

# 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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## Editor's Message

We are thrilled to bring you the 23rd 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 CEO Day @ UKM event, a collaborative effort between the Malaysian Palm Oil Council (MPOC) and the Department of Food Sciences, Faculty of Science & Technology (FST) at Universiti Kebangsaan Malaysia (UKM), stood as a testament to the commitment of industry leaders to nurturing the next generation. This event provided a valuable platform for students to connect with prominent figures in the industry, opening doors to career and internship opportunities. Key highlights included the inspiring opening ceremony, enlightening CEO forum, and the engaging POPSIG exhibition.

National Chemical Engineering Exposure Camp (NCEEC) 2023: Inspiring Future Engineers organized by IChemE-UM Student Chapter, in collaboration with the Ministry of Education (MOE/KPM) Malaysia and IChemE's Palm Oil Processing Special Interest Group (POPSIG), in conjunction with MPOC, the National Chemical Engineering Exposure Camp (NCEEC) 2023 was a significant endeavor to introduce pre-university students to the world of Chemical Engineering. This program aimed to foster an understanding of the industry's role in achieving United Nations Sustainable Development Goals (SDGs) and educating students about various aspects of responsible palm oil processing.

POPSIG-MPOC Palm Oil Educational Roadshow @ UPM 2023: Spreading Knowledge organized by UPM-Chemical Engineering Student Society (ChESS), this roadshow, co-organized with POPSIG and MPOC, continued the mission of educating pre-university students about the crucial roles of chemical engineers within the palm oil industry and their contribution to SDGs. This program also delved into practical applications such as life cycle analysis, circular economy principles, wildlife management, and social impacts, all within the context of sustainable palm oil processing.

Several educational visits were organized in collaboration with industry partners. UPM-ChESS students had the opportunity to visit the Malaysian Palm Oil Board (MPOB) and the Sime Darby Plantation Palm Oil Experience Centre. These visits provided students with firsthand insights into the workings of the palm oil industry, enhancing their knowledge and awareness.

The IChemE Student Chapter Festival 2023, jointly organized by IChemE-UM Student Chapter and IChemE-UCSI Student Chapter, with support from POPSIG and MPOC, aimed to strengthen bonds among IChemE Student Chapters and foster connections with industrial companies. This event served as a valuable platform to gain insights into the processing and manufacturing industry, understand the roles of chemical engineers, and facilitate the exchange of knowledge, ideas, and experiences.

In closing, we extend our heartfelt congratulations to Yang Berusaha Belvinder Kaur Sron on her new role as Chief Executive Officer of the Malaysian Palm Oil Council, and to YBhg Dato' Dr. Suzana Idayu Wati Osman. Their leadership and dedication continue to inspire us all.

We hope you find this newsletter both informative and inspiring as we strive to promote excellence in the palm oil industry and the field of chemical engineering.

POPSIG gratefully acknowledges our sponsors




## Roadshow MPOC CEO Day @ UKM

The CEO Day @ UKM event, jointly organized by the Malaysian Palm Oil Council (MPOC) and the Department of Food Sciences, Faculty of Science & Technology (FST), Universiti Kebangsaan Malaysia (UKM), provided an enriching platform for students to connect with industry leaders and explore career and internship opportunities. The key highlights of the event are the opening ceremony, CEO forum, and POPSIG exhibition.

During the opening ceremony, the CEO Day began with an official inauguration at Dewan Canselor Tun Abdul Razak (DECTAR), UKM, with YBhg. Datuk Dr. Ahmad Parveez Haji Ghulam Kadir, Director General of the Malaysian Palm Oil Board (MPOB), as the guest of honor. Joining him on stage were YBrs. Pn. Belvinder Sron, Acting CEO of MPOC, and Professor Dr. Norhamidi Muhamad, Pro Naib Canselor (Development and Infrastructure) of UKM.

The CEO Forum, chaired by YBrs. Dr. Ruslan Abdullah from MPOC, featured a panel of industry experts, including the YBrs. En. Joseph Tek Choon Yee, CEO of Malaysian Palm Oil Association (MPOA); YBhg. Professor Datin Paduka Dr. Khatijah Yusof, Professor at UPM; Tn. Hj. Burhanuddin Md. Radzi, Managing Director of Les' Opaque; Pn. Hasfahlinda Binti Mohamed Hassan, Group Chief Marketing Officer of Domino's Pizza Malaysia, Singapore & Cambodia; and En. Rodney Wong Kai Heng, CEO of Munch World Marketing Sdn Bhd.

The Palm Oil Sustainability Interest Group (POPSIG) booth welcomed over 300 visitors and showcased upcoming activities for 2023, offering attractive prizes sponsored by MPOC to students. POPSIG expressed its commitment to collaborate with various stakeholders, including MPOB, MPOGCF, FGV, UKM-YSD, and KLK, in upcoming engagements. POPSIG acknowledged Desmet Malaysia Sdn Bhd as a strong partner and recognized the contributions of Endress+Hauser (Malaysia) Sdn Bhd to POPSIG activities in 2021 and 2022.

For the Sustainable Product Innovation from Palm Waste Competition, YBhg. Professor The Chair Professor Ir Dr. Chong Mei Fong was invited to evaluate the candidates in the Sustainable Product Innovation from Palm Waste competition. POPSIG and YBhg. Professor The Chair expressed congratulations to all winners and participants for their outstanding work.

The success of the event was attributed to the efforts of the exhibition project team, which included Professor Chong Mei Fong, Oscar Ting Teo Wei, Ng Wai Lun, Kek Ming Xuan, Hemavathi Silvamany, Dennis Tang Boon Yong, Melvin Wee Xin Jie, Cheah He Ming, Dr. Chew Juan Jing, and Dr. Wendy Ng Pei Qin.

The event organizers expressed their gratitude to Yeow Teck Ann, Jocelyn Lim Jean Yi, and Andersson T'ng from Xiamen University Malaysia for their valuable assistance.





## Roadshow National Chemical Engineering Exposure Camp (NCEEC) 2023

National Chemical Engineering Exposure Camp (NCEEC) 2023 was organised by IChemE-UM Student Chapter, recognised by the Ministry of Education (MOE/KPM) Malaysia and partnered with IChemE's Palm Oil Processing Special Interest Group (POPSIG), in conjunction with Malaysian Palm Oil Council (MPOC).

The programme aimed to facilitate the exposure of pre-university students to Chemical Engineering course, profession and IChemE-UMSC.

The objectives for pre-university students at CEO Day @ UKM encompass enlightening them about the pivotal roles of chemical engineers within the palm oil industry, highlighting the industry's positive impact on UN Sustainable Development Goals (SDGs), particularly SDG3, SDG7, SDG8, SDG12, and SDG13. Additionally, the event aims to nurture leadership skills among these students and deepen their understanding of sustainable palm oil processing, emphasizing the industry's commitment to responsible and environmentally friendly practices.

During the CEO Day @ UKM event, Professor Ir Dr Abdul Aziz bin Abdul Rahman, a Professor in the Department of Chemical Engineering at Universiti Malaya, emphasized the significance of chemical engineering in everyday life, stressing that it encompasses more than just chemistry. He hoped that the program would help students gain a better understanding of the chemical engineering sector. Saw Xukai, the President of IChemE-Universiti Malaya Student Chapter for 2022-2023, expressed gratitude to the participants for attending the event and highlighted its value in providing an overview of chemical engineering as both a degree and a profession. He wished all participants a fruitful and enjoyable experience, aiming for them to gain valuable insights during the two-day event.

During the POPSIG session titled "The Secret of the Palm Oil Wonderland," Hemavathi Silvamany, Senior Engineer at Sime Darby Plantation Research Sdn Bhd, provided participants with insights into the upstream and downstream operations of Sime Darby Plantation Berhad. She emphasized the growing global demand for vegetable oils, projecting a 60% increase by 2050, with Malaysia contributing significantly as it exported about 31% of the world's palm oil in 2022. Hemavathi stressed the importance of sustainable palm oil production in addressing various Sustainable Development Goals (SDGs), such as poverty reduction, affordable food, biodiversity conservation, and social interests. Palm oil's indispensable role in feeding billions globally was highlighted, with an expected 55% share in global edible oil consumption by 2050. She underscored the vital role of chemical engineers in enhancing sustainability, safety, and oil extraction processes in the palm oil industry, aligning with sustainability and environmental optimization principles.



## Roadshow: POPSIG-MPOC Palm Oil Educational Roadshow @ UPM 2023

POPSIG-MPOC Palm Oil Educational Roadshow @ UPM 2023 was organised by UPM-Chemical Engineering Student Society (ChESS). The event was co-organised by Palm Oil Processing Special Interest Group (POPSIG), in conjunction with Malaysian Palm Oil Council (MPOC).

The objectives set for pre-university students at POPSIG-MPOC Palm Oil Educational Roadshow is to encompass providing them with insights into the pivotal roles of chemical engineers within the palm oil industry and fostering an understanding of the industry's significant contributions to the United Nations Sustainable Development Goals (SDGs), specifically focusing on SDG3 (Good Health and Well-being), SDG7 (Affordable and Clean Energy), SDG8 (Decent Work and Economic Growth), SDG12 (Responsible Consumption and Production), and SDG13 (Climate Action). Additionally, the event aims to educate students about the practical applications of life cycle analysis, circular economy principles, wildlife management, and social impacts in the context of a sustainable palm oil industry. Furthermore, the program seeks to nurture leadership skills among pre-university students and deepen their comprehension of sustainable palm oil processing methods within the industry.

During the opening speeches at the POPSIG-MPOC Palm Oil Educational Roadshow, Professor Dr. Robiah Binti Yunus from Universiti Putra Malaysia warmly welcomed the event's guests and expressed her hope that the students would enrich their knowledge through the program. President Wong Zhong Han, President of UPM-Chemical Engineering Student Society 2022-2023, highlighted the vital role of palm oil in achieving the United Nations' Sustainable Development Goals (SDGs), emphasizing its contributions to poverty alleviation, zero hunger, clean energy, and climate protection. He envisioned the roadshow as a platform to explore and comprehend the palm oil industry, inspiring UPM students to consider careers within it while contributing to its sustainability. President Wong also anticipated that the event would foster stronger academic-industry ties, potentially leading to new partnerships and collaborations, marking a significant milestone as the first physical POPSIG-MPOC Palm Oil Educational Roadshow after the pandemic.

For the keynote presentations, Dr Vijaya Subramaniam (MPOB) underlined that Malaysia was the second largest export country of palm oil. She described that BOD5 level of palm oil waste was very high. She briefed on the production line of palm oil. Life cycle sustainability assessment (LCSA) referred to the evaluation of all environmental, social and economic positive and negative impacts, as well as benefits in decision-making processes towards more sustainable products throughout their life cycle.

Mr Tan Chee Yong (MPOCC) described MSPO Principle 4: social responsibility, health, safety employment conditions. He presented the improved handling and storage of chemicals, improved estate fertiliser store. He discussed employees' safety and health, employment conditions, and living conditions. He shared to the students about the job opportunities in the sustainable palm oil industry, for example, sustainability officer, auditor, consultant and subject matter expert.

YBrs Professor Ir Dr Denny Ng (ARPOS/Sunway University) presented the integrated biorefinery where biomass can be used for combined heat and power (CHP) via thermal chemical pathway and biological pathway. The circular economy model optimises the value chain based on carbon emissions, waste generation, profitability and social aspects.

For the Teh-Tarik session, Mr Zamakhshari Muhamad (MPOGCF) and Ir Dr Calvin Chok Vui Soon (KLK OLEO) joined the panel to share the opinions and suggestions to the students. During the student-panel exchange, seven participants involved in the panel discussion, namely: Wong Zhong Han, Koo Zhun Wai, Tan Pei Sing, Tay Rui Era, Wan Nur Atikah Bt Wan Md Jalal Azmi, Al hajri Hedaya Ibrahim Said Hilal and Chiew Weng Lam.

The following topics were raised by the participants are the challenges faced by the small farmers in adopting the advanced technology to improve their operations, roles of AI in chemical engineering, land of use change, and regional ban on palm oil in biofuel, similarity between palm oil and oil and gas industries, and the influencing stakeholders.



Figure 1: From left to right: Ir Dr Calvin Chok Vui Soon (Technology Manager at KLK Oleomas Sdn Bhd), Dr Vijaya Subramaniam (Head of Peat Ecosystem and Biodiversity Unit, Biology and Sustainability Division, MPOB), YBrs Professor Ir Dr Denny Ng (Chair of ARPOS, Dean and Professor in the School of Engineering and Technology at Sunway University), Mr Tan Chee Yong (Manager, Technical Outreach and Extension Service Unit, MPOCC), Mr Zamakhshari Muhamad (General Manager of MPOGCF).



## Event: UPM-ChESS Visited MPOB

On 20 March 2023, a group of UPM Chemical Engineering Student Society (UPM-ChESS) visited Malaysian Palm Oil Board (MPOB) in Bandar Baru Bangi, Selangor from 9:30am to 11:00am MYT under POPSIG-MPOB technical collaboration. The event recorded 35 participants.

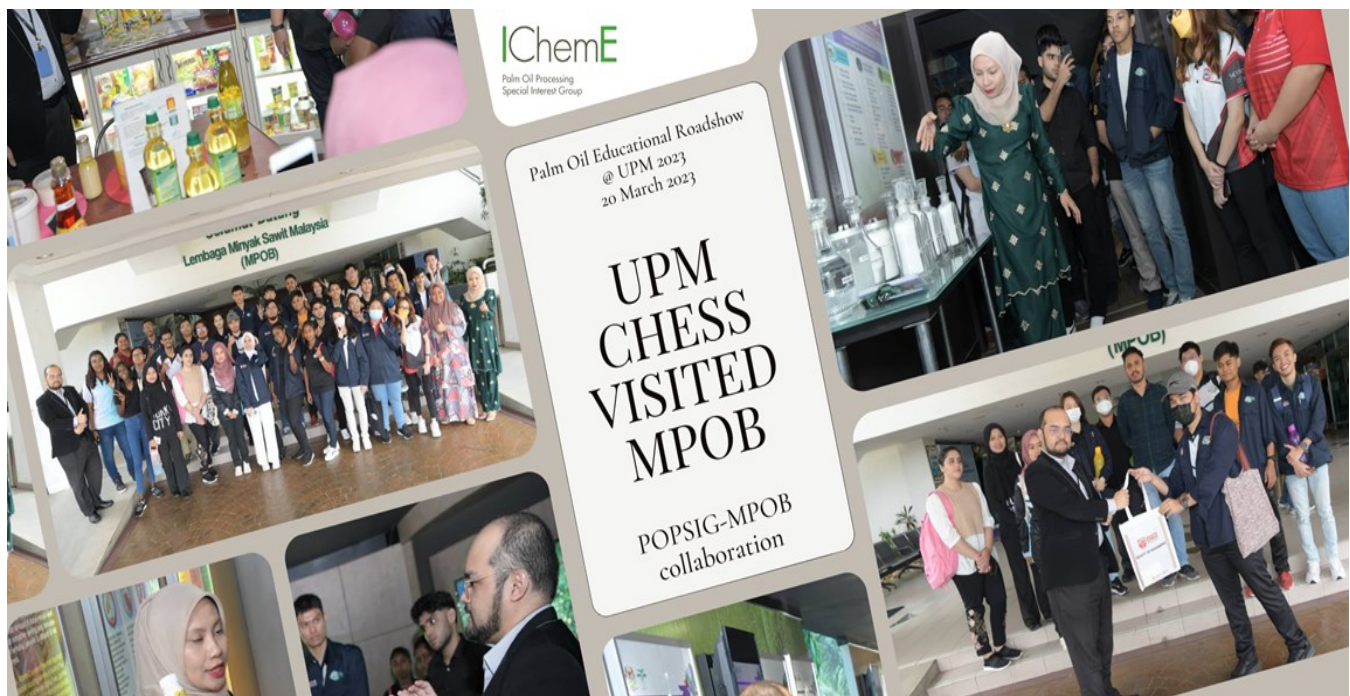
During the visit, Ms Asliza Semiran gave the visitors a tour of the palm oil gallery. Ms Asliza introduced the history of the palm oil industry in Malaysia. The gallery was occupied with the replica and instruments used to get palm oil starting from forest cleaning to planting the seed until harvesting the crop. The visitors observed the real instruments used by the ancestor which were displayed in the gallery.

The visitors experienced sensory learning to touch and smell the crude before and after it went through the refinery process from crude oil (CPO) to palm fatty acid distillate (PFAD) to RBD palm oil (RPO) to RBD palm stearin (RPS) until the effluent RBD palm olein (RPOL) was produced.

Through video animation, the students understood the values of the oil palm tree in the daily life as value-added products. The tour demonstrated that the palm oil industry implemented zero-waste management.

The participants were informed about the marketing strategies in the palm oil industry as palm oil needs to compete with other cooking oil including canola and sunflower oil which are well-known in the non-Asian market. The data on the exported palm oil to other countries across the globe were also analysed during the visit.

Throughout the visit, the students showed their interest in the palm oil industry and grabbed the opportunity to ask questions in order to enhance their understanding of the palm oil industry.





## Event: UPM-ChESS Visited Sime Darby Plantation Centre of Sustainability

On 20 March 2023, a group of UPM Chemical Engineering Student Society (UPM-ChESS) visited the Sime Darby Plantation Palm Oil Experience Centre, Centre of Sustainability in Carey Island from 10:00am to 1:00pm MYT. The event recorded 30 participants.

The group was joined by Yang Berbahagia Associate Professor Datin Ir Dr Siti Aslina Hussain (Associate Professor at UPM), Associate Professor Dr Norhafizah binti Abdullah (Associate Professor at UPM) and Dr Mohamad Syazarudin bin Mohd Said (Senior Lecturer at UPM). The tour was led by Mr Ezzaruddin Abdul Rapar from Sime Darby Plantation.

During the visit, the students learned that it is important to choose the appropriate cooking oil for different type of food. Palm oil has a high burning point and is ideal for deep frying. The group learned that oil palm is unique because it is classified as monoecious, bearing both male and female inflorescences on the same palm in different but overlapping cycles. The oil palm is considered ripe and ready for harvesting when the fruits turn red and have around 10 fruit drops.

The students were also impressed to see the rapid evolution of technology in the palm oil industry, such as the use of crane grabbers to increase efficiency and maximize yield. Overall, it was a fruitful and beneficial experience to the group of visitors.

POPSIG gratefully acknowledges the support provided by Malaysian Palm Oil Council (MPOC) to POPSIG-MPOC Palm Oil Educational Roadshow. POPSIG gratefully appreciated the event organisation by Sime Darby Plantation Ecogardens Sdn Bhd.



Figure 1: Associate Professor Dr. Norhafizah binti Abdullah presented a Token of Appreciation to the tour leader Mr Ezzaruddin Abdul Rapar (SDP). The presentation was joined by Yang Berbahagia Associate Professor Datin Ir Dr Siti Aslina Hussain.

## Event: IChemE Student Chapter Festival 2023

The IChemE Student Chapter Festival 2023, jointly organized by IChemE-UM Student Chapter and IChemE-UCSI Student Chapter, with support from IChemE's Palm Oil Processing Special Interest Group (POPSIG) and the Malaysian Palm Oil Council (MPOC), commenced at Auditorium 1, Block U, Faculty of Engineering, Universiti Malaya. The event served as a platform to strengthen the bonds among IChemE Student Chapters and bridge connections with industrial companies. It aimed to provide participants with insights into the processing and manufacturing industry, shed light on the roles and responsibilities of chemical engineers, and facilitate the exchange of knowledge, ideas, and experiences.

**POPSIG Roundtable Discussion:** As part of the festival, a POPSIG Roundtable Discussion was conducted to delve into the manufacturing processes in the palm oil industry and understand its contributions to the United Nations Sustainable Development Goals (UN SDGs). The discussion also focused on identifying environmental, social, and governance (ESG) challenges and opportunities in the Malaysian palm oil sector. It provided a valuable platform for students and professionals to exchange views and suggestions.

**Sharing Session:** During the festival, speakers shared their expertise and insights. Professor Ir Dr. Denny Ng highlighted the integrated applications of resources across multiple industries. Mr. Hee Chen Siang emphasized the provision of renewable energy solutions with reduced utilities for the industry, emphasizing innovative integration for enhanced energy efficiencies. Mr. Dennis Tang Boon Yong discussed waste oil recycling and its conversion into renewable fuel feedstock. Professor DDR Lam Hon Loong presented the circular economy life cycle framework for the palm oil industry, explaining industry commitments, governmental policies, life cycle analysis, and lean and green analyses.

**President's and Director's Addresses:** President Saw Xukai expressed his delight that the IChemE Student Chapter Festival was organized both physically and virtually in 2023, fostering connections among students from various universities and promoting the goals of the chemical engineering community. Director Ms. Ng Xin Tong conveyed her gratitude to all contributors for the event's success. She highlighted the insightful simulation workshops, engaging roundtable discussions, bonding sessions, and idea presentation competitions on Day 1. Day 2 featured a virtual factory tour and an enlightening industrial talk session, contributing to a more sustainable and innovative future for the field of chemical engineering.



Figure 1. Group photo (1st left); participants of the forum (top right); panel discussion (bottom, 2nd right); presentation of tokens of appreciation to the panellists (bottom, 1st right).

## Webinar: Conversion of Glycerol into 1,3-Propanediol and Biomass into Value-added Products

In this webinar, Dr Tan Jian Ping an academic staff of Chemical Engineering Department for School of Energy and Chemical Engineering, Xiamen University Malaysia discussed on the conversion of glycerol from biodiesel into 1,3-propanediol and palm oil based biomass into value-added products. This research is relevant to SDG 11 (Sustainable City and Community), SDG 12 (Responsible Consumption and Production), and SDG 13 Climate Change and Adaptation. The speakers had highlighted on the circular bio-economy and provided some samples biorefinery model which shows the integration biomass, biofuels, biomaterials and bioenergy cycle, based on green and sustainable technologies in the scope bio economy and circular economy leading to a new manufacturing paradigm.

Besides that, he also talked on the role of the industrial biotechnology and industrial biotechnology. It was mentioned that the industrial biotechnologies with a high probability of reaching the market by 2030. Industrial biotechnology is advancing rapidly, with a focus on improving enzymes for various chemical applications and enhancing micro-organisms for the production of a growing range of chemical products. This progress often involves genes discovered through bioprospecting. Additionally, the field is seeing the development of biosensors for monitoring environmental pollutants and biometric systems for identification. High energy-density biofuels sourced from sugar cane and cellulosic biomass are being refined, while biomaterials like bioplastics are gaining a larger market share, particularly in specialized niches where they offer advantages. Industrial biotechnology is considered the third wave of biotech, distinct from medical and agricultural biotechnology. By 2030, it is projected to account for 39% of the economic value generated by biotechnology, reflecting significant investments in research and development in this sector.

The speaker highlights research efforts in Malaysia focused on converting oil palm biomass into high-value chemicals. While Malaysia currently emphasizes low-tech applications like animal feeding and pellet production, the potential for producing fine chemicals from palm oil and agricultural waste remains largely untapped. The global market forecast for 1,3-propanediol (PDO), a key chemical, shows substantial growth, with a Compound Annual Growth Rate (CAGR) of 14.2%. North America leads in PDO consumption due to favorable regulations, while Asia-Pacific and Central/South America are expected to experience the highest growth rates. However, second-generation feedstocks for chemical production face challenges, including high investment requirements and capital costs significantly higher than first-generation feedstock plants.

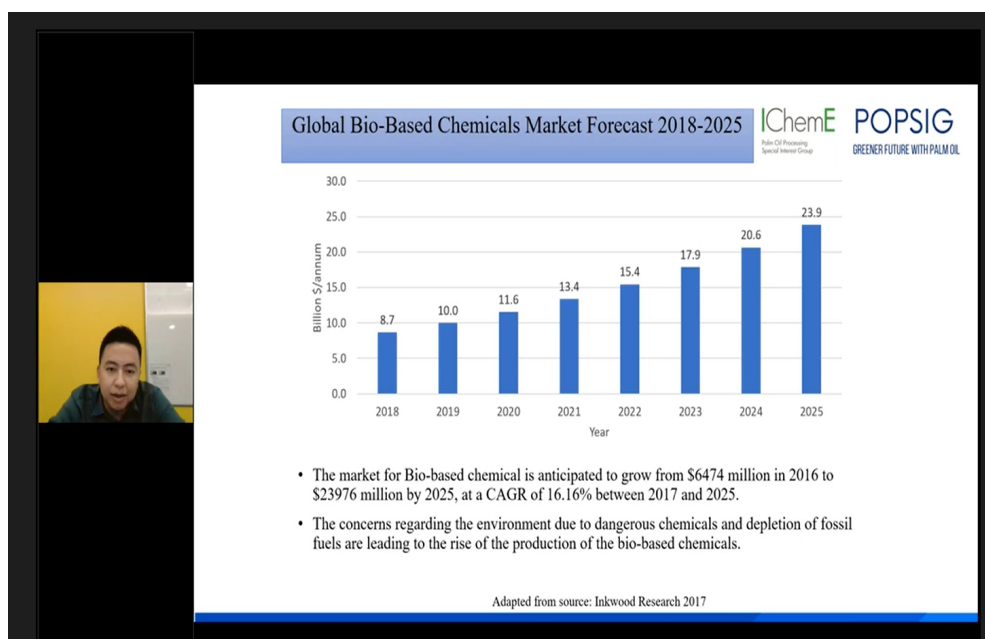


Figure 1: Dr Tan shared on the global bio-based chemicals market forecast from 2018 to 2025.



## Webinar: The Role of Sustainable Palm Oil in Protecting Biodiversity and Ecosystems

In this webinar, Ms Michelle Desilets, Executive Director of Orangutan Land Trust, United Kingdom shared the function of the Orangutan Land Trust to protect biodiversity particularly on the various plant and animal life on Earth. She explained the meaning of sustainability and the triple bottom line principles. The triple bottom line refers to planet related to environmental issues, prosperity related to economic issues, and people related to social issues. This Orangutan Land Trust is also the proud members to the Roundtable on Sustainable Palm Oil (RSPO). In this RSPO, it is categories under prosperity, people and plant impact goal. Each impact goal are associated to the respective principles. The RSPO plays a crucial role in the conservation of orangutan habitats through its sustainability standards for palm oil production. These standards aim to mitigate the environmental and social impacts of palm oil cultivation, including deforestation and habitat destruction, which are major threats to orangutans in regions where palm oil is produced. The Orangutan Land Trust, on the other hand, is an organization dedicated to the protection and conservation of orangutans and their habitats.

The importance of the RSPO's collaboration with the Orangutan Land Trust lies in their combined efforts to promote sustainable palm oil practices. By adhering to RSPO standards, palm oil producers can reduce their environmental footprint, protect orangutan habitats, and support biodiversity conservation. This partnership helps ensure that palm oil production coexists with the preservation of critical orangutan landscapes, thus contributing to the long-term survival of this endangered species.

In essence, the RSPO and the Orangutan Land Trust work together to address the ecological and ethical challenges associated with palm oil production, striving to strike a balance between economic interests and the protection of orangutan populations and their habitats.



Figure 1: Orangutan Land Trust is linked to the RSPO.



Figure 2: RSPO Impact Report for year 2022.

## Article: The Palm Oil Industry: A Dilemma

Written by Ooi Yun Sheng  
(Universiti Putra Malaysia)

It is declared most decidedly, and agreed most readily, that the palm oil industry, lucrative though it is, has but one fatal drawback, which is its being associated with wilderness and seclusion. Hence, one who works in that industry must befriend solitude, and enjoy the company of wild animals typical of tropical countries such as Malaysia, so as not to distress oneself too much. Besides, treading on muddy ground sweating profusely is a strenuous task that requires exceedingly much physical exertion, and must be unfit for those who are highly educated! Working in the palm oil industry seems no different from being a zoologist or a botanist, for all of them work in forests and deal with plants – a conclusion easily drawn by a great many uncles and aunts. Besides, it is not uncommon to see issues related to that industry such as loss of biodiversity, deforestation, exploitation of workers and the like sprinkled all over the pages of a newspaper. Those issues are addressed in the UN Sustainable Development Goals (SDGs), and, therefore, cannot be overlooked. Such prejudices and concerns, whether true or false, are widely circulated in our society and contribute to people's reluctance in engaging with that industry. However, the palm oil industry is not without its merits, which render it one of the most important and indispensable industries in Malaysia, for its economic contributions are significant, and its versatility, which allows it to take the shapes of food, cosmetics, medicines and biodiesel, is commendable. Therefore, the palm oil industry presents one with a challenging dilemma as one grapples with the question of whether the substantial efforts required in its development are justifiable, considering both its undeniable importance, the pressing issues it faces, and the pervasive prejudices surrounding it.

It is helpful to attempt a description of the impacts brought by the development of a palm oil plantation. Through the trees and flowers and rivers, where the animals – tigers, tapirs, snakes – dwell, the breeze breathes, bringing with it the fragrance of flowers, the earthy smell of mud, and the murmur of waters. Therein harmony prevails, and diversity rules. But one day a bulldozer invades the wood, crushing whatever that lies in its way, and leaving in its wake land wasted and trodden. The rightful inmates of the forest are chased away elsewhere, 'to some other safer and better place,' as they put it. Hence oil palm trees and mills stand erect where the trees stood, odours of fertilizers and pesticides fill where the perfumed breeze breathed, and homogeneity reigns in place of diversity. From this short description a few points could be made: a palm oil plantation is not as diverse as a typical rainforest; the animals living in a palm oil plantation are not the same as those living in a rainforest; a palm oil plantation is less natural than a rainforest. These points are not without support and verification, for according to Sakai, Hassan, Vairappan, and Shirai (2022), "Deforestation due to the expansion of oil palm plantations has resulted in increasingly simplified tropical forests in terms of their structures and species compositions" (p. 420). Hence it seems that the palm oil industry brings nothing but destruction, and must be banished straight off. However, this is not the case, for in the same journal another statement has come to its rescue: "Palm oil is a representative and im-

portant biomass, not only as the most edible vegetable oil consumed worldwide, but also as a material for chemicals and biofuels." (Sakai, Hassan, Vairappan, & Shirai, 2022, p. 414). This indeed, compels one to give the abandonment of the palm oil industry a second thought.

To begin with, one should invoke the help of a statement of impartial statistics, by Subramaniam, Choo, Muhammad, Hashim, Tan, and Puah (2010), "In 2009 alone, the total exports of oil palm products, constituting palm oil, palm kernel oil, palm kernel cake, oleochemicals and finished products, amounted to 22.40 million tonnes, resulting in total export earnings of RM 49.59 billion" (p. 895). It is with this indisputable proof that one is able to assert that the palm oil industry contributes significantly to the economy of Malaysia. But here another dilemma arises, for indeed, RM 49.59 billion and 22.40 million tonnes are figures so staggering in size that one could not help suspecting that behind those numbers, cold and intricate machinery exists, which effectively turns labours of exploited workers into million tonnes of products, and million tonnes of products into billions of ringgits. A groundless suspicion it is not, for according to the International Labour Organization, "281 million workers live in extreme poverty in developing countries such as China, India, Malaysia, and Thailand." Picture then, the palm oil plantation as a machine newly built in place of the forest – the processing facilities are its heart, the masses of oil palm trees its body cells, the pathways stretching through the trees its veins, and the workers harvesting palm fruits its blood cells. The blood cells, tired from being constantly on the move, retire to their lodgings in some remote corner, which are declared to be well supplied with electricity and water. At the end of each month, they are awarded with wages which, having been shared with their wives and children, should be able to sustain those who are thrifty enough. However, the reality often paints a different picture, for the lodgings are often plagued by intermittent power and water supply, and the wages can hardly cover their basic needs.

In reply to one's indignation for the forest and workers, Subramaniam, Choo, Muhammad, Hashim, Tan, and Puah (2010) state that, "The world is demanding for economic growth, yet this growth must be achieved through environmental conservation while enhancing the quality of human life" (p. 896). Hence in support of the statement, a great many solutions suggest themselves. As an example, Sakai, Hassan, Vairappan, and Shirai (2022) declare that, "In the aim to establish a green bioeconomy, in addition to optimization and using the best biorefinery systems, it is also necessary to consider the total utilization process of biomass (including all waste materials) to minimize the environmental burden." (p. 417). Besides, on 15th July 2021 the Malaysian Palm Oil Board (MPOB) also chimed in by ordering the palm oil mill in Ulu Keratong, which had caused river pollution, to stop operating immediately. IOI Corp, the Malaysian palm oil company, could not tolerate labour abuse either, and had their labour policies and working conditions evaluated, as reported by Reuters on 29th June 2021, following a report published by human rights group Finnwatch, which accused them of mis-

treating workers. Indeed, all these actions suggest promising changes for the palm oil industry. But at second sight things seem not so simple. More questions follow the suggested solutions: How can one ensure that the best biorefinery systems, which are without a doubt expensive, are purchased? How can one ensure that the new regulations implemented by a company to protect its workers' welfare are complied with? Will the workers, who are generally illiterate and deprived of information, know their rights and dare to speak up when abused or mistreated? A company could have educated their workers, but will it put an end to labour abuse when they themselves are so afraid of losing their jobs that they are willing to quietly submit to mistreatment by their superiors? After all, is abuse and mistreatment non-existent in educated societies? More solutions will be given, but more questions will also follow, and the loop seems never-ending.

One who lives in this non-ideal world but nevertheless wishes to improve it must, as reasoned by the above paragraphs, face the dilemma inflicted by the palm oil industry. On the one hand, it improves life by making our country more prosperous, producing useful products and providing working opportunities for many. On the other hand, it seems to make life more miserable: trees are felled and rivers polluted on its account; workers suffer labour abuse and mistreatment; and animals are killed or moved to other places when the palm oil companies take over their habitats. However, it is due to humanity and appreciation for life that one is determined to continue giving solutions, suggesting ideas, and making improvements, so as to make the palm oil industry more sustainable. The dilemma could be easily resolved if compassion for all lives drives the development of the palm oil industry instead of greed and anger.

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# Article: Sustainable Palm Oil Production: Alleviating Carbon Footprint & Safeguarding Biodiversity

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Being the most popularly used vegetable oil in the world, palm oil (*Elaeis Guineensis*) is extracted from fruits of palm oil trees. Temperature ranged between 24°C to 32°C with evenly distributed rainfall and sunshine are favoured for optimum growth of palm oil trees. Palm oil are preferred over the world mainly due to few characteristics, including healthier fats, affordable price and great adaptability. According to the researches, a palm oil tree is capable to produce 40kg of palm oil annually with 30% to 35% of oil per palm fruit [1]. It is also able to produce four to nine times more oil per hectare than any other oil crop [2]. For five decades, the global production of palm oil has been escalating, in which its annual production was quadrupled from 15.2M tonnes to 62.6M tonnes between 1995 and 2015. Additionally, it is expected to be quadrupled until 240M tonnes by year 2050 [3]. On the other hand, the palm oil consumption worldwide increased gradually from 59.378M tonnes to 76.039M tonnes between 2015/2016 and 2022/2023 as shown in Figure 1, showing its great potential in research and development and substantial role in global economy [4]. Undeniably, sustainable palm oil plantation always cannot be neglected since it accounts for 10% of global permanent cropland with average 8kg of palm oil consumption per capita per year [3]. In terms sustainability, it is recommended when compared with other kinds of plantations because it could alleviate carbon footprint and safeguard biodiversity significantly, which have been proved through Roundtable on Sustainable Palm Oil (RSPO) and Malaysia Sustainable Palm Oil (MSPO) certifications.

Firstly, low carbon agriculture has always been emphasized in modern agricultural development to reduce the impacts of climate change. Its assessment typically involves the methodical analysis of direct and indirect carbon emissions resulting from agricultural activities that may contribute to greenhouse effects. It is usually calculated and analysed by using Life Cycle Analysis [5]. Due to the land-use-changes from natural forests to tropical plantations, conventional palm oil plantations have been widely criticized to cause adverse environmental concerns. Specifically, emission of greenhouse gases resulted from deforestation and alteration in carbon stocks resulted from drainage of peatland, leading to the increment in carbon footprint. Besides, biodiversity loss also occurred, which is caused by forest fires. [6]. According to researches, the conversion of rainforest and peatland to oil palm plantations brings an estimated emission of 163 tonnes and 1550 tonnes of carbon per hectare of land to the atmosphere [7]. Moreover, deforestation for the purpose of palm oil plantation has also dislocated wildlife and local communities depending on the natural resources for livelihood, sustenance, and traditions [8]. This in turn exhibits the adverse impacts brought by conventional palm oil production.

Hence, sustainable palm oil plantation is encouraged by RSPO to create a balance and mutual benefits between palm oil cultivation and environment preservation through the concepts and principles illustrated in Figure 2 [9, 10]. Mandatory RSPO prohibits the oil palm growers from clearing any forests with high conservation value and high carbon stock for planta-

tions. High conservation value is defined as biological, ecological, social or cultural values that are critically significant or important nationally, regionally, and globally [11]. Meanwhile, forests with high carbon stock mean forests area with huge storage of carbon and biodiversity [12]. Furthermore, growing oil palms in peat-rich soil is also restrained since draining of peatlands generates carbon dioxide and possesses high fire risks [8]. Instead, for carbon footprint reduction purpose, they bear the responsibility to protect and enhance palm oil plantation according to the standards in order to be certified by RSPO. They also need to avoid illegal hunting, conserve wildlife corridors, and enhance forest connectivity for biodiversity enhancement and ecosystem conservation purposes [6].

According to an extensive study, RSPO Certified Palm Oil results in 35% lower climate change impact compared to non-certified palm oil mainly due to the decline in greenhouse gases emission [8]. As an evidence, in Table 1, in overall, RSPO certified palm oil shows a lower greenhouse gases emission as compared to non-certified palm oil [6]. Since tropical forests store around six times more volume of carbon than oil palm plantation, by avoiding deforestation and land conversion, the carbon emission could be limited [8]. Moreover, RSPO compliance also lessened the plantation-level and mill emissions by 21% and 97% respectively [7]. For instance, the certified sustainable palm oil only has the average CO<sub>2</sub> emission of 0.45 tonnes per tonne oil as compared to rapeseed with 2.47 tonnes and sunflower with 1.18 tonnes [13]. On the other hand, it also protects the biodiversity or ecosystems through the enforced environmental and social criteria. As found in the data, the High Conservation Value area under the management of RSPO increased by 21%, with a total of 189,777 hectares identified from 2016 to 2017 [14].

Going into MSPO certification scheme, its objective is to create, maintain and administer a fund to be used for establishing and operating a sustainable palm oil certification scheme in Malaysia [15]. Palm oil is definitely one of the current focusing sectors of research and development in Malaysia as proved in the data, in which it accounts for 13.7% of gross national income [3]. In palm oil sector, Malaysia accounts for 25.8% and 34.3% of global production and exports respectively by year 2020 [16]. The crude palm oil production and export are also forecasted to increase to 19M tonnes and 16.3M tonnes in 2023, from 18.45M and 15.72M tonnes in 2022 [17]. It is mandatory for all oil palm growers in order to comply with the environmental conservation and protection. Other than that, for smallholders, with the sustainable management practice, the quality and revenues of palm fruits could also be boosted [18]. Through MSPO, it aims to achieve net zero carbon emission by year 2040 by transforming palm oil industry towards sustainability through the implementation of principles in Figure 3 [2, 13, 19]. It is aligned with the 12th Malaysia Plan, which plans to create a low carbon and climate resilient economy [13]. For examples, in order to conserve biodiversity, planting of new oil palms in peatlands and natural forests are prohibited. For the sake of low carbon footprint, high carbon stock areas will also be protected [2].

Through mandatory MSPO certification, the critical issues on high carbon footprint and biodiversity loss could be solved. Data shows that until September 2022, 5,638,996 hectares of palm oil areas and 461 mills are certified under MSPO, which is equivalent to 98.28% and 98.93% respectively, showing a great commitment and efforts invested by MSPO in achieving palm oil sustainability since palm oil occupies a big portion of Malaysia's economic sector [2]. According to the researches, palm oil produced through MSPO only has average emissions of 0.38 MT CO<sub>2</sub>eq/MT, which is lower than soy (2.89), rapeseed (2.47), and sunflower (1.18) [20]. Ergo, palm oil production at this new era are on its way towards sustainability. Through the sustainable production of palm oil, issues on carbon footprint and biodiversity are no longer the serious issues as compared to other plantations. Sustainable palm oil production offers numerous benefits, such as increased yields, reduced cultivation on peatland, and improved conservation and preservation of nature [6].

The rapid development of palm oil industry has brought a comprehensive research on its compliance towards United Nation Sustainable Development Goals (SDGs) in Figure 4. By reducing greenhouse gases emission through low carbon footprint enforcement, palm oil production is capable to achieve SDG3 – Good Health and Well Being. In addition, it also achieves SDG12 – Responsible Consumption and Production since it guarantees the biodiversity and ecosystem preservation. Next, it is the SDG13 – Climate Change. Palm oil production generates lesser greenhouse gases as compared with other oil crops, which alleviates the unfavourable environmental concerns. Last but not least, it is SDG15 – Life on Land. By producing sustainable palm oil, deforestation is avoided to create a balance between human and wildlife,

avoiding biodiversity loss [21]. Other than that, Environmental, Social, Governance (ESG) aspects as in Figure 5 could also be achieved through sustainable palm oil. It primarily achieves environmental aspects in terms of biodiversity loss, climate change, reduced carbon emissions, deforestation and pollution by reducing carbon footprint and protecting biodiversity. Besides, for social aspect, health and safety of public are guaranteed through reduced greenhouse gases emissions. Lastly, for governance aspect, it achieves accountability by producing certified sustainable palm oil [22]. Through RSPO and MSPO, palm oil industry grows exponentially due to its limitless potential and benefits, as in accordance with the three pillars (3Ps) of sustainability – people, planet and profit in Figure 6 [23].

In conclusion, effective transformations are employed in plenty parts of palm oil production in order to achieve profitability and sustainability in palm oil sector simultaneously. Palm oil plantations nowadays implied sustainability from all aspects in order to connect people and life. Hence, the misperception on conventional palm oil should be corrected so that more people can be benefitted from it. Efforts from every side could be incorporated to educate public on the advantages and importance of palm oil.

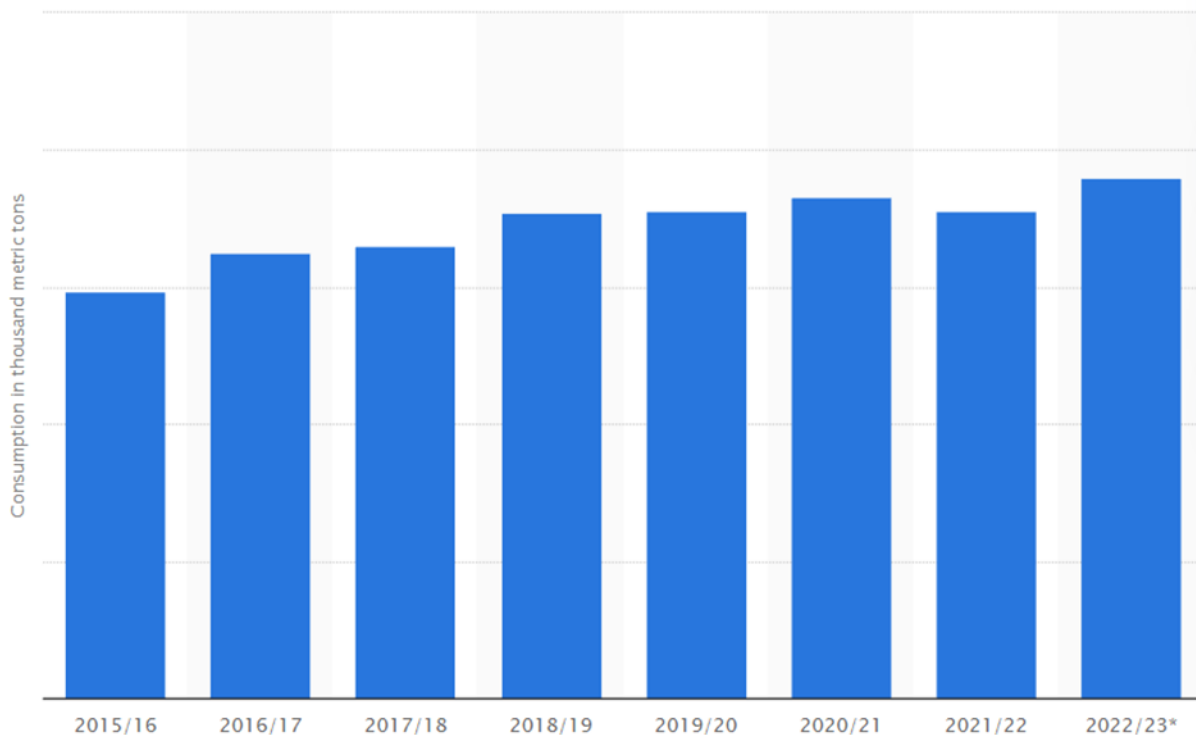


Figure 1. Palm Oil Consumption Worldwide from Term 2015/2016 to 2022/2023 [4]

Table 1: Sensitivity Analysis for Greenhouse Gases Emission between RSPO Certified and Non-Certified Palm Oil [6]

Investigated parameter	RSPO certified	Non-certified
<b>A) Carbon stock in nature conservation</b>		
<b>Default:</b> 165tC/ha	3.41	5.34
Low carbon stock: 83tC/ha	3.43	5.34
High carbon stock: 330tC/ha	3.39	5.34
<b>B) Nature conservation on waterlogged peat</b>		
<b>Default:</b> 0% nature conservation on peat	3.41	5.34
10% nature conservation on peat	3.38	5.34
50% nature conservation on peat	3.25	5.34
100% nature conservation on peat	3.09	5.34
<b>C) Peat soil CO<sub>2</sub> emission factor</b>		
<b>Default:</b> peat CO <sub>2</sub> emission factor at 41.4t CO <sub>2</sub> /ha	3.41	5.34
High peat CO <sub>2</sub> emission factor at 84.5t CO <sub>2</sub> /ha	4.22	7.76
<b>D) Peat drainage depth for certified estates</b>		
<b>Default:</b> drainage depth at 57cm for certified and 73 for non-certified	3.41	5.34
Drainage depth at 73cm for certified and 73 for non-certified	3.64	5.34





Figure 2: RSPO Concepts & Principles [10]



Figure 3: MSPO Principles [19]



Figure 4: List of United Nation SDGs [21]

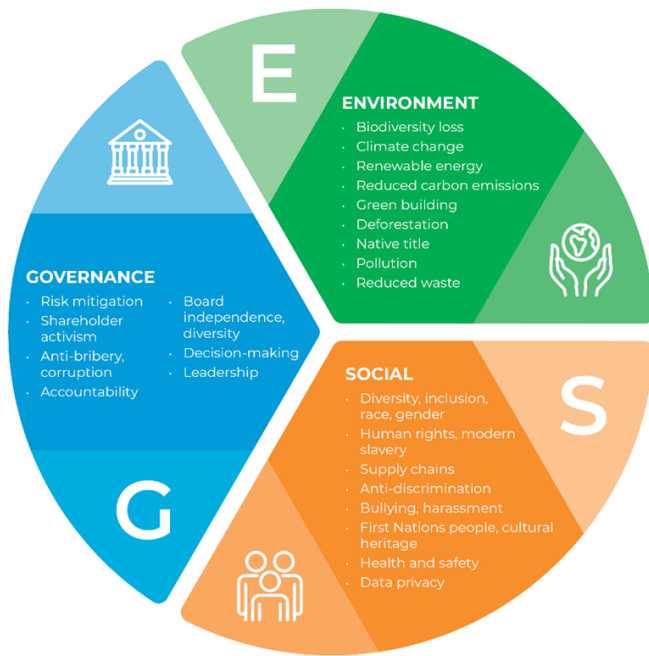


Figure 5: 5 ESG Aspects [22]



Figure 6: 3Ps of Sustainability [23]

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# Infographic: Malaysian Palm Oil: Cultivating Sustainability From Seed to Shelf

Written by Saravanan Kumaravelu  
(Universiti Putra Malaysia)

## MALAYSIAN PALM OIL: CULTIVATING SUSTAINABILITY FROM SEED TO SHELF

**Did you Know ?**  
Malaysian Palm Oil (PO) industry has successfully achieved many Sustainability Development Goals (SDGs) outlined by United Nations.

**SDG 1 NO POVERTY**  
Under FELDA's land resettlement schemes for oil palm cultivation, poverty rate amongst smallholders reduced from **50% (1960)** to **5% (2020)**.

**SDG 3 GOOD HEALTH AND WELL-BEING**  
PO is rich in **antioxidants** and **Vitamin E**. Infrastructure development around PO plantations **improved accessibility towards healthcare facilities** among smallholders.

**SDG 8 DECENT WORK AND ECONOMIC GROWTH**  
In 2021, PO contributed to **2.5 percent of Malaysia's GDP** which is equivalent to 34.79 billion. PO industry provides opportunity to over 500K employees around Malaysia.

**SDG 9 INDUSTRY INNOVATION AND INFRASTRUCTURE**  
Developed technologies for **PO disease control** and **production of biomass products from Palm Oil Mill Effluent**. AI and satellite imaging are potential technologies to be integrated.

**SDG 12 RESPONSIBLE CONSUMPTION AND PRODUCTION**  
Malaysia is committed to limiting oil palm plantation areas to **6.5 million hectares** since 2021. This effort ensures **sustainability** and **ZERO deforestation** in the palm oil industry.

**SDG 15 LIFE ON LAND**  
2.9 tonnes of palm oil can be produced from 1 hectare land (**4x higher yield/hectare** than other alternatives). This reduces mass deforestation thus, **wildlife can be protected**.

The industry's efforts to achieve sustainability by 2030, **CONNECT**

People from different backgrounds. Malaysians and global community. Humans and wildlife. Urban and rural communities.

**News: Congratulations Yang Berusaha Belvinder Kaur Sron on her new role Chief Executive Officer Malaysian Pam Oil Council**

**IChemE**  
Palm Oil Processing  
Special Interest Group

**POPSIG**  
GREENER FUTURE WITH PALM OIL



*Congratulations*

**Yang Berusaha  
Belvinder Kaur Sron**

*on her new role as*

**Chief Executive Officer  
Malaysian Palm Oil Council**

*Sincerely*

**POPSIG**



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## News: Congratulations YBhg Dato' Dr Suzana Idayu Wati Osman

IChemE

Palm Oil Processing  
Special Interest Group



*Congratulations*

**Yang Berbahagia Dato' Dr.  
Suzana Idayu Wati Osman**

*on her appointment as*

**Chairwoman of MPOCC**

*effective 11 April 2023*

*Sincerely*

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GREENER FUTURE WITH PALM OIL



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*Choose one for each video*

1. Palm oil process plant in the future 100 years
2. The Generation Z work-life in palm oil industry
3. Female engineer building her family with palm oil industry

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1. Individual; or,
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DATES	EVENTS
<b>3 May 2023</b>	Event: POPSIG University Roadshow @ USM 2023
<b>8 May 2023</b>	Webinar: Hydrogen Enriched Syngas Production Derived from Co-Gasification of Oil Palm Biomass and Plastic Waste Mixtures
<b>26 May 2023 - 4 June 2023</b>	Event: Sustain Our World Hybrid Camp 2023
<b>23 June 2023</b>	Webinar: Celebrating Women's in Engineering Day
<b>17 July 2023</b>	Webinar: Journey Towards Achieving Zero Liquid Discharge for Palm Oil Mill
<b>1 August 2023</b>	Webinar: MPOC Digital Market Forum—Analyzing Palm Oil Prospect and Potentials—2023 and Beyond
<b>22 August 2023</b>	Event: Palm International Nutra-Cosmeceutical Conference
<b>25 –27 September 2023</b>	Event: RSPO - Monash Joint Symposium 2023
<b>2 October 2023</b>	Webinar: Liquid Biofuel Production from Biogas for Carbon Neutral
<b>4 October 2023</b>	Seminar: Sustainable and Circular Economy in Palm Oil Global Outlook
<b>18 October 2023</b>	Conference: POPSIG Research Showcase 2023
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