POPSIG

Greener Future with Palm Oil

A palm oil newsletter brought to you by:

IChemE Palm Oil Processing Special Interest Group

IChemE

Palm Oil Processing
Special Interest Group

Beyond Palm Oil: Connecting Life

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Sustainable and Circular Economy in Palm Oil Global Seminar

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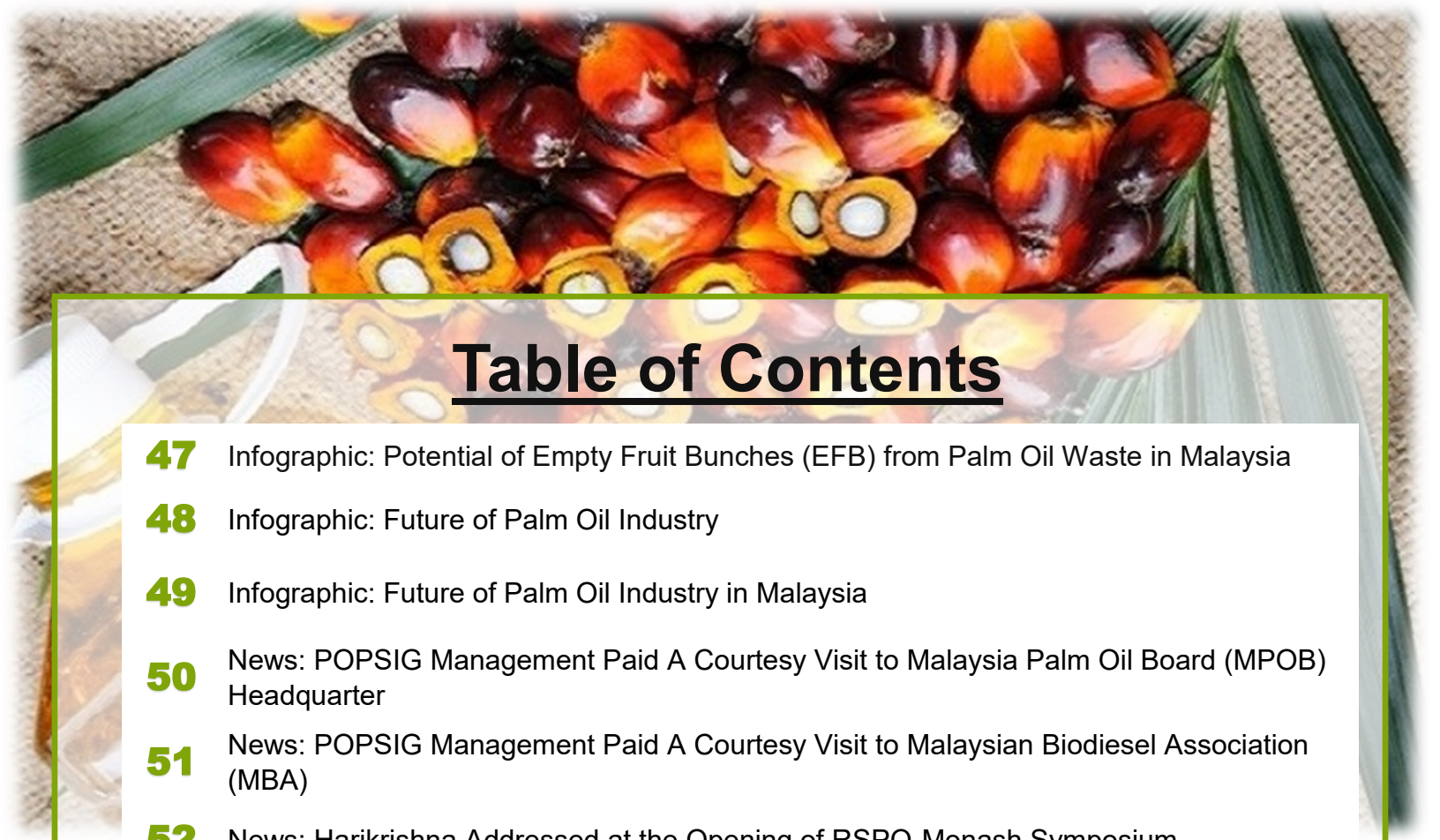

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IChemE ADVANCING CHEMICAL ENGINEERING WORLDWIDE

Palm Oil Processing Special Interest Group

Leadership Team

Editor's Message

We are excited to bring you the 25th edition of our newsletter, filled with exciting updates and achievements from the world of chemical engineering, palm oil industry, and education. In this issue, we highlight some remarkable events that have taken place, fostering knowledge sharing, and creating pathways for young talents in our industry.

The Palm International Nutra-Cosmeceutical Conference (PINC) featured three sessions covering diverse aspects of the palm oil industry. In Session 1, discussions included health benefits of palm oil bioactives, exploring topics like immune-boosting properties of palm tocotrienols and effects of carotenes on macular degeneration. WH Leong provided insights into legislative updates and market potential. Session 2 delved into palm downstream products in the beauty industry, addressing challenges. Session 3, moderated by MPOC CEO Belvinder Kaur Sron, covered current issues, including palmitic acid and cancer risk, saturates in public health, regulatory preparedness for contaminants, and challenges in palm mixed carotene.

PRSPO-Monash Joint Symposium 2023 aims to provide a platform for researchers and industry practitioners from around the world to share and explore latest and ongoing research findings as well as to discuss future directions for the advancement of a sustainable palm oil industry. The event featured research discussions on focus areas relating to the RSPO and the Monash-Industry Plant Oils Research Laboratory (MIPO) with topics such as assessment of the performance, outcomes and impacts of social and environmental sustainability, highlighting oil palm smallholders, consumer and market demands, palm oil in food and health, as well as new technologies in palm oil processing and waste. This symposium include oral presentations, panel sessions and poster presentation.

POPSIG Research Showcase 2023 highlights of this event consist of plenary forum discussing on the topic of 'Decarbonisation of Palm Oil Value Chain' and also presenting few papers on the topics of CO2 adsorption performance of char-derived concurrent activated and surface modified (CAM) palm kernel shell derived activated carbon, upcycling lignocellulosic oil palm frond and decanter cake as the substrate for black soldier fly larvae treated with bacteria, mixed cultures resource recovery from glycerin pitch, and biodiesel production from palm oil using barium oxide-reduced graphene oxide (BaO-rGO) bifunctional catalyst.

POPSIG has had the pleasure to contribute to POPSIG-MPOC Palm Oil Educational Roadshow at UKM 2023, East-West Technical Exchanges on Palm Oil Global Outlook webinar, and Liquid Biofuel Production from Biogas for Carbon Neutral webinar. POPSIG would like to congratulate the award recipients of POPSIG-KLK palm oil video competition 2023, POPSIG article honorarium, and POPSIG-MPO Palm Oil Infographic Competition 2023.

Thank all our valued POPSIG members and POPSIG sponsors for their continuous support and dedication.

Event: Palm International Nutra-Cosmeceutical Conference (PINC) 2023

On Tuesday 22nd August 2023, MPOC hosted the 7th PINC in Le Méridien Putrajaya, Malaysia.

Yang Berbahagia Professor The Chair Professor Ir Dr Chong Mei Fong was represented by the POPSIG team consisting of Ng Wai Lun, Head of Industrial and Corporate Communications Unit, POPSIG; Yap Feng Ming, Vice Secretary, POPSIG; Jocelyn Lim Jean Yi, Vice Treasurer, POPSIG; and Leiu Yu Xuan, Roadshow Coordinator, POPSIG

The delegates of POPSIG Annual Award Ceremony and Research Showcase 2023 & ARPOS Decarbonisation Forum 2023 also participated which consists of Darren Lim Ming Qian, Director; Loi Xuen Ler, Deputy Director; Patrick Tan Yee Siang, Head of Department (Photography & Publicity); and Charlene Ho Yan Weng, Executive at Department of Logistics & Catering.

The plenary session featured two presentations: Dr. Roger Clemens from the University of Southern California discussed the potential replacement of palm oil with synthetic palmitic acid, while Chris de Lavigne from Deloitte APAC in Singapore provided a global overview of oleochemicals and bioactives.

The event featured three sessions covering diverse aspects of the palm oil industry. In Session 1, discussions centered on palm oil bioactives and health benefits, with presentations on topics such as the immune-boosting properties of palm tocotrienols by Professor Dr. Ammu K Radhakrishnan, and the effects of carotenes on age-related macular degeneration by Associate Professor Dr. Mai Chun Wai. WH Leong provided insights into legislative updates, challenges, and market potentials of palm tocotrienols. Session 2 delved into the potential of palm downstream products in the beauty and cosmeceutical industry, featuring talks on palm-based oleochemicals by Norashikin Ahmad and market challenges of palm vitamin E tocotrienols by Marianne Loong. Session 3, a forum on current issues and emerging challenges in the palm oil industry, was moderated by MPOC CEO Ms. Belvinder Kaur Sron and included discussions on palmitic acid and cancer risk by Dr. Roger Clemens, public health perspectives on saturates by Professor Dr. Tilakavati Karupaiah, regulatory preparedness for process contaminants by Ir. Shyam Lakshmanan, and challenges and opportunities related to palm mixed carotene by Bryan See.

Event: RSPO-Monash Joint Symposium 2023

On 25th September 2023, RSPO and Monash University Malaysia had successfully conducted the first joint research symposium. This symposium aims to provide a platform for researchers and industry practitioners from around the world to share and explore latest and ongoing research findings as well as to discuss future directions for the advancement of a sustainable palm oil industry.

The RSPO-Monash Joint Symposium also aims to create awareness and interest among students and young academics, and to support their engagement in the field of palm oil sustainability. Hence, the platform is an opportunity for students to participate and contribute to the symposium by presenting their research projects.

The event featured research discussions on focus areas relating to the RSPO and the Monash-Industry Plant Oils Research Laboratory (MIPO) with topics such as assessment of the performance, outcomes and impacts of social and environmental sustainability, highlighting oil palm smallholders, consumer and market demands, palm oil in food and health, as well as new technologies in palm oil processing and waste. This symposium include oral presentations, panel sessions and poster presentation.

The event featured a diverse array of speakers and topics over the course of two days, covering crucial aspects of the palm oil industry with a strong emphasis on sustainability. Opening remarks on Day 1 were delivered by Professor Ir Chan Eng Seng, Head of Monash-Industry Plant Oils Research Laboratory, and Mr Yen Hun Sung, Head of Impacts Monitoring at the Roundtable on Sustainable Palm Oil (RSPO). The keynote speech was presented by Dr Harikrishna Kulaveerasingam, Chief Research and Development Officer at Sime Darby Plantation Berhad. Day 1 sessions explored downstream processing, conservation of high-value areas, and challenges in labor, RSPO certification, and the roadmap for a resilient palm oil industry. Speakers included experts from Monash University Malaysia, the Malaysian Palm Oil Board, Desmet, Wilmar International Limited, Borneo Futures, and RSPO. Day 2 continued with discussions on achieving a circular economy, empowering smallholders, and shaping the future of sustainable palm oil. Notable speakers included Professor Ir Dr Chong Mei Fong, Dato' Leong Kin Mun, and Ir Hong Wai Onn, addressing topics such as waste reuse, smallholder empowerment, and emerging trends. The event concluded with award and certificate presentations, recognizing outstanding contributions to sustainable practices in the palm oil sector.

Event: POPSIG Research Showcase 2023

On the 18th October 2023, IChemE POPSIG had successfully organized the POPSIG Research Showcase 2023 event. This event provides students a platform to present their research projects about the technological advancement for the palm oil industry. Yang Berbahagia Prof Ir Chong Mei Fong, Chair of POPSIG and Mr Chia Ing Chuk, the Global Refining Technology from Desmet officiated this event. The presenters are the recipients of the 2022 POPSIG Student Research Project Bursary and 2023 POPSIG Student Research Project Bursary.

The highlights of this event consist of plenary forum discussing on the topic of 'Decarbonisation of Palm Oil Value Chain' and also presenting few papers on the topics of CO_2 adsorption performance of char-derived concurrent activated and surface modified (CAM) palm kernel shell derived activated carbon, upcycling lignocellulosic oil palm frond and decanter cake as the substrate for black soldier fly larvae treated with bacteria, mixed cultures resource recovery from glycerin pitch, and biodiesel production from palm oil using barium oxide-reduced graphene oxide (BaO-rGO) bifunctional catalyst.

The plenary forum consists of speakers, Yang Berbahagia Datuk Dr Ahmad Parveez Haji Ghulam Kadir (Director General of Malaysian Palm Oil Board), Dr Surina Binti Ismail; Group Head of Sustainability (IOI Corporation Berhad), Dr Henry Chan (Conservation Director, WWF Malaysia), and Mr Rashyid Redza Anwarudin (Chief Sustainability Officer, Sime Darby Plantation Berhad).

Event: POPSIG-MPOC Palm Oil Educational Roadshow at UKM 2023

On the 30th October 2023, this University Roadshow was organized by UKM Chemical Engineering Student Club (CheSC) at Auditorium Siber Teknopolis (AST), Universiti Kebangsaan Malaysia. This event was supporte by POPSIG in conjunction with MPOC. The roadshow aims to provide an understanding about the upstream and downstream operations of the palm oil industry, and the sustainable development in palm oil industry through a series of interactive events. The theme of this event is Malaysian Youth Drives Change for the Future of Palm Oil Industry which aims to provide an understanding about the ongoing and planned development in palm oil industry through a series of interactive events, to provide a platform to exchange views and suggestions between the students and the professionals, to provide an opportunity for the students to visit the industry to understand applications of the learned knowledge, and to deliver about the latest technological development in palm oil industry to address the challenges during the roundtable discussion.

The presentation on Palm Oil is Nature's Gift was delivered by Yang Berbahagia Academician Tan Sri Emeritus Profesor Datuk Augustine SH Ong from MOSTA. Meanwhile, the presentation on Futureproofing the Palm Oil Industry through Nature-based Solutions was presented byDr Meilina Ong-Abdullah from MPOB. In her talk, she discussed on the mandatory sustainability compliance imposed on the palm oil industry is perceived as a bane to the industry, on top of other commitments pledged by Malaysia to the international community e.g. net-zero emission by 2050 and reducing CO2 intensity against GDP by 45% by 2030. Shouldering these commitments require the industry to be agile in changing status quo and adopting new approaches as well as technologies to work within the realms of the environmental, social, and governance (ESG) rating system to guarantee palm oil's future sustainability. Nature-based solutions underpin sustainable development as it leverages natural processes and ecosystems to address the challenges faced by the industry. The talk also touched on the augmenting nature-based solutions with technology for posterity of the palm oil industry.

Besides that, Ms Areej Taufik from MPOC delivered on the talk entitled ''Dispelling Misconceptions and Countering Negative Labels Surrounding Palm Oil. She addressed the misconceptions about palm oil is vital for fostering an accurate and informed dialogue on its production and use. Despite being a versatile and widely consumed vegetable oil, palm oil is unfairly associated with concerns such as unhealthy diets, deforestation, biodiversity loss, and social issues, leading to the use of discriminatory labels. This paper focuses on dispelling food and nutrition misconceptions about palm oil and highlights the negative impact of discriminatory labelling.

Discriminatory labels, like "no palm oil" or "without palm oil," are misleading, creating an unwarranted perception of palm oil as unsafe for consumption. Scientifically, there is no substantial evidence supporting the notion that palm oil poses health risks. Media claims of palm oil contributing to deforestation and biodiversity loss are countered by the extensive conservation efforts in palm-oil producing countries. The entire palm oil chain undergoes rigorous certification processes, making it the most certified sustainable vegetable oil.

To counter negative labels, collaboration among stakeholders, including producers, environmental organizations, and governments, is crucial. Raising awareness about sustainable palm oil practices through transparent communication channels is essential to combat misinformation. This approach encourages responsible palm oil sourcing by businesses and consumers, contributing to a more balanced and informed perspective on palm oil that recognizes its economic significance while addressing environmental and social challenges.

Prof DDr Lam Hon Loong, the Professor of Department of Chemical and Environmental Engineering and Director in the Centre of Excellent for Green Technology for University of Nottingham Malaysia was the forum chair.


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Webinar: East-West Technical Exchanges on Palm Oil Global Outlook

On the 4th October 2023, POPSIG had organized a webinar entitled, 'East-West Technical Exchanges on Palm Oil Global Outlook'. The global palm oil industry has been historically beset by sustainability issues. A sustainable and circular economy approach in the palm oil global outlook aims to tackle these problems, laying a foundation for ethical, environmental, and economic viability.

This seminar aimed to address the pressing challenges that have long plagued palm oil production. We explored innovative ways to integrate sustainable and circular economic principles into the palm oil supply chain. The integration of sustainability and circular economy into the palm oil supply chain, can transform this contentious industry into a paragon of sustainability.

During the event, Mr. Jens Søgaard Jacobsen, Chief Sales Officer of MBP Solutions Limited, Switzerland, highlighted their commitment to transforming by-products from the palm oil industry into raw materials for various sectors, promoting sustainability and economic returns. He emphasized the impact of legislation, such as the EU Renewable Energy Directive (RED) and national blending mandates, on the value of by-products. Mr. Jacobsen also discussed the upcoming EU RED III targets and the certification requirements for palm oil mills. Dr. Nurul Adela Bukhari from the Malaysian Palm Oil Board highlighted the potential of oil palm biomass for biorefinery and the importance of establishing a circular economy using wastewater. Dr. Muhammad Afiq Zubir from Universiti Teknologi Malaysia discussed GHG emissions in the energy and agricultural sectors, presenting organizational-level accounting and efforts to enhance sustainability in the palm oil industry. POPSIG expressed gratitude to supporters, including Desmet Malaysia, MPOC, KLK OLEO, MOMG, and Sime Darby Oils, for their valuable contributions to the event.

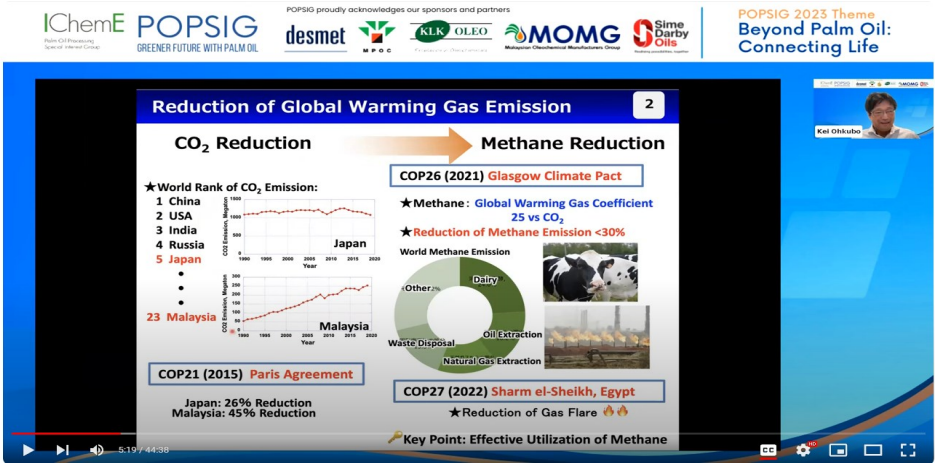
Webinar: MPOC Digital Market Forum – Analyzing Palm Oil Prospect and Potentials – 2023 and Beyond

On the 1st August 2023, the Malaysian Palm Oil Council (MPOC) had organized the second edition of Digital Market Forum. The Digital Market Forum series aims to update the stakeholders on the latest developments and opportunites in some of our key markets. The moderator for this session is Ms Belvinder Sron, the Chief Executive Officer from MPOC. In a series of presentations, key speakers from the Malaysian Palm Oil Council (MPOC) discussed various aspects of the palm oil industry. Karthigayen Kumar, the Regional Manager of Africa, focused on enhancing the presence of Malaysian palm oil in East Africa. Hajar Shamsudin, the Manager of MMD at MPOC, delved into the downstream aspects, specifically charting the export growth of Malaysian palm oil. Rina Mariati, the Regional Manager of Asia Pacific, discussed the role of ASEAN as the primary driver for palm oil demand in the Asia-Pacific (APAC) region. Lastly, Mohd Izham Hassan, the Deputy Director at MMD, provided an analysis of the palm oil market outlook beyond 2023 in his presentation titled "What's Beyond 2023: An Analysis of Palm Oil Market Outlook." The presentations collectively aimed to provide insights into strategies for market expansion, downstream development, regional demand dynamics, and future market trends in the palm oil industry.

Webinar: Liquid Biofuel Production from Biogas for Carbon Neutral

On the 2nd October 2023, the webinar entitled, 'Liquid Biofuel Production from Biogas for Carbon Neutral' was presented by Professor Dr Kei Ohkubo, the Professor of Institute for Advanced Co-Creation Studies, Osaka University Japan. In his lecture, he shows the chemical reaction that is photochemical oxygenation of methane in biogas to yield methanol and formic acid. A key molecule is chlorine dioxide used as a deodorant. This reaction is an environmentally benign approach towards the photooxidation of organic compounds. The photochemical oxygenation of methane containing biogas using chlorine dioxide reported herein will be generalized to provide novel application for usage of biogas instead of gas electric power generation in biogas plant in dairy sectors in Japan as well as palm oil sectors in Malaysia.

In year 2022, he and his team had designed the biogas oxygenation in 1000L reactor in Okopee Town. The Okoppe Carbon Neutral Innovation Consortium aims to move towards the reaslization of zero carbon. In order to achieve this, the conversion from biogas to liquid energy involved the treatment of manure from 560 milk cows of 540,000 $m^{3/}$year biogas. The biggest plant is situated in Okoppe, Hokkaido. The gas storage from this plant is able to store 200,000 L gas consisting of 60% of methane and 40% of carbon dioxide. The gas stored could be converted into methanol (80 ton/year) for the application of chemicals, fuels, and solvents. In addition, it also can produced 400 ton/year of formic acid which is used as a additive for silage hydrogen carrier. This project is supported by Institute for Open Innovation, Osaka University, New Energy and Industrial Technology Development Organization (NEDO), and many others.



Article: Beyond Palm Oil: Connecting Life

Written by Neduran A/L Kaliappan
(Universiti Kebangsaan Malaysia)

One of the most useful and popular vegetable oils in the world, palm oil has a wide range of uses, from biofuels and industrial items to food and cosmetics. However, due to its negative effects on the environment and society, palm oil extraction has recently come under scrutiny. The production of conventional palm oil is linked to several problems, including habitat damage, deforestation, and violations of human rights. It is essential to look beyond palm oil and investigate additional sustainable options and practices that connect our lives in a positive way as the global community becomes more conscious of the need for sustainability.

Particularly in Southeast Asia, the palm oil business has been a significant contributor to deforestation in tropical areas. By releasing carbon held in forests, this deforestation not only worsens climate change but also leads to the loss of biodiversity. In addition to environmental challenges, there are significant social problems associated with the production of palm oil, such as land disputes, worker exploitation, and the eviction of indigenous populations. Consumers, businesses, and governments are looking for sustainable alternatives to palm oil because of these difficulties. To encourage ethical production methods, sustainable palm oil certification programs like the round table on Sustainable Palm Oil (RSPO) have been formed. These certificates have drawn criticism, meanwhile, for not going far enough to solve the issues facing the sector. There are many reasons why this sustainable palm oil method was introduced into this world.

First, a life cycle analysis (LCA) is a methodical procedure for assessing a product's or process's environmental effects at every stage of its life cycle, from raw material extraction to manufacture, transit, usage, and disposal. Conducting an LCA is essential for determining the sustainability and overall environmental impact of sustainable alternatives to palm oil. Setting the objective and parameters of the study is the first stage in carrying out an LCA for sustainable palm oil substitutes. This comprises defining the system boundaries and defining the functional unit, such as one kilogram of palm oil replacement. The scope should consider any substantial environmental implications and encompass all pertinent phases, from the manufacture of raw materials through end-of-life disposal.

It is also a useful method for evaluating the sustainability and impact on the environment of alternatives to palm oil. LCA assists stakeholders in making knowledgeable decisions to lessen the environmental impact and support more sustainable practices in the palm oil sector by analyzing the whole life cycle of these alternatives, from raw material production through disposal. This research advances our knowledge of how sustainable palm oil substitutes might link people to one another through ethical production and consumption.

Next, the need to lessen the environmental and social problems connected to the production of palm oil is what pushes the search for sustainable alternatives to palm oil. Finding alternative oil sources is important, but it is just as important to use sustainable processing techniques to turn these sources into oil. Sustainable processing guarantees that the costs of production for the environment and society are kept to a minimum, which helps to create a supply chain that is more responsible and environmentally friendly. The exploration of this idea of sustainable processing in relation to sustainable alternatives to palm oil is very much needed.

Sustainable processing of palm oil substitutes emphasizes making the most effective use of resources possible. This entails maximizing the use of energy, water, and raw materials throughout the production process. Innovative methods may dramatically cut resource usage and leave a reduced ecological impact, such closed-loop systems and energy-efficient equipment. For the processing to be sustainable, there must be transparency across the supply chain. It makes it possible for customers and stakeholders to track the source of raw materials, ensuring that they are sourced ethically. Real-time insight into the production process is made possible by technologies like block chain and digital tracking systems, promoting moral and sustainable practices.

Making educated decisions on behalf of the customer is another aspect of connecting life through sustainability in this life cycle. Consumers may significantly influence the demand for sustainable and ethical products by being informed about the goods they use and the businesses they support. For customers looking for environmentally and morally responsible products, certification labels like RSPO (Round table on Sustainable Palm Oil) and Fair Trade are crucial resources.

The incorporation of renewable energy sources into manufacturing facilities is another important tenet of sustainable processing. Utilizing renewable energy sources like biomass, solar, or wind minimizes processing-related greenhouse gas emissions. Heat recovery systems and LED lighting, for example, are energy-efficient technology and practices that can help minimize the carbon footprint of alternative oil production. Sustainable processing adheres to the principles of a circular economy, which minimizes waste and effectively uses resources. Sustainable processing reduces waste and improves the overall sustainability of the production chain by producing creative ways to use by-products and trash produced during processing, such as turning them into biofuels, animal feed, or bio-based materials.

Moreover, to solve the environmental and social issues related to the production of palm oil, the quest for sustainable alternatives to palm oil is essential. Though promising, this transformation must be made with a commitment to protecting biodiversity. Alternatives to palm oil shouldn't unintentionally cause habitat loss, species extinction, or ecological deterioration. The significance of protecting biodiversity is discussed in this article in relation to sustainable alternatives to palm oil.

The phrase "biodiversity" refers to the variety of life on Earth, including the many species, ecosystems, and genetic resources that make up that life. The Earth is currently experiencing a biodiversity crisis that includes declining species

populations, habitat destruction, and ecosystem degradation. Many species, including orangutans, tigers, and rhinoceroses, have gone extinct because of habitat loss and deforestation caused by the production of palm oil in regions like Southeast Asia and South America.

Making sure that no forests are being destroyed in the process of seeking sustainable palm oil alternatives is one of the most important aspects of protecting biodiversity. Alternative oil crops should be grown instead of removing key forests or important ecosystems, including soy, sunflower, or coconut. Protecting natural ecosystems requires a commitment to supply chains that do not contribute to deforestation and appropriate land use.

The preservation of biodiversity is significantly aided by consumer knowledge and demand. Consumers that are well-informed may help businesses that use ethical and sustainable sourcing methods by purchasing items that have been certified as being favorable to biodiversity. Consumer pressure may force the sector to adopt more ethical manufacturing practices. In the move to alternatives for palm oil, sustainability is essential for satisfying the ethical obligation of maintaining biodiversity. Making ensuring that the development of substitute oils does not unintentionally impact ecosystems, species, and genetic diversity is crucial. The palm oil substitute sector can help create a world that is more biodiverse and linked by implementing responsible sourcing, sustainable agriculture, and biodiversity conservation practices.

Indigenous communities play a crucial role for this topic which is most important. In this case, displacement of land Indigenous groups are routinely evicted from their ancestral grounds as a result of palm oil development. The indigenous people who have lived in these areas for generations are frequently evicted from their native grounds as businesses destroy forests and build plantations. Their way of life and cultural heritage could suffer greatly as a result of this. Furthermore, loss of employment showing how hunting, fishing, and gathering supplies for food, medicine, and shelter are all common livelihoods practiced by Indigenous cultures who frequently rely on the forests. These traditional lifestyles may be disrupted by the conversion of these forests into palm oil plantations, leaving tribes without a source of income and nutrition.

As a final observation, there are many other ways to connect life through sustainability besides palm oil. This entails supporting ethical sourcing, adopting sustainable agricultural methods, and encouraging the development of alternative oil innovations. Additionally, it calls on consumers to be informed and to make deliberate decisions that support businesses and programs that are in line with sustainable objectives. By doing this, we may forge a future in which the decisions we choose benefit both our planet and its inhabitants. The road towards effective oil extraction serves as a tribute to human development and our commitment to achieving a balance between our energy requirements and the health of the earth. Besides that, there is no denying the impact of the palm oil business on the environment and society, but there is a growing movement to "Go Beyond Palm Oil" and connect life in a more sustainable and ethical manner. Although there are still many obstacles to overcome, the move towards sustainable palm oil production and the investigation of alternatives is an encouraging beginning in the right direction. We can collectively address the intricate problems associated with palm oil production and advance toward a more connected, accountable, and sustainable future by making thoughtful decisions, pushing for change, and supporting businesses dedicated to sustainabil-

Figure 1. Palm Oil Fractions and Their Uses (https://mpoc.org.my/palm-oil-fractions-and-their-uses/)

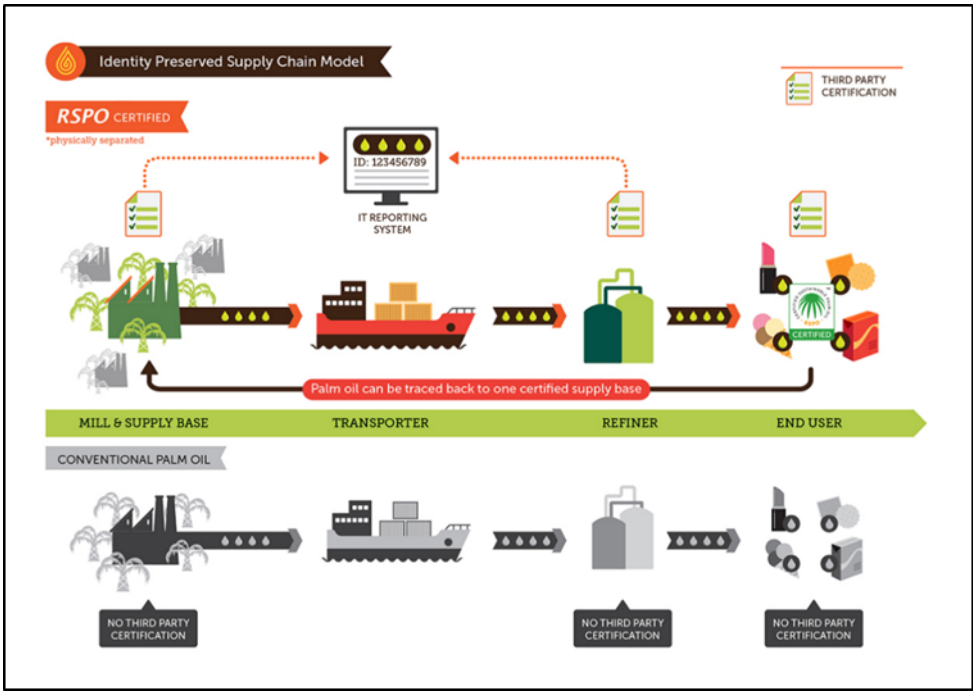


Figure 2. Supply Chain Systems (https://www.stephensonpersonalcare.com/blog/2016-05-23-knowledge-corner-everything-you-need-to-know-about-sustainable-palm-oil)

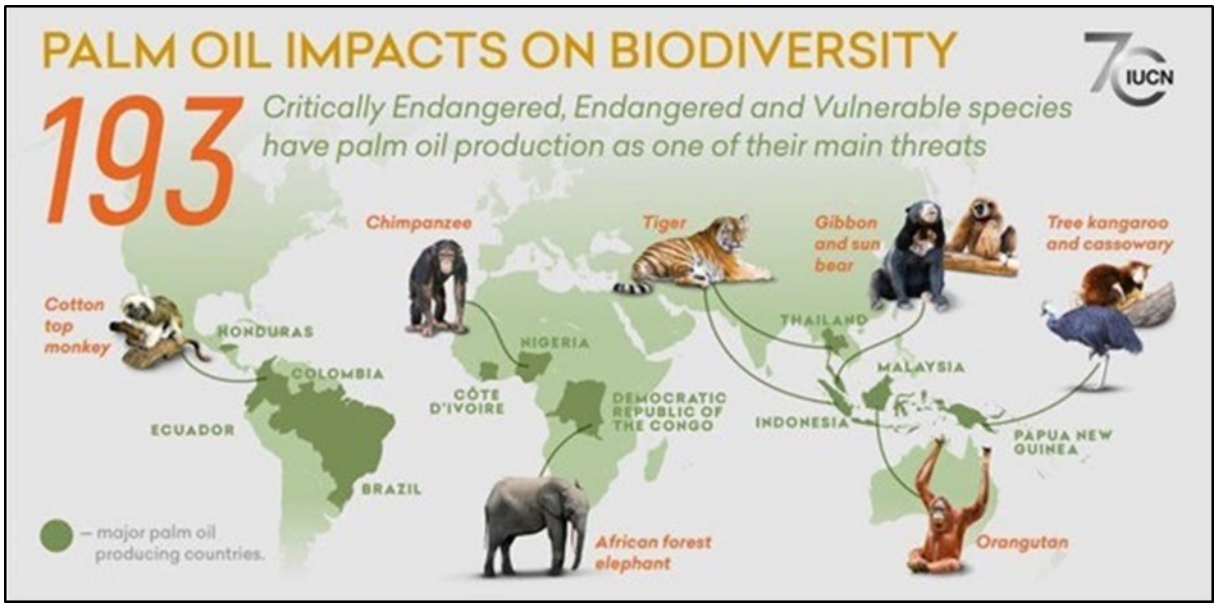


Figure 3. Biodiversity & Palm Oil (https://www.sustainablepalmoilchoice.eu/biodiversity-palm-oil/)

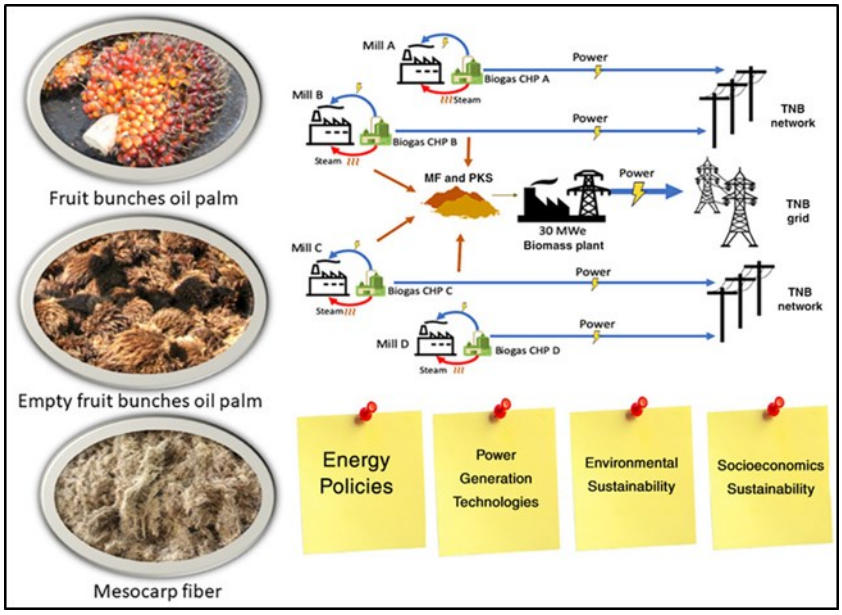


Figure 4. Potential and challenges of palm oil biomass power generation (https://wires.onlinelibrary.wiley.com/doi/full/10.1002/wene.437)

Figure 5. GAR has achieved 100% TTP for owned mills as of end 2017. (https://www.goldenagri.com.sg/id/beyond-traceability-responsible-palm-oil-supply-chain/)

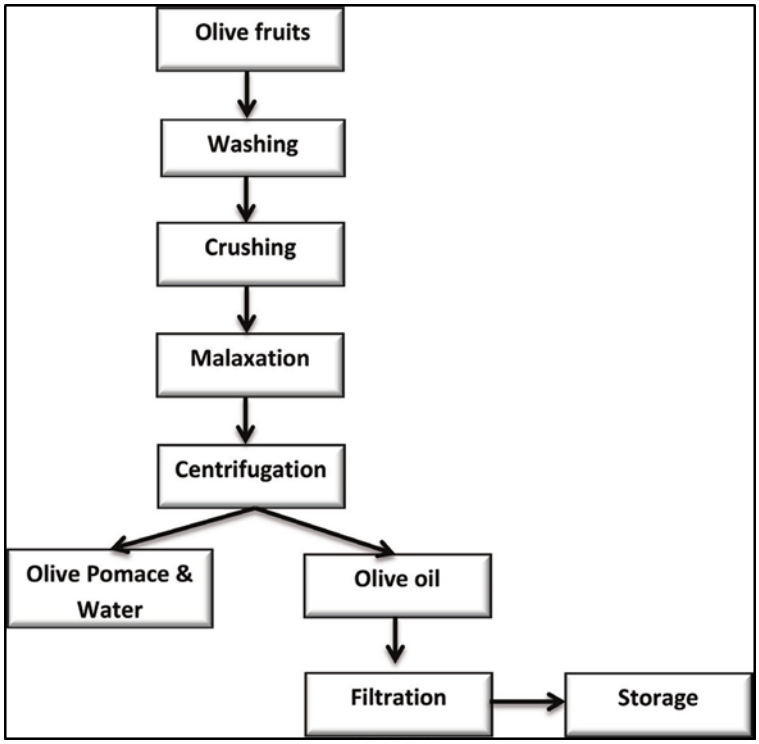


Figure 6. Flow chart of olive oil extraction (https://www.researchgate.net/figure/Flow-chart-of-olive-oil-extraction_fig1_329075431)

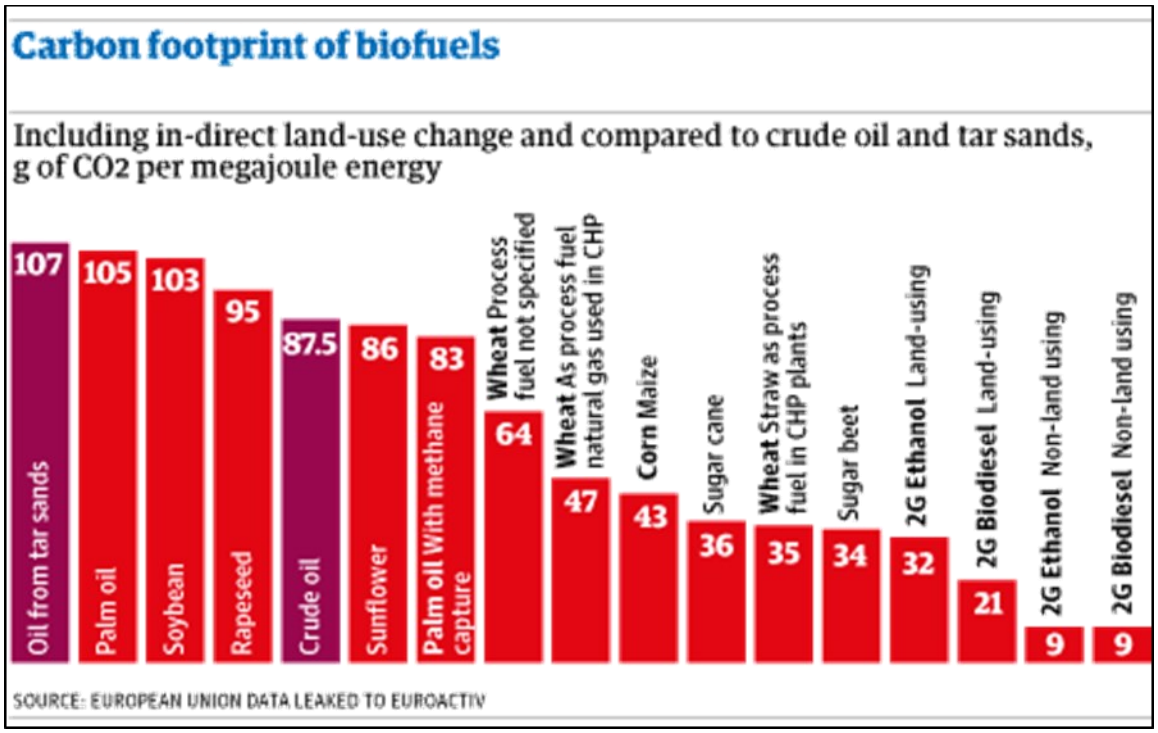


Figure 7. Carbon Footprint of Palm Oil and the Palm Biodiesel Dilemma (http://rank.com.my/energywise/?p=284#sthash.aBPsztv2.8dhASed2.dpbs)

Figure 8. Palm Oil and Indigenous Peoples (https://labelitright.wordpress.com/2016/10/06/palm-oil-and-indigenous-peoples/)

Figure 9. Impacts of the palm oil industry (https://www.spott.org/palm-oil-resource-archive/impacts/)

Article: Sustainable Palm Oil in Malaysia: Smallholders, Certification, and the Path Forward

Written by Chia Jan Feng
(Universiti Kebangsaan Malaysia)

1.0 Introduction

Within the verdant expanses of Malaysia, palm oil cultivation transcends mere agriculture, emerging as a pivotal socio-economic linchpin. Smallholder farmers, who contribute to a staggering 30-40% of palm oil cultivation in the country (Malaysian Palm Oil Certification Council 2022), own approximately 40% of the total area used for oil palm production (Roundtable on Sustainable Palm Oil 2023). While they grapple with challenges like the European Union (EU) boycotts due to sustainability and labor concerns, opportunities arise elsewhere. With India importing 2.89 million tonnes and China 1.76 million tonnes of Malaysian palm oil (Malaysian Palm Oil Certification Council 2022) as shown in appendix A, the market potential is evident. This evolving landscape highlights the need for sustainable growth that balances economic, social, and environmental aspects. The shifting dynamics underscore the pressing need for a sustainable approach that harmonizes economic, social, and environmental objectives. Central to this pursuit is the Malaysian Sustainable Palm Oil (MSPO) Certification Scheme. As a national initiative, the MSPO scheme aims to promote sustainable practices within the palm oil sector, addressing the environmental and social ramifications of the booming demand for palm oil. Its goal is not only to alleviate these concerns but also to optimize yield and productivity. However, even as awareness about certification grows among smallholders, many are still reluctant. Awareness alone doesn't guarantee action, particularly when key decision-making factors aren't addressed. This article, therefore, examines the impact of the Malaysian Sustainable Palm Oil (MSPO) certification on smallholders, government initiatives to support it, and the reasons influencing smallholders' decisions regarding certification.

2.0 Impact of Certification for Smallholder Oil Palm Farmers

The MSPO certification goes beyond a mere label, it embodies a dedication to sustainability. Tailored for the palm oil sector, MSPO covers economic, social, and environmental pillars. Through thorough training and financial aid, it ensures smallholders not only meet standards but truly benefit from them.

2.1 Social Impacts

The social dynamics of smallholders is deeply impacted by MSPO certification. With this certification, they receive thorough training in Good Agricultural Practices (GAP), safety, environmental conservation, and MSPO principles. A notable initiative is the Smallholders Organized Cluster (SPOC), where participants are equipped with Personal Protective Equipment (PPE) and trained on its proper usage (Senawi, R. et al. 2019). This not only elevates safety standards but also instills a sense of professionalism among smallholders. Moreover, MSPO serves as a connector, linking smallholders with other key players. This interconnectedness has given birth to a robust platform for dialogue, grievance redressal, and stakeholder consultation, weaving a tight-knit community where everyone's voice is valued.

2.2 Environmental Impacts

The MSPO certification gives the environment, often overshadowed by industrial growth, a much-needed voice. Guided by this certification, smallholders adopt best practices—from efficient fertilizer use to advanced harvesting methods. These aren't just theoretical; they yield tangible environmental benefits. A comparative study highlighted that RSPO certified sustainable palm oil has a significantly lower global warming footprint, reduced by 35% (Roundtable on Sustainable Palm Oil 2019). Additionally, the certification mandates the protection of High Conservation Value (HCV) areas, promotes the restoration of degraded lands, and establishes wildlife corridors, ensuring a balanced ecosystem where wildlife flourishes.

2.3 Economic Impacts

The MSPO certification offers significant economic benefits to smallholder farmers. It boosts the potential for increased Fresh Fruit Bunch (FFB) yield, with data from 2017 indicating that Malaysian smallholders could achieve over 30 tons per hectare annually (Herdiansyah et al. 2020), rivaling larger estates. Moreover, certified smallholders in East Malaysia reportedly earn about 25% more than uncertified ones (Malaysian Palm Oil Certification Council 2022). Rooted in Good Agricultural Practice (GAP), the MSPO enhances productivity and offers cost savings on inputs like pesticides and fertilizers. It also provides financial incentives including audit fee claims and preparation cost claims, directly cutting costs and boosting profit margins. Furthermore, MSPO-certified farmers enjoy a competitive advantage in local and global markets, heightening the global appeal of Malaysian palm oil. In summary, MSPO certification equips smallholders with increased productivity, reduced costs, greater income, and broader market reach.

3.0 Governments' Efforts in Sustainable Certification of Smallholders

While certification indeed offers numerous advantages to smallholders, encompassing environmental, social, and economic benefits, a significant portion of these smallholders remain uncertified despite being aware of these benefits. Recognizing this gap, the government has initiated several measures to bolster the certification rates among smallholders.

Financial support has been a cornerstone of these efforts. The Malaysian government, understanding the financial constraints faced by smallholders, has rolled out substantial financial incentives to facilitate their participation in the sustainable certification scheme. A notable initiative in this regard is the allocation of USD 35 million as subsidies (Food and Agriculture Organization of the United Nations 2019), specifically earmarked to aid smallholders in obtaining their certification.

In addition to financial backing, the government has also emphasized the importance of knowledge dissemination and capacity building. Extension services and training programs have been launched to enhance smallholders' understanding of the certification process, its inherent benefits, and the best practices required to achieve it. For instance: TUNAS officers, part of the extension services, educate smallholders about sustainability and guide them towards sustainable certification. Additionally, specialized training programs are provided:

Awareness of Malaysia Sustainable Palm Oil Course: An introduction to the MSPO Standard, designed for business owners, consultants, government officials, and palm oil industry professionals.

Interpretation and Implementation Course: Focused on practical techniques for sustainable practices, aiding participants in system development and management.

Internal Auditor Training Course: Equips participants with skills for auditing, covering planning, execution, and reporting of audit findings.

These endeavors are designed to arm smallholders with the insights and tools essential for a smooth certification application process.

Recognizing the challenges individual smallholders might face, the government introduced the concept of Group certification. Under the MSPO certification, the Sustainable Palm Oil Clusters (SPOC) model was adopted. This model clusters smallholders based on their geographical proximity, enabling them to pool resources, share knowledge, and collectively work towards certification, thereby simplifying the process (Aziz et al. 2021).

Collaborative efforts have also been a significant part of the government's strategy. By forging partnerships with NGOs and the private sector, the government aims to tap into a broader resource pool and expertise. Collaborations with entities like the Malaysian Palm Oil Certification Council (MPOCC) and corporate giants like Wilmar International are testament to this approach. These partnerships focus on assisting suppliers in Malaysia to align with MSPO certification standards, ensuring a cohesive approach to sustainable palm oil production.

Lastly, to underscore the importance of certification and ensure industry-wide adherence, the Ministry of Primary Industries (MPI) took a decisive step by announcing the mandatory implementation of MSPO certification from January 1st, 2020 (Aziz et al. 2021). This mandate ensures that all stakeholders, including the smallholders, align with the MSPO standards, marking a significant stride towards a sustainable palm oil industry in Malaysia.

4.0 Factors Influencing Smallholders' Participation in Palm Oil Sustainable Certification

Despite government incentives and efforts, many smallholders are still reluctant to seek sustainable certification for palm oil. This hesitation indicates some key decision-making factors might have been missing (Ahmad Rizal et al. 2021). Ammar Redza's research highlights this, pinpointing four crucial elements influencing smallholders' stance on certification: "Perceived Economic Benefit," "Social Interaction," "Shared Identity," and "Communication Discourse."

The "Perceived Economic Benefit" encompasses the tangible financial advantages smallholders anticipate from certification, such as augmented profits and diminished operational costs. Smallholders' rational choice does not entirely rely on awareness; instead, they also evaluate the benefits and risks before making any decision. Upfront commitments, both in terms of finances for equipment and time for training, can act as barriers. Therefore, promotional campaigns should spotlight the enduring financial rewards and present tangible solutions, such as subsidies or grants, to alleviate these immediate burdens. Clearly communicating these benefits can instill confidence in smallholders, making the scheme psychologically more appealing to smallholders.

"Social Interaction" also significantly influences smallholders' participation. Social interaction bonds reflect the intensity of connections among community members and foster the growth of a healthy society. Smallholders, who often live within close-knit communities, depend on each other for communication, exchange of information, and assistance. They interact in public spaces, such as coffee shops, religious halls, and municipal halls, where they exchange information about their plantations business and management. A single negative experience or misconception about the certification can lead an entire community to skepticism. To counteract this, the presence of positive testimonials within the community is crucial. For example, presentations by successfully certified smallholder farmers, supported by empirical data highlighting enhanced profits and market access, can effectively inspire and persuade others to consider the certification. Additionally, social interaction has been proven to expand a person's network structure and reduce structural holes, allowing information to be widely disseminated. Such interactions not only bridge information gaps, bolster knowledge but also strengthen their beliefs, fostering greater participation in sustainable certification.

"Shared Identity", described as a set of beliefs shared by the members about the central, enduring, and distinctive characteristics of a society, significantly affects smallholders' willingness to pursue certification. Being part of a community instills this shared identity, which then influences sustainable certification decisions. A study from Kenya illustrates this point, showing that farmers, through united efforts, can access essential information - a significant barrier in many southern nations. This collaborative approach facilitated greater market access and elevated their income (Kirui and Njiraini, 2013). However, even with the Sustainable Palm Oil Cluster (SPOC) model in place, certain smallholders within the cluster might not resonate with this shared identity, highlighting the importance of reinforcing this bond to attract other uncertified smallholders.

"Communication Discourse" is another linchpin in this equation. It represents ongoing engagement between parties, echoing Habermas's theory of communicative action and deliberative democracy. This concept emphasizes well-founded arguments over simple statements (Habermas, 1994). Smallholders, who have an intrinsic connection to their lands, sometimes feel their concerns are dismissed or overlooked. They need a platform where their voices and experiences are not just heard but respected and valued. Without this, there's a risk of them feeling marginalized and disrespected, leading to reluctance to adopt new innovations, or joining sustainable initiatives. To address this, it's imperative to integrate communication discourse more deeply into policy and decision-making processes. By fostering an environment of mutual respect and open dialogue, smallholders become active con-

tributors, critically assessing, and shaping new policies. One thing that is certain is that smallholders are increasingly examining the impact of new practices and policies on their well-being. (Ahmad Rizal et al. 2021).

5.0 Conclusion

The journey of palm oil cultivation in Malaysia is marked by both challenges and opportunities. With the MSPO certification, the country is taking significant strides towards ensuring sustainability in the sector. This certification, while symbolizing a commitment to eco-friendly practices, also brings tangible benefits across economic, social, and environmental dimensions. However, the reluctance of some smallholders to adopt this certification, despite its evident advantages, underscores the complexities involved in decision-making processes. Factors such as perceived economic benefits, the strength of social interactions, shared community identity, and the quality of communication play pivotal roles in influencing these decisions. Thus, a holistic understanding of these factors is crucial for policymakers and industry stakeholders. As the palm oil industry continues to evolve, it is imperative to ensure that the voices of smallholders are heard, their concerns addressed, and their well-being prioritized. Only then can the industry truly move towards a sustainable future where both the environment and the people thrive.

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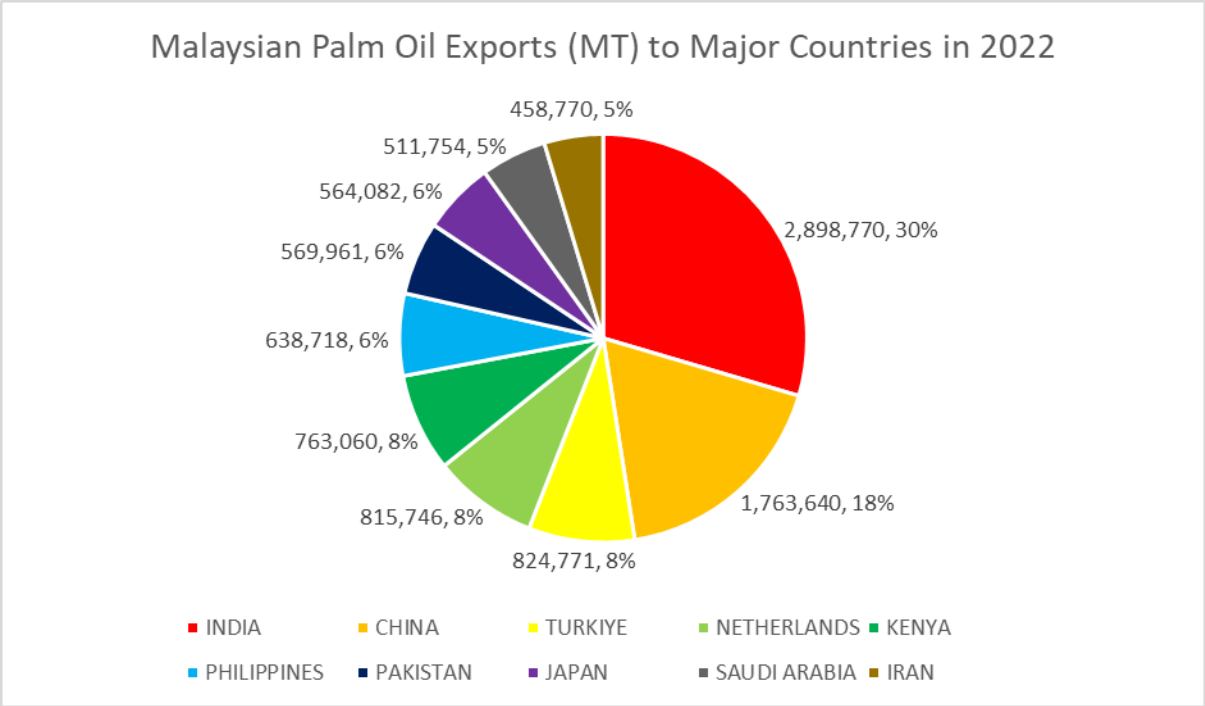

Figure 1. Malaysian Palm Oil Exports (MT) to Major Countries in 2022 (Source: Malaysian Palm Oil Council 2023)

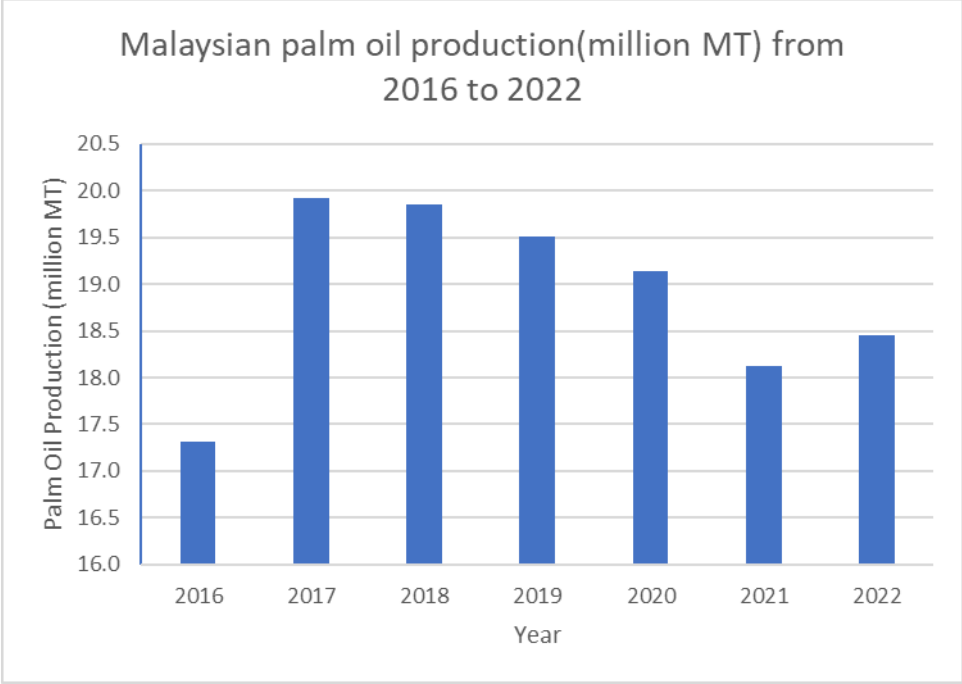

Figure 2. Malaysian palm oil production (million MT) from 2016 to 2022 (Source: Malaysian Palm Oil Council 2023)

Article: Sustainable Palm Oil Industry: Water Footprint Assessment & Reduction

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Are you aware that palm oil, scientifically known as "Elaeis guineensis", stands out as the most efficient crop globally, yielding a higher oil output per land area compared to any other equivalent vegetable crop? Do you know that it is versatile, oxidation-resistant, and heat-stable, which make it attractive for grower and consumer? Globally, Indonesia and Malaysia collectively contribute more than 85% to the global palm oil supply, in which palm oil becomes one of the major revenue generators for them [1]. According to the latest information of year 2023, the current world production of palm oil is around 79.464 million MT with the market size of 68.14 billion USD, proving the popularity of palm oil [2, 3]. In order to boost awareness regarding environmental and societal impacts of palm oil, Roundtable on Sustainable Palm Oil (RSPO) has been established. It instituted production standards for growers, delineating best practices in the production and sourcing of palm oil. With widespread industry acceptance, it has garnered support from a majority of global stakeholders [1].

Nonetheless, recently, there is a misperception from the public that palm oil production has a high water footprint, which is not environmental-friendly and threatening the water availability. This article is going to discuss about the water footprint of palm oil plantation and the innovative solutions to effectively reduce the water footprint. First and foremost, let's define what is water footprint. Water footprint of palm oil is defined as the total volume of freshwater used to produce one ton of Fresh Fruit Bunch (FFB), measured in m3/yield. It is further categorized into three fractions, which are green (rainwater), blue (surface water and groundwater) and grey (chemical compounds' dilution water) [4]. In overall, during the 1996-2005 period, the global water footprint for agricultural crop production was highest for wheat (15%), rice & paddy (13%), and maize (10%). In contrast, the water footprint attributable to oil palm globally was comparatively low, accounting for only 2% as in Figure 1 [5].

The study carried out by Research Centre & Community Development (LPPM) of Stiper Institute of Agriculture (Instiper) Yogyakarta, Indonesia in collaboration with the Indonesia Oil Palm Plantation Fund Management Agency (BPDPKS) proves the assertion that palm oil does not present a risk to water source. The assessment of water usage and root length density revealed that oil palm predominantly extracts water from the upper root zone. This implies that oil palm relies primarily on rainwater and surface water for its water needs. For evidence, the study in Central Kalimantan, Indonesia depicts that the water footprint of palm oil plantation at the area level was 1,002.1 m3/ton, compared to sunflower seed (3,366 m3/ton), rapeseed (2,271 m3/ton), and olives (3,015 m3/ton) [4].

Looking into the details of water usage, for evapotranspiration level, another result shows that the water requirement in palm oil plantation was only 1,104 mm/year, compared to bamboo and lamtoro plants (3,000 mm/year), followed by acacia plants (2,400 mm/year), sengon tree (2,300 mm/year), pine and rubber (1,300 mm/year) as depicted in Figure 2 [6]. Moreover, according to another research, as illustrated in Figure 3, it is evident that oil palm emerged as one of the most water-efficient plants for bioenergy production (75 m3/GJ). Notably, the major water-wasteful plants include rapeseed (184 m3/GJ), coconut (126 m3/GJ), and cassava (118 m3/GJ) [7]. These findings indicate that palm oil plants have lower water requirements, signifying greater efficiency and water conservation compared to other commodities. This observation effectively refutes the concern that the water footprint of oil palm poses a threat to the availability of water resources.

For further enhancement of palm oil sustainability, advanced smart technologies, especially those related with Industry Revolution (IR) 4.0, could be utilized to improve the production efficiency. The adaptation of smart irrigation system stands out as a promising strategy to monitor soil conditions and regulate irrigation levels to optimize water and fertilizer usage. For example, this is accomplished through the utilization of a network comprising sensors, controllers, and servers designed to ascertain the necessary irrigation and fertilization levels. By referring to Figure 4, the system operates by analysing moisture content and transmitting the data to central server. A comprehensive assessment of the economic viability of smart irrigation has been executed to examine its effectiveness. It indicates that, even with a substantial initial Capital Expenditure (CAPEX), a positive Return on Investment (ROI) could be attained in 5 years, provided the plantation size is a minimum of 1.5 ha. Besides, it demonstrates a notable decrease in both water footprint and expenses required to achieve optimal moisture conditions [8]. Presently, Malaysian Palm Oil Board (MPOB) is integrating the Internet of Things (IoT) technology, a component of IR 4.0, into the palm oil industry. This involves the implementation of geospatial and drone technology, alongside the utilization of Geographic Information System (GIS) and Oil Palm Resource Information System (OPRIS). OPRIS is designed to identify and furnish geospatial information concerning oil palm plantations, soil types, agro-climatic conditions, and areas deemed suitable and prospective for oil palm cultivation [9].

Let's examine its feasibility via successful applications supported by data. A pilot precision irrigation system in Malaysia that applies IR 4.0 concepts powered by solar energy is applied for nurturing palm oil seedlings at the estate of YP Plantation Holdings in Rompin, Pahang. Figure 5 illustrates its application of a water dripping technique to irrigate each seedling tray directly. The system is controlled by a microcontroller equipped with a timer and soil moisture sensors for monitoring functions. According to the results, this innovative system successfully reduced water wastage by 30% compared to the previous manual watering approach. Additionally, it effectively monitors the essential moisture content required for optimal seedling growth, contributing to the production of high-quality yields [10]. Moving forward to Uumbal oil palm plantation in Tabasco, Mexico where internet coverage is constrained, it currently boasts an information network encompassing real-time data on historical climate, weather forecasts, and irrigation monitoring by applying LoRaWAN network. This data is accessible through the mobile application

"Fieldclimate" from any location and at any time. The weather forecast has proven instrumental in aiding farmers to optimize daily operations, enabling them to plan activities such as harvesting, spraying, or any tasks involving personnel more effectively. The availability of such information has significantly enhanced the company's decision-making response time, mitigating potential crop-related stress [11].

Through the assessment and effective reduction of water footprint in palm oil industry, undeniably, palm oil plantation actually aligns with the Sustainable Development Goals (SDG). Firstly, it is SDG 6 – Clean Water and Sanitation. As aforementioned, palm oil is one of the most efficient crops in terms of water usage naturally. It could effectively optimize water usage, easing the reliance on water sources and reducing water wastage. As a result, sufficient and reliable water supply are always guaranteed [12]. Moreover, it also complies with SDG 12 – Responsible Consumption and Production. Through precise agricultural techniques in smart irrigation system, water consumption could be optimized and minimized. Consequently, sustainable management and use of water resources could be achieved [13]. Next, for Environmental, Social and Governance (ESG) aspects, palm oil plantation meets the environmental objectives by optimizing water usage, contributing to environmental conservation. For social target, it actively engages with local communities and stakeholders to address issues and incorporate strategies into water management. Regarding governance goal, it upholds transparency and accountability in responsible water management practices [14].

In essence, palm oil plantation plays a pivotal role in global agriculture, boasting efficiency and versatility in oil production. By debunking misconceptions, palm oil could positively contribute to environmental conservation, societal well-being, and governance responsibility. Through embracing technological innovations and aligning with SDG for palm oil industry, the future viability of palm oil could be safeguarded to connect life, bringing increased benefits to the world. It is imperative that the youth, as the driving force shaping the future of the palm oil industry, contribute innovative technologies and solutions as aligned with IR 4.0 principles. Palm oil industry holds significant development potential, and the active involvement of the younger generation is crucial for its continued improvement and sustainable growth.

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Article: Recent Applications and Strategies for Sustainability of Palm Oil in the Food Industry

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1. Introduction

Oil palm (Elaeis guineensis) is predominantly grown in southeast Asia. Palm oil, extracted from the mesocarp of the oil palm (Choudhary & Grover 2019), is the largest producer and consumer of vegetable oil worldwide (Azman et al. 2023; Shahbandeh 2022). Malaysia ranks second in global production(Absalome et al. 2020; Sulaiman et al. 2022). Not only is palm oil used in the feed, cosmetics, textiles, and daily necessities industries, but also extensively applied in the food industry due to its stability and abundant nutrients(Mancini et al. 2015; Sati 2023). As in cooking, interestingly, palm oil is considered as high-quality frying oil, due to lower oxidation and high thermal stability(Dian et al. 2017; Izuddin et al. 2023). Furthermore, palm oil is rich in various bioactive ingredients, such as palmitic acid, β-carotene and vitamin E(Amri et al. 2021; Baldassarre et al. 2023).

However, recent studies have indicated that production of palm oil has led to destruction in ecological environment(Mukherjee & Sovacool 2014; Pirker et al. 2016). In some degree, the sustainability of palm oil is in serious doubt(Wassmann et al. 2023). Recently, some sustainable strategies for palm oil application in the food industry, such as developing new palm oil formulations and improving the extraction process of palm oil have been applied. Blending of palm oil, palm kernel oil and their fractions with sunflower oil in different ratio can be used to formulate various types of reduced fat spread(Dian et al. 2017). The extraction process of palm oil without refining and bleaching can help to retain carotenoid, vitamin E and sterol in red palm oil (Tan et al. 2021). These strategies could be beneficial for products to obtain better textural and storage properties, and even be commercialized. Although these strategies can improve product quality, more sustainable strategies need to be proposed from different aspects to facilitate the development of the palm oil industry. Subsequently, this article compressed the extraction process of palm oil and reviewed some applications of palm oil in food products. Five sustainable strategies for palm oil applied in the food industry are proposed based on various aspects. These efficient strategies can contribute to further progression of the palm oil industry.

2. The extraction process of palm oil and its applications in food products

2.1 The extraction process of palm oil (Corley & Tinker 2008)

Pre-treatment was conducted prior to the extraction process. The fruits were selected based on the standardized grade and the dust, mildew and damaged fruits were removed. Next, a sterilization process was applied with high pressure steam resulting in separation process of kernel from its branch and shell. After that, the fruits were pressed, and the oil was extracted from the fruits. Post-extraction, the impurities from the crude oil were removed and the oil undergone drying process. Then, the fiber was separated from the cake and dry nut was produced, graded and cracked. At last, the dry kernel was packed and stored. The extraction process of palm oil is summarized in Figure. 1.

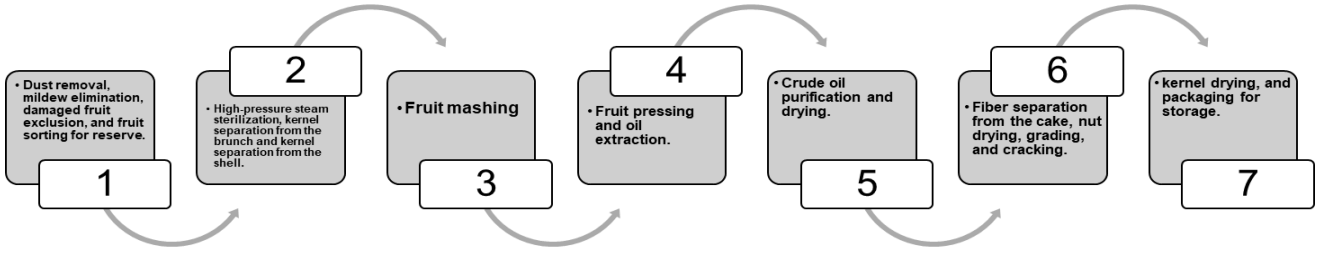

Figure 1. The extraction process of palm oil

2.2 Palm oil applications in food products

2.2.1 Bakery products

Palm oil is one of the primary baking oils. Palm stearin enabled bakery products to remain pliable even without hydrogenation, thereby significantly reducing trans-fat intake in diets(Kellens et al. 2007). When approximately 10% of palm oil shortening was added during the bread baking process, the bread's volume was increased to the optimum level of 4%(Chin et al. 2010). It displayed that palm oil positively impacted the texture and filling capacity of bakery products, and their commercial value could be improved.

2.2.2 Fried food

Palm oil is the preferred frying oil due to its high stability. Palm oil was evaluated by the score for taste of the product that had been fried five times. The fried product in palm oil and soybean oil received similar high score (8.5 and 8.6), but low score (7.8) in mustard oil. Sensory evaluation revealed that the palatability of food items fried in palm oil was comparable to soybean oil, while food items fried in mustard oil exhibited poor palatability(Rashid et al. 2023). Nile tilapia is typically fried before consumption, with palm oil being the usual choice(Tadesse Zula et al. 2021). It is common that palm oil is used in fried food.

2.2.3 Chocolate

Palm oil is frequently used as a substitute for cocoa butter in chocolate products. Substituting palm oil for cocoa butter in the chocolate bar-making process resulted in an increase of unsaturated fats content and a decrease in the melting point and hardness of chocolate bars(Limbardo et al. 2017). Chocolate products derived from a blend of coconut fat and palm oil shortening exhibited physical properties similar to those from cocoa butter(Limphapayom 2013).

2.2.4 Plant protein drinks

In addition, palm oil-based soy milk can enhance the emulsion stability of vegetable protein drinks. Higher storage stability in palm oil-based compared to traditional plant protein drinks (Pan et al. 2017). Better viscosity, stability and sensory of red palm oil emulsion drink can be obtained by adding different concentrations of Carbon Methyl Cellulose (CMC) and mango flavor (Silsia et al. 2021).

3. Sustainable strategies for palm oil applied in the food industry

3.1 Sustainability in strengthening institutions and systems improvement.

Roundtable on Sustainable Palm Oil (RSPO) has been developing and implementing global standards for sustainable palm oil. Numerous regions have also established organizations and robust systems to drive the uptake of more sustainable palm oil in the world. Malaysian Sustainable Palm Oil (MSPO) was established in 2013, launching a certification scheme for sustainable oil palm. Food safety requirements of palm oil products can be reasonably addressed by the Malaysian Palm Oil Board (MPOB). European Sustainable Palm Oil (ESPO) was established in 2015 and the Indonesia Sustainable Palm Oil (ISPO) standard was introduced in 2011. All of them are committed to sustainable economic, social and environmental objectives. Furthermore, promoting sustainability necessitates the development of market mechanisms, particularly in the oil palm sector (Omar et al. 2012).

3.2 Sustainability on innovative palm oil applications in food products

Development on the sustainability of palm oil in the food industry is possible by improving the quality of palm oil-used food products and devoting to its diversification and innovation. The pendawa chocolate with mixing ratio of palm oil and coconut oil had the same nutrition as the original and better texture(Harahap et al. 2023). In addition, palm oil and monoglyceride stearate were used as a base oil and oleogelator separately, and produced oleogels which can partially substitute for cocoa butter (30% w/w) to make chocolate with heat-stable and bloom-resistant(Chen et al. 2022). Hence, focusing on innovation to improve nutritional and practical value could inspire larger production capacity of palm oil-used food products.

3.3 Sustainability in valorization of biomass waste from palm oil

Biomass production from empty fruit bunch (EFB) after extraction of palm oil can be reduced and utilized into gas fuel production which can be considered as a renewable energy resource by gasification technology(Aktawan et al. 2020). Converting biomass waste into energy not only solved energy crisis, but also benefited environmental conservation. Furthermore, oil palm male inflorescence organic waste can be used to synthesis carboxymethyl cellulose, which is regarded as an ice cream stabilizer(Jainal et al. 2023). Therefore, it is possible that the sustainability of oil palm can be realized by converting biomass waste into energy and making new food additives.

3.4 Sustainability in optimization process and equipment advancement

Optimization of palm oil extraction process and advancing equipment for its production can improve its security in the food industry. Converging on lower production costs could significantly improve economic returns. Both aluminum and 316 stainless steel were chosen as storage tank for palm oil in terms of equipment advancement(Nizam & Mahmud 2021). Prior to

palm oil extraction, fresh fruit bunches undergone sterilization process in boiler and sterilizer. An integrated design combined the boiler and sterilizer for fresh fruit bunches, resulting in significantly reduced specific water consumption compared to conventional methods(Wae-Hayee et al. 2022). Consequently, enhancement of security and lower production costs from palm oil applications can be applied to promote the sustainability of palm oil in food products.

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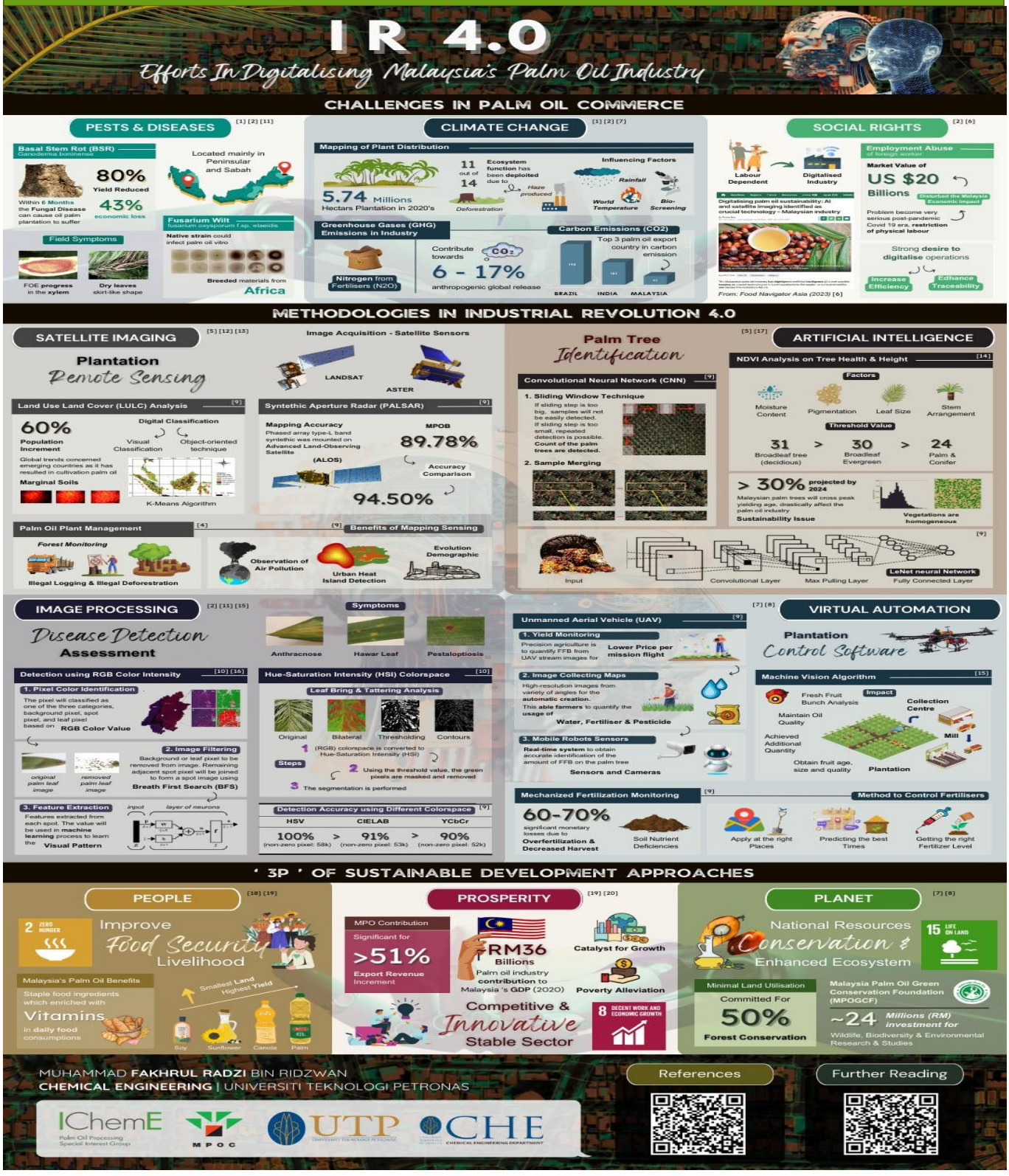
Infographic: IR 4.0 Efforts In Digitalising Malaysia's Palm Oil Industry

Prepared by Muhammad Fakhrul Radzi Bin Ridwan
(Universiti Teknologi PETRONAS)



Infographic: Shaping A Sustainable Tomorrow—Innovating The Malaysian Palm Oil Industry

Prepared by Tashwin A/L Sandra Segeran
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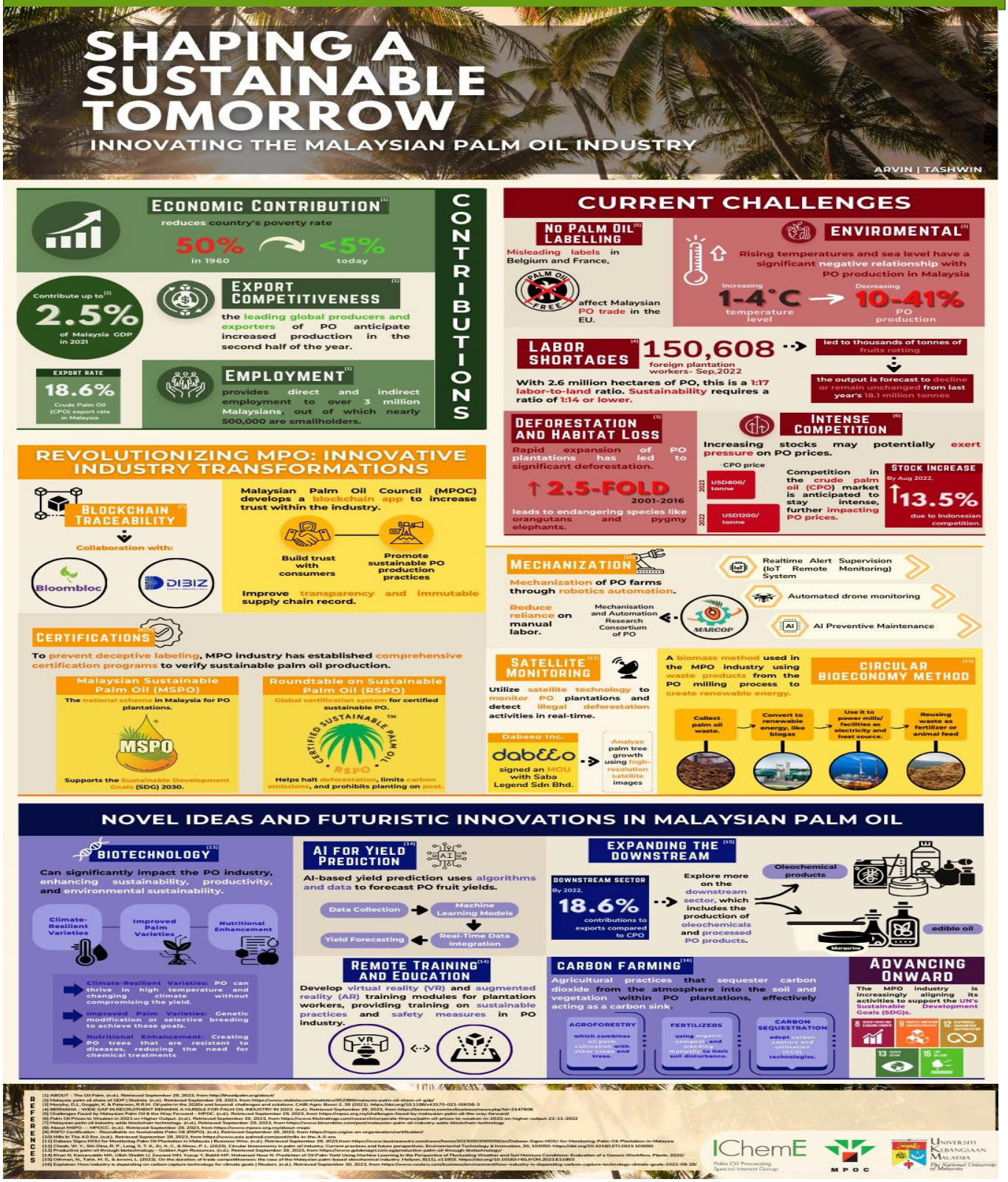

Infographic: The Future of Palm Oil Industry: Technological Milestones in Palm Oil Industry

Prepared by Thiranai Thongchan, Koh Jia Ee Penny, and Kang Li Qian
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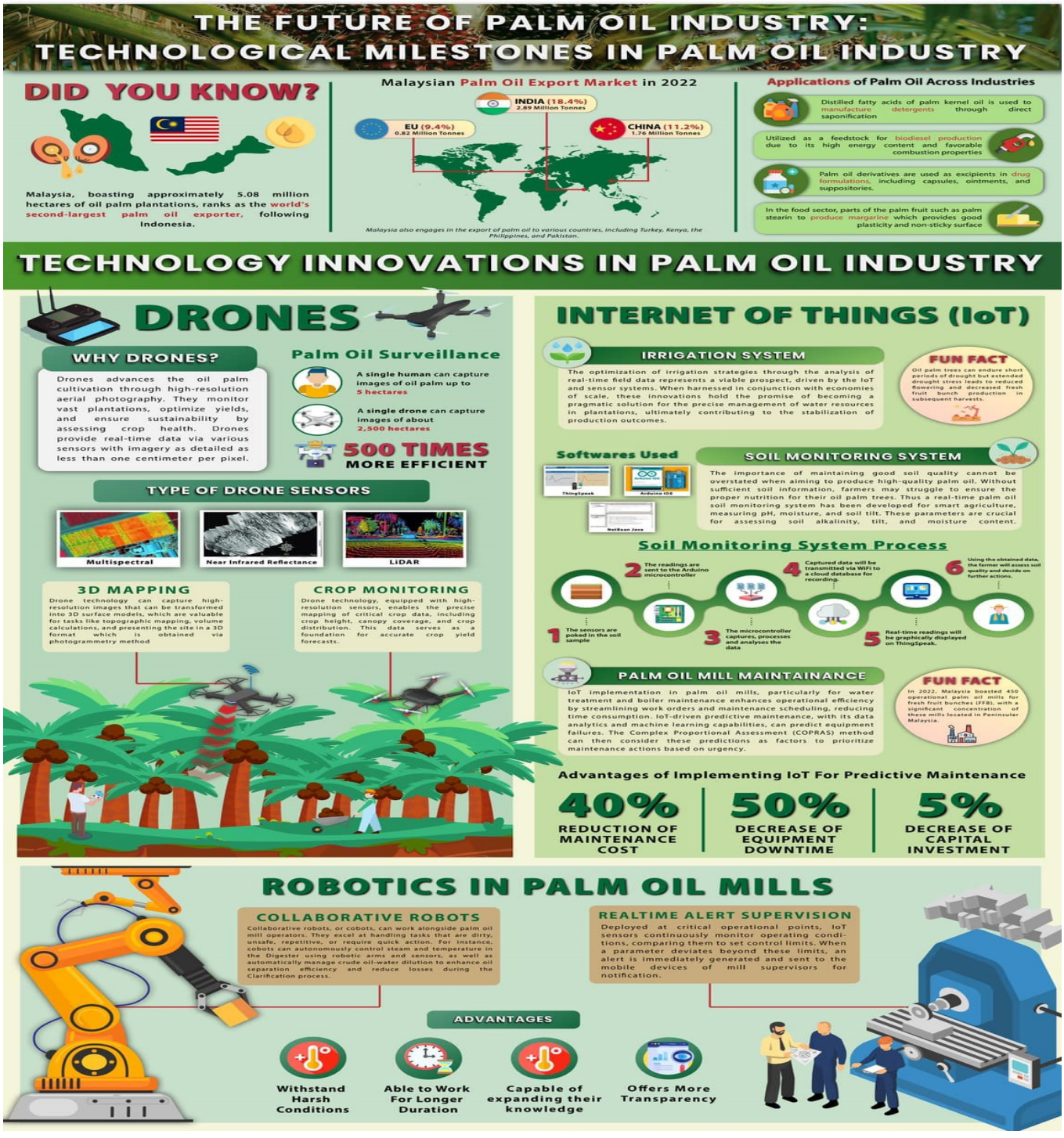

Infographic: Navigating Sustainability Challenges for a Thriving Future

Prepared by Lum Wai Hong
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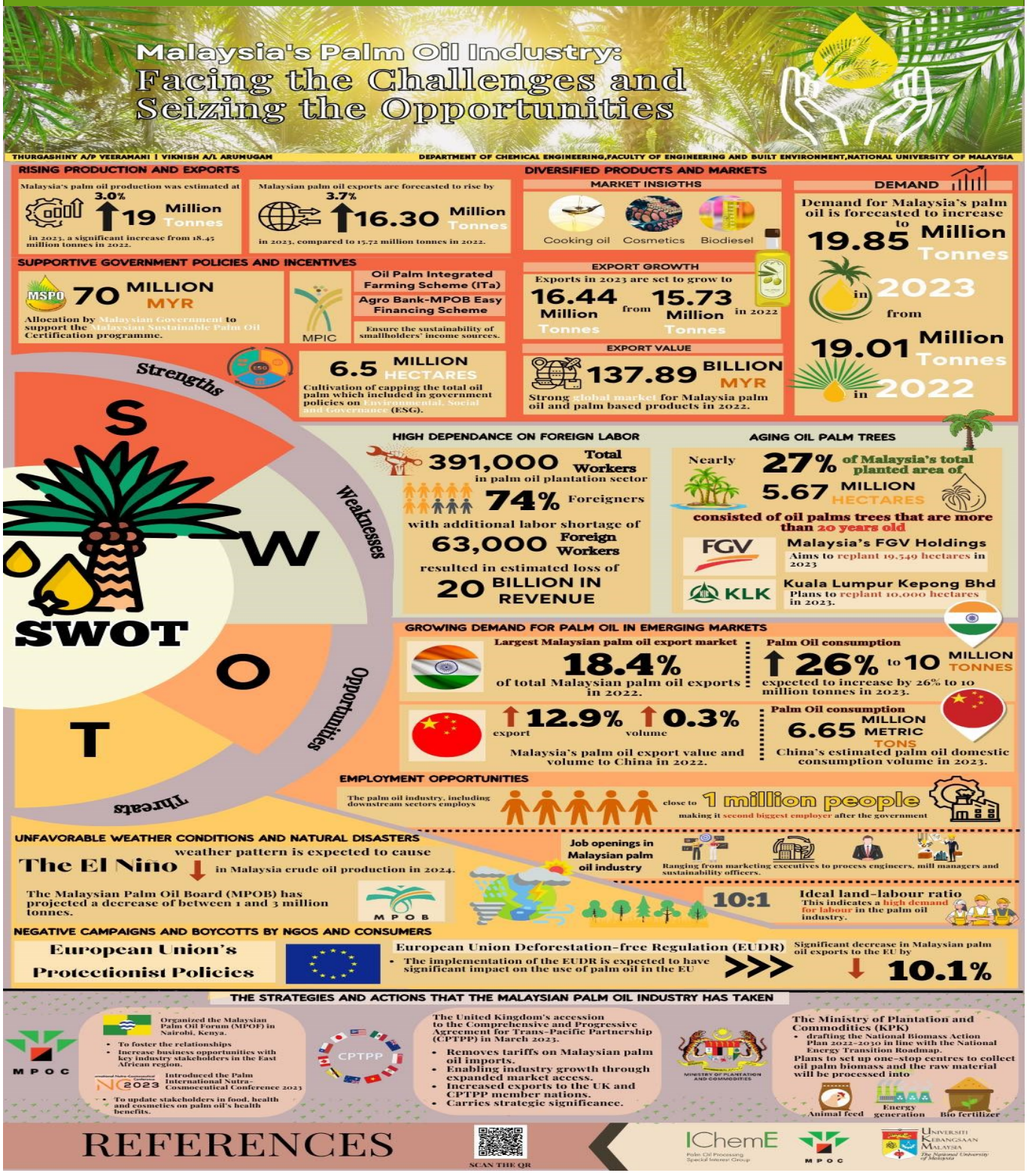
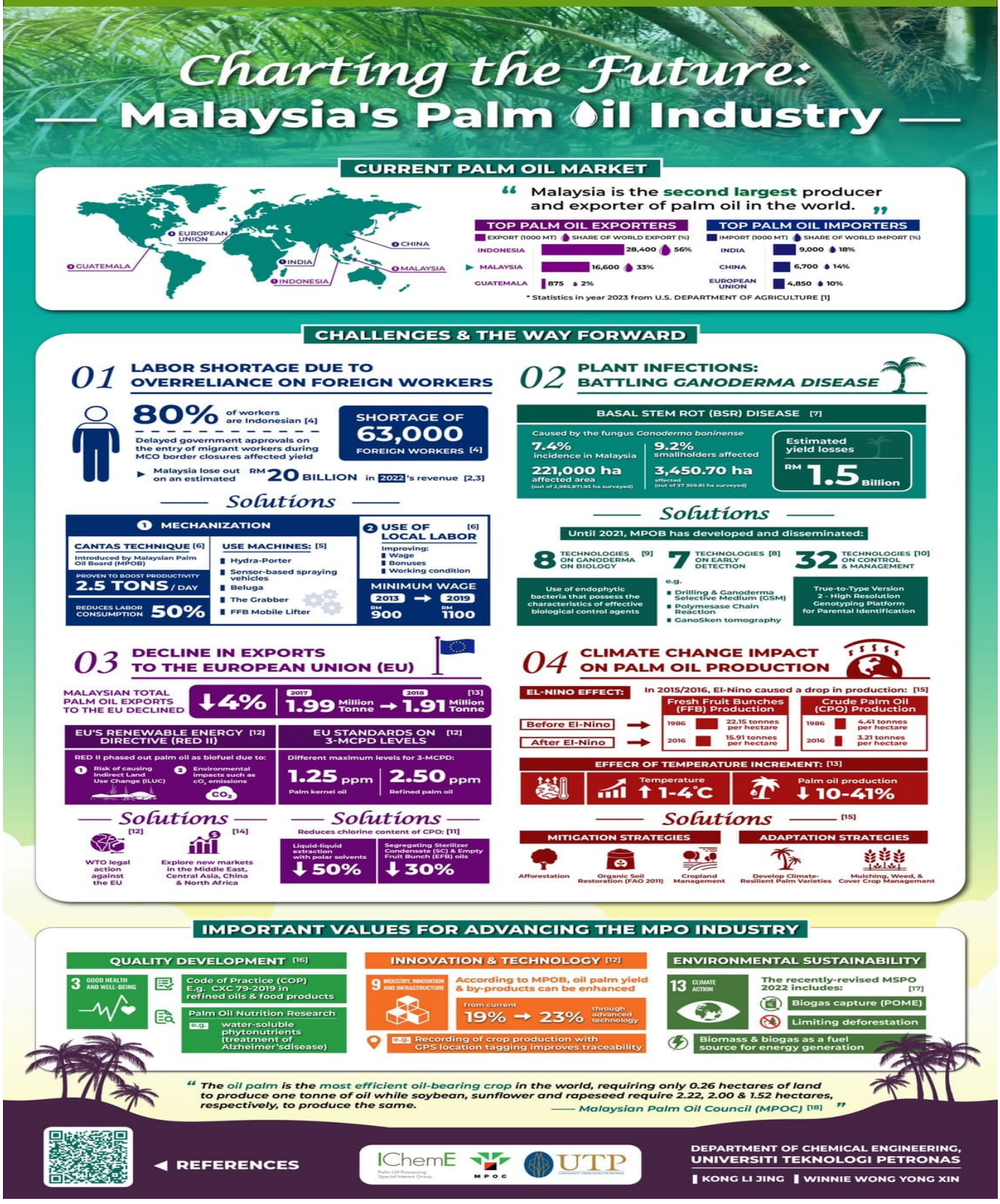
Infographic: Malaysia's Palm Oil Industry: Facing the Challenges and Seizing the Opportunities

Prepared by Viknish A/L Arumugam, and Thurgashiny A/P Veeramani, (Universiti Kebangsaan Malaysia



Infographic: Charting The Future—Malaysia's Palm Oil Industry

Prepared by Kong Li Jing and Winnie Wong yong Xin
(Universiti Teknologi PETRONAS)



Infographic: Innovation in the Palm Oil Industry

Prepared by Grayson Pan Kee Hao
(Universiti Teknologi PETRONAS)

Innovations in the Palm Oil Industry.

What is Palm Oil?

Oil Palm (*Elaeis guineensis*) is a plant that originates from the tropical rain forest regions of West Africa. Oil palm produces two distinct types of oils: **crude palm oil** from mesocarp and **crude palm kernel oil** from kernels. Today, palm oil is among the **most widely-used** and **cheapest** vegetable oils in the world. It is one of the main feedstocks for oleo-chemical industries, and is found in approximately **60%** of all packaged products in supermarkets. [1][3][5][10]

As of September 2023

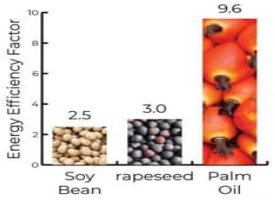
32% Production share of global oil & fats market.

and

53% of worldwide vegetable oil exports.

using only

6% of agricultural land intended for oil production.



[3][11]

Challenges Faced by the Industry

Malaysia is the second largest producer of palm oil worldwide, and has thus been on the recieving end of various critiques from NGOs for unsustainable agricultural practices for palm oil production.

- **2.3%** of Global Deforestation — **Deforestation & Climate Change Issues**
- **Palm Oil Mill Effluent (POME) Pollution**
- affects **54%** endangered mammals — **Habitat destruction of Endangered Species**
- More Than **100%** Price Increase During the COVID-19 Pandemic — **Unpredictable Global Scenarios**

[1][8][9][10]

So, whats next?

Development of more efficient and sustainable methods of Palm Oil production should be the priority for the industry. Here are just some of the many possible optimisations

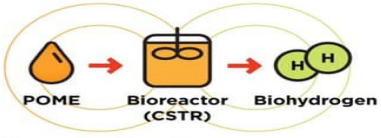
A study showed engines running on biodielsel were able to complete **30,000km** of mileage with no technical problems.

Biodiesel Production using Palm Oil

Biodiesel has sparked much interest due to it's similarities with conventional petroleum based diesel in terms of energy content and chemical structure, while reducing net CO_2 emissions by **78.45%**. This is commonly done through homogenous catalysis of the transesterification processes, or alternatively through heterogenous, enzymatic, and supercritical technologies. It has been reported that pure palm biodiesel can be directly used as fuel in a diesel engine without prior modification. [2]

Biohydrogen Production from Palm Oil Mill Effluent (POME)

Biohydrogen is hydrogen produced by algae, bacteria, and other biomass materials; Hydrogen is well regarded as a clean fuel that is seen as highly integral to a greener energy landscape. The highly polluting POME wastewater can be treated using **anaerobic dark fermentation (DF)** systems to produce biohydrogen. Further modifications to the DF method, such as dilute acid pre-treatment of the POME wastewater with HNO_3 and H_3PO_4 to breakdown the complex carnohydrates in POME to more fermentable sugars. [4][7]



Optimisations for Sustainable Palm Plantation Development

Various optimisations can be done towards palm oil plantations, a 2019 study using an input-output optimisation model (IOM) showed that a combined mix of inorganic & organic fertilisation can improve fresh fruit bunch productivity, giving maximum ecomic yield while reducing land usage by **24%**. From the same study, a reduction in greenhouse gas emissions from **282.95 kt CO2 eq / year** to **200.73 kt CO2 eq / year** was achieved. [6]

Breeding and Biotechnology to Improve Oil Palm as a Crop

Genomics-based strategies such as marker-assisted selection are already generating several useful advances for a variety of important traits that include oil yield, fatty acid composition and crop morphology. Through a genomics-based programme called 'Genome Select' carried out by Sime Darby, the yield of the produced plants is reported to be **9.9 ton/ hectare** over 5 years in field trials with optimum conditions, this is **more than double** of the current average palm oil yields of around 4 ton/ hectare. [8]

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References: https://tinyurl.com/GPICRef

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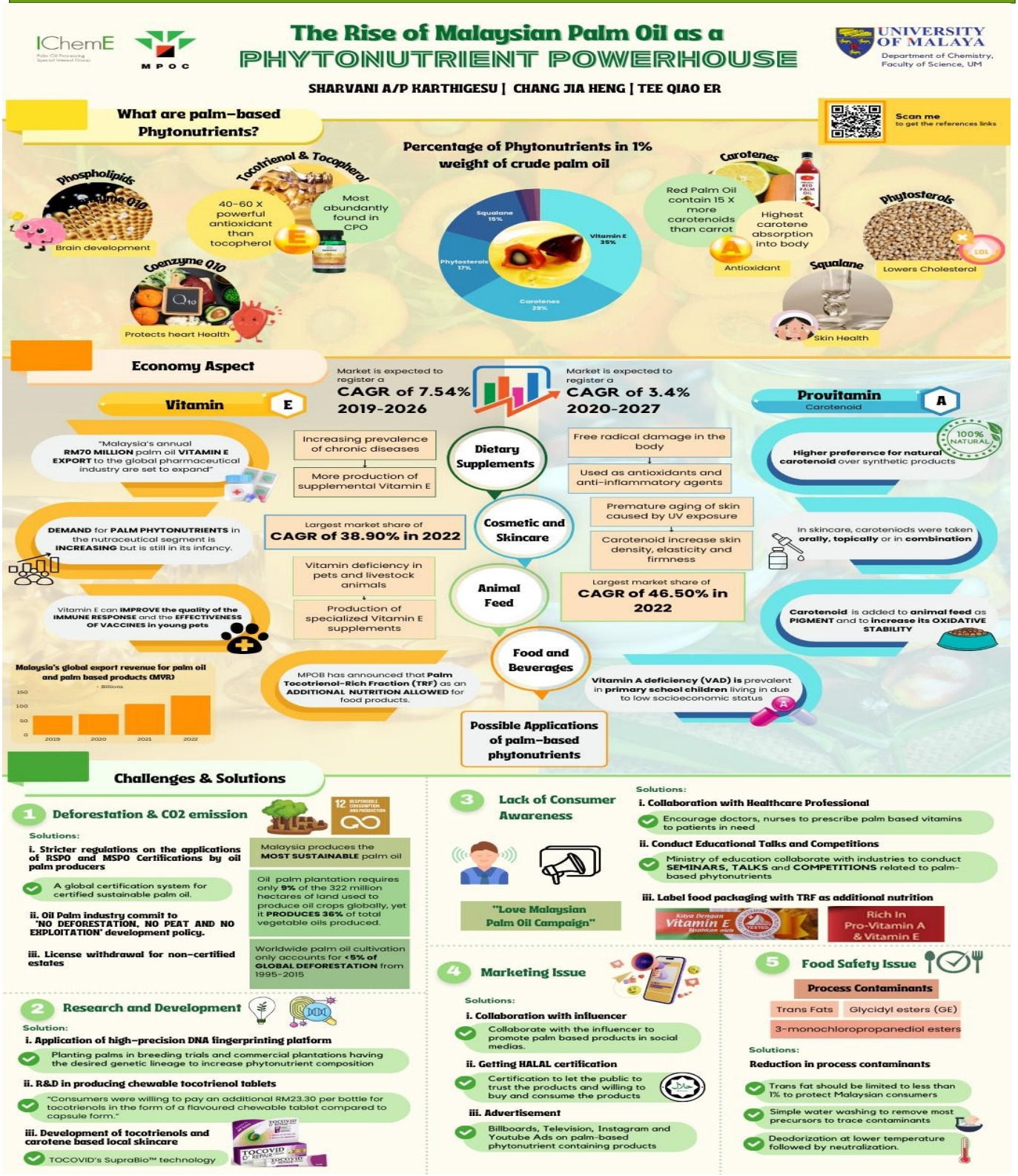
Infographic: Young Palm's Triple-P Future

Prepared by Lim Jia Yang, Ng Chiu Hwi, and Adam Loh Ee Xian (Universiti Malaya)

Infographic: The Rise of Malaysian Palm Oil as a Phytonutrient Powerhouse

Prepared by Sharvani A/P Karthigesu, Chang Jia Heng, and Tee Qiao Er (Universiti Malaya)



Infographic: Future of Palm Oil Industry Overcoming Hurdles for a Sustainable Future: Labour Issues and Solutions on Upstream

Prepared by Lee Khai Jin and Loh Wen Han
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Organised by: IChemE Palm Oil Processing Special Interest Group; MPOC

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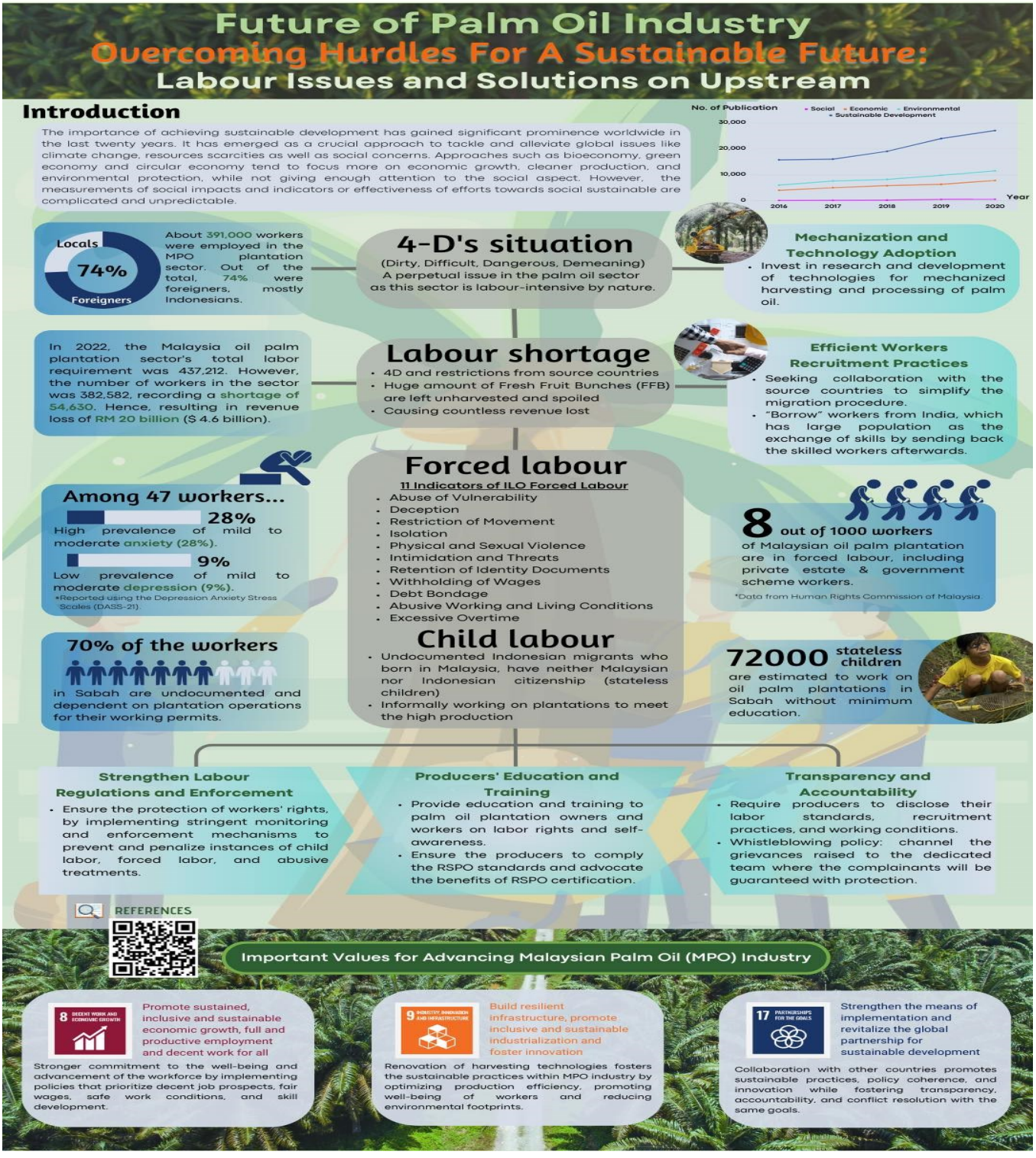

Infographic: Malaysian Palm Oil: Nurturing The Golden Future

Prepared by Kelvin Chuah jIng Lee and Wan Jia Wei
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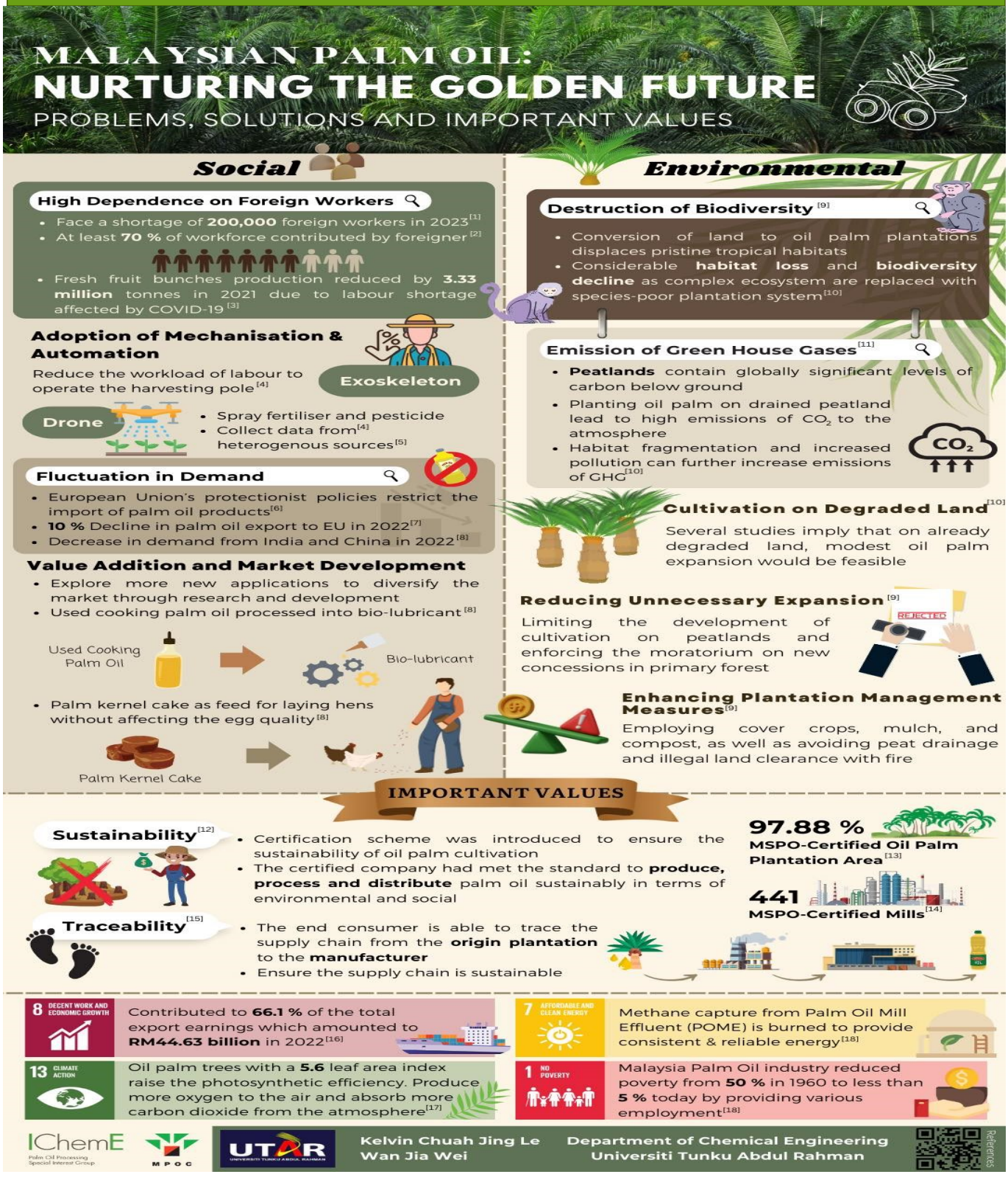
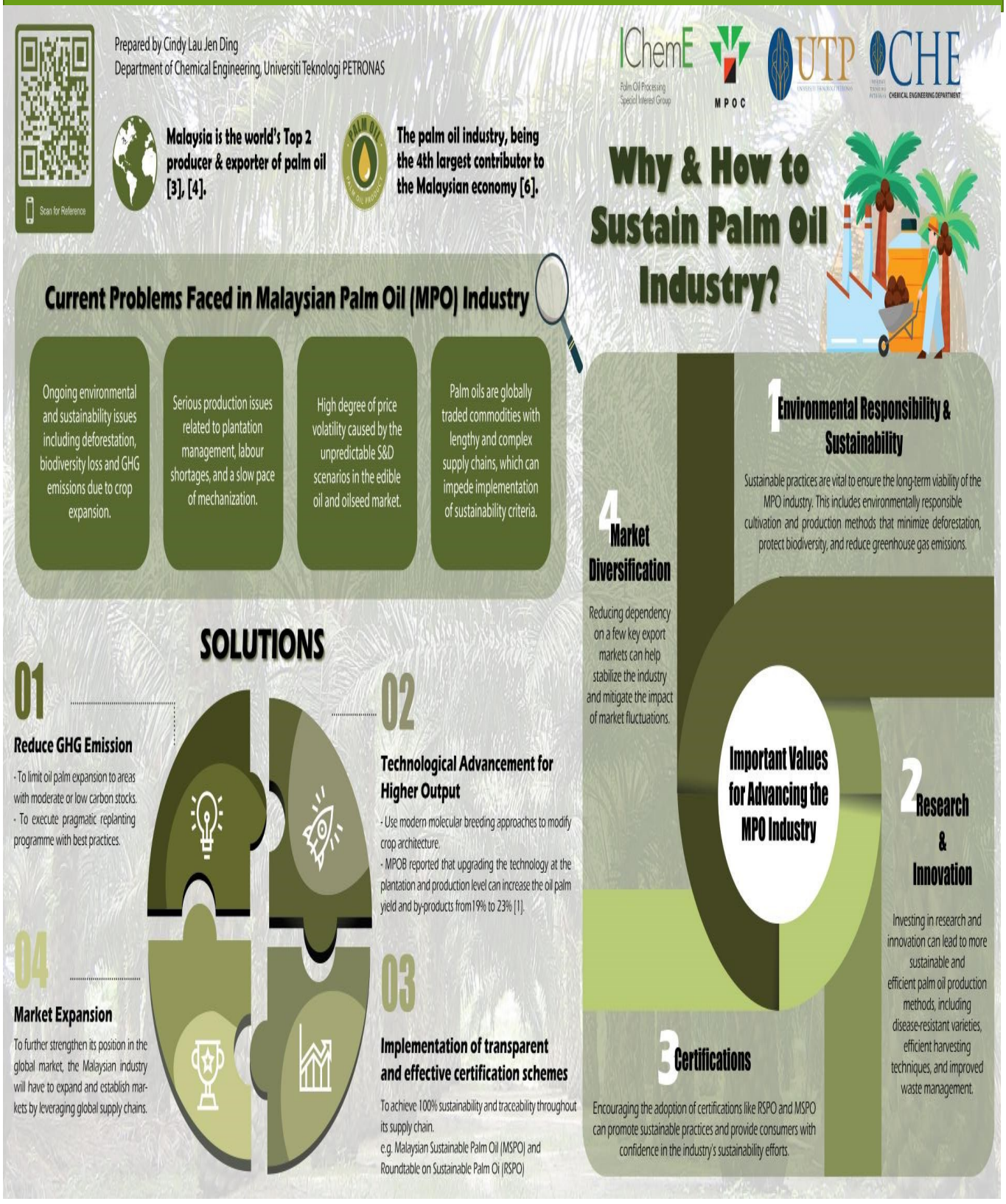


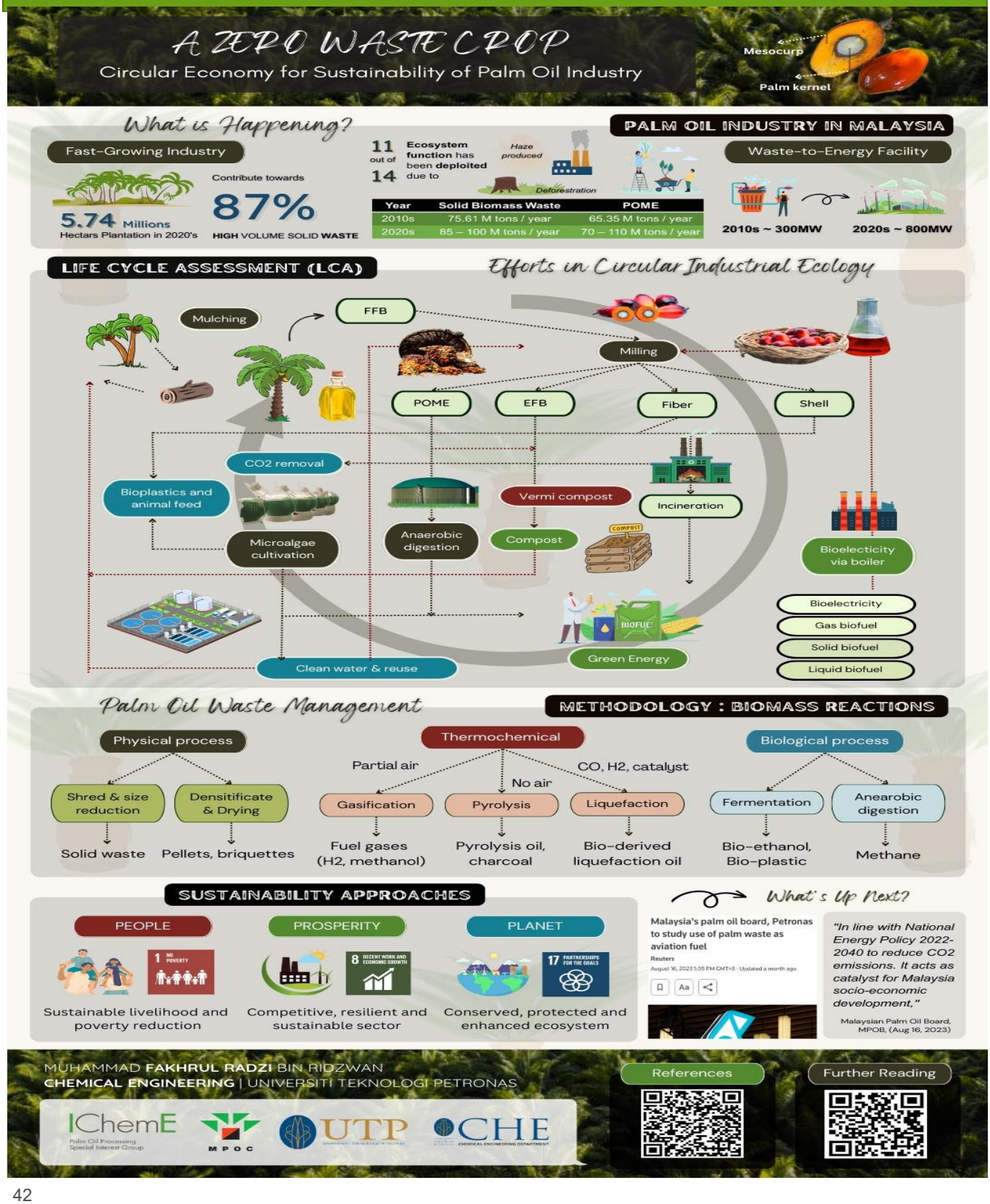
Infographic: Why & How to Sustain Palm Oil Industry?

Prepared by Cindy Lau Jen Ding
(Universiti Teknologi PETRONAS (UTP))



Infographic: A Zero Waste Crop

Prepared by Muhammad Fakhrul Radzi Bin Ridzwan
(Universiti Teknologi PETRONAS (UTP))

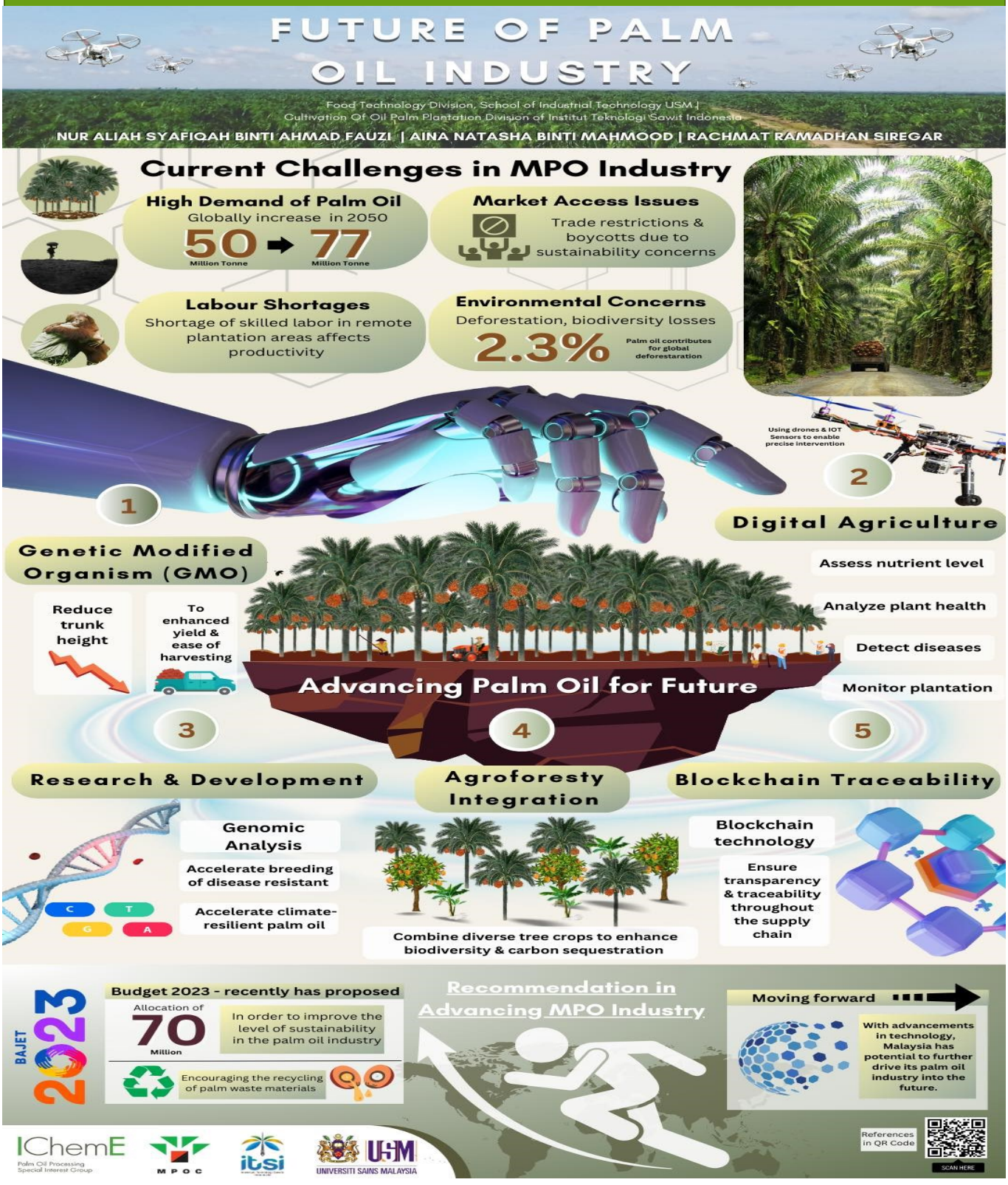


Infographic: The Future of Malaysia Oil Palm Industry

Prepared by Kenneth Chong Yih Haur
(Universiti Teknologi PETRONAS (UTP))

Infographic: Future of Palm Oil Industry

Prepared by Nur Allah Syafiqah Binti Ahmad Fauzi, Aina Natasha Binti Mahmood and Rachmat Ramadhan Siregar (Universiti Sains Malaysia (USM))



Infographic: The Future of Palm Oil Industry

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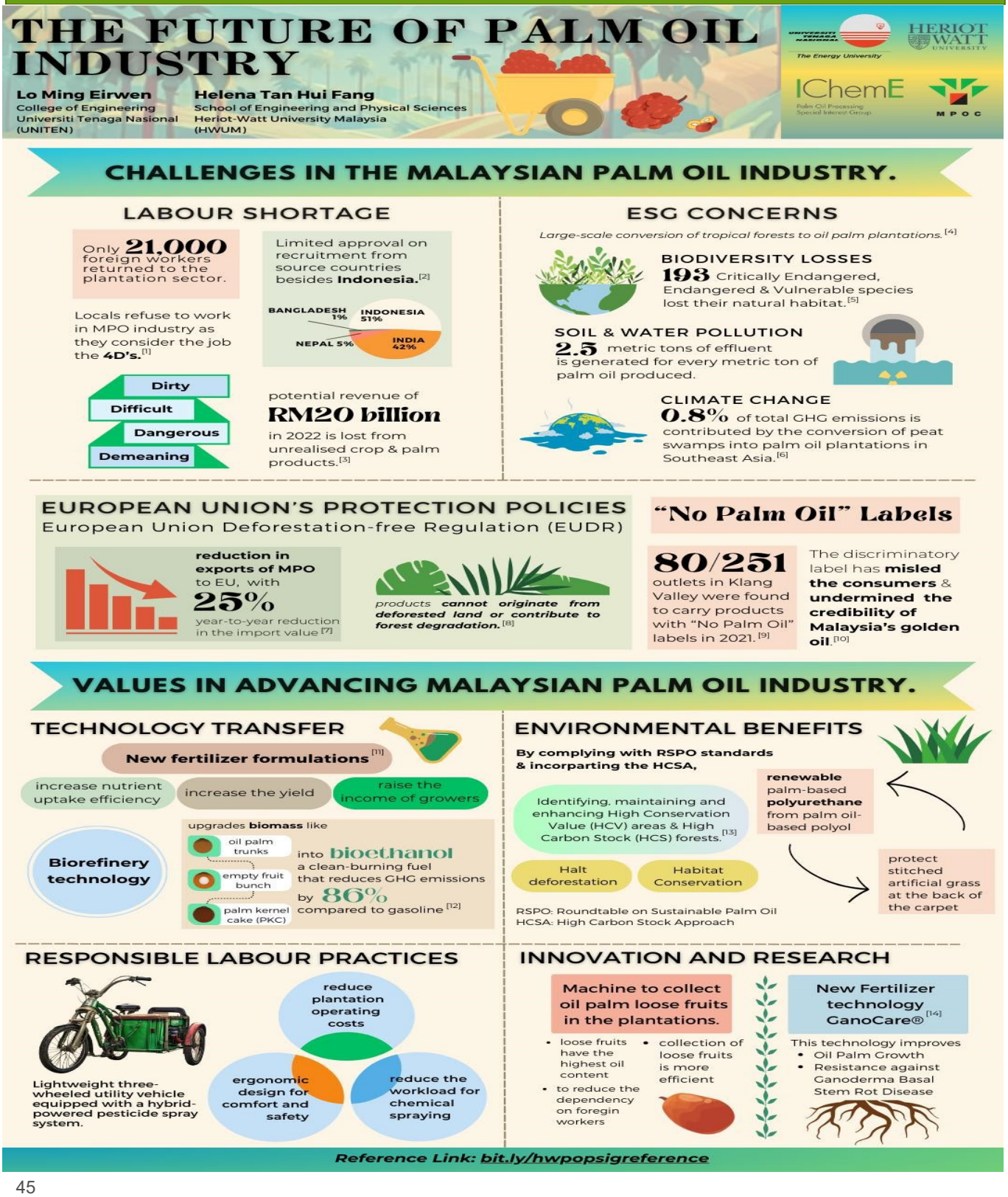

Infographic: Navigating the Future: Palm Oil Industry Insights

Prepared by Ong Jun Du
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Infographic: Potential of Empty Fruit Bunches (EFB) From Palm Oil Waste in Malaysia

Prepared by Low Ru Yi and Teh Chin Man
(Universiti Malaya)

Infographic: Future of Palm Oil Industry

Prepared by Nur Aisyah Syahirah Binti Ahmad Fauzi, Nurul Izzati Izah Binti Izani, and Wan Nurbalqis Faalihah Binti Wan Bukhari
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▪ WAN NURBALQIS FAALIHAH BINTI WAN BUKHARI ▪
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Infographic: Future of Palm Oil Industry in Malaysia

Prepared by Hani and Yi Xun
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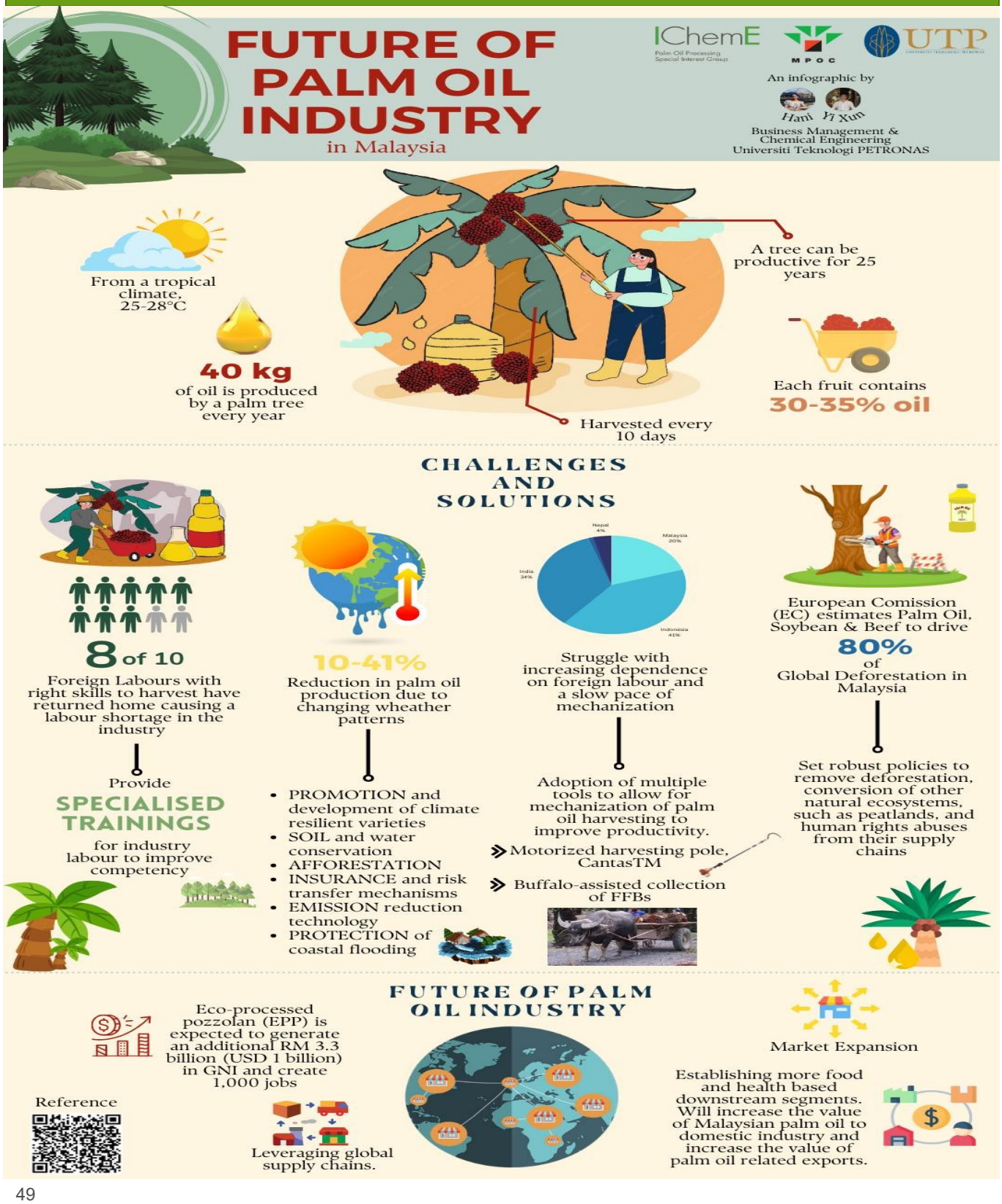


News: POPSIG Management Paid A Courtesy Visit to Malaysia Palm Oil Board (MPOB) Headquarter

The Chairlady Yang Berbahagia Professor The Chair Professor Ir Dr Chong Mei Fong led POPSIG management to pay a courtesy visit to the headquarter of Malaysian Palm Oil Board (MPOB) in Bandar Baru Bangi on Friday 11 August 2023.

POPSIG management team were represented by Yang Berbahagia Professor The Chair Professor Ir Dr Chong Mei Fong, Chairlady of POPSIG; Mr Ng Wai Lun, Head of Industrial and Corporate Communications Unit, POPSIG; Ms Jocelyn Lim Jean Yi, Vice Treasurer at POPSIG; and Ms Leiu Yu Xuan, Roadshow Coordinator at POPSIG.

MPOB team attending the meeting were Yang Berbahagia Datuk Dr Ahmad Parveez Haji Ghulam Kadir, Director General of MPOB; Dr Loh Soh Kheang, Head of Energy and Environment Unit, Engineering and Processing Research Division, MPOB; Mr Nik Aznizan Nik Ibrahim, Head of Corporate Communications Unit, Information Technology and Corporate Service Division, MPOB; Mr Nasrin Abu Bakar, Group Leader of Milling and Waste Management Technology Group, Milling and Processing Unit, Engineering and Processing Research Division, MPOB; and Ms Nor Asliza Semiran, Corporate Communications Unit, Information Technology and Corporate Service Division, MPOB.

POPSIG expressed a warm welcome to the collaboration with the Malaysian Palm Oil Board (MPOB), emphasizing its commitment to engaging in joint technical activities benefiting both industrial players and university students. The discussions between POPSIG and MPOB extended to exploring the potential for technical collaborations specifically within the context of the POPSIG University Roadshow, underscoring the shared interest in advancing awareness and understanding of the intricacies of the biodiesel industry. As part of this collaborative effort, a learning visit to the MPOB Gallery was undertaken, providing a valuable opportunity for participants to gain firsthand insights into the advancements and innovations within the palm oil sector. This multifaceted collaboration between POPSIG and MPOB underscores a concerted effort to bridge industry and academia, fostering knowledge exchange and facilitating a deeper understanding of the technical aspects crucial to the biodiesel landscape.

Malaysian Palm Oil Board (MPOB) is the government agency entrusted to serve the country's oil palm industry. Its main role is to promote and develop national objectives, policies and priorities for the wellbeing of the Malaysian oil palm industry. It was incorporated by an Act of Parliament (Act 582) and established on 1 May 2000, taking over, through a merger, the functions of the Palm Oil Research Institute of Malaysia (PORIM) and the Palm Oil Registration and Licensing Authority (PORLA). Each of these respective organisations has been involved in the oil palm industry for more than 20 years and it is to render more effective services as well as to give greater national and international focus to the industry that MPOB was instituted.

POPSIG management gratefully acknowledges the support provided by Desmet Malaysia Sdn Bhd, Malaysian Palm Oil Council (MPOC), Kuala Lumpur-Kepong Oleomas Sdn Bhd (KLK OLEO), Malaysian Oleochemical Manufacturers Group (MOMG), and Sime Darby Oils (SDO) to our activities.

News: POPSIG Management Paid A Courtesy Visit to Malaysian Biodiesel Association (MBA)

The Chairlady Yang Berbahagia Professor The Chair Professor Ir Dr Chong Mei Fong led POPSIG management to pay a courtesy visit to Wilma FMM and greeted the President of Malaysian Biodiesel Association (MBA) in Kuala Lumpur on Monday 21 August 2023.

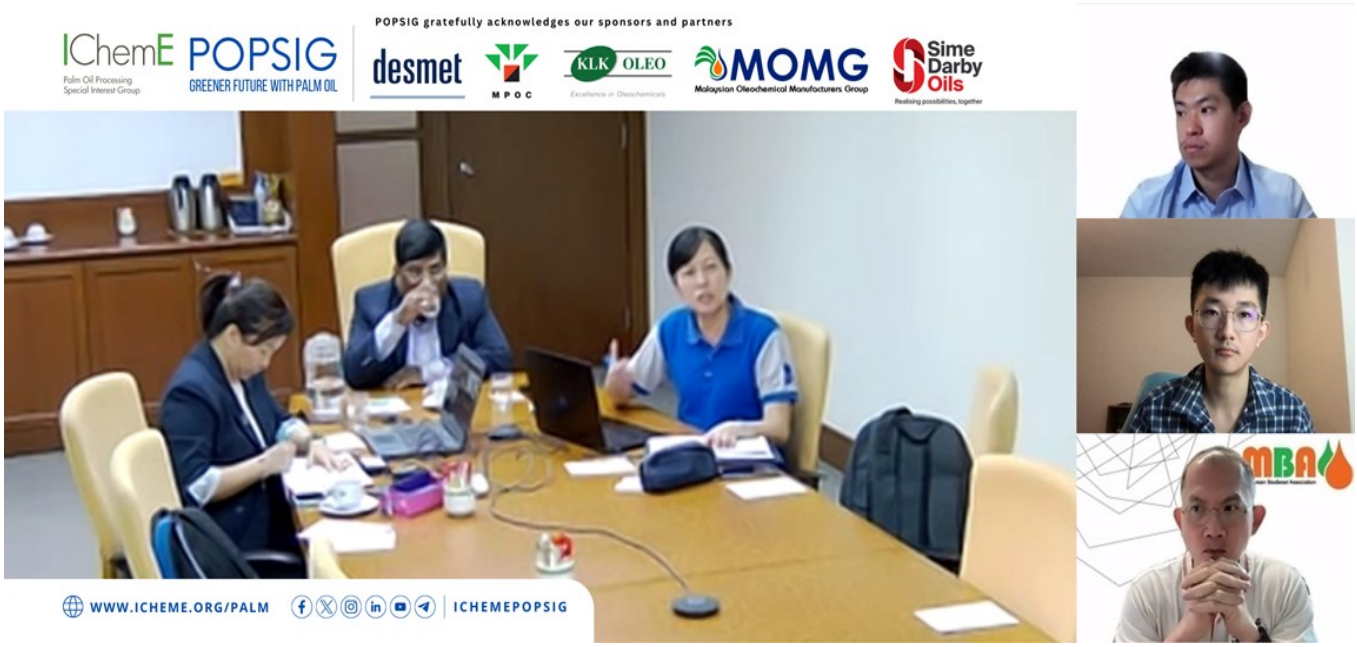
POPSIG management team was represented by Yang Berbahagia Professor The Chair Professor Ir Dr Chong Mei Fong, Chairlady of POPSIG, Mr Oscar Ting Teo Wei, Chief Manager of Information, Communications and Technology & Head of UK, EU, Swiss and Norwegian Affairs, POPSIG, and Mr Ng Wai Lun, Head of Industrial and Corporate Communications Unit, POPSIG.

MBA team attending the meeting were Mr Unnikrishnan R Unnithan, President of MBA; Mr Tee Lip Teng, Deputy President of MBA; Mr Eric Kiu Kwong Seng, Committee Member, MBA; Mr Long Tian Ching, Committee Member, MBA; and Ms Chan Pek Wan, Secretariat of MBA.

POPSIG expressed enthusiasm for the collaboration with MBA, particularly in engaging in technical activities beneficial to industrial stakeholders. The Chairlady extended a warm welcome to MBA representatives, encouraging their participation in the POPSIG University Roadshow aimed at increasing awareness about advancements in the biodiesel industry. Mr. Ting highlighted POPSIG's past initiatives, including a university roadshow featuring representatives from Genting Biorefinery Sdn Bhd and Sime Darby Oils Biodiesel. Additionally, Mr. Unnithan invited university students to take part in the upcoming 4th Biodiesel Conference in October. Mr. Ting provided insights into the latest developments in palm-derived biodiesel within the EU region. Mr. Unnithan expressed hope for POPSIG's management team to organize events addressing Indirect Land Use Change (ILUC) risks on a global scale. The Chairlady discussed the potential to support postgraduate students pursuing studies in biodiesel development. Finally, Mr. Long explored the prospect of recruiting students and graduates to contribute to the biodiesel sector, reflecting a collaborative effort between POPSIG and MBA across various facets of the biodiesel landscape.

Malaysian Biodiesel Association (MBA) was established on September 2, 2008 and consist of members, located in Peninsular Malaysia, Sabah and Sarawak. MBA was primarily established to represent the interest of the biodiesel industry in Malaysia. The association works closely and represents the industry in government dialogues, forums and committees.

POPSIG management gratefully acknowledges the support provided by Desmet Malaysia Sdn Bhd, Malaysian Palm Oil Council (MPOC), Kuala Lumpur-Kepong Oleomas Sdn Bhd (KLK OLEO), Malaysian Oleochemical Manufacturers Group (MOMG), and Sime Darby Oils (SDO) to our activities.



News: Harikrishna Addressed at the Opening of RSPO-Monash Symposium

Dr. Harikrishna Kulaveerasingam, Senior Vice President I and Chief Research & Development Officer of Sime Darby Plantation Berhad delivered the Keynote Address titled "Plantation 4.0: Challenges & Opportunities in the Oil Palm Industry" in Plenary Theatre in Monash University Malaysia on 25 September 2023.

In his keynote, Dr. Harikrishna shared some of Sime Darby Plantation's (SDP) research and development initiatives as well as SDP's plans for the future.

Dr. Harikrishna talked about SDP's pursuit for higher-yielding palms through genomics and the remarkable results of GenomeSelect™, which has proven to outperform the current best planting materials in the market. He also shared videos of machines that have been rolled out in our operations, and SDP's vision for the future of palm oil through mechanisation, automation and digitalisation. Our aim is to transform the palm oil industry into a less labour intensive industry.

One of the key takeaways from Prof. Ir. Chan Eng Seng, Head of Monash-Industry Plant Oils Research Laboratory (MIPO) at Monash University, and Mr. Yen Hun Sung, Head of Impacts Monitoring, Evaluation, and Learning (IMEL) at the Roundtable on Sustainable Palm Oil (RSPO), is that the power of partnerships and collaborations is the way forward for the oil palm industry.

Dr. Harikrishna completed his first degree (B.Sc.) in Plant Sciences at the University of London (Wye College), UK, and his Ph.D. in Plant Developmental and Molecular Biology at the University of Leicester in the UK.

Dr. Harikrishna joined the Sime Darby Technology Centre Sdn. Bhd. an R&D company within the Sime Darby R&D Centre in July of 2003. Currently, he is the Senior Vice President I and Chief Research and Development Officer of Sime Darby Plantation Bhd. Over his career, Dr. Harikrishna has been a post-doctoral Fellow of University of California, Davis, USA; a lecturer in biotechnology at Universiti Putra Malaysia and a visiting scientist at the Massachusetts Institute of Technology, Cambridge, USA. He has over 30 years postgraduate experience in biotechnology and is a co-author on numerous publications and patents. In 2012 he was inducted into the Malaysian Academy of Science as a fellow. He is currently a member of the Scientific Advisory Council of the Institute of Systems Biology (INBIOSIS), Universiti Kebangsaan Malaysia since 2016 and a visiting Professor to the School of Biological Sciences, University of Nottingham, Malaysia.

Dr. Harikrishna spearheaded the effort to sequence the oil palm genome at Sime Darby and in May 2009, Sime Darby announced that it had successfully sequenced, assembled, and annotated the oil palm genome exclusively using second generation sequencing technology. In April 2016 Sime Darby announced the first commercial planting of genome select oil palm seedlings – making Sime Darby the world's first company to achieve this scientific break-through using this technology. In April 2017 Sime Darby Plantation's Genome Select was announced as a winner for the Edison Best New Product Awards™ under the Sustainability Category.

RSPO-Monash Joint Symposium 2023 was proudly supported by POPSIG.

News: Oscar Visited Industriepark Höshst in Germany

Upon the invitation, Oscar Ting paid a visit to Industriepark Höchst in Frankfurt am Main, Germany on 20th July 2023.

He was presented the production of biodiesel and pharmaceutical-grade glycerin from vegetable oils and waste fuel at Industriepark Höchst. At the meeting, the project leaders informed Oscar that palm oil, which was previously used in manufacturing, has then been replaced by other vegetable oils.

Walking down the Industriepark equivalent to the size of 644 soccer fields, he also observed the significant investment in implementing large-scale green technologies in edible oil industry in Germany.

Oscar also visited Rheinland-Pflaz and Hessen to observe the sustainable development, circular economy and hydrogen projects in Germany.

During the visit, he has taken note about the views of the firms and organisations in Europe on palm oil. At the same time, he also shared about the work done by companies and institutions in other countries, such as: Japan and Malaysia.

He also shared to the leaders in Frankfurt a.M. about the great support to POPSIG by its sponsors and partners, namely Desmet, MPOC, KLK OLEO, MOMG and Sime Darby Oils.

Oscar, who leads the EU, UK, Switzerland and Norwegian Affairs, has made POPSIG the first palm oil group in the world to be recognised by the EU as the top performed organisation on the sustainable youth development project in recent year.

Oscar, speaking in German, expressed his sincere appreciation to the companies in the European Union for hosting him a

News: MPOB Meterai In Collaboration with PETRONAS, Explore the Potential of Aviation Fuel from Palm Waste

On the 14th August 2023, MPOB signed a Memorandum of Understanding (MoU) with PETRONAS as an effort to maximize the application of used palm oil and palm waste materials such as palm factory effluent or POME to produce sustainable aviation fuel (SAF), he agreement was signed by Datuk Datuk Dr. Ahmad Parveez Ghulam Kadir, Director General of MPOB and representing Petronas is Mr.Ahmad Adly Alias, Vice President of Filtering, Marketing and Trade, Milliran Business, PETRONAS. he ceremony was witnessed by Datuk Mohamad Helmy Othman Basha, Chairman of MPOB and Datuk Sazali Hamzah, Executive Vice President and CEO of PETRONAS Hiliran Business. he idea of SAF production arose after seeing used palm oil and palm residue potential brightened as an important raw material for the production of such value added products at the same time reducing the country's dependence on fossil fuels.

News: MPOB is Proud to be One of the Supporters at the Palm Oil Milling Exhibition & Conference (POMtec)

On the 8th-9th August 2023, MPOB is proud to be one of the supporters at the Palm Oil Milling Technology Exhibition & Conference (POMtec) from 8 – 9 August 2023. Director General of MPOB, Datuk Dr. Ahmad Parveez has been invited to chair the second session along with other panel members- Assoc. Prof. Dr. Ir. Viknesh Andiappan from Swinburne, Dr. Jibrail Kansedo, from Curtin University Malaysia, Assoc. Prof. Dr. Brigdid Chin Lai Fui, from Curtin University Malaysia and Dr. Sivasangar Seenivasagam, from UPM.

News: Winners of POPSIG-MPO Palm Oil Infographic Competition 2023

A total of 42 submissions from 73 students across 11 universities has been received on 01 October 2023. On 19 October 2023, the Judging Committee have unanimously made the final decision on the Top 20 infographics. The list of Top 20 winning teams is presented as follow according to their ascending rank, as shown in the Appendix. The Top 20 infographics will be displayed during the POPSIG-MPOC Palm Oil Educational Roadshow at Universiti Kebangsaan Malaysia (UKM) on 30 October 2023. Congratulations to the Top 20 winning teams. The Organising and Judging Committees would like to appreciate the excellent contributions of all participants in this competition.

The list of Top 20 winning teams, according to the rank order:

1. **Muhammad Fakhrul Radzi Bin Ridzwan (Universiti Teknologi PETRONAS)**
2. **Tashwin A/L Sandra Segeran (Universiti Kebangsaan Malaysia), and Arvin A/L Saravanan (Universiti Kebangsaan Malaysia)**
3. **Thiranai Thongchan (Universiti Sains Malaysia), Koh Jia Ee Penny (Universiti Sains Malaysia), and Kang Li Qian (Universiti Sains Malaysia)**
4. **Lum Wai Hong (Universiti Malaya)**
5. **Viknish A/L Arumugam (Universiti Kebangsaan Malaysia), and Thurgashiny A/P Veeramani (Universiti Kebangsaan Malaysia)**
6. **Kong Li Jing (Universiti Teknologi PETRONAS), and Winnie Wong Yong Xin (Universiti Teknologi PETRONAS)**
7. **Grayson Pan Kee Hao (Universiti Teknologi PETRONAS)**
8. **Lim Jia Yang (Universiti Malaya), Ng Chiu Hwi (Universiti Malaya), and Adam Loh Ee Xian (Universiti Malaya)**
9. **Sharvani A/P Karthigesu (Universiti Malaya), Chang Jia Heng (Universiti Malaya), and Tee Qiao Er (Universiti Malaya)**
10. **Lee Khai Jin (Universiti Malaya), and Loh Wen Han (Universiti Malaya)**
11. **Kelvin Chuah Jing Le (Universiti Tunku Abdul Rahman), and Wan Jia Wei (Universiti Tunku Abdul Rahman)**
12. **Cindy Lau Jen Ding (Universiti Teknologi PETRONAS)**
13. **Muhammad Fakhrul Radzi Bin Ridzwan (Universiti Teknologi PETRONAS)**
14. **Kenneth Chong Yih Haur (Universiti Teknologi PETRONAS)**
15. **Nur Aliah Syafiqah binti Ahmad Fauzi (Universiti Sains Malaysia), Aina Natasha binti Mahmood (Universiti Sains Malaysia), and Rachmat Ramadhan Siregar (Institut Teknologi Sawit Indonesia)**
16. **Helena Tan Hui Fang (Heriot-Watt University Malaysia), and Lo Ming Eirwen (Universiti Tenaga Nasional)**
17. **Ong Jun Du (Universiti Sains Malaysia)**
18. **Low Ru Yi (Universiti Malaya) Teh Chin Man (Universiti Malaya)**
19. **Nur Aisyah Syahirah Binti Ahmad Fauzi (Universiti Putra Malaysia) Nurul Izzati Izah Binti Izani (Universiti Putra Malaysia) Wan Nurbalqis Faalihah Binti Wan Bukhari (Universiti Putra Malaysia)**
20. **Nur Hani Idris (Universiti Teknologi PETRONAS), and Low Yi Xun (Universiti Teknologi PETRONAS)**

News: From Zero to Eight

News: Congratulations to Award Recipients of POPSIG-KLK Palm Oil Video Competition 2023

Congratulations to Andersson T'ng Khai Shern, Yeow Teck Ann, Wong Man Kei, Bachelor of Engineering (Honours) Chemical Engineering, Xiamen University Malaysia. Their video is titled "Overview of Palm Oil Process in the Coming Hundred Years". Their video is awarded for comprehensively presenting the future possibilities and advanced technologies in the palm oil industry, in addition to the detailed areas on catalysis, digitalisation and safety topics.
View the video at: https://youtu.be/xjY8gzXecpw

News: Congratulations to Award Recipients of POPSIG-KLK Palm Oil Video Competition 2023

Congratulations to Ng Wai Hoong, Bachelor of Engineering (Honours) Chemical Engineering, Universiti Malaya. Wai Hoong's video is titled "Impact of Generation Z Towards the Palm Oil Industry". His video is awarded for showcasing a broad connection between Generation Z and the oils and fats sector. This connection encompasses specific aspects relevant to the palm oil industry. The video underscores the potential impacts of Generation Z on the advancement of the palm oil sector.
View the video at: https://youtu.be/qkgUEjwIziw

News: Congratulations to Award Recipients of POPSIG-KLK Palm Oil Video Competition 2023

Congratulations to Yiek Siew Teck, Bachelor of Engineering (Honours) Chemical Engineering (Year 3), Curtin University Malaysia. Siew Teck's video is titled "Tomorrow's Green Gold: The Palm Oil Process Plant of the Future". His video is awarded for connecting advanced technology into palm oil processing and subtly link to diversity and sustainability, in which these elements envision a futuristic palm oil industry.
View the video at: https://youtu.be/75IJIX-tqWk

News: Thank You to Our 34 Participants Who Showed Their Hard Work and Dedicated Contributions at the Palm Oil Video Competition

News: Malaysia Independence Day

Organised by: IChemE Palm Oil Processing Special Interest Group | POPSIG GREENER FUTURE WITH PALM OIL

Collaborator & Sponsor: MPOC

In conjunction with: MSPO

Supported by: Universiti Kebangsaan Malaysia The National University of Malaysia | Sime Darby YAYASAN | UKM-YSD CHAIR FOR SUSTAINABILITY KURSI KELESTARIAN UKM-YSD

POPSIG-MPOC PALM OIL INFOGRAPHIC COMPETITION

1st Announcement

Theme

Future of Palm Oil Industry

Participation

1. Individual; or,
2. Group of two (2) to three (3)

Champion
RM1,000
cash prize

Registration & Submission

1. Submission opens from 21 August 2023 until 01 October 2023.
2. Participants only need to complete one online form for participation.

GIVEAWAY
Total value up to RM4,800 cash prize

For more enquires, email to popsigmalaysia@gmail.com

Information available at www.icheme.org/palm-awards

WWW.ICHEME.ORG/PALM | ICHEMEPOPSIG

UPCOMING EVENTS

DATES	EVENTS
9 November 2023	Event: International Palm Oil Congress and Exhibition 2023
20 November 2023	Event: POPSIG-MPOC Palm Oil Educational Roadshow at Swinburne 2023
22 December 2023	Event: Palm Oil Processing Special Interest Group Annual Meeting

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