliability of Finite Element Analysis to Determine the Mechanical Damage in Fruits and Root-Vegetables**
146	Sudau E.T. and Chuah T. S. *(Politeknik Jeli)* sudau@pjk.edu.my	**Potential of Pennisetum Purpureum Weed Extract on Inhibition of Anthracnose Pathogen, Colletotrichum Gloeosporioides on Mango Fruits**
151	Wan Nor Afzan Mohd Azmi, Muhammad Irfan Zainisham, Nurul Asrihah Zabudin, Siti Solehah Ismail *(Politeknik Jeli)* wanafzanss@gmail.com	**Effects of Azolla Medium to Mustard Growth**
152	Masitah Binti Mohamad *(Politeknik Jeli)* masitah.sam@gmail.com	**Natural Growth of Plant by Bio-Organic Input**
153	Siti Nor Fatihah, Mhd Ikhwanuddin, Muhd Farouk, Harman *(Politeknik Jeli)* fatihah@pjk.edu.my	**Effect of Mulberry Leaves Extract (Morus Alba) on Growth for Giant Freshwater Prawn (Macrobrahium Rosenbergii)**
156	Siti Nurumairah Mohamed Razali, Hasfalina Che Man, Mohd Zuhair Mohd Nor, Muhammad Hazwan Hamzah *(UPM)* Hazwanhamzah87@gmail.com	**Converting Durian-Based Traditional Dessert into Ready-To-Eat Food by Adopting the Sausage Technology**
157	Nor Hayati Mat Nor, Noor Izma Ab Ghani, Affidah Mardziah Mukhtar *(Politeknik Kota Bharu)* yatimn76@gmail.com	**Kajian Rekabentuk Eco2GC Drain Cover**
158	Nor Sazlina Ismail, Nor Hayati Mat Nor, Azahan Daud *(Politeknik Kota Bharu)* shazlina@pkb.edu.my	**S-ECO Furnace: Relau Pembakar Sampah Kering Jenis Mini**
159	Norli Ismail, Mohd Faidzul Abdul Rahman, Sakinah Ibrahim *(Politeknik Kota Bharu)* norli@pkb.edu.my	**Merekabentuk, Membangunkan Dan Mengujilari Mesin Pelerai Biji Jagung**
160	Zaleha Ya'akub, Rohana Semaail, Fauziah Hamdan *(Politeknik Kota Bharu)* zalehayaakub@gmail.com	**Membina Mesin Angkat Mudah 'Fastwork Lifter' Untuk Kegunaan Industri Pembinaan Kecil**
161	Roslehaini Hamzah, Rus Ayunita Jusoh, Md Fadzil Hasbollah *(Politeknik Kota Bharu)* roslehaini5572@gmail.com	**Merekabentuk Agro Easy Trolley Untuk Mengangkut Hasil Pertanian**
162	Suraya Mustaffa, Fauziah Hamdan, Roslehaini Hamzah *(Politeknik Kota Bharu)* suraya.poli@1govuc.gov.my	**Pembinaan Mini Inkubator Untuk Pengeraman Telur**
163	Hui Yi Eng, Norazatul Mohd Rozalli, Nurul Najihah Ilias *(USM)* norazatulhanim@usm.my	**Physicochemical, Textural and Thermal Properties of Rice Bran Oil Spread as Alternate Shortening for Bakery Products**
164	Julia Jamaluddin, Rosnani Hassan, Noriah Abdullah, Aspalila Awang	**Effect of Mixing Ratio to Tensile Strength of Sugarcane Bagasse and Polypropylene Composite**

	(Politeknik Kota Bharu) julia@pkb.edu.my	
165	Ahmad Shamsul Wadi Ahmad @ Ahmad Sowi *(Politeknik Kota Bharu)* wadi.poli@1govuc.gov.my	**Development A Natural Filtration of Concentrated Conductivity from Industrial Reverse Osmosis at Pharmaceutical Company for Conductivity Reading**
166	Abdul manaff Mahmood, Noriah Abdullah, Rosnani Hassan *(Politeknik Kota Bharu)* manaff@pkb.edu.my	**Merekabentuk Dan Membina Mesin Pemisah Selaput Lendir Biji Koko**
172	Sofiah Hanim H., Noraziha N., Zuraikai M. *(Politeknik Jeli)* sofeahanim@gmail.com	**Kajian Penggunaan Efluen Minyak Kelapa Sawit (POME) Sebagai Media Tanaman**
176	Noor Azme Omar, Muhamad Huzaifah Wahap, Zubaidi Johar *(NAHRIM)* azme@nahrim.gov.my	**Sewerage Water Treatment Using Phytoremediation**
177	Muhamad Huzaifah Wahap, Noor Azme Omar, Zubaidi Johar *(NAHRIM)* huzaifah@nahrim.gov.my	**Implementing Constructed Nature Based System Solution as Alternatives Water Treatment**
181	Muhammad Haniff Ahmad *(MARDI)* mhaniff@mardi.gov.my	**Water Recycling System: Sustainable Water Management Approach for Paddy Production**
189	Syamimi Rozelan, Hasfalina Che Man, Rosnah Shamsudin (UPM) synajihaaa@gmail.com	**Some Physical Properties of Pineapple Leaves for Chopping Machine**
190	Norizatulshima Ibrahim, Nur Aziah Alias & Faris Rassoulli Rizal Wong *(MRB)* norizatul@lgm.gov.my	**Revolution of Data Collection Using Arcgis Survey123 Application**
191	Puteri Nurain Megat Ahmad Azman, Rosnah Shamsudin, Hasfalina Che Man and Mohammad Effendy Ya'acob *(UPM)* rosmahs@upm.edu.my	**Effects of Flowing Water on Soaking Water Quality During the Retting Process of Pepper Berries (Piper Nigrum L.)**
192	Nor Aziatul Azidah Azhari, Rosnah Shamsudin, Susilawati Kasim, Mohd Shamsul Anuar *(UPM)* rosnahs@upm.edu.my	**Binding Effect of Physico-Technical Properties of The *Azolla Pinnata* Granules and Tablets as Soilless Growth Media**
197	Mohd Najib Ahmad, Abdul Rashid Mohamed Shariff and Ramle Moslim *(MPOB)* mnajib@mpob.gov.my	**The OTO-BAC™: An Automated Artificial Intelligence (AI) Detector & Counter for Bagworm (Lepidoptera: Psychidae) Census**
205	Philip Yap, Amiratul Azzuwana Aniqah Abdul Rahman, Mohamad Hafiz Abidin, Mohd Rais Ismail Hafifi Hafiz Zulkifli *(MPOB)* adrianphilip18@gmail.com	**Factors Influencing The Certification Process of Malaysian Sustainable Palm Oil (MSPO) During Certification Phase for Independent Smallholders**
213	Nur Izzatie Mazlan, Jasmin Arif Shah, Nurul Amiera Khalid, Nur Bahiah Mohamed Haris *(UPM)* amierakhalid@gmail.com	**Farmers' Readiness to Face Challenges Post-MCO in the Central Zone of Malaysia**
215	Nur Bahiah Mohamed Haris, Siti Amal Fatunah Sheik Idris, Jasmin Arif Shah Mohamad Ariff Fikri *(UPM)* bahiaharis@gmail.com	**Program Development Skills towards Work Performance of Extension Agent during MCO in Central Region (Peninsular Malaysia)**

LIST OF POSTER PAPERS

ID	Presenter / Author	Paper Title
141	Masniza Sairi, Mohd Shukry Hassan Basri, Nur Syafini Ghazali, Joanna Cho Lee Ying, Arina Mohd Noh, Mohd Fazly Mail, Mohd Shahrir Azizan, Yahya Sahari, Sharifah Hafiza Mohd Ramli, Mohd Zaffrie Mat Amin, Azman Hamzah, Azhar Mat Noor, Mohamad Abhar Akmal Hamid, Nur Izzati Muhsin, Mohd Hafiz Mohd Amin Tawakkal, Amir Redzuan Shamsulkamal, Shafie Alwi, Mohd Zaimi Zainol Abidin, Muhammad Aliq Jamaluddin, Mohd Daniel Hazeq Abdul Rashid, Mohd Azmirredzuan Sani (*MARDI)* masniza@mardi.gov.my	**Evaluation of Evaporative-Cooled Truck Performance During Transportation of Vegetables**
149	Noor Ain Abd Hamid, Nur Farahiah Zakaria, Nur Aina Lyana Mohamad Ali *(Politeknik Jeli)* noorain@pjk.edu.my	**Study on Utilization of Black Soldier Fly Larvae (Hermetia illucens) as Protein Substitute in the Pellet Diet of Clarias gariepenus Fingerling**
154	Nazifa Athirah Mat Zakhi, Nurul Husna Radzali, Mohamad Firdza Mohamad Shukery, Mohd Nazren Radzuan *(UPM)* mohdnazren@upm.edu.my	**Determination of optimal Application of Biosurfactant by using Linear Programming (LP) Model**
171	Mohd Fazly M., Mohammad Hariz A. R., Mohd Ridzuan M. D. *(MARDI)* fazlym@mardi.gov.my	**Development and Performance of Pyrolyzer for Production of Biochar and Wood Vinegar from Domestic Agriculture Farm Waste**
173	Wan Mohd Fariz Wan Azman, Rosnah Shamsudin, Mohd Zuhair Mohd Nor, Azman Hamzah *(MARDI)* rosnahs@upm.edu.my	**Evaluation and Optimization Of Disc Grating Machine For Sago Starch Production (Metroxylon Spp.).**
174	Mohamad Jani Saad, Chia Chin Hua, Sarani Zakaria, Mohd Saiful Sajab *(MARDI)* jani@mardi.gov.my	**Activated carbon produced from rice husk by NaOH and KOH activation and its adsorption in methylene blue**
175	M. N. Nordin, M. S. Mat Jusoh, B. H. Abu Bakar, M. S. Hassan Basri, M.T. Ahmad, M. F. Mail, T. V. Chong, C. C. Teoh *(MARDI)* mnadzim.mardi@1govuc.gov.my	**Study on Water Distribution of Spraying Drone by different Speed and Altitude**
178	Halifah Afiza Ismail, Shiamala Devi Ramaiya, Noorasmah Saupi, Muta Harah Zakaria *(UPM)* shiamala@upm.edu.my	**Effect of Fruit Maturation and Ripening Potential for Optimum Eating Quality of Giant Granadilla (Passiflora quadrangularis L.)**
179	Mohd Shahmihaizan Mat Jusoh, Mohd Nadzim Nordin, Wan Mohd Aznan Wan Ahamad, Md. Akhir Hamid, Norahshekin Abdul Rahman, Ahmad Kamil Zolkafli, Bunyamin Abu Kassim, Humaizi Md Jamin *(MARDI)* wmaznan@mardi.gov.my	**Comparison Study on Fiber and Cocopeat from Young Coconut Husks and Old Coconut Husks**
180	Mohd Khusairy Khadzir, Erwan Shah Shari, Mohd Haniff Ahmad, Rohazrin Abdul Rani, Adli Fikri Ahmad Sayuti *(MARDI)* mkhusairy@mardi.gov.my	**Evaluation of Planting Spacing and Effects on The Yield for Malaysia Grain Corn Production**

182	Eddy Herman bin Sharu *(MARDI)* edherman@mardi.gov.my	**Hydraulic Performance Analysis of Drip Irrigation System Using Pressure Compensated Dripper at Low Operating Pressure**
183	Ishak, H. Noor Ismawaty, N. Zaulia, O. Nurul Afza, A. K. *(MARDI)* Ishak.mardi@1govuc.gov.my	**Study The Influence Storage Duration And Storage Temperature On Total Soluble Solids (Tss) Of Selected Mutant Purple Sweet Potato.**
184	Hafidha Azmon, Mohd Fazly Mail, Mohd Nadzim Nordin, Mohd Shukry Hassan Basri, Norahshekin Abdul Rahman *(MARDI)* hafidha@mardi.gov.my	**Ergonomic Evaluation of Maize Seeding using Conventional Method and Lightweight Motorized Maize Seeder**
185	Sharifah Hafiza, M. R., Yahya, S.N., Abdullah., Siti Rajwani, H, Ahmad Fadhlul Wafiq, A. R., Faewati, A. K. *(MARDI)* sshafiza@mardo.gov.my	**Properties of Grain Corn During Short Term Storage in Tropical Ambient Temperature**
187	Zanariah Mohd Dom, Adibah Zahiah Azhar, Saidatul Nurul Atika Masaudin *(UPM)* nana@upm.edu.my	**Utilization of Banana Peel as Functional Ingredient in product Development**
188	Mohd Mustakim, M., Mohd Din A., Marhalil, M. and Fadila, A. M. *(MPOB)* mohd.mustakim@mpob.gov.my	**Oils Demand for Development of Large Kernel Planting Material**
193	Arinah Adila Abdul Halim, Rosnah Shamsudin, Siti Hajar Arifin, Wan Nor Zanariah Zainol@Abdullah *(UPM)* rosnahs@upm.edu.my	**A Review: Kinetic Model on Quality Changes During Heat Blanching of Dabai Fruit**
194	Muhammad Nadzrul Faiz, Siti Mariam Shamsi *(UiTM)* mariam_shamsi@uitm.edu.my	**Development of Temperature and Humidity Monitoring System in UiTM Jasin Greenhouse**
195	A.S.S. Sulaiman, A.S. Bujang, S.A. Hassim, M.S. Azman *(MARDI)* syafik@mardi.gov.my	**Effects of Root Zone Cooling Method on Lactuca sativa Cultivation Under Roof Top Garden Structure in Tropics**
196	Mohd Shafiq I., Rosnah S. *(UPM)* shafiqid@yahoo.com	**Agriculture Residue Chopper - A Review of Potential Chopper Blade Mechanism for Harvesting Pineapple Leaves**
198	Mohd Zubir Md Idris *(MARDI)* mzubir@mardi.gov.my	**Sorghum Cultivation as an Industrial Crop in Malaysia**
199	Sabran, M. S., Mustaffha, S. *(UiTM)* samihah096@uitm.edu.my	**Water Quality Monitoring at Paddy Field in Merlimau, Melaka**
200	Adli Fikri Ahmad Sayuti, Rohazrin Abdul Rani *(MARDI)* adlifikri@mardi.gov.my	**Preliminary Study of Pineapple Pruning Machine for Pineapple Suckers Production**
201	Rohazrin Abdul Rani, Adli Fikri Ahmad Sayuti, Mohd Khusairy Khadzir, Muhamad Haniff *(MARDI)* rohazrin@mardi.gov.my	**Calibration and Performance Evaluation of Grain Corn Fertilizing Implement**
203	Mohd Taufik Ahmad, Mohamad Fakhrul Zaman Omar, Mohd Khusairy Khadzir, Eddy Herman Sharu, Mohamed Fauzi Md Isa, Mohd Hashim Aziz, Azlan Othman, Saifulizan Mohd Nor, Bunyamin Abu Kasim, Norhafizi Mansor *(MARDI)* taufik@mardi.gov.my	**Effect of Mole drain and Tracked Agricultural Prime Movers on Soft Soil Paddy Areas**

206	Badril Abu Bakar, Siti Noor Alliah Baharom, Rohazrin Abd. Rani, Mohd. Taufik Ahmad, Mohd. Nizam Zubir, Adli Fikri Ahmad Sayuti, Mohd. Nadzim Nordin, Mohammad Aufa Mhd Bookeri, Jusnaini Muslimin *(MARDI)* badril@mardi.gov.my	**Potential for Smart Agriculture Implementation in Pineapple Production**
208	Ten Seng Teik, G. Krishnen, K.A. Khulidin, M.A. Mohamad Tahir, M.H. Hashim, S. Khairudin *(MARDI)* stten@mardi.gov.my	**Smart IoT Controlled Environment Greenhouse System**
209	Arina Mohd Noh, Muhd Akhtar Mohamad Tahir, Khairul Anuar Shafie *(MARDI)* arina@mardi.gov.my	**Plant Factory Airflow Distribution Analysis with Different Inlet Configuration**
211	Mohamed Hafeifi Basir, Intan Nadhirah Masri *(MARDI)* hafeifi@mardi.gov.my	**Determination of Light Emitting Diode (LED) Spectrum at Seedlings Production for Optimal Growth of Different Type of Lettuce in MARDI Plant Factory**
212	Noor Lida Habi Mat Dian, Fu Ju Yen, Harrison Lau Lik Nang, Azmil Haizam Ahmad Tarmizi, Fu Ju Yen, Nur Haqim Ismail, Sivaruby Kanagaratnam *(MPOB)* nlida@mpob.gov.my	**Shelf-life stability of palm-based carotenoids in cookies**
214	Siti Noor Aliah Baharom, Jusnaini Muslimin, Badril Abu Bakar, Muhammad Zamir Abdul Rasid, Ramlan Ismail, Mohd Zamri Khairi Abdullah and Muhammad Shukri Hassan *(MARDI)* aliah@mardi.gov.my	**Total Nitrogen Estimation of Paddy Soil Using Visible and Near Infrared Spectroscopy**

ID141

Evaluation of evaporative-cooled truck performance during transportation of vegetables

Masniza Sairi[1*], Mohd Shukry Hassan Basri[1], Nur Syafini Ghazali[2], Joanna Cho Lee Ying[2], Arina Mohd Noh[1], Mohd Fazly Mail[1], Mohd Shahrir Azizan[1], Yahya Sahari[1], Sharifah Hafiza Mohd Ramli[1], Mohd Zaffrie Mat Amin[3], Azman Hamzah[1], Azhar Mat Noor[2], Mohamad Abhar Akmal Hamid[2], Nur Izzati Muhsin[2], Mohd Hafiz Mohd Amin Tawakkal[1], Amir Redzuan Shamsulkamal[1], Shafie Alwi[1], Mohd Zaimi Zainol Abidin[1], Muhammad Aliq Jamaluddin[1], Mohd Daniel Hazeq Abdul Rashid[1] and Mohd Azmirredzuan Sani[1]

[1]Engineering Research Centre, MARDI Headquarters, 43400 Serdang, Selangor, Malaysia
[2]Horticulture Research Centre, MARDI Headquarters, 43400 Serdang, Selangor, Malaysia
[3]Socio Economy, Market Intelligence and Agribusiness Research Centre, MARDI Headquarters, 43400 Serdang, Selangor, Malaysia
*Corresponding author, e-mail: masniza@mardi.gov.my

The research describes the development of an evaporative cooling system in a non-refrigerated truck for short-term storage of vegetables during transportation. The system comprises an evaporative cooler, storage unit, power supply, control panel, and real-time data monitoring (of temperature, T and relative humidity, RH). Computational fluid dynamic (CFD) simulation was conducted to investigate the temperature and airflow distribution in the evaporative-cooled storage unit for five different configurations of air inlet and outlet. The configuration of one air inlet (front - lower left) and two air outlets (top – front and back center) of the storage unit showed the optimum temperature and airflow distributions, hence applied in the system modification. The functionality and performance of the modified system were then evaluated in terms of the cooling profile of the storage unit and leafy vegetable quality for the fresh market. Three storage treatments for the selected vegetables were investigated, i.e., evaporative-cooled truck (T1), canvas truck (T2), and cold truck (T3); a journey from Cameron Highlands to Serdang for five hours. The average temperature inside the storage unit was T3 < T1 < T2. Evaporative-cooled truck exhibited average temperature reduction, DT of 10 ◦C from the ambient condition. It also demonstrated RH of > 90 %, in agreement with recommended RH for leafy vegetable storage. Post-five-hour storage treatments, vegetables stored under T1 exhibited the least weight loss as compared to T2 and T3. The results indicate that the evaporative cooling system manages to preserve vegetable quality soon after harvesting hence the potential to reduce postharvest loss during transportation.

Keywords: evaporative cooling; short-term storage; transportation; cooling profile; vegetable quality

ID144

Quality Inspection of Food and Agricultural Products using Artificial Intelligence

Maimunah Mohd Ali[1], Norhashila Hashim[1,3*], Samsuzana Abd Aziz[1,3], Ola Lasekan[2]
[1]Department of Biological and Agricultural Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400, Serdang, Selangor, Malaysia
[2]Department of Food Technology, Faculty of Food Science and Technology, Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia
[3]SMART Farming Technology Research Centre, Faculty of Engineering, Universiti Putra Malaysia
*Corresponding author, e-mail: norhashila@upm.edu.my

A rising awareness for quality inspection of food and agricultural products has generated a growing effort to develop rapid and non-destructive techniques. Quality detection of food and agricultural products has prime importance in various stages of processing due to the laborious processes and the inability of the system to measure the whole of the food production. The detection of food quality has previously depended on various destructive techniques that require sample destruction and a large amount of postharvest losses. Over the last decade, several attempts have been made in order to find the most efficient method to replace destructive techniques. Artificial Intelligence (AI) has emerged with big data technologies and high-performance computation to create new opportunities in the multidisciplinary agri-food domain. The sophistication of artificial intelligence has evolved rapidly with modern technologies into real-time monitoring techniques that provide rich recommendations and insights. This review presents the key concepts of artificial intelligence comprising an expert system, artificial neural network, and fuzzy logic. A special focus is laid on the strength of AI applications in determining food quality for producing high and optimum yields. The future use of artificial intelligence for assessing quality inspection is promising which could lead to a real-time as well as rapid evaluation of various food and agricultural products.
Keywords: artificial intelligence; quality inspection; food products; agriculture; non-destructive

ID145

Reliability of finite element analysis in measure the mechanical damage in fruits and root-vegetables

Nurazwin Zulkiflia, Norhashila Hashim a,b*, Hazreen Haizi Haritha,b and Mohamad Firdza Mohamad Shukeryb Daniel I. Onwude c
[a]Department of Biological and Agricultural Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia
[b]SMART Farming Technology Research Centre (SFTRC), Faculty of Engineering, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia.
Department of Agricultural and Food Engineering, Faculty of Engineering, University of Uyo, 52021 Uyo, Nigeria
*Corresponding author, e-mail: norhashila@upm.edu.my

Fresh agricultural products are very susceptible to physical damage resulted from the mechanical impact during post-harvest operations such as packaging, storing and transporting. Defects produce are prone to cellular damage that can then serve as infection sites for numerous wound pathogens that result in much of the postharvest diseases This paper reviewed the applicability of finite element modelling (FEM) for predicting the damage in fruits and root vegetables (FV) during the condition of static and dynamic loadings. However, many unresolved issues that need to be addressed to improve the finite element (FE) models. This work aims to provide readers with background information regarding the current state of FEM in predicting the mechanical damage in FV. A brief description of the relation between the reverse engineering approach, mechanical tests and FE method is discussed. The improvements to experimental validation techniques which allow for better-calibrated models are also explained. This article presents the recent developments in FEM, highlighting the applications and its contributions to the agricultural field as well as identifying open issues where extensive research is needed.

ID146

Potential of Pennisetum purpureum weed extract on inhibition of anthracnose pathogen, Colletotrichum gloeosporioides on mango fruits.

Sudau E.T.[1]* and Chuah T. S.[2]
[1]Department of Agrotechnology and Bio-Industry, Politeknik Jeli, Jalan Raya Timur-Barat, 17600 Jeli, Kelantan
[2]Faculty of Plantation and Agrotechnology, UiTM Cawangan Perlis, Kampus Arau 02600 Arau
*Corresponding author, e-mail: sudau@pjk.edu.my

Background: Anthracnose is the major pre- and postharvest disease of mango which caused by Colletotrichum gloeosporioides. In-vitro and in-vivo studies were done to evaluate the antifungal activity of Pennisetum purpureum weed extract on control of C. gloeosporioides. Result: The in-vitro result showed that methanol crude extract of P. purpureum exhibited the best antifungal activity against C. gloeosprioides with an average minimum inhibition concentration value of 3.13 mg/ml and it had the highest total activity (5.28 ml/g) on inhibition of C. gloeosprioides. Meanwhile, the in-vivo result demonstrated that the fruits coated with alginate incorporated crude extract at a concentration of 18 mg/ml were most effective in retaining fruit firmness and had the smallest size lesion in diameter (0.34 cm) as compared to other treatments. The phytochemical assay of methanolic crude extract revealed the presence of phenolic compound (tannins), alkaloids and flavonoids but steroids, saponin, amino acid and oil were absent. Conclusion: This study has demonstrated that alginate based coating incorporated with methanolic crude extract of P. purpureum could be used to inhibit anthracnose pathogen of C. gloeosporioides, thereby extending the shelf life of mango fruits.

Keywords: anthracnose, coating, compound, plant extract, mango

ID149

Study on Utilization of Black Soldier Fly Larvae (Hermetia illucens) as Protein Substitute in the Pellet Diet of Clarias gariepenus Fingerling

Noor Ain binti Abd Hamid, Nur Farahiah binti Zakaria, Nur Aina Lyana binti Mohamad Ali
Jabatan Agroteknologi dan Bio-Industri, Politeknik Jeli, Kelantan, Malaysia
*Corresponding author, e-mail: noorain@pjk.edu.my

Fish farming is faced the challenge of high cost of feeds because the cost of high quality protein like fish meal that required in food formulations. Therefore, the need for alternative protein sources is much needed Black soldier larvae (Hermetia illucens) are alternative feed that contain a high source of protein. The black soldier fly larvae (BSF) become a suitable fishmeal alternative in aqua feeds based on their nutritional value and eco-friendly resources. BSF larvae contain high protein levels (42.7% dry matter; DM). Fish diets should contain 32% to 45% protein content. Therefore, it can be a substitute for fish meal. This study was conducted to produce dry pellets containing BSF larvae and tapioca flour as raw material. Effect of freshwater fish meal replacement with black soldier fly larvae (BSFM) were investigated. This study involved the cultivation of Clarias gariepenus fingerling given BSF larval pellets and a commercial diet. The results showed that there was a difference between the weight gains of C. gariepenus which were 6.46g in BSF larval pellets while the commercial diet was 1.9g during 28 days of experiments. There was also, no significant difference ($p < .05$) in the mean weight gain, specific growth rate (SGR) and survival rate. The use of BSF meal as an alternative source of protein can reduce production costs in the aquaculture industry without reducing its quality. The use of BSF meal as an alternative source of protein in fish farming can reduce production costs in the aquaculture industry without changing its quality.

ID151
Effects of Azolla Medium To Mustard Growth

Wan Nor Afzan Bt Mohd Azmi, Muhammad Irfan Bin Zainisham, Nurul Asrihah Binti Zabudin, Siti Solehah Binti Ismail
Jabatan Agroteknologi dan Bio-Industri, Politeknik Jeli, Kelantan, Malaysia
*Corresponding author: wanafzanss@gmail.com

The agricultural sector is expanding throughout the world. In this country, mustard is the highest production. Good and fertile media are needed to produce a high quality and quantity of mustard. The innovation media were introduced in this study. The objective of this study were to determine the effect of azolla medium to mustard growth and to observe the suitable media for mustard growth. In this study, three treatment were used which T1 (100% of cocopeat), T2 (100% of azolla) and T3 (50% cocopeat and 50% azolla). There are 3 parameters measured such as number of leaves, plant height and width of leaves. All the data collected were analyzed using Microsoft Excel and data presented in bar graph to compare the differences of parameters between three treatments. The result from the study showed that T1 (100% of cocopeat) give a positive effect and followed by T3 (50% cocopeat and 50% azolla) in all parameters. For the conclusion, T1 (100% cocopeat) and (50% cocopeat and 50% azolla) give a positive effect to mustard of these treatments are suitable media for mustard growth because in the previous study Azolla contribute as biofertilizer and increase the fertilizer in the rice field. This enables the agricultural industry to thrive on new innovations that are essential to the vitality of plants to make better choices in the future.

ID152
Natural Growth of Plant by Bio-Organic Input

Mashitah M.
Politeknik Jeli Kelantan, Jalan Raya Timur Barat, 17600 Jeli, Kelantan
*Corresponding author: masitah.sam@gmail.com

Fertilizers are usually added on plants to improve the plants growth and production. OHN is a fluid form of fertilizers which consists of leftover of agricultural and wet market wastes and also microbes. OHN was fermented and added to the plants when it's ready to use after 1 week. The experiment is done to produce organic fertilizer from wet market waste for a better soil fertility and also to increase the growth of spinach plants by using different concentrations of OHN. In this experiment, two different concentrations of OHN were made which is 10% and 20% and there was also controlled. The efficiency of this experiment was measured by the height of the plant, number of leaves and the length of spinach. In the end of this experiment, OHN with a concentration of 20% have shown an excellent result which have the 21.7 cm height of the plant, 23 number of leaves, and 7.3 cm length of spinach. The study has shown that the OHN with the concentration of 20% able to enhance the growth of the spinach. As a conclusion, the implementation of OHN in plants has been approved to enhance the growth of plants, reduce amount of market wastes and also sustain the fertility of the soil and also known as organic fertilizer.

ID153

Effect of Mulberry Leaves Extract (Morus Alba) On Growth for Post Larvae in Giant Freshwater Prawn (Macrobrachium Rosenbergii)

Siti Nor Fatihah[1*], Mhd Ikhwanuddin[2], Muhd Farouk, Harman[3]
[1]Department of Agrotechnology and Bio-Industry, Politeknik Jeli Kelantan Jalan Raya Timur-Barat 17600 Jeli, Kelantan.
[2]Institute of Tropical Aquaculture, Universiti Malaysia Terengganu 21030 Kuala Nerus, Terengganu.
[3]FRI Batu Maung, Department of Fisheries Malaysia 11960 Bayan Lepas, Pulau Pinang.
[*]Coressponding author; e-mail: fatihah@pjk.edu.my

The study was assessed to determine the effect of mulberry leaves extract (Morus alba) on growth rate of giant freshwater prawn, Macrobrahium rosenbergii. As well as identifying, the various factors in acceptance of the mulberry extract through sprayed sinking pellet and high motility in post larvae (PL) was mainly caused that occurs in the experiment. In the present study, the mulberry leaves extract was mixed with commercial pellet using the spray method; pellet with 5 % and 10 % mulberry leaves extract. There was a control treatment with no mulberry leaves extract. M. rosenbergii were fed with the pellet (commercial pellet for control, 5 % and 10 % with mulberry leaves extract) for 30 days and each treatment have a 10 tails of juvenile in M. rosenbergii. The result showed the pellet with 10 % mulberry leaves extract was more effective with the high survival rate and molting. As a conclusion, the mulberry leaves has a good effect on growth of M. rosenbergii. The present study will increase the production of PL in M. rosenbergii with the minimal motility and cost.

ID154

Determination of optimal Application of Biosurfactant by using Linear Programming (LP) Model

Nazifa Athirah Mat Zakhi[1], Nurul Husna Radzali[1], Mohamad Firdza Mohamad Shukery[1], Mohd Nazren Radzuan[1,2,3]*
[1]Department of Biological & Agricultural Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia
[2]Smart Farming Technology Research Center (SFTRC), Department of Biological & Agricultural Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor
[3]Laboratory of Processing and Product Development, Institute of Plantation Studies (IKP), Management Office, Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia.
*Corresponding author, e-mail: mohdnazren@upm.edu.my

In the generation of world industrialization, natural useful resource exploration has provided as a source of research and development for science and superior technology, leading to the manufacturing on the world market of products with high equity value, such as biosurfactants. Biosurfactants are amphiphilic microbial molecule that contains hydrophilic and hydrophobic that partition at liquid / liquid, liquid / gas or liquid / solid interfaces. Such characteristics of these biomolecules to play a key function in foam formation, detergence, emulsification, biopesticide and pharmaceutical which are acceptable aspect in a number of sectors. In addition to getting a strong advantageous effect on the major global issues, biosurfactant production performs a widespread function in establishing sustainable processes in the industry, such as the use of renewable resources and green products. Low toxicity and biodegradability have resulted in the escalation in scientific research on a broad range of industrial purposes for bioremediation biosurfactants as nicely as the oil, food processing, health, chemical, agricultural and cosmetic industries. This research study about mathematical model that can determine the worthwhile products and biosurfactant-pathways that will give maximum profit to the biosurfactant application. There are eight stages of research methodology that will be employed in the improvement of the fine biosurfactant application. The model comprised of linear programming (LP) model that uses various equations to identify the most profitable application for biosurfactant.

Keywords: biosurfactants, biomolecules, linear programming (LP)

ID156
Converting Durian-Based Traditional Dessert into Ready-To-Eat Food by Adopting the Sausage Technology

Siti Nurumairah Mohamed Razali[1], Hasfalina Che Man[1,2], Mohd Zuhair Mohd Nor[3,4], Muhammad Hazwan Hamzah[1,2]*
[1]Department of Biological and Agricultural Engineering, Faculty of Engineering, Universiti Putra
[2]Smart Farming Technology Research Centre, Faculty of Engineering, Universiti Putra Malaysia,
[3]Department of Process and Food Engineering, Faculty of Engineering, Universiti Putra Malaysia,
[4]Laboratory of Halal Science Research, Halal Products Research Institute, Universiti Putra Malaysia,
*Corresponding author, e-mel: hazwanhamzah@upm.edu.my

Durian known as King of Fruit is a prominent, common native Southeast Asian fruit. Durian fruit is very popular among the locals. Nowadays, there are various types of durian-based products available in the market such as ice-cream, cakes, chips, chocolate bars, and pre-mixed powders. There are also traditional dessert products produced using fresh durian filling such as 'dodol', 'lempuk', and 'bingka'. However, as time goes on, traditional desserts are increasingly forgotten. A study has been done in which converting durian-based traditional desserts into ready-to-eat food using sausage production technology. The sausage production technique began with the process of grinding the durian paste, mixing the ingredients, stuffing the mixture into the sausage casing, steaming the mixture, and chilling the Ready-To-Eat (RTE) durian-based dessert. Next, the firmness and moisture content of the RTE durian-based dessert produced were also analyzed. Apart from that, sensory evaluation is conducted to determine the consumer acceptance of the RTE durian-based dessert that has been produced. Based on the results obtained, the best firmness for this RTE durian-based dessert is 10.42 N. The value of the moisture content obtained is high which is between 52.05% to 61.89%. The average sensory evaluation resulted 3.7 out of its full score which is 5. In conclusion, this method can be used to increase the added value and uniqueness of the RTE durian-based dessert produced, however, improvements such as product formulations and freezing methods to extend the product's shelf life is necessary for the future to produce better RTE dessert products.

ID157
Kajian Rekabentuk Eco2GC Drain Cover

[1]Nor Hayati binti Mat Nor, [2] Noor Izma binti Ab Ghani and [3]Affidah Mardziah binti Mukhtar
Civil Engineering Department, Polytechnic of Kota Bharu, Kelantan, Malaysia
*Corresponding author: yatimn76@gmail.com

Isu longkang tersumbat nampak remeh, namun ia memberikan kesan yang tidak baik kepada persekitaran, kesihatan dan pekerja kebersihan. Norhidayah (2019) melalui Berita Harian telah menulis berkaitan isu sisa daun dan ranting kering yang menutup longkang di Serdang, Selangor. Terdapat banyak sebab yang menjadikan longkang tersumbat seperti dipenuhi sampah sarap, pasir dan tanah serta daun dan ranting kering. Berikutan dengan itu satu kajian rekabentuk Eco2GC Drain Cover dihasilkan bagi mengatasi masalah longkang tersumbat. Eco2GC Drain Cover adalah singkatan bagi Economic To Green Concrete Drain Cover di mana produk ini direkabentuk selaras dengan saliran mesra alam (MSMA). Objektif rekabentuk produk ini adalah untuk mengenalpasti kadar aliran air, mengenalpasti kekuatan mampatan, dan mengenalpasti penjimatan masa penyelenggaraan longkang yang menggunakan Eco2GC Drain Cover. Konsep asas rekabentuk Eco2GC Drain Cover adalah menekankan kepada fungsi asal longkang untuk mengalirkan air namun ia juga dapat mengelakkan daripada sampah, tanah, pasir, daun dan ranting dari masuk ke longkang. Hasil daripada kajian rekabentuk longkang ini didapati, ujian pengaliran air Eco2GC Drain Cover melalui poros adalah 1.999 liter/saat, ujian kekuatan mampatan adalah 43.63N/mm2 pada umur 28 hari, penjimatan masa pekerja menyelenggara longkang adalah 72.5%. Dengan itu, produk Eco2GC Drain Cover ini memberikan kesan yang amat baik kepada pengurusan sisa dan dapat mengelakkan longkang tersumbat daripada sampah, tanah, pasir, daun dan ranting kering.

Kata kunci: longkang tersumbat, Eco2GC Drain Cover, poros, pengurusan sisa

ID158
S-ECO Furnace: Relau Pembakar Sampah Kering Jenis Mini

[1] Nor Sazlina binti Ismail, [2] Nor Hayati binti Mat Nor and [3]Azahan bin Daud
Civil Engineering Department, Polytechnic of Kota Bharu, Kelantan, Malaysia
*Corresponding author; e-mail: shazlina@pkb.edu.my

Menurut Berita Harian 18 Jun 2019, rakyat Malaysia menjana sampah sebanyak 37890 tan setiap hari. Isu sisa daun dan ranting kering yang menutup longkang juga turut diperkatakan. Oleh itu, sejak Mei 2017, kerajaan amat menyarankan penghasilan teknologi tinggi untuk mengurus sampah kerana ia boleh menjana ekonomi kepada negara. S-Eco Furnace adalah sejenis relau pembakar sampah jenis mini. Umumnya ia memberi kesan kepada kesihatan umum dan persekitaran. Kajian lapangan bagi menilai keberkesanan produk ini dilakukan di kawasan Bengkel Kejuruteraan Awam dan Mekanikal. Objektif penghasilan produk ini adalah untuk mengukur keberkesanan penggunaan produk dari segi kos operasi, penjimatan masa, penjimatan tenaga manusia dan penghasilan sisa pelupusan muktamad. Hasil kajian telah menunjukkan bahawa dengan menggunakan S-Eco Furnace , kos operasi telah menunjukkan kos penjimatan sehingga 33%, masa untuk pembakaran selama 4 jam 30 minit untuk kuantiti sampah seberat lebih kurang 173 kg, pejimatan tenaga manusia sehingga 66.7% dan penghasilan sisa pelupusan muktamad dapat mengurangkan kapasiti pusat pengumpulan sampah sebanyak 0.5%. Penghasilan sisa pelupusan muktamad bagi S-Eco Furnaces adalah abu hasil pembakaran. Abu ini kemudiannya boleh digunakan sebagai bahan campuran dalam penghasilan baja untuk tanaman. Kesimpulannya, penghasilan produk ini memberikan kesan yang amat baik kepada persekitaran dan pengurusan sisa sampah kering seperti daun dan ranting kayu.
Kata kunci: S-Eco Furnace, Relau Pembakar, Sampah Kering, Mini

ID159
Merekabentuk, Membangunkan Dan Mengujilari Mesin Pelerai Biji Jagung

Norli Binti Ismail, Mohd Faidzul Bin Abdul Rahman, Sakinah Binti Ibrahim
Jabatan Kejuruteraan Mekanikal, Politeknik Kota Bharu, Ketereh, Kelantan, Malaysia
* Corresponding author, e-mail: norli@pkb.edu.my

Mesin pelerai biji jagung direkabentuk sebagai satu mesin yang berfungsi untuk meleraikan biji jagung daripada tongkolnya. Mesin pelerai jagung di pasaran mempunyai saiz yang besar dan harga mahal. Terdapat permintaan peniaga dan surirumah yang memerlukan satu mesin yang dapat memudahkan kerja melerai biji jagung. Proses melerai biji jagung yang agak sukar untuk dilakukan oleh seorang yang kurang mahir dan boleh menyebabkan hasil biji jagung tersebut pecah, rosak dan tidak lerai sepenuhnya dari tongkol. Permasalahan ini boleh diselesaikan dengan merekabentuk dan membangunkan sebuah mesin pelerai biji jagung yang bersaiz kecil pada kos yang murah dan proses pengendalian yang mudah, cepat dan selamat. Penggunaan peleraian biji jagung secara manual memakan masa dan berisiko. Objektif projek ini adalah untuk merekabentuk mesin pelerai biji jagung dari tongkolnya dengan lebih cepat, mudah dan selamat dikendalikan. Selain itu dapat membangunkan sebuah mesin pelerai biji jagung pada saiz kecil dengan kos yang mampu milik dan mudah alih. Projek ini menggunakan mata bilah pemotong yang berbentuk silinder dan motor untuk menggerakkan mata bilah pemotong. Bentuk keseluruhan badan projek dibina dengan lebih lengkungan bagi memudahkan biji jagung jatuh atau keluar ke tempat pengumpulan. Bahagian yang dihasilkan pada mesin pelerai biji jagung ialah bahagian pemotongan, bahagian masukan biji jagung, bahagian pengumpulan dan bahan pembuangan. Ini melibatkan proses pembuatan iaitu pengukuran, pemotongan, pengimpalan, penggerudian, pemasangan, penyambungan dan proses ujilari. Berdasarkan daripada proses ujilari yang telah dibuat didapati mesin ini dapat meleraikan biji jagung dengan cepat, mudah dan selamat. Penghasilan biji jagung terlerai adalah lebih baik, tidak rosak dan berkualiti. Hanya memerlukan masa di antara 12 hingga 15 saat sahaja untuk meleraikan satu tongkol jagung. Manakala peratus peleraian biji adalah sebanyak 95%. Mesin yang terhasil adalah lebih kecil dengan ciri-ciri mudah alih, mampu milik dan pengendalian yang amat mudah dan selamat. Pemerhatian dibuat juga didapati mesin ini dapat melerai biji jagung dengan cepat dan mudah berbanding dengan menggunakan kaedah secara manual. Mesin pelerai biji jagung yang dihasilkan juga bersaiz kecil pada kos yang murah dan proses pengendalian yang mudah dan cepat serta selamat digunakan.
Kata kunci: biji jagung; lerai; tongkol

ID160
Membina Mesin Angkat Mudah Alih "FastWork Lifter" Untuk Kegunaan Industri Pembinaan Kecil

Zaleha binti Ya'akub, Rohana binti Semaail, Fauziah binti Hamdan
[1]Jabatan Kejuruteraan Mekanikal, Politeknik Kota Bharu, Ketereh, Kelantan, Malaysia
* Corresponding author, e-mail: zalehayaakub@gmail.com

Mesin angkat merupakan suatu alat yang digunakan untuk mengangkat atau menurunkan beban dengan menggunakan sistem mekanism takal. Ia banyak digunakan di dalam industri kecil dan sederhana ataupun industri berat. Dalam industri pembinaan yang bersaiz kecil, mengangkat dan menurunkan beban dari kenderaan pengangkutan seperti lori kebiasaanya memerlukan penggunaan tenaga manusia yang tinggi. Keadaan ini boleh menyebabkan kemudaratan dan merbahaya kepada pekerja. Fastwork Lifter merupakan satu projek inovasi dalam industri mesin angkat yang dibangunkan untuk mengatasi masalah yang dihadapi pekerja ini. Ia digunakan ketika menghantar produk ke tempat persendirian, di mana mesin angkat tidak disediakan. Fastwork Lifter ini dibangunkan bertujuan untuk mengurangkan penggunaan tenaga(kudrat) para pekerja dan menjaga kesihatan pekerja. Mesin ini digunakan untuk menurunkan beban dari lori dan meletakkannya di tempat yang betul. Rekabentuknya yang kecil bertujuan supaya mesin angkat ini dapat di bawa ke mana sahaja. Fastwork Lifter yang dibangunkan menggunakan beberapa roda kecil dan dawai sebagai komponen asas sistem takal untuk menurun dan menaikkan pelantar. Beban boleh ditambah ke atas pelantar dalam kuantiti yang kecil dan diturunkan dengan memusing pemegang secara manual. Mesin ini telah diuji ketahanannya dan ia boleh membawa beban sehingga 50 kg.

Kata kunci: Mesinangkat; sistem takal; industri

ID161
Mereka Bentuk Agro Easy Trolley Untuk Mengangkut Hasil Pertanian

Roslehaini Binti Hamzah [1], Rus Ayunita Binti Jusoh[1], Md Fadzil Bin Hasbollah[2]
[1]Jabatan Kejuruteraan Mekanikal, Politeknik Kota Bharu, , Ketereh, Kelantan, Malaysia
[2]Jabatan Matematik dan Sains Komputer, Politeknik Kota Bharu, , Ketereh, Kelantan, Malaysia
* Corresponding author, e-mail: roslehaini@pkb.edu.my

Agro Easy trolley is a trolley designed to transport agricultural products such as vegetables, fruits, legumes and tubers from the farm. This trolley has five wheels that function to facilitate movement. The production of this trolley is based on a number of issues voiced by farmers such as health problems due to transporting heavy agricultural products and difficult to move the tractor in uneven areas. The target users of this trolley are farmers who will transport agricultural and fertilizer products. The project is designed to produce an ergonomic trolley, easy to operate on uneven ground surfaces and can accommodate agricultural produce that can be stacked in stages. The Agro Easy Trolley design method uses the metal bending technique on the handle part and the welding technique is used for the iron bonding process on the base part. This trolley has been tested to transport agricultural produce from nearby farm areas. The results of this test found that this trolley was easier to handle by farmers compared to pushcarts. The Agro Easy Trolley handle is designed to fit the height of the user causing it to not put pressure on the back of the user.

Keywords: Troli; ergonomik; hasilpertanian

ID162
Pembinaan Mini Inkubator Untuk Pengeraman Telur

Suraya Binti Mustaffa, Fauziah Binti Hamdan, Roslehaini Binti Hamzah
Jabatan Kejuruteraan Mekanikal,,Politeknik Kota Bharu, Ketereh, Kelantan, Malaysia
* Corresponding author, e-mail: suraya.poli@1govuc.gov.my

Pengeraman merupakan proses di mana selepas telur keluar daripada induk dan telur tersebut akan dieram supaya menetas. Secara teori, proses pengeraman ini mengambil masa selama 28 hari untuk itik dan 21 hari untuk ayam. Permasalahan yang biasa dialami dalam proses pengeraman ini ialah peratusan penetasan telur adalah lebih rendah dan memerlukan masa yang agak lama untuk menetas. Selain daripada kaedah pengeraman secara semulajadi, kaedah inkubator juga digunakan. Mini inkubator merupakan projek inovasi di mana ia menggunakan sistem penetasan telur dengan membekalkan haba bagi mengekalkan suhu pengeraman antara 36-38 oC. Alat ini direka untuk membantu meningkatkan peratus penetasan telur poltri seperti ayam, itik, angsa dan burung puyuh. Mini inkubator direka bagi menggantikan tugas pengeraman oleh induk yang mana ia mempunyai satu sistem kawalan bagi mengawal suhu dan kelembapan yang diperlukan bagi menetaskan telur. Mini inkubator dibina dengan menggunakan kotak daripada papan lapis dan dipasang dengan thermostat bagi tujuan pengawalan suhu serta menggunakan motor untuk menggerakkan telur secara automatik. Mini inkubator ini telah diuji selama 21 hari dengan meletakkan telur ayam untuk menguji peratus penetasan telur. Selepas diuji selama 21 hari didapati 95% telur ayam telah berjaya ditetaskan. Kesimpulannya, projek inovasi ini dapat meningkatkan penetasan telur dengan menghasilkan kualiti telur yang baik.

Kata kunci: Inkubator; pengeraman ;penetasan.

ID163
Physicochemical, Textural, Thermal Properties of Rice Bran Oil Spread as Alternate Shortening for Bakery Products

Hui Yi Eng[1], Norazatul Mohd Rozalli[1*], Nurul Najihah Ilias[1]
[1] Food Technology Division, School of Industrial Technology, Universiti Sains Malaysia, 11800 Pulau Pinang, Malaysia.
* Corresponding author, e-mail: norazatulhanim@usm.my

The rice bran oil (RBO) can form its semisolid spread through solvent fractionation. The rice bran oil spread (RBOS) is proposed to be included in the production of bakery products. The aim of this is study is to compare the physicochemical, textural properties and thermal properties of RBOS with commercial shortening (CS). Spreadability analysis was conducted using a texture analyzer. There was no significant difference ($p > 0.05$) in firmness and work of shear between CS and RBOS. The fatty acid compositions were determined through GC-MS. The major fatty acids in RBOS were palmitic acid, oleic acid and linoleic acid which is similar to those in RBO but significantly ($p < 0.05$) higher in saturated fatty acid content. RBO contains a high amount of γ-oryzanol and phytosterols which is beneficial in solid fat structuring. The quantitation of γ-oryzanol was performed by using UV-Vis spectrophotometer while the phytosterol content was analyzed by using HPLC. There was no significant difference ($p > 0.05$) in γ-oryzanol between RBO (1,299.88 ± 50.97 mg/ 100 g sample) and RBOS (1,201.86 ± 84.37 mg/ 100 g sample). However, there was a significant difference ($p < 0.05$) in phytosterols between CS (4.17 ± 0.26 mg/ 100 g sample), RBO (247.00 ± 0.89 mg/ 100 g sample) and RBOS (184.16 ± 0.56 mg/ 100 g sample). Besides, thermal analysis of CS and RBOS were carried out using DSC and TGA. The similar textural properties but better physicochemical properties make RBOS becomes a suitable choice as alternate shortening for bakery product.

ID164

Effect of Mixing Ratio To Tensile Strength Of Sugarcane Bagasse And Polypropylene Composite

Julia Binti Jamaluddin*, Rosnani Binti Hassan, Noriah Binti Abdullah, Aspalila Binti Awang
Jabatan Kejuruteraan Mekanikal, Politeknik Kota Bharu, Ketereh 16450, Malaysia
*Corresponding author, e-mail: julia@pkb.edu.my

Natural fibers is widely use as polymer composites as their biodegradable, economically, light weight, easy processing, rich of resources and environment friendly product. In Malaysia, sugarcane bagasse do not have value as raw material and dumped in certain area which can cause environmental pollution and clog water drainage. Composites cannot be easily recycled and reuse and also take several decades to dispose. The natural fiber which is sugarcane bagasse is add to the polypropylene as reinforcement in matter to produce environment friendly product or green product. This natural fiber polypropylene has been mixed in internal mixing machine and compression moulding machine. All the sample product have been made according weight percentage ratio 40:60, 50:50, 30:70 and 0:100 between sugarcane bagasse and polypropylene. This natural fiber polypropylene product has been analyzed on their strengths by using tensile test. Data were analyze at yield strength at offset 0.2%, the ultimate tensile strength and the tensile elongation of the composite. The tensile strength, elongation and yield strength were decreased when the ratio of Sugarcane Bagasse fibers are decreased. The sugarcane bagasse fibers reinforced polypropylene composites with 40% fibers and 60% polypropylene was optimum mixing ratio. Implications of this study will reduce the effects plastics to environment.

Keywords: polymer composites; sugarcane bagasse; polypropylene; ratio; tensile strength

ID165

Development A Natural Filtration Of Concentrated Conductivity From Industrial Reverse Osmosis At Pharmaceutical Company For Conductivity Reading

Ahmad Shamsul Wadi b. Ahmad @ Ahmad Sowi
Department of Mechanical Engineering, Politeknik Kota Bharu, 16450 Ketereh Kelantan, Malaysia.
*Corresponding author, e-mail: wadi.poli@1govuc.gov.my

This project focus on development natural dilution process of highly concentrated conductivity from Reverse Osmosis (RO) at one of pharmaceutical company. This company is one of the pharmaceutical companies in Malaysia that is use water as base products. RO become one of the essential process need to produce water with certain grade use for production lines. The highly concentrated conductivity produce from RO cannot flush into drainage system because it can harmful the environment and also against the environmental policy. The main purpose of these studied to dilute the highly concentrated conductivity from RO using natural dilution without using chemical reaction or hazardous materials before flush into drainage system. The highly concentrated conductivity from RO flushed to the first out of five created ponds. Coco yams were plant around the all five ponds because those plants had ability to absorb dissolved metals such as magnesium, calcium, cilium and etc. from water to generate their foods. This process can reduce water conductivity. Koi fish and cat fish also used in certain ponds as indicator whether the ponds can maintain water conductivity or not. Water sample from all ponds sent to chemical laboratory every day for a year to measured conductivity. A year data of water conductivity were analyzed using Microsoft Excel to see the trending of water conductivity. From the analyzed shows this dilution process can decrease the water conductivity without using any chemical reaction or hazardous materials.

ID166
Merekabentuk Dan Membina Mesin Pemisah Selaput Lendir Biji Koko

Abdul manaff Mahmood , Noriah Abdullah*, Rosnani Hassan
Jabatan Kejuruteraan Mekanikal, Politeknik Kota Bharu, Kelantan
*Corresponding author, e-mail: manaff@pkb.edu.my

Koko (Theobroma cacao) adalah merupakan tanaman komoditi yang diusahakan secara perladangan dan juga pekebun kecil di negara kita Malaysia. Bahan tanaman bagi penanaman koko adalah menggunakan biji benih. Biji benih koko di sediakan dengan cara membuang lendir (mucilage) yang menyelaputi biji koko terlebih dahulu sebelum proses menyemai. Situasi ini amat perlu untuk memudah dan mempercepatkan percambahan biji benih koko semasa penyemaian. Namun begitu kaedah membuang lendir pada masa kini adalah secara manual menggunakan tenaga manusia. Kaedah ini lambat dan tidak dapat menyediakan kuantiti yang banyak dalam masa yang singkat. Bagi mengatasi masalah ini sebuah ”Mesin Pemisah Selaput Lendir Biji Koko” (MPSLKOKO) telah dicipta untuk mempercepatkan proses penyediaan biji benih koko dalam kuantiti yang banyak. Mesin ini terdiri daripada binaan kerangka utama, bekas muatan biji koko dan unit pengasingan. Kaedah pemisahan lendir ialah secara gerakan putaran serta geseran unit pengasing dengan bantuan habuk gergaji (berfungsi menyerap lendir) dan mendapat bekalan kuasa dari motor elektrik. Hasilnya biji benih koko dan lendir terasing dengan baik dan seragam. Ujian percambahan mendapati penyediaan biji benih hasil dari pengasingan oleh mesin adalah lebih daripada 90%. Mesin ini berkecekapan memisah lendir sebanyak 30 kg/jam. Analisis dan pemerhatian yang dijalankan mendapati mesin ini lebih cekap dari tenaga manusia dan dapat mengasing dalam kuantiti yang banyak. Kesimpulannya MPSLKOKO yang dicipta dan diuji mampu mengatasi masalah penyediaan biji benih koko dalam kuantiti yang banyak dan dalam masa yang singkat seperti yang diperlukan.

Kata kunci: Koko; selaput; pemisah

ID171

Development and Performance of Pyrolyzer for Production of Biochar and Wood Vinegar from Domestic Agriculture Farm Waste

Mohd Fazly Mail.[1*], Mohammad Hariz Abdul Rahman.[2], Mohd Ridzuan Mohd Daud[3], Mohammad Shahid Shahrun[4], Nur Adliza Baharom[5]
[1]Farm Mechanization Program, Engineering Research Centre, MARDI
[2]Climate Change Program, Agro-Biodiversity & Environment Research Centre, MARDI
[3]Agronomy & Production System Program, Horticulture Research Centre, MARDI
[4]Soil Science and Water Program, Soil and Fertilizer Research Centre, MARDI
[5]Pest and Disease Management Program, Horticulture Research Centre, MARDI
*Corresponding author: email; fazlym@mardi.gov.my

This invention describes the development and performance of a pyrolyzer to produce biochar and wood vinegar from domestic agriculture farm waste. Two pyrolyzers (fix and portable) were designed and developed by MARDI. The system consists of a kiln with ignition area and feeder, cyclone area connected with 7.5 cm diameter pipe, two vinegar collectors, and temperature data logger. The system is capable of producing two main products; biochar and wood vinegar. The main heating materials are coconut shells and other pruning wastes such as mango and carambola, burned in the kiln under limited oxygen. Wood vinegar is a by-product of charcoal production. The design concept is to force the gases produced into the liquid through condensation. Theoretically, the smoke from the burned pruning wastes would rise. The gases will then enter a 7.5 cm pipe. At this stage, the pipe forces the gases to hit each other and become liquid. There is a cyclonic system to optimize the conversion of gas into a liquid. At the bottom of the system, there is one connected pipe to collect wood vinegar. An additional line is connected to the cyclone system to force the remaining gases through a smaller tube to become liquid. Overall, there are two vessels to collect the vinegar. After the functional test run, the results showed that the prototype gave satisfactory results with biochar products with 60 to 70% carbon with additional wood vinegar products suitable for eventual use. The study recommends pyrolization of waste as one of the sustainable approaches to manage abundant agricultural residues.

Keywords: pyrolyzer, biochar, plant vinegar, pruning wastes, limited oxygen

ID172

Kajian Penggunaan Efluen Minyak Kelapa Sawit (POME) Sebagai Media Tanaman

Sofiah Hanim H.,[1]Noraziha N[2]., Zuraikai M[3].
Jabatan Agroteknologi & Bio-Industri, Politeknik Jeli Kelantan
*Corresponding author, e-mail: sofeahanim@gmail.com

Kajian ini adalah bertujuan untuk mengenalpasti penggunaan Efluen Minyak Kelapa Sawit (POME) sebagai media tanaman. Skop kajian tertumpu kepada media tanaman bagi sawi pak choy (Brassica chinensis). Kajian telah dibuat dengan mengambil kira POME sebagai bahan utama dicampurkan □rganic bahan lain seperti pasir, baja □rganic dan tanah dalam nisbah yang berbeza. Data kajian adalah berbentuk kuantitatif dan dianalisis secara □rganic□c berdasarkan jumlah purata. Data ukuran saiz lebar daun dan tinggi tanaman sawi pakchoy diambil sebanyak 4 kali dalam masa sebulan. Hasil kajian menunjukkan bahawa campuran media tanaman yang terdiri daripada POME, pasir dan baja □rganic (3 : 1 : 1) menghasilkan tanaman yang paling tinggi dengan bacaan 25.5cm. Manakala ukuran lebar daunnya adalah 15.4cm. Berdasarkan kajian ini jelas menunjukkan bahawa POME boleh dijadikan sebagai bahan dalam penyediaan media tanaman bagi tanaman sawi pak choy.

ID173

Evaluation and optimization of disc grating machine for sago starch production (Metroxylon spp.)

W.M. Wan Azman[1,2], R. Shamsudin[2,*], M.Z. Mohd Nor[2], A. Hamzah[1]
[12]Engineering Research Central, MARDI Headquarters, Persiaran MARDI-UPM, 43400, Serdang, Selangor, Malaysia.
[2]Department of Process and Food Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400, UPM Serdang, Selangor, Malaysia.
[*]Corresponding author, e-mail: rosnahs@upm.edu.my

The production of Sago starch involving multiple processes and the grating process was the most important since the recovery of sago starch was directly affected. In order to produce a finer size of grated sago and high starch recovery, a new design of sago disc grating machine has been developed. A evaluation was performed to determine the optimum operation on the basis of the feeding rate and grating speed input on the sago disc grating machine, and the starch recovery as the output. The grated sago was dried and sieved at different sizes to analysis the size. A model equation was developed to predict the starch recovery. As the result, the optimum feeding rate was 0.1 m/min with 1500 rpm of grating speed produce 23.57% of sago starch recovery. Studies show that the feeding rate and grating speed affects the size of the grated sago produced ($P<0.01$) and directly affects starch recovery.

Keywords: Sago palm, starch, grated sago size, optimization

ID174

Activated carbon produced from rice husk by NaOH and KOH activation and its adsorption in methylene blue

Mohamad Jani Saad [a *], Chia Chin Hua[b], Sarani Zakaria[b], Mohd Saiful Sajab[c]
[a]Engineering Research Centre, Malaysian Agriculture Research and Development Institute, 43400 Serdang, Selangor, Malaysia
[b]Bioresources and Biorefinery Laboratory, Materials Science Program, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia
[c]Research Centre for Sustainable Process Technology, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia
[*]Corresponding author, e-mail: jani@mardi.gov.my

Sodium hydroxide (NaOH) and potassium hydroxide (KOH) rice husk activated carbon were prepared using a method of two-step comprising of carbonization and activation processes. These adsorbent samples were used to remove methylene blue (MB) solution. Some chemical and physical characteristics of adsorbents were determined using proximate analysis, Brunauer–Emmett–Teller surface area (BET) and scanning electron microscope (SEM) prior to run the experiments of MB adsorption. The analyses of adsorption kinetics were performed at several conditions of pH, MB concentration and temperature to investigate the efficiency of adsorption of the samples on the MB solution. The analyses of adsorption kinetics related to the pseudo-second-order model. The capacity of adsorption of the KOH rice husk activated carbon (RHACK) on MB achieved a maximum of adsorption at 317.24 mg/g as compared to the NaOH rice husk activated carbon (RHACNa) at 210.90 mg/g. The model of intraparticle diffusion showed that the process of adsorption of RHACK and RHACNa against MB included the diffusion of MB molecules and external mass transfer to the surface of adsorbents.

ID175

Study on Water Distribution of Spraying Drone by different Speed and Altitude

M. N. Nordin[1*], M. S. Mat Jusoh[1], B. H. Abu Bakar[1], M. S. Hassan Basri[1], M. T. Ahmad[1], M. F. Mail[1], T. V. Chong[2], C. C. Teoh[1]
[1]Pusat Penyelidikan Kejuruteraan, MARDI, Serdang Selangor
[2]Pusat Penyelidikan Padi dan Beras MARDI Seberang Perai.
*Corresponding author, e-mail: mnadzim.mardi@1govuc.gov.my

The application of unmanned aerial vehicles (UAV) in Malaysia, or best known as a drone, is changing from time to time. Today, drones are used not only in the military, but also in agriculture. The use of drones is common in agriculture due to a reduction in cultivated land, labor shortages and obsolete methods. The spraying of pesticides and herbicides may also be carried out using drones. The time-consuming using drone is faster compared to the conventional method. On the market, there are different kinds and types of drone sprayers. Although the manufacturer has set the Standard Operating Procedure (SOP) of drone usage, the efficacy of spraying should first be examined because Malaysia's weather and environmental factors vary from other countries. The purpose of this paper is to investigate the effect of the coverage area during the spraying application on the height and speed of the drone. The plot is 0.5 hectares at MARDI Seberang Perai. Three speeds of 2 m / s, 3 m / s and 4 m / s and three altitudes of 1.5 m, 2.0 m and 2.5 m from the top of the crop were tested. Wind speed and direction were recorded using an anemometer during the study. Water-sensitive paper was used during the experiment to examine the effect on spraying. To calculate the coverage area percentage, the spraying effect on water sensitive paper was analyzed using Imagej software. The results are expected to show which speed and altitude may contribute to the largest area of coverage percentage. The appropriate speed and altitude for the spraying operation on the basis of crop requirements can be concluded from the result.

ID176

Sewerage Water Treatment Using Phytoremediation

Noor Azme Omar, Muhamad Huzaifah Wahap, Zubaidi Johar
Research Center for Water Quality and Environment, National Water Research Institute of Malaysia (NAHRIM), Lot 5377 Jalan Putra Permai, Seri Kembangan, 43300 Selangor
*Corresponding author, e-mail: azme@nahrim.gov.my

Surface water are being contaminated by various toxic elements through anthropogenic activities and natural sources between residential and premises. Studies had shown that aquatic plants had its ability to improve water quality in purifying polluted surface water. Many studies had been introduced to treat the sewerage water and had been a cost to public to pay monthly. Thus, increasing living cost after water and electrical tariff. In this study, sewerage water at urban, rural, remote or even island could possibly use some aquatic plant as alternative sewerage water treatment. The objective of the study is to identify the effectiveness level of certain aquatic species suitable for sewerage water treatment.Some aquatic plants will be used in this study to identify the level of chemical absorption from wastewater. The testing plot located in a small basin with constant, controlled water flow from the sewerage holding tank. In this study, sewerage, water from Puchong Sewerage Treatment Plant had been used as a polluted source. The water quality at each basin will be monitored and recorded daily and end at a constant reading of water quality.From the study, it was found that certain aquatic species could absorb some chemical characteristic during phytoremediation processed as founded by many previous studies nationally and internationally. The treatment of sewerage sources for this study had been deteriorated over 20% from the sewerage characteristics using different types of species. This had identified that alternative wastewater treatment using some species could possibly treated the sewerage water within a period of time. Further study could be done for improving wastewater treatment timeframe either in a different scale or in an integrated mode of treatment in order to treat others characteristics sources of wastewater.

ID177

Implementing Constructed Nature Based System Solution As Alternatives Water Treatment

Muhamad Huzaifah Wahap[1], Noor Azme Omar[2], Zubaidi Johar[3]
[1]Research Center for Water Quality and Environment, National Water Research Institute of Malaysia (NAHRIM), Lot 5377 Jalan Putra Permai, Seri Kembangan, 43300 Selangor
*Corresponding author, e-mail: huzaifah@nahrim.gov.my

Industrial had contributed environment pollution. Wastewater had been increasing in any country around the world, from agricultural sectors to commercial sectors. Wastewater treatment had raised overhead cost on operational and maintenance. Many studies had been done in alternatives wastewater treatment. In general, a variety of waste water treatment processes are employed which includes primary treatment, secondary treatment and tertiary treatment. In this study, three designs system of tertiary treatment will be observed to evaluate the wastewater quality reduction. The objective of the study is to identify the solution design for wastewater treatment efficiency using different designs of treatment. There are three design which are large scale design, medium scale design and portable scale design. As to had similar characters, all three design will be put fishes and some with the wastewater from sewerage plant. The different among design are whereas the first design will using wastewater sources directed from sewerage plant, while the second design will be having water from large sized with different fishes and the thirds design will using from small fished sized. From the study, it was found that different solution design system could perform treatment for a different wastewater characteristic. Average range of treatment had been deteriorated between 10 to 60% on differences water quality parameters. This had identified that constructed nature-based system could possible performed as one of the wastewater treatments. Further study could be done for any sources of wastewater in future as an added value to improvised existed design in order to improve surface water quality.

ID178

Effect of Fruit Maturation and Ripening Potential for Optimum Eating Quality of Giant Granadilla (Passiflora quadrangularis L.)

Halifah Afiza Ismail[1], Shiamala Devi Ramaiya[1,2*], Noorasmah Saupi[1,2], Muta Harah Zakaria[3]
[1]Department of Crop Science, Faculty of Agriculture Science and Forestry, Universiti Putra Malaysia Bintulu Campus, 97008 Bintulu, Sarawak, Malaysia
[2]Institut Ekosains Borneo, Universiti Putra Malaysia Bintulu Campus, 97008 Bintulu, Sarawak
[3]Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia, 43400 UPM Serdang
*Corresponding author, e-mail: shiamala@upm.edu.my

Passiflora quadrangularis is one of the species in genus *Passiflora*, well-known for its appealing and sumptuous flowers and aromatic fruits. This species bears largest fruit (~1-3 kg) with edible fleshy mesocarp. Although it has been planted together with the popular purple and yellow passion fruits, scientific studies have not explored its production, pre- and post-harvest handling, and nutritional profiling. The present study therefore aims to examine the ripening behaviour of *P. quadrangularis* and to evaluate the nutritional properties of this fruit. The experiment was conducted at passion fruit farm in Universiti Putra Malaysia Bintulu Sarawak Campus, Malaysia. The flowers were tagged at anthesis and fruit was harvested at three developmental stages; 1) green, harvested after 40 and 45 days after anthesis (DAA); 2) mature-green, harvested 50 and 55 DAA, and 3) fully ripe, 60 and 65 DAA. All the samples were analyzed based on general properties following AOAC standard protocol. The optimum harvesting period of this fruit was 55 to 60 days after anthesis (DAA). Fruits harvested on day 55 are ideal for cooking. Fruits harvested at day 60 were suitable for consumed as fresh, both mesocarp and pulp. At ripening (day 60) the fruit firmness was 3.33N, with total soluble solid of the pulp was 14.57°Brix. Pulp and mesocarp pH also increased slightly at maturation, 3.76 and 5.14, respectively. *Passiflora quadrangularis* is a non-climacteric fruit and must be treated with ethylene to enhance the ripening during storage. Findings on nutritional properties showed, apart from the excellent moisture in the pulp and mesocarp (85.77%), it also possessed good carbohydrate, protein and fiber content. The mesocarp possessed twice higher flavonoid content compared to the phenolic concentration and this was further supported the stronger antioxidant activity in the mesocarp. This study documented the quality of *P. quadrangularis* fruit at different pre-harvesting stages which are crucial for improving marketable qualities, fruit production, and product development.

Keywords: Fruit maturity; fruit ripening; non-climacteric fruit; passion fruit

ID179

Comparison Study on Fiber and Cocopeat from Young Coconut Husks and Old Coconut Husks

Mohd Shahmihaizan bin Mat Jusoh, Mohd Nadzim bin Nordin, Wan Mohd Aznan bin Wan Ahamad*, Md. Akhir bin Hamid, Norahshekin binti Abdul Rahman, Ahmad Kamil bin Zolkafli, Bunyamin bin Abu Kassim[1], Humaizi bin Md Jamin
Engineering Research Center, MARDI headquarters, Serdang, Selangor, 43400, Malaysia
*Corresponding author, e-mail: wmaznan@mardi.gov.my

Fiber and cocopeat are waste products from coconut husks that can be turned into value added products. Fiber and cocopeat from old coconut husks are well known in coconut industry in the world. This paper described fibre strength from young coconut husks, nutrient content and water-holding ability of young coconut cocopeat compared to old coconut cocopeat. The strength of fiber was determined by using Instron Universal Testing Machine. The results showed that mean load at break for young coconut fiber was 13.76 N while mean load at break for old coconut fiber was 14.93 N. Maximum tensile stress for young coconut fiber was 1.55 MPa and 1.76 MPa for old coconut fiber. The nutrient contents were determined for young cocopeat and old cocopeat resulted as phosphorus (372.79 ppm, 339 ppm), potassium (6829.68 ppm, 10040.46 ppm), calcium (508.74 ppm, 578.40 ppm), magnesium (468.67 ppm, 715.60 ppm) and sodium (1579.70 ppm, 3917.60 ppm). The pH value was 6.55 and 5.39 respectively. The ash contains were 2.62% for young cocopeat while 4.06% for old cocopeat. For water holding ability test, moisture content of each sample from young coconut cocopeat, old coconut cocopeat and peat moss was determined by using soil moisture meter. After seven days with water added 500 ml two times/day, results showed that water holding ability for peat moss was the best while young cocopeat was better than the old cocopeat. All the results showed that fiber and cocopeat from young coconut husk have high potential for sustainable production in the coconut industry.

ID180

Evaluation Of Planting Spacing And Effects On The Yield For Malaysia Grain Corn Production

Mohd Khusairy Khadzir[1], Erwan Shah Bin Shari[1], Mohd Haniff Ahmad[1], Rohazrin Abdul Rani[2], Adli Fikri Ahmad Sayuti[2]
[1]Pusat Penyelidikan Kejuruteraan, MARDI Seberang Perai, Kepala Batas, 13200 Pulau Pinang,
*Corresponding author, e-mail: mkhusairy@mardi.gov.my

Currently, the average grain corn yield in farmer field is 3-4 t/ha and sometimes as low as 1 to 2 t/ha. Whereas large scale planting in research station, the harvested average yield can reach up to 5 to 6 t/ha and CCT yield of 8-9 t/ha and the operation cost is more than RM5,000.00/ha. Planting spacing study is one of the mechanisms for lowering the cost of grain corn cultivation. It's also plays an important role in the growth of corn crops. The objective of this study is to evaluate the effects of planting spacing on the yield of grain corn. The evaluation has been conducted at MARDI Seberang Perai, Pulau Pinang. A 90hp tractor attached with pneumatic row planting machine used for the cultivation operation. Five planting spacing (13, 16, 19, 22, and 25 cm) was evaluated. Study showed no significant differences on growth performance and cob corn. For the yield, the results showed significant differences at $p < 0.05$. The highest yield at planting spacing at 13 cm is 10.78 tan/ha

Keywords: Planting spacing, yield, wet weight, cost, weed control

ID181
Water Recycling System: Sustainable Water Management Approach For Paddy Production

Muhammad Haniff A.
Engineering Research Center, MARDI, Seberang Perai, Pulau Pinang
*Corresponding author: mhaniff@mardi.gov.my

The current climate change, combined with ever increasing demands from both traditional and new water users, including municipal, industrial, and agricultural has impacted on water resources. Recycling of the water as irrigation to secure seed production has a substantial impact on sustainability of food security. Development of water recycling system to sustain the seed production was implemented through 8 seasons since 2014 to 2019 at the Rice Center of Excellence (CoE) research plot MARDI Seberang Perai. The system included the facilities to irrigated and collected the water to reuse again. This approach to sustain the water resources to ensure the cultivation of paddy is not affected even in any weather effect. Rainfall and irrigation flow data were collected for the whole seasons. The crop water requirement was estimated relevant formula before the cultivation process. Observation of field water depth was monitored every 2 days before irrigation applied. The standard of procedure for seed production were used for all activities in crop cultural practices for seed production comply regulations. This system proved that the total amount of water saves ranges in between 20% to 32% for every seasons water supply depend on the rainfall intensity. Its secured to produce exceed 3.5 t/ha of fragrance paddy seed for research and development purposes.

ID182
Hydraulic Performance Analysis of Drip Irrigation System Using Pressure Compensated Dripper at Low Operating Pressure

Eddy Herman bin Sharu[1]*
[1]Engineering Research centre, Malaysia Agriculture Research and Development Institute (MARDI), 43400 Serdang, Selangor, Malaysia
*Corresponding author, e-mail: edherman@mardi.gov.my

Irrigation is the most important component in ensuring that crops can produce optimal yields. The use of drip irrigation can help farmers in providing water to crops in the amount required by the crop. Drip irrigation usually uses an uncompensated dripper and also a pressure compensated dripper. The use of an uncompensated dripper requires precise pressure to ensure a uniform flow for each dripper while the use of a pressure compensated dripper will also provide a uniform flow when operating pressure was used within the range specified by the dripper manufacturer. The purpose of this study is to evaluate the hydraulic performance of the drip irrigation system using low pressure compared to the minimum pressure recommended by dripper manufacturers. The pressure operation recommended by the manufacturer is 1.5-4 bars. This study uses pressures as low as 1 bar (low pressure), 2 bars, and 2.5 bars (recommended by manufacture) to operate this irrigation system. The volumetric approach was used to calculate each emitter's flow rate. Coefficient uniformity (CU), emission uniformity (EU), coefficient of variation (CV), and emitter flow variation (EFV) were the hydraulic parameters evaluated. The results show that CU, CV, and EU are in excellent classification, and the value for CU and the EU is more than 95 percent efficiency. The CV value is below 0.03 which is a very good classification. Meanwhile, emitter flow variation is 10% when operating at 2.5 bars and 2.0 bars and is considered the desirable classification. On the other hand, the emitter flow variation was reported at 6% for the 1 bar operating pressure and the classification was also recorded in the desirable classification. The results conclude that the use of low operating pressure compared to the minimum operating pressure proposed by the manufacturer can also operate in excellent condition according to the hydraulic parameters evaluated.

Keywords: Drip irrigation; Pressure compensated; hydraulic performance; low operating pressure

ID183

Study The Influence Storage Duration And Storage Temperature On Total Soluble Solids (Tss) Of Selected Mutant Purple Sweet Potato

Ishak, H[1]. Noor Ismawaty, N[2]. Zaulia,O[2]. Nurul Afza, A. K[2].
[1]Pusat Penyelidikan Kejuruteraan, Persiaran Mardi-Upm, Mardi Head Quarters, 43400 Serdang,
[2]Pusat Penyelidikan Tanaman Industri, Persiaran Mardi-Upm, Mardi Head Quarters, 43400 Serdang,
*Corresponding Author, e-mail: ishak.mardi@1govuc.gov.my

Quality of sweet potatoes (Ipomoea batatas) is reduced after harvest, such as weight loss, sprouts and decay due to improper storage conditions. Internal quality associated with the loss of nutritional compounds such as total soluble solids is also affected. Thus, this study aims to identified the effect of temperature and duration factors during storage on total soluble solid content of purple flesh Mutant sweet potato. The tubers were harvested at 12±1weeks after planting from Bachok, Kelantan MARDI Station and brought to MARDI Headquarter for post-harvest study. The tubers were washed, sorted, graded for three different sizes and followed by cured for 3 days in cold room at 27±1°C temperature and 75±1% of relative humidity (RH).. It followed by weighted around 1 kilogram which contains all three sizes, packed using LDPE plastic packaging for 54 packs and divided to 3 different storage temperatures 10 ±1° C, 13±1 ° C and 27±1° C (ambient)) for six weeks. Total soluble solids were analyzed at the initial and weekly for six weeks. From the Multilevel Categoric Design ANOVA analysis shown of the quadratic regression model demonstrated that the model is significant with low p-value (< 0.0001), storage temperature and storage duration contributed significantly on total soluble solids content (P-values of 0.0077 and 0.0001, respectively). The study showed that the total soluble solids in mutant purple sweet potatoes can be sustained at a storage temperature of around 10ºC.

ID184

Ergonomic Evaluation of Maize Seeding using Conventional Method and Lightweight Motorized Maize Seeder

Hafidha Azmon[1]*, Mohd Fazly Mail[1], Mohd Nadzim Nordin[1], Mohd Shukry Hassan Basri[2], Norahshekin Abdul Rahman[1], Siti Ashah Ab Rahim[1]
[1]Farm Mechanization Program, Engineering Research Centre, MARDI, Serdang Selangor
[2]Smart and Precision Farming Program, Engineering Research Centre, MARDI, Serdang Selangor
*Corresponding author: hafidha@mardi.gov.my

Manual activity in maize seeding involves moving, lowering body, knee bending, squatting, digging, and seed sowing which can cause an awkward posture due to heavy exertion on the body. These are the symptom of Musculoskeletal Disorders (MSD) or the ergonomic hazard which can lead to human fatigue and disability if done repeatedly and extended in a long time. The paper explained on the ergonomic evaluation of seeding risk assessment using two methods; bare hand and using a lightweight motorized maize seeder. The evaluated maize seeder was designed with a minimum number of parts to make the assembly and maintenance requirements easy without affecting the functionality of the metering device. The maize seeder is easy to operate, light to carry and convenient to use with a single-handed griper to improve ergonomics in the field. Using the concept of gravitational drop and the battery to power the motor, the farmer experiences slightly bent body position with a relaxed posture that requires less stressful angles on seeding activity. Seeding postures on methods were evaluated by means of Rapid Upper Limb Assessment (RULA) and Rapid Entire Body Assessment (REBA) in order to determine the area of bodily discomfort. The RULA result shows that ergonomic risk score on manual seeding activity was at score 7 which is in a high risk compared to seeding activity using the maize seeder which results at score 4 which is in a low risk. While REBA result shows high risk on manual seeding with score 11 and low risk on seeding with seeder which is in score 3. Seeding by bare hand adopting poor posture at the neck, trunk, and wrist twist. The work rate for seeding maize using conventional method and seeder were 0.114 m/s and 0.167 m/s respectively. The study concludes that the use of the lightweight motorized maize seeder can reduce the risks of MSDs due to working in an awkward posture in sowing maize on the field.
Keywords: ergonomic, maize seeder, Rapid Upper Limb Assessment, Rapid Entire Body Assessment

ID185

Properties of grain corn during short term storage in tropical ambient temperature

[1]Sharifah Hafiza, M. R., [1]Yahya, S.,[2]N., Abdullah.,[2]Siti Rajwani, H, [1]Ahmad Fadhlul Wafiq, A. R., and [1]Faewati, A. K.
[1]Postharvest and Processing Mechanization, Engineering Research Centre, MARDI Headquarters, Persiaran MARDI-UPM, 43400 Serdang Selangor
[2] Commercial & Business Research Centre, MARDI Headquarters, Persiaran MARDI-UPM, 43400 Serdang Selangor
*Corresponding author, e-mail: shhafiza@mardi.gov.my

Grain corn in nature possesses a tendency to absorb and release moisture even during storage. Grain respiration will lead to fungal growth, consequently mycotoxin development and decreased nutritional components. Storage in tropical weather like Malaysia, in which the temperature is constantly hot throughout the years (temperature 23-33 °C, with relative humidity around 81%) will promote further spoilage to the stored grain corn. Therefore, this paper discussed the properties of grain corn during three months of storage in a Malaysian weather setting. Grain corn with the initial moisture content of 12.5± 0.02% MC was bagged in the woven polypropylene jumbo bags, 40 kgs bag and a sealed container was stored in a different storage facility in MARDI for three months. Grain corn after three months of storage showed a consistent water activity, a darkening value in chroma index, within the permissible limit of fungal growth and exhibits insect pest development of two major species of Coleoptera family. Grain corn after three months of storage is considered safe though the quality is degraded due to insect pest infestations

Keywords : grain corn, storage, animal feed

ID187

Utilization of banana peel as functional ingredient in product development

Zanariah Mohd Dom*, Adibah Zahiah Azhar,Saidatul Nurul Atika Masaudin
Department of Food and Process Engineering, Faculty of Engineering, Universiti Putra Malaysia, Serdang, Malaysia
*Corresponding author, e-mail: nana@upm.edu.my

The agro-food industry's exponential growth of plant waste production is a critical global issue, taking into account its storage, disposal, environmental impact and potential health risks. However, by-product utilization of agricultural waste for the retrieval of added-value compounds offers new avenues for industrial production and waste management. The waste of banana primarily the peels are potentially a useful sources for substitution of value added product such as dietary fibers, bioactive components, including carotenoids, polyphenols, pro-vitamins as well as essential minerals. This project describes the types and the composition of raw banana peel wastes and the bioactive components of the peel, the processing methods and the possible application of banana peel flour (BPF). Of particular interest, the proximate analysis and physicochemical properties of potential BPF and the properties of the by-product are discussed. These informations were then used to identify types of food that is suitable for production industry. Then, the utilization of banana peel flour in beef burger patties, waffle ice cream cones and yellow noodles were chosen. The formulation of BPF were prepared in three different formulations: 2%, 4% and 6% for beef burger patties, 10%, 20% and 30% for banana peel noodle and 5%, 10% and 20% for waffle cone respectively. Overall, BPF substitutions in these food products have affected and improved high cooking quality, nutritional values, colour, texture and sensory characteristics relative to control.

ID188
Oils Demand for Development of Large Kernel Planting Material

Mohd Mustakim, M[1], Mohd Din A[2], Marhalil, M[2] and Fadila, A. M[2]*
[1]Advanced Biotechnology & Breeding Centre, Malaysian Palm Oil Board, No. 6 Persiaran Institusi, Bandar Baru Bangi, 43000 Kajang, Selangor
[2]Advanced Biotechnology & Breeding Centre, Malaysian Palm Oil Board, No. 6 Persiaran Institusi, Bandar Baru Bangi, 43000 Kajang, Selangor
*Corresponding author, e-mail: mohd.mustakim@mpob.gov.my

Palm kernel oil, which is similar to coconut oil, is high in saturated fats. This edible oil derived from the kernel of the oil palm *Elaeisguineensis*, the other product besides the palm oil. Palm kernel oil which high in lauric acid had many health benefits and also used for the manufacture of soaps, washing powders and personal care products. Due to the similarity of palm kernel oil and coconut oil, they can almost completely substitute for each other. However, the amount of palm kernel oil nowadays had decreases relatively to palm oil because of the need to produce new oil palm planting material with higher mesocarp thus reduce the kernel contents. The development for high kernel oil palm materials has been carried in MPOB through excessive evaluation of germplasm collection in order to find materials with a high percentage of kernel content. This evaluation programme conducted in trial 0.506 in MPOB Research Station Bagan Datuk with a total of 992 palms planted. This trial was laid down in a randomized complete block design (RCBD), with 16 palms/progeny in four replications. The result showed that the trial means for kernel to fruit (K/F) and kernel to bunch (K/B) was 14.99 % and 8.70 %, respectively. The best progeny for K/F and K/B was PK 4627 (0.312/941 x 0.256/2255) with 21.25 % and 7.52 %, respectively. The K/F and K/B increase almost 20-30% more compared to standard DxP cross which had K/F of 10.10 % and K/B of 5.62 %. Based on the evaluated data, selected palms will be used to develop improved high kernel parental palm for commercial DxP seed which subsequently targeted for increasing lauric oil production to cater demands in the future.
Keywords: Palm kernel; lauric acid; planting material.

ID189
Some Physical Properties of Pineapple Leaves for Chopping Machine

Syamimi Rozelan[1]*, Hasfalina Che Man[1], Rosnah Shamsudin[2]
[1]Department of Biological and Agricultural Engineering, Faculty of Engineering, Universiti Putra Malaysia, Serdang, 43400, Selangor, Malaysia
[2]Department of Process and Food Engineering, Faculty of Engineering, Universiti Putra Malaysia, Serdang, 43400, Selangor, Malaysia
*Corresponding author, e-mail: synajihaaa@gmail.com

The production of pineapple residue is increases in line with pineapple production in Malaysia. In order to overcome this issue, a conceptual design of harvesting and chopping machine will be developed to process the pineapple leaves. The combined-chopper is important to be developed as an alternative to the current manual handling method such as left on the ground until next plantation or burnt. This new machine will be introduced to harvest and able to chop the pineapple leaves into smaller size. This chopper machine will be comprised of a specialized blade to cut the pineapple leaves with a rotating conveyor to collect the harvested leaves prior chopping into the selected size. In this study, the average length and width of three most popular cultivars in Malaysia such as MD2 (V1), Josapine (V2) and Nanas Madu Kaca (A 11) (V3) were recorded. The results indicated that the average length and width of MD2 pineapple leaves were 742.00 mm and 58.00 mm respectively. The average length and width of Josapine pineapple leaves were 685.50 mm and 56.70 mm respectively. The average length and width of Nanas Madu Kaca (A 11) pineapple leaves were 817.75 mm and 56 mm respectively. These physical characteristics of pineapple leaf in important to design the chopper machine for pineapple leaves after the harvesting process.
Keywords: Pineapple leaves; chopping machine; physical properties; pineapple residue;

ID190
Revolution of Data Collection Using Arcgis Survey123 Application

Norizatulshima Ibrahim, Nur Aziah Alias & Faris Rassoulli Rizal Wong
Malaysian Rubber Board
*Corresponding author, e-mail: norizatul@lgm.gov.my

Industry 4.0 encompasses the discovery of various new technologies such as automation, Internet of Things (IoT), Big Data and Analysis, simulation, system integration, the usage of robotics and cloud computing. In Industry 4.0, a two-way relationship exists between humans and machines that makes human beings a part of that technology. In line with the Industrial Revolution 4.0, the Extension Research Unit (UPPG) has sought to improve the census / survey method for social science research through the usage of the ArcGIS Survey123 software application. This application is one of the various applications in the ArcGIS ecosystem that can be utilized to enhance field work.
In this paper, the authors substituted the physical (paper-based) form with an online version as the instrument for data collection. Unfortunately, the limitations of using online forms were soon realized by enumerators when there were issues with internet access on the field especially in rural areas.
However, the issue was successfully resolved by the Extension Research Unit in subsequent attempts to apply the data collection method with the *Getah untuk Pribumi* (GUP) Programme Impact Study. Areas covered by the study are Segamat Kechil (Johor), Kampung Bukit Payong (Melaka), Kampung Sg. Sampo & Kampung Tohor (Negeri Sembilan), Pos Tuel & Pos Plug (Kelantan), Sungai Siput (Perak) and Betau (Pahang).
Therefore, the data collection method commonly practiced was improved.

Keywords: ArcGIS Survey123 Application

ID191
Effects of flowing water on soaking water quality during the retting process of pepper berries (Piper nigrum L.)

Puteri Nurain Megat Ahmad Azman [1], Rosnah Shamsudin [1,2,*], Hasfalina Che Man [3] and Mohammad Effendy Ya'acob [1]
[1]Department of Process and Food Engineering, Faculty of Engineering, Universiti Putra Malaysia,
[2]Institute of Advanced Technology, Universiti Putra Malaysia, Serdang 43400, Selangor, Malaysia
[3]Department of Biological and Agricultural Engineering, Faculty of Engineering, UPM
*Corresponding author, e-mail: rosnahs@upm.edu.my

This study assesses the effects of flowing water on soaking water quality during the retting process of pepper berries. Generally, there are organic matters and the bioactive compounds that naturally exist in pepper that may have leached out into the soaking water because of the prolonged retting process. Daily samplings were carried out by triplicate of water sample for 7 consecutive days. The soaking test was carried out by having 5 kg of pepper berries soaked under the flowing water with the flow rate 70 L/min. Six parameters were measured based on standard methods: pH, turbidity, dissolved oxygen, chemical oxygen demand total dissolved solids and colour. The results showed the changes of soaking water in turbidity (from 13.73 ±0.85 NTU to 33.53 ±0.71 NTU), pH (from 6.95 ±0.02 to 6.23), dissolved oxygen (from 7.75 ±0.09 g/ml to 6.15 ±0.02 g/ml), chemical oxygen demand (from 24.33 ±1.53 g/ml to 27.67 ±1.53 g/ml), total dissolved solid (from 39.53 ±2.36 g/ml to 58.50 ±0.65 g/ml) and total colour change (from 0.53 ±0.09 to 0.87 ±0.03) during the retting process were corresponding to the soaking time. As a result, this study reveals that the use of flow water for the retting process has a higher tendency to avoid sedimentation and, in the meantime, to ensure the quality of the white pepper.

ID192

Binding Effect of Physico-Technical Properties of The *Azolla Pinnata* Granules and Tablets as Soilless Growth Media

Nor Aziatul Azidah Azhari[1], Rosnah Shamsudin[1,2*], Susilawati Kasim[3], Mohd Shamsul Anuar[1]
[1]Department of Process and Food Engineering, Engineering Faculty, Universiti Putra Malaysia,
[2]Institute of Advanced Technology, Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor,
[3] Department of Land Management, Agriculture Faculty, Universiti Putra Malaysia, 43400 Serdang,
*Corresponding author, e-mail: rosnahs@upm.edu.my

An important challenge to the general acceptance of soilless growth media is the formulation of suitable ratio type that achieves soil quality requirements as a growth media. Nowadays, there were several alternate soilless growth media were creates and mostly were synthetic commodity. In this research, *Azolla pinnata* was introduced as new alternative part for forming organic soilless growth media with some organic binders. *A. pinnata* historically used in livestock industry as a food supplies. It rich in protein and high amount in macro and micro-nutrients required by plants. It revealed *A.pinnata* was the best alternative substitution of soil as a growth medium.The objectives of this study are to formulate the dried leaf of *A.pinnata* into robust tablets and evaluate the effect of some organic binders on the quality of tablets. The leaves of *A.pinnata* were dried under sun-dried and at three different temperature which were 40˚C, 50 ˚C and 60 ˚C for oven drying. Later on, the dried samples of *A.pinnata*ground to a particle size, 500 μmeter. Tablets of the powder were respectively produced using three different materials: cassava starch, Bentonite clay and rice husk mixed with water as binders. The granules were respectively compressed into tablets and the quality of the tablets was evaluated by standard methods by testing tensile strength and EMU of formulated tablets. The results showed that granules produced with dried ground *A.pinnata* mixed with rice husk and water as binder had higher EMU than granules produced with water and *A.pinnata* with cassava starch and also *A.pinnata* with Bentonite clay. Tablets formulated with water, dried *A.pinnata* and rice husk as binder had higher tensile strength of the tablets produced all limits of acceptance. On compression of the granules robust tablets that met criteria for quality acceptance were successfully formulated with the binders.

Keywords: *Azolla pinnata*, ratio formulation, physico-technical properties, binding effects

ID193

A Review: Kinetic Model on Quality Changes During Heat Blanching of Dabai Fruit

Arinah Adila Abdul Halim[1], Rosnah Shamsudin[**1,2], Siti Hajar Arifin[1], Wan Nor Zanariah Zainol@Abdullah[3]
[1]Department of Process and Food Engineering, Faculty of Engineering, Universiti Putra Malaysia.
[2]Institute of Advanced Technology, Universiti Putra Malaysia, 43400, Serdang, Selangor, Malaysia.
[3]Department of Science and Technology Faculty of Humanities, Management and Science, Universiti Putra Malaysia Bintulu Sarawak Campus, 97008, Bintulu, Sarawak, Malaysia.
[*]Corresponding author, e-mail: rosnahs@upm.edu.my

Dabai fruit (*Canarium odontophyllumMiq.*) is one of the underutilized fruits that are mostly available in Sarawak. Dabai fruit have many nutrients that were beneficial for the consumers such as high in antioxidant and carotenoid content. Usually, the locals will soak the dabai fruit in warm water for a few minutes to soften the flesh of the dabai fruit before serving it with soy sauce or eating it with rice or make it as 'ulam'. The blanching treatment of dabai fruit affected the nutrients and characteristics of dabai fruit that contributes to the quality changes of the dabai fruit. There is still limited research and information about the quality changes of dabai fruit due to heat blanching treatment. Thus, it is necessary to study about the quality changes during heat blanching of dabai fruit to study the changes of the characteristics, nutrients and properties of the dabai fruit. Kinetic modelling on the quality changes of dabai fruit is crucial for quality modelling and quality control of dabai fruit during the heat blanching treatment. Kinetic modelling is also important to identify which temperature and time that is optimum for the quality of dabai after the heat blanching treatment, also to determine the rate changes of the properties and characteristics of dabai fruit that were affected. In this paper, general aspects of blanching process are discussed. Properties and methods to measure the quality changes were discussed. Models of kinetic according to the properties and characteristics affected by the blanching treatment were also reviewed.
Keywords: dabai; *Canarium odontophyllumMiq;* blanching; kinetic modelling; quality changes,

ID194

Development of Temperature and Humidity Monitoring System in UiTM Jasin Greenhouse

Muhammad Nadzrul Faiz[1], S. M. Shamsi[2*]
[1]Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA Kampus Jasin, Merlimau, Melaka
[2]Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA Kampus Jasin, Merlimau
*Corresponding author, e-mail: mariam_shamsi@uitm.edu.my

The implementation of the UiTM Jasin greenhouse temperature and humidity monitoring system is proposed in this study. For greenhouse users and growers, the study of temperature and humidity data seems to be problematic. This issue has made it impossible for them to guarantee the exact greenhouse temperature. In the agriculture sector, to ensure that yields are good, all factors need to be taken seriously. The main objective of this project is the development and monitoring of the UiTM Jasin greenhouse temperature and humidity sensor. Using the Arduino and DHT-22 sensors, the system was designed to detect temperature and humidity within the greenhouse and to provide information on the serial monitor and to write the information to the SD card. Data collection was performed for three (3) different time sessions, from 8 a.m. to 10 a.m., from 12 p.m. to 2 p.m. and from 5 p.m. to 7 p.m. to ensure that all relative temperature and humidity specifics are covered by the data. Two (2) weeks of data collection have been collected. The results of this study show that the impact of outside temperature as a dependent variable on the greenhouse's inside temperature was very strong, where the greenhouse's inside temperature was higher than the outside temperature. The study would, in conclusion, make it easier for farmers to plan their work.

Keywords: Arduino; Greenhouse; Humidity; Monitoring; Temperature

ID195

Effects of Root Zone Cooling Method on Lactuca sativa Cultivation Under Roof Top Garden Structure in Tropics

A.S.S. Sulaiman, A.S. Bujang, S.A. Hassim, M.S. Azman
Precision and smart Agriculture Programme,
Engineering Research Centre, MARDI Headquarters Serdang, 43400 Selangor, Malaysia
* Corresponding author, e-mail: syafik@mardi.gov.my

A roof top garden structure was installed on top of a 20-foot freight container plant factory in MARDI Serdang, Selangor. The roof top garden consists of 3 major components which is a rain shelter, a reticulated hydroponic growing system via Nutrient Film Technique (NFT) and a chiller system to chill and control nutrient-water temperature in the fertilizer tank. Lactuca sativa was cultivated using root zone cooling, with a hydroponic setup at ambient temperature as control to study the effects of the root zone cooling system (RZC) on the crop yields in the tropics. The weight of crop, weight of root, leaf width and leaf numbers of Lactuca sativa have been selected as yield parameters, recorded and analyzed. From the results, all the growing parameters performance for Lactuca sativa grown in root zone cooling method were found to better compared to control. For yield parameters performance, Lactuca sativa grown in control were found to be better, compared to root zone cooling method. The yield weight for Lactuca sativa cultivated using control is higher than RZC system by 39.4 %, ranging from 36.69- 39.04 g using control and from 20.59-23.66 g by using RZC method. Roots weight for Lactuca sativa cultivated using control method is better than RZC by 14.1 %, ranging from 5.73- 6.22 g using control, meanwhile from 4.69-5.34 g by using RZC respectively. Number of leaves for Lactuca sativa cultivated using control method is more than RZC by 26 %, ranging from 14-15 using control and static at 11 by using RZC system. The leaves dimension for Lactuca sativa cultivated using control is bigger than RZC by 48 %. The range of Lactuca sativa leaves dimension cultivated using control method is from 580.35-670.27 cm2, meanwhile by RZC is from 318.68-348.45 cm2.

ID196

A Review: Agriculture Residue Chopper as a Potential Chopper Blade Mechanism for Harvesting Pineapple Leaves

Mohd Shafiq I.[1], Rosnah S.[2**]
[1]Department of Biological and Agricultural Engineering, Universiti Putra Malaysia, Serdang, Selangor 43400, Malaysia
[2]Department of Process and Food Engineering, Universiti Putra Malaysia, Serdang, Selangor 43400, Malaysia
*Corresponding author, e-mail: shafiqid@yahoo.com

Previous studies highlighted the need to develop efficient and economical chopping and size reduction equipment for various agricultural residues. To let the agriculture residues decomposed or burnt in the field are not sustainable waste management practices whereas it is better to turn the waste into valuable resources. Field crop residues which are considered cheap fodder options are suitable to feed animals and poultry. Choppers are classified into cylinder or flywheel types, depending on the method of cutting. Large size choppers are generally flywheel types and majority of small choppers are cylinder type. Chopper productivity, energy requirement and cutting quality are determined by type of materials, moisture content, rotary speed of main shaft, number of knives and feeding rate. This review paper aims to bring a further understanding of the design, capabilities and limitation from a different type of agricultural residues chopper that has been developed.

Keywords: chopper; agricultural residue; waste management; pineapple leaves

ID197

OTO-BAC™: An Automated Artificial Intelligence (AI) Detector & Counter for Bagworm (Lepidoptera: Psychidae) Census

Mohd Najib Ahmad[1*], Abdul Rashid Mohamed Shariff[3] and Ramle Moslim[2]
[1]Agronomy & Geospatial Unit, Malaysian Palm Oil Board, 6, Persiaran Institusi, Bandar Baru Bangi, 43600 Kajang, Selangor
[2] Malaysian Palm Oil Board, 6, Persiaran Institusi, Bandar Baru Bangi, 43600 Kajang, Selangor
[3] Department of Biological and Agricultural Engineering, Faculty of Engineering, Universiti Putra Malaysia (UPM), 43400 Serdang, Selangor
*Corresponding author, e-mail: mnajib@mpob.gov.my

The bagworm species of Metisa plana, is one of the major species of leaf eating insect pest that attack oil palms in Peninsular Malaysia. Without any treatment, this situation may cause 43% yield loss from a moderate attack. In 2020, the economic loss due to the bagworm attack was recorded at around RM 180 million. Based on this scenario, it is necessary to closely monitor the bagworm outbreak at the infested areas. In normal practice, the census is conducted manually by counting a number of bagworm population per frond through naked eyes. Accuracy and precise data collection are doubtful, sometimes involves human errors such as miscounting, cheating and creating data. Data accuracy is vital prior to planning and conducting any control actions at the reported and infested area. Realising the need for better census operation and result, the objective of this technology is to design and develop a specific machine vision that incorporate image processing algorithm according to its functional modes. The first in the world device being developed is called Automated Bagworm Counter or in the short trademark name, is known as Oto-BaC™. The software was functioned based on GPU computation and used TensorFlow/Teano library set up for the trained dataset. The Oto-BaC™ used an ordinary camera and self-developed DL algorithms, consisted of motion-tracking and false color analysis to detect living and dead larvae and pupae of M. plana and to count number of living and dead larvae and pupae population per frond, respectively, corresponding to three major groups or sizes classification. The automated device is a simple, accurate and easy to use for detecting and counting bagworms on the palm leaflet. The technology is based on the developed deep learning with Faster R-CNN technique (Ren et al., 2015) towards real time object detection. The device was developed to assist bagworm counting for field work, and was the first developed instrument although it has not yet been tested for enumeration purposes. Furthermore, the development of the ground-based device is the first innovation ever and pioneer in the oil palm industry, in which, it reduces human error in census and promoting precision agriculture practice. By applying infrared sensor and image processing algorithms, this device can be effectively used by the farmers and planters to monitor bagworm population in their farm, which can increase yields. It has a bright potential to be used and commercialized to assist workers in doing census works.

ID198
Sorghum Cultivation as an Industrial Crop in Malaysia

Mohd Zubir Md Idris
MARDI
*Corresponding author, e-mail: mzubir@mardi.gov.my

Sorghum or also known as 'sekoi' is classified as a cereal crop. Its scientific name is 'Sorghum bicolour' and can be categorized into 3 types namely grains, animal feed and sweet types. This sweet plant is used as a sweet extract to be processed into human food 'bio-ethanol' and aerobic digestion 'aerobic digestion' is used for the production of 'bio-methane' as a source of biogas. This plant is also listed in the 5 most important grain crops in the world. Selection of sorghum seed varieties and planning of mechanization system for the production of industrial sorghum plantations were carried out. Study of mechanization of sorghum crop production, including suitability of planting and care machines and sorghum harvesting using automation system. Evaluation of sorghum cultivation, crop care and harvesting machines is necessary for the adaptation of sorghum cultivation in Malaysia. In African countries, sorghum is grown in arid areas for grain production and Nigeria is the 2nd largest producer of sorghum grains in the world after the United States. This sorghum plant is one of the most efficient crops because it is able to survive in drought tolerant areas with low input cost of production and can be harvested several times for use as fodder (forage). In the animal feed industry, sorghum is used in poultry and ruminant (dairy beef and beef). The gas source of the biological material (biogas) sorghum results from the reaction between aerobic digestion decomposing microorganisms in sorghum fermentation that will produce biogas. The accumulation of biogas in large quantities can be used for fuel purposes. Canada, the United States and Germany have used sorghum as a source of commercial biogas production as a fuel for electricity generation.

ID199
Water Quality Monitoring at Paddy Field in Merlimau, Melaka

Sabran, M. S.,[1], Mustaffha, S.[1]*
[1]Faculty of Plantation and Agrotechnology, Universiti Teknologi Mara Cawangan Melaka Kampus Jasin, 77300 Merlimau, Melaka, Malaysia
*Corresponding author, e-mail: samihah096@uitm.edu.my

Water is the main resource of rice cultivar input for growth development and yield production. The water quality can affect the rice yield. The aim of the study is to analyze the water quality at the paddy field. The water quality at Merlimau paddy field was tested using Cyberscan 600 series. The variables taken are pH, conductivity level, sodium chloride (NaCl) and resistivity level. The monitoring was conducted at three stages of paddy cultivation process which are during land preparation, vegetative stage and maturing stage. This study can help the farmers to know the state of water quality that has been used to irrigate the paddy field.

Keywords: water quality; paddy field; paddy water pH; paddy water conductivity; sodium chloride

ID200

Preliminary Study of Pineapple Pruning Machine for Pineapple Suckers Production

A.S Adli Fikri[1]and A.R Rohazrin[2]
[1]Engineering Research Centre, Malaysian Agriculture Research and Development Institute (MARDI), 43400 Serdang, Selangor, Malaysia
[2]Engineering Research Centre, Malaysian Agriculture Research and Development Institute (MARDI), 43400 Serdang, Selangor, Malaysia
*Corresponding author, e-mail: adlifikri@mardi.gov.my

After the pineapple crop is 15 months old, the pineapple will be harvested and pruning process will be done before fertilization work begin. Normally in conventional method, farmers will use a sharp machete or sickle to pruning the leave since pineapple leaves and cob have a high fibers content causing the leaves and cob break easily. The convention method requires a lot of time as well as the need for a large labor force, and the cost of production would also increase in this regard. The objective of the study was to evaluate the performance and effectiveness pruning using a mechanization approach compare to the conventional method in pruning the pineapple crop. In 11th Malaysia plan (RMK-11) a new concept and prototype were developed with 2 blade disc type, powered by gearbox 1:3 ratio and adjustable height for peat soil condition. Using of 38hp of tractor high clearance rubber trek with powered by PTO (Power take off) speed 540 and rpm 1500.The height of the cutter blade can be adjustable according to the height of the crop needed to be pruned. The machine capable working rate is 0.86 ha/hour, speed tractor is 2.03km/hour and the machine efficiency are 92 %. Machined time operation is up to 1.2 hour/ha and operating for 8.4 ha/per-day. As a result, the machine seems have a clean-cut result on pineapple leaves and cob without breaking the pineapple crop.
Keywords: Pineapple pruning machine, conventional, pineapple crop, pineapple suckers

ID201

Calibration And Performance Evaluation Of Grain Corn Fertilizing Implement

Rohazrin Abdul Rani[1]*, Adli Fikri Ahmad Sayuti[1], , Mohd Khusairy Khadzir[2], Muhamad Haniff [2]
[1]Engineering Research Centre, MARDI Headquartes, 43400 Serdang Selangor
[2] Engineering Research Centre, Seberang Perai MARDI Station, Pulau Pinang
*Corresponding author, e-mail: rohazrin@mardi.gov.my

A fertilizing implement brand Gasprado, was calibrated and evaluated the performance to apply urea to grain corn crops at MARDI Seberang Perai, Pulau Pinang. Calibration was conducted to set the right metering device's opening for dropping urea to meet the application rate of 130kg/ha. This was done by measuring the amount of urea dropped in a 20-meter distance in a particular setting. The machine is for four rows crop application that has four metering devices which was numbered 1, 2, 3, & 4. The machine uses a spring tine type cultivating system. The implement was tested for fertilizing 56 rows of grain corn in a distance of 62 meters long that giving up a total area of 0.2604 ha. The times taken for the tractor to finish four rows per run along a 62-meter distance and to turn at the headland were recorded to evaluate the performance. The implement's metering devices 1, 2, 3, and 4 were calibrated at setting the number of B-1.5, B-0, B-0 and B-0 respectively that giving the urea rate application of 133 kg/ha, the nearest rate to the recommendation. The average working speed of the operation is 4.08 km/h with a theoretical field capacity is 1.224 ha/h. Meanwhile, the machine's effective field capacity is 0.5208 ha/h which was had a field efficiency of 42.5 % for the particular farm design. An improper farm design is one of the factors affecting the machine performance. The tractor was seen in difficulty to make a turn at the narrow farm headland. A minimum headland width for a 60 hp tractor with a total length of 3 m is 5 m. The use of a machine can speed up the operation of applying fertilizer to the grain corn crop but the performance is depending on the farm layout.
Keywords: Fertilizing implement, Calibration, performance evaluation, and grain corn

ID203

Effect of Mole drain and Tracked Agricultural Prime Movers on Soft Soil Paddy Areas

Mohd Taufik Ahmad[1*], Mohamad Fakhrul Zaman Omar[2], Mohd Khusairy Khadzir[3], Eddy Herman Sharu[1], Mohamed Fauzi Md Isa[3], Mohd Hashim Aziz[3], Azlan Othman[3], Saifulizan Mohd Nor[3], Bunyamin Abu Kasim[1] and Norhafizi Mansor[1]
[1]Engineering Research Center, MARDI HQ, 43400 Serdang, Selangor
[2]Engineering Research Center, MARDI Sintok, 06050 Sintok, Kedah
[3]Engineering Research Center, MARDI Seberang Perai, 13200 Kepala Batas, Pulau Pinang
*Corresponding author, e-mail: taufik@mardi.gov.my

Soft soil condition has become a major problem faced by Malaysian paddy farmers. MARDI has developed mole drain subsoiler and tracked agricultural prime movers to overcome this problem. The objective of this paper is to evaluate the effect of integrating mole drain and tracked prime movers on soft soil area. The mole drain was installed on an identified soft soil area at an experimental plot at the Department of Agriculture (DOA) Station, Kg Bukit Merah, Seberang Perai Tengah, Penang. Tracked prime movers were used for land preparation, transplanting and harvesting. Results showed that the soft soil condition of the plot was reduced to from 79% to 17%, a reduction of 62%.

Keywords: soft soil; paddy mechanization; mole drain system; halftrack

ID205

Factors Influencing The Certification Process of Malaysian Sustainable Palm Oil (MSPO) During Certification Phase for Independent Smallholders

Philip Yap, AmiratulAzzuwana Aniqah Abdul Rahman, Mohamad Hafiz Abidin, Mohd Rais Ismail and Hafifi Hafiz Zulkifli
Malaysian Palm Oil Board
*Corresponding author, e-mail: adrianphilip18@gmail.com

The MSPO certification scheme was adopted nationwide and made mandatory for all smallholders, plantations and mills started 1st January 2020. In Malaysia, an independent smallholder is defined as an individual who owned land less than 40.46 hectares in aggregate and they accounted for 17% of the total oil palm planted area. However, long time duration required to obtain MSPO certification for independent smallholders affects their eligibility to supply their fresh fruit bunches (FFB) to certify palm oil mills for export. Hence, the factors influencing the MSPO certification process for independent smallholders during certification phase were determined. Certification phase has two levels which are certification phase 1 and certification phase 2. In phase 1, there were several activities conducted such as, application to Certification Body (CB), preparation of the stage 1 audit plan, stage 1 audit and issuance of the stage 1 audit report. In phase 2, several activities were conducted such as, preparation of a corrective action report for the stage 1 audit findings, preparation of the stage 2 audit plan and stakeholders' consultation, stage 2 audit, peer and technical review, and issuance of MSPO certificate. The study showed that during the certification phase for independent smallholders, the preparation of the stage 2 audit plan and stakeholders' consultation required the longest time to be completed in 52 days, followed by draft of the final audit report with 29 days and preparation of stage 1 audit plan with 25 days. Meanwhile, issuance of MSPO certificate required the shortest time to be completed with 1 day. This suggested that the rate of certification phase (audit activities) determined the process of obtaining MSPO certification for independent smallholders. The selection of established CB can help to speed up the MSPO certification process especially to the smallholders. Therefore, it is only proper that Malaysia, as one of the leading palm oil producers, has a comprehensive certification scheme which is locally adaptable and meet the sustainability requirements internationally following the principles of sustainability which the MSPO standard was built upon.

Keywords: MSPO, Certification, Independent Smallholders, Audit, Factors, Palm Oil

ID206
Potential for Smart Agriculture Implementation in Pineapple Production

Badril Abu Bakar[1]*, Siti Noor Alliah Baharom[1], Rohazrin Abd. Rani[1], Mohd. Taufik Ahmad[1], Mohd. Nizam Zubir[1], Adli Fikri Ahmad Sayuti[1], Mohd. Nadzim Nordin[1], Mohammad Aufa Mhd Bookeri[1], Jusnaini Muslimin[1],
[1]Engineering Research Center, Malaysian Agricultural Research and Development Institute (MARDI) Headquarters, 43400 Serdang, Selangor, Malaysia
[2]Horticulture Research Center, Malaysian Agricultural Research and Development Institute (MARDI), Seberang Perai, Pulau Pinang, Malaysia
*Corresponding author, e-mail: badril@mardi.gov.my

This work reviews the current state of the art for pineapple production in Malaysia from the perspective of mechanization and automation. It examines the issues and challenges facing this industry. The review has led us to the conclusion that pineapple production still relies heavily on manual labour. The problems facing this industry is no different than other food crops in that low yield labour and high cost are the primary issues that need to be tackled. Although numerous engineering research work to overcome production issues has been done for crops such as rice and maize, engineering research for pineapples has been scarce. The lack of engineering research literature on this crop presents an opportunity for the scientific community to invest effort in this relatively untapped industry. This work further proposes areas where the use of Industry 4.0 technologies can be exploited in order to increase productivity and reduce input costs. Cyber-physical systems that could address issues in planting, crop maintenance and harvesting are put forth as a possible solution.

Keywords: Pineapple; Industry 4.0; Cyber-Physical System

ID208
Smart IoT Controlled Environment Greenhouse System

S.T. Ten[1], G. Krishnen[2], K.A. Khulidin[2], M.A. Mohamad Tahir[1], M.H. Hashim[1], S. Khairudin[2]
[1]Engineering Research Centre, (MARDI), 43400 Serdang, Selangor
[2]Soil Science, Water and Fertilizer Research Centre, (MARDI), 43400 Serdang, Selangor
*Corresponding author, e-mail: stten@mardi.gov.my

Mushroom is not only can be served as flavoursome food but the most important it can be served as nutritional and medicinal value food as well. Therefore, mushroom is an important commodity under the Malaysia National Agro-Food Policy. Currently, mushroom cultivation is being done in conventional method and not systematic, therefore smart controlled environment mushroom house (CEMH) has been developed by transforming greenhouse into controlled environment smart mushroom house integrated with the internet of things (IoT) system. This smart CEMH micro-climate is automatically controlled by the combination of data parameters provided by various types of sensors. This system has been further enhanced by the integration of the IoT system. The computation and monitoring process can be done either locally or remotely. The current system is set up for Pleurotus pulmonaris cultivation to identify the best isolate to be proposed for mass production. The interconnection of sensors, mechanical and electronic systems is to optimize the growth condition. The developed system is managed to consistently control the temperature and relative humidity (%RH) in the range of 18oC to 27oC and %RH not lower than 70% respectively. For this condition, this system is able to produce at least 30% more yield than ordinary mushroom houses. Moreover, the contamination rate is successfully kept below 2% and is considered very low compared to ordinary entrepreneur mushroom houses which are usually more than 10%. This system can provide the research facility for the high nutritional and medicinal value mushrooms.

Keywords: controlled environment, micro-climate, internet of things, greenhouse, *Pleurotus pulmonaris*

ID209

Plant Factory Airflow Distribution Analysis with Different Inlet Configuration

Arina Mohd Noh, Muhd Akhtar Mohamad Tahir, Khairul Anuar Shafie
Engineering Research Center, MARDI HQ, 43400 Serdang, Selangor
Malaysian Agricultural Research and Development Institute (MARDI), 43400 Serdang, Selangor
*Corresponding author, e-mail: arina@mardi.gov.my

Air flow was important in plant factories as it is responsible for the air exchange inside the structure to create desired growing conditions for plants. Uniform airflow distribution enhance photosynthesis and transpiration process of the plants. In this study computational fluid dynamics (CFD) simulation was used to analyse the airflow distribution inside a commercial scale plant factory developed by MARDI. CFD is playing an important role in designing and optimization of control environment structure in the agriculture industry. Many studies have proved that CFD technique able to predict the internal climate of the plant factory in the designing stage before the actual plant was built. This study was conducted to analyse the air flow characteristics in a plant factory with different inlet and outlet locations. The study also analyse the effect of different air flow direction from the inlet to the overall air distribution inside the plant factory. Validation of the developed CFD model was carried out by comparing simulation results with experimental data. The validation result shows an acceptable percentage error between simulated and actual data. The validated CFD model was then used to analyse different inlet and outlet location that can produce more uniform air flow distribution inside the plant factory. From the simulation results it shows that the new inlet location able to produce more uniform air flow and temperature distribution compare to existing inlet location.

Keywords: CFD simulation, plant factory, air flow distribution, uniform

ID211

Determination of Light Emitting Diode (LED) Spectrum at Seedlings Production for Optimal Growth of Different Type of Lettuce in MARDI Plant Factory

Mohamed Hafeifi Basir[1] and Intan Nadhirah Masri[2]
[1]Horticulture Research Centre, Malaysian Agriculture Research and Development Institute (MARDI),,
[2]Soil Science, Water and Fertilizer Research Centre, MARDI
*corresponding author, email: hafeifi@mardi.gov.my

Seedling production is a crucial part of the production of fresh vegetables in a plant factory. Light is one of the plants need to produce a healthy seedling before being transplanted to the production area. Different light formulation resulted in different growth performance of the plant. Hence, this study was conducted to aim for suitable light formulation on various type of lettuce in MARDI Plant Factory. The study was conducted in two stages: 1) seedling production and 2) production area. Treatments were evaluated at seedlings production stage by using split plot design with four replications. LED light treatments was the main factor with the various ratio of spectrum colour of Red (R), Blue (B), Green (G) and full spectrum. (LED 1; 5R:1B, LED 2; 1R:1B, LED 3; 1R: 2B, LED 4; 2R:1B, LED 5; 4R:1B:1G and LED 6; Full spectrum as control). Lettuce variety (V1; Butterhead, V2; Green Coral, V3; Red Coral and V4; Mini Cos) was the sub-factor. Variables measured at seedlings production was seed germination. Growth biomass and chlorophyll content were evaluated in the production area. At seedlings production, the full spectrum lighting show significant seeds germination percentage compare to other LED lighting and V1 performed well on germination percentage and time compare to other varieties. The interaction between LED lighting and lettuce was observed on the leaf numbers, shoot fresh weight, and shoot-root ratio at the production area. LED 1 and LED 5 on butterhead and green coral significantly affected the number of leaves that were relatively influenced by light quality and air temperature. The yield on green coral lettuce grown under LED 1, LED 2 and LED 5 was significantly higher than others. However, plant biomass and chlorophyll content for all treatments were not significantly different. The allometry of plant was expressed on a shoot-root ratio with LED 2 on green coral shows a significant higher shoot-root ratio compared to other treatment. The study's findings showed that LED 1, LED 2 and LED 5 light supplied on the seedling's productions provided optimal growing conditions in the production area for butterhead and green coral lettuce in MPF cultivation.

ID212

Shelf-life stability of palm-based carotenoids in cookies

Noor Lida Habi Mat Dian[1*], Fu Ju Yen[1], Harrison Lau Lik Nang[1], Azmil Haizam Ahmad Tarmizi[1], Fu Ju Yen[1], Nur Haqim Ismail[1], Sivaruby Kanagaratnam[1] and Excelvite Sdn. Bhd.[2]
Malaysian Palm Oil Board, Kajang, Selangor
*Corresponding author, email; nlida@mpob.gov.my

Palm oil is a good source of micronutrients, constituting about 1% of crude palm oil (CPO). One of the dominant micronutrients in CPO is carotenoids (500-800 ppm). Palm carotenoids consist mainly (>90%) of β-carotene and α-carotene. Carotenes improve vitamin A status in individuals with vitamin A deficiency and possess antioxidant (that may benefit brain, skin, lung, and eye health), anti-cancer and coronary heart disease prevention properties. Cookies are flat-baked treats and are an important source of nutrients and energy. Cookies can provide an ideal matrix by which functionality and health attributes by the use of functional ingredients can be transferred to the consumer in an economically and practically feasible way. In formulating functional foods, the bioactive nutrient's stability during preparation and storage and the bioavailability of the nutrient is of great importance and critical to ensure maximum benefit to the consumer. This paper reports the shelf-life stability of palm-based carotenoids in cookies upon six-months storage at various temperatures. The stability of palm-based carotenoids in cookies was excellent with 95.6%, 94.0% and 87.5% retention after 6-months storage at 5°C, 15°C and 30°C, respectively.

ID213

Farmers' Readiness to Face Challenges Post-MCO in the Central Zone of Malaysia

Nur Izzatie Mazlan[1], Jasmin Arif Shah[1*], Nurul Amiera Khalid[1] and Nur Bahiah Mohamed Haris[1]
[1]Department of Agriculture Technology, Universiti Putra Malaysia, Serdang, Selangor, Malaysia,
*Corresponding author: Jasmin Arif Shah, Address; jasmin.arifshah@upm.edu.my

On 18th March of 2020, the Malaysia government has implemented the Movement Control Order (MCO) to control the COVID-19 pandemic cases in Malaysia. Prohibition of movement affects the agricultural sector whereby farmers cannot manage their farms and sell their products as usual. Thus, the purpose of this study aims to determine the factor that influences farmers' readiness to face the challenges of the post-MCO in the central zone of Malaysia. The study employed a simple random sampling method. Using a quantitative survey methodology consists of 6 sections of questions (A, B, C, D, E and F). A total of 85 vegetable farmers selected to be a respondent. Data of this study was collected using two methods namely online (Google Form) and manually (face to face). The data were analyzed using SPSS (version 25) to indicate the descriptive, correlation and regression analysis. The findings indicate that technology, implementation, leadership and decision-making skills show a moderate to high level with farmers readiness to face challenges post-MCO. The highest factor contributing to farmers readiness is decision-making skill. The adjusted R^2 value of 0.533 implies that the decision-making skill explains about 53% of the variance in the farmer's readiness in this study. Hence, this shows that decision-making skill can lead to farmers empowerment and readiness to face challenges post-MCO.

Keywords: Farmers' readiness; Technology skill; Implementation skill, Leadership skill; Decision-making skill; Agriculture Extension.

ID214

Total Nitrogen Estimation of Paddy Soil Using Visible and Near Infrared Spectroscopy

B. S. N. Aliah[1]*, J. Muslimin[1], B. Abu Bakar[1], A. R. Muhammad Zamir[1], M.A. R. Ismail1, M. Z. K. Abdullah[1] and M. S. Hassan[1]
[1]Engineering Research Centre, Malaysian Agricultural Research and Development Institute (MARDI), Selangor, Malaysia
[2]Soil Science, Water & Fertilizer Research Centre, Malaysian Agricultural Research and Development Institute (MARDI), Selangor, Malaysia
*Corresponding author, email; aliah@mardi.gov.my

The current soil nutrient estimation method is laborious, repetitive, time consuming and costly, making it less efficient for large-scale soil fertility assessment in precision agriculture practice. This paper discussed the feasibility of visible and near-infrared (Vis-NIR) spectroscopy as an alternative method for rapid measurement of total nitrogen in soil, which is more efficient for huge area of paddy fields. For this purpose, Vis-NIR reflectance spectra (360 – 1750 nm) were acquired on 200 soil samples using spectrometers. Partial Least Squares Regression (PLSR) with full (leave-one-out) cross-validation was used to develop the calibration model between the Vis-NIR soil spectra and the total nitrogen obtained by chemical analysis in laboratory. The coefficient of determination (R2val) and residual prediction deviation (RPD) of the developed calibration model for total nitrogen is 0.78 and 1.86, respectively. The predicted total nitrogen map generated based on the Vis-NIR spectroscopy is comparable with the measured map generated from the laboratory analysis. This result indicates that the Vis-NIR infrared spectroscopy is potential to be used for total nitrogen estimation in soil

Keywords: visible and near infrared spectroscopy, soil nutrient, precision agriculture, total nitrogen, partial least square regression

ID215

Program Development Skills towards Work Performance of Extension Agent during MCO in Central Region (Peninsular Malaysia)

Siti Amal Fatunah Sheik Idris[1], Mohamad Ariff Fikri Ali[1], Nur Bahiah Mohamed Haris[1**], Jasmin Arif Shah[1]

[1]Department of Agriculture Technology, Universiti Putra Malaysia (UPM), 43400 Serdang, Selangor

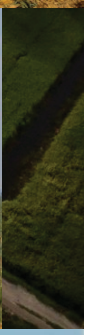
**Corresponding author: Nur Bahiah Mohamed Haris, Address; Department of Agriculture Technology, Universiti Putra Malaysia (UPM), 43400 Serdang, Selangor, Malaysia; nurbahiah@upm.edu.my

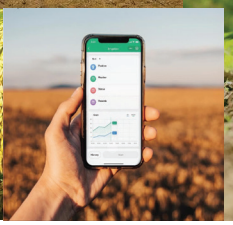
Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus that impacted the whole world in 2019. It has been a year since an outbreak of a new strain of coronavirus was first reported in Wuhan, China. Declared a pandemic by the World Health Organisation in March, it has now infected more than 92 million people worldwide. Since March 2020, Malaysia implemented a Movement Control Order (MCO) as a preventive measure towards the spread of the virus. This has eventually affected all activities including the agriculture sector, particularly in the process of managing the program development skills to the farmers. As the process of program development skills that involve planning, implementing, monitoring and evaluating (also known as PIME in this study) is the imminent activities for developing farmers knowledge and skills, therefore, this study is intended to determine these skills towards their work performance during the Covid-19 pandemic in Central Region, Peninsular Malaysia. The specific objectives of this study are to evaluate: 1) the level of development skills (as independent variables) and work performance of extension agent, 2) the relationship between the development skills with the work performance of extension agent and 3) the strongest development skills that contribute to the work performance of extension agents during MCO period. All extension agents (88 respondents) from Selangor and Perak was employed in this research. Data gathered and analysed using SPSS (Version 25). Based on the result, even though there is restricted movement during the pandemic, all the development skills and work performance level can be considered as high during the MCO in the Central Region. Among the four independent variables, the monitoring and evaluation skills show significant towards work performance. Between these two skills, the monitoring skill contributes the most towards their work performance during MCO. About 83.33% variance of work performance is explained by the development skills and the balance 16.67% is explained by the other factors. Therefore, this study will further acknowledge the importance of properly managing the program development skills among extension agent particularly during the pandemic outbreak (MCO period), in order to keep assisting the farmers in their production and proposed a new marketing strategy to be ready for post-MCO and future references.

Keywords: Program Development; Extension Agent; Work Performance

SCS

Machinery . Smart Agriculture . Manufacturing . Agribusinesses





FARMASTER ISEKI AGRIMAC www.agrimac.co TITAN

SINCOSAGRI SUZUE

HOTLINE : 019-441-9888 / 03-7831-9829

SELANGOR . KEDAH . SABAH . SARAWAK
149B, Lorong 1B, Off Jalan TUDM, Subang N/V, Section U6, 40150 Shah Alam, Selangor, Malaysia.
Email : global@scsgroups.com
Http : www.scsgroups.com
MALAYSIA . INDONESIA . CHINA

WONG AGRICULTURAL ENGINEERING SDN BHD

99, Batu 13 ¼, Jalan Kodiang, 06000 Jitra,
Kedah, West Malaysia.

Tel: +604 - 917 4351 / 916 1268
Fax: +604 - 917 8863
Website: www.wongagri.com

- ☑ Adjustable Chassis Height
- ☑ Orderliness Straw Discharge
- ☑ Longer Threshing Cylinder
- ☑ Luxury Cab With Air-Cond
- ☑ Wider Reaper

THINKER XG 100 PLUS

NF 802 / NF 902 RUBBER TRACK TRACTOR

- ☑ Light Weight
- ☑ 360°c Rotation
- ☑ Multifunction Tractor
- ☑ Turbo Power Shift Type
- ☑ Highly Protect Paddy Fields

AIKEWONG SPRAYER MACHINE (3 IN 1)

- ☑ Pesticide Capacity: 500 Litre
- ☑ Fertilizer Capacity: 300KG
- ☑ Spraying Width: 40 FTS

FOR MORE INFO, CALL:
012 - 412 2192

YOUR NEXT GEN - FARMING

Combine Harvester

WS 8.0

Land Preparation

Tractor Challenger
Rubber Track Tractor

WD 385D

WD 1104

Mesin Buat Batas

Rotovator

Disc Plough

Transplanting

Hand Type Transplanter

Riding Type Transplanter

Mesin Buat Semai

Land Management

Hybrid Agriculture Drone

Agriculture Drone

Boom Sprayer

Post Harvesting

Mini Round Bales

Rice Mill

2 in 1 Rice Mill

Rice Separator

Rice Polish Machine

Flat Bed Dryer

Follow Us

WORLDSTAR

CONTACT US
019-575 1917 / 019-456 1917

2268 & 2269 Pulau Nyior,
Batu 14 1/2 Jalan Kodiang,
06000 Jitra

MKR over the years has further established itself as Key Supplier and Trusted Project Delivery Partner for major organisations in Malaysia.

PRODUCTS

Agriculture Machineries

- Land leveller
- Forrage Harvestor
- Manure Spreader
- Tubewell System
- Portable Biogas System
- Infield Transportation System
- Internet of Things (IOT)

Database Infrastructure

- Uninterruptible Power Supply (UPS)

Oil & Gas

- Pressure Vessel
- Heat Exchangers
- Containerized Pressure Blasting System

www.mkrhartamas.com

LIST OF SPONSORS: