

MALAYSIA INNOVATES 2022



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HOME GROWN
MALAYSIAN
INNOVATIONS

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SUSTAINABLE AGRICULTURE AND FOOD SECURITY

SUSTAINABLE BUSINESS

SUSTAINABLE COMMUNITY AND GREEN CITIES

Malaysia Innovates 2022

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FOREWORD

BY YAB PRIME MINISTER

“A fast-changing global economy landscape demands for a dynamic and proactive approach by the nation.”

Research, development, commercialisation and innovation (R&D&C&I) plays a vital role in nurturing and enculturating innovation to accelerate socioeconomic development towards an enhanced state of social wellbeing. Emphasis will be given to augmenting R&D&C&I capacity and capability for wealth generation. In this regard, coordination and harmonisation of funding mechanisms for all R&D&C&I activities will be implemented in ensuring these activities are in line with national priorities.

This very first edition of **Malaysia Innovates Report** features 24 homegrown innovation projects developed by Malaysians from diverse fields and backgrounds.



It also highlights five (5) innovation projects by primary and secondary schools. It is a documentation of Malaysians' achievements and capability to strive further in R&D&C&I and contribute to the nation's prosperity.

This report also serves as a manifestation of the nation's capability and competitiveness towards achieving a high-income nation status. It is my sincere

wish that this report will continue to inspire more local innovators, researchers, academia and industry players to join hands in building up synergy in the effort to develop more high-impact innovation products.

DATO' SRI ISMAIL SABRI YAAKOB

Prime Minister of Malaysia
Putrajaya

August 2022

PREFACE



“The Twelfth Malaysia Plan outlined efforts to modernise the economy through the acceleration of research, development, commercialisation and innovation.”

DATO' SRI MUSTAPA BIN MOHAMED

Minister in the Prime Minister's Department (Economy)
Putrajaya

August 2022

“Research, development, commercialisation and innovation plays a vital part in nurturing innovation and accelerating socioeconomic development for an improved quality of life.”

DATUK SERI SAIFUL ANUAR BIN LEBAI HUSSEN

Director General, Economic Planning Unit, The Prime Minister's Department
Putrajaya

August 2022



“If there is one silver lining to the pandemic, it was the unleashing of the phenomenon of grassroots innovation, a surfacing of the best of human ingenuity. Of finding a way, working out a solution, of making a good or even great, out of a bad. UNDP is proud to be part of this effort that celebrates the possibility that the space for ideas is unconstrained and unbounded.”

NILOY BANERJEE

UNDP Resident Representative for Malaysia, Singapore and Brunei
Darussalam

August 2022





This very first edition of the Malaysia Innovates report features twenty four innovations developed by local innovators from diverse backgrounds and fields. It also highlights five innovation projects developed by primary and secondary school children.

INTRODUCTION

INNOVATION FOR SUSTAINABLE PROSPERITY

This report aims to inspire local innovators, researchers, academia and industry as Malaysia strives towards becoming a high-income nation through innovation. Projects featured in this report were meticulously vetted by ministries' internal selection process before being evaluated further and selected by prominent panels. This publication is by no means an exhaustive list or a ranking of innovations in this country. The innovations featured here are merely a drop in a vast ocean of innovators making positive contributions to Malaysia's development.

Projects in this report are based on the three themes and four catalytic policy enablers outlined in the Twelfth Malaysia Plan. The three themes are Resetting the Economy, Strengthening Security, Wellbeing and Inclusivity as well as Advancing Sustainability. The four catalytic policy enablers to support the three themes are developing future talent, accelerating technology adoption and innovation, enhancing connectivity and transport infrastructure as well as strengthening the public service.

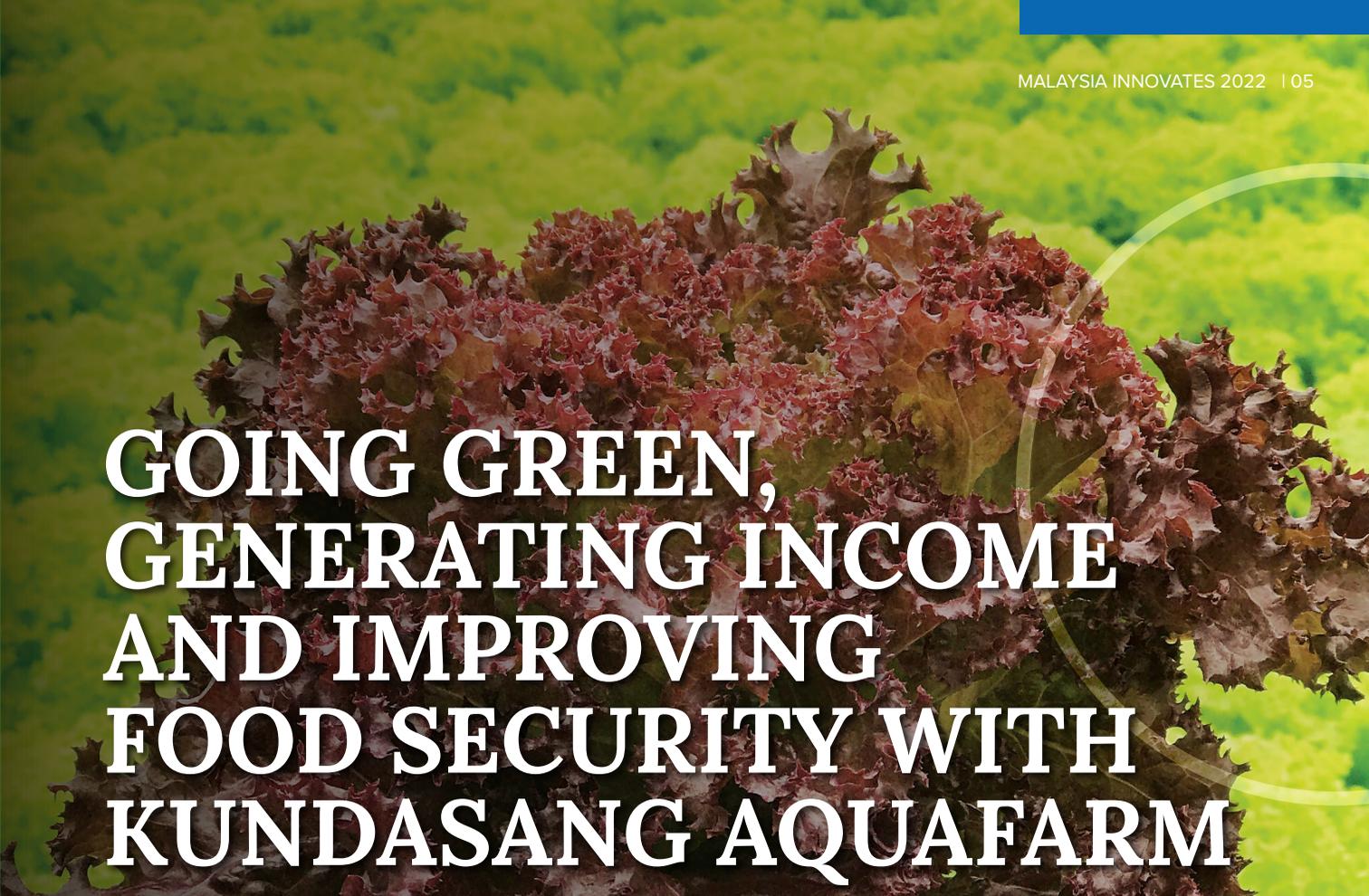
These projects have high potential to be commercialised in line with resetting the economy, strengthening security, wellbeing and inclusivity, and advancing sustainability.

Malaysia aspires to align its research and development (R&D) efforts towards commercialisation, wealth generation and economic growth. The commercialisation of research will play a significant role in enhancing knowledge transfer, economic growth, job creation, and entrepreneurship. This will be coordinated by the newly established Research Management Unit (RMU), under the Economic Planning Unit of the Prime Minister's Department.

This report will be published annually to encourage members of "Keluarga Malaysia" involved in the field of R&D&C&I to continue producing high impact innovations.

Sustainable Agriculture and Food Security

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GOING GREEN, GENERATING INCOME AND IMPROVING FOOD SECURITY WITH KUNDASANG AQUAFARM

When an earthquake hit Kundasang in 2015 and ruined the chances for Mr. Azizul Julirin and his family to make a living, he came up with the brilliant idea of creating an aquafarm using aquaponic technology. Designed to incorporate two functions in one system, the Kundasang Aquafarm takes the form of aquaculture by rearing fish and hydroponics, where vegetables are planted without the use of soil in an enclosed area. What is needed is just an area of any size and some water from the surrounding areas, and you are good to go.

“We grow vegetables soilless and with this technology we reduce the usage of water up to 75%.”

The aquafarm is sustainable and ensures that the environment is not harmed. For instance, waste from the fish is used as nutrients for the vegetable plantations, instead of chemicals. In addition, space is used creatively as vertical planting is also practised in his aquafarm.

According to Mr. Azizul, not only is this Aquafarm a blessing for him and his family, it also benefits the rest of his community, given its large-scale commercialisation.

Kundasang, being the main supplier of vegetable produce in Borneo, needed a more sustainable way for production. Instead of continuously clearing large areas of land, his soilless invention to grow vegetables does the trick and comes in handy. This method requires less time and labour to increase yield. This will ensure all those involved earn a better living while being eco-friendly.

“It makes our farming activities easier. We increased our production, while reducing our operating and labour costs, but the most important thing is it makes our lives better.”



The Kundasang Aquafarm is a success story as it has helped communities in rural and urban areas. Mr. Azizul goes on to share how a friend transformed his condominium unit into an indoor farm and successfully sold vegetables and home-made drinks from his produce to nearby petrol stations. Suffice to say, the aquafarm ticks all the right boxes where saving the environment, generating income, and improving food security are concerned.

“I hope that we can pay enough attention to our food security, which not only includes vegetables but rice and other food as well.”

No one would have guessed that such a solution which started as an experiment would turn into something beneficial for the community. Mr. Azizul was able to develop two aquafarms – one which focuses on research and training, and the other purely for commercialisation. His aquafarm is open to anyone wanting to learn and start one's own aquafarm. To date, there have been over 5,000 visitors to his aquafarm and 120 students from 12 different research institutes have benefitted from his training programme. The programme has helped the student community increase their side income, while encouraging others in the community to create aquafarms of their own.

Seeing how this has benefitted people from different age groups and localities, Mr. Azizul plans to promote the adoption of this technique to the whole of Malaysia. He also intends to educate society about the importance of food security and inculcate more sustainable ways to produce homegrown products. Ultimately, he believes we are responsible for our own future, and we should be prepared so that we would be on the right track to live a better life.

“Our future is our own (doing), so we must decide very well what we are doing now because it will affect our future.”



UTM SIMPLIFIES BEE FARMING THROUGH TECHNOLOGY AND KNOWLEDGE

Dr. Mohd Khairuddin Ramliy, a senior lecturer from Universiti Teknologi Malaysia (UTM), strongly adheres to UTM's mission of becoming a "University for Society", where it aims to offer solutions to improve economic disparities in society. This has helped Dr. Khairuddin and his research team to create their latest innovation in bee farming called the Bee Modular Box for Kelulut (Stingless Bees).

The technology behind this innovation has been the outcome of Dr. Khairuddin and his team's hard work for a good seven years. In fact, as a postgraduate

student in the early 2010s, he was approached by the community in Simpang Renggam, Johor about this innovation. At that time, the modular boxes for stingless bees were wooden, which was disadvantageous for a few reasons.

One of the disadvantages is that it was not long lasting due to pests, the weather, humidity levels, and other reasons. To overcome this issue, Dr. Khairuddin conducted more research and collaborated with the university and local community, and eventually found a sustainable solution. He created a special kind of concrete which

overcame these issues without compromising the quality of the stingless bee honey. When asked why he did not use normal concrete instead, he shared that normal concrete would not be able to sustain or replicate the natural environment of the bees due to its chemical compounds. Thus, specially formulated concrete is needed to ensure the best condition and sustainability for the bees to produce high honey yields.

“The concrete itself is (a) specially formulated concrete, through seven years of research.”

The intensive research paid off as the Bee Modular Box technology resulted in more than one colony of stingless bees making the modular box their home. The

special concrete also ensures that honey can be produced in a safer and long-lasting environment for at least 10 years as compared to the ones made from wood or normal concrete.

This innovation helps the community in Simpang Renggam, Johor, to have a decent living while ensuring the environment is protected. The innovation is based on a quadruple-helix model between UTM, the state government, corporate bodies and the local community to produce high-quality products for the stingless bee honey market.

Dr. Khairuddin cannot be prouder of his team at UTM and excited about his innovation as it is able to solve societal problems holistically.

He has also embraced the idea that any innovation that comes to mind cannot be realised with a “touch-and-go mindset”. Instead, innovations are supposed to be impactful and offer solutions that can last for two to three years, at least. It is this mindset that has inspired him in creating an innovation like this.

Initially, the Bee Modular Box innovation was part of UTM's corporate social responsibility (CSR) project. Now, not only does the community benefit from selling the honey and its by-products, it also attracts more tourists. Doing so will help the community to generate a profitable income.





Dr. Khairuddin believes it is also important to teach the community about doing business and marketing. Through teaching and sharing sessions, the community will be equipped with knowledge on branding, marketing and business management. Eventually, this would allow the community to be independent.

“We (do) not only give the technology to the people, but also, the knowledge in terms of conducting the business.”

Another bonus was that owners of the Bee Modular Box need not worry about going out of their way to collect the honey. Instead, Dr. Khairuddin and his team collect honey on a monthly basis. This

automatically reduces the burden on owners and frees them up to tend to their other business activities.

The team which collects the honey once a month then pays its value back to the owners. This goes to show that this very easy-to-work business model has made it easier for owners to forge a close and trusting business relationship with UTM. Owners of the Bee Modular Box are enriched with a complete ecosystem, and they do not have to go to other distributors to own a technology like this. Hence, this also gives the Bee Modular Box technology from UTM an edge over others in the market.

“(Owners) know that if they have UTM Bee Modular Box, they have the complete ecosystem.”

Dr. Khairuddin mentioned that local stingless bee honey is truly the best in the world and is even more nutritious than manuka. According to Dr. Norhasnida Zawawi’s research (UPM, 2020), trehalose sugar, which can be found in stingless bee honey, is the main property responsible for reducing sugar in the blood.

The Bee Modular Box can produce high quality stingless bee honey at a hydration rate of less than 22% - which is the ideal rate, placing it among available world-class products. Furthermore, stingless bees help

in the deposition or pollination from 20 to up to 40 times compared to normal honeybees because of their smaller size, which not only preserves the environment but also improves the production and growth of other kinds of vegetation like rambutan and durian.

“(We) discovered that...kelulut honey...can reduce blood sugar levels.”

“(Malaysia’s) kelulut honey is ranked No. 1 in the world.”

The Bee Modular Box innovation can truly have a sustainable impact on communities and even the environment in decades to come. Seeing how beneficial the innovation is, the Pahang State Government, through Perbadanan Kemajuan Negeri Pahang (PKNP), has also invested in opening a huge piece of land in Tasik Paya Bungor, which will serve as a tourist attraction and contribute to the economic livelihoods of the local community. This modern farming concept resonates with Dr. Khairuddin and his team's dream of improving livelihoods and creating a more sustainable environment where the Bee Modular Box innovation can thrive.





OVERCOMING FOOD SHORTAGE WITH SAFE NUCLEAR INTERVENTIONS IN MUSHROOM FARMING

The term 'nuclear technology' often conjures up alarming images of radioactive contamination and the resulting damage to deoxyribonucleic acid (DNA) that can cause mutations and cancer.

However, Malaysian Nuclear Agency is set to change the negative perception surrounding nuclear technology by using it for good. To be precise, it is exposing mushrooms to gamma rays to modify mushroom genes. One of the documented positive results was that shitake mushrooms previously planted only in the highlands have been modified so that they can be planted in the lowlands as well. The technology application in agriculture looks very promising.

Ts. Dr. Azhar Mohamad from Malaysian Nuclear Agency said that the use of nuclear technology to alter the genetic material of plants is not at all dangerous. Instead, this method enables different variations of plants to be grown for the benefit of society.

Through this nuclear application, a wide variety of mushrooms can be produced. This diversity enables the selection and screening of quality mushrooms that are resistant to the changes in the environment and can be grown and harvested in a shorter time.

This new breed is not classified as a Genetically Modified Organism (GMO) because no external DNA is inserted into the cells of the mushroom.

The mushrooms are grown on suitable substrates such as rice straw and wood dust that have been formed into blocks for easy handling. The substrates need to be dried thoroughly first before being processed to form the block shapes. These materials are ideal to be used as substrates as they are cost-efficient and easy to prepare. Mushroom farmers do not need to prepare these mushroom blocks because they are produced commercially.

Driven by his goal to go green, Dr. Azhar's project makes the process of producing the mushroom blocks from farm waste more efficient by using nuclear radiation.

His method keeps the cost of production low as there is no need for farmers to purchase an expensive block-making machine.

Mushroom blocks are fermented in a mushroom house with a controlled environment, where temperature, ventilation, and humidity are controlled using an Internet of Things (IoT) system.

Mushrooms can be collected continuously and can be produced up to four times per block, per cycle. After a cycle is completed, the waste can be composted for fertigation activities. To speed up the decomposition of waste, a specific type of decomposition microbe is used.

Dr. Azhar's team faced several challenges in getting the farmers to adopt the technology and methods. Initially, there was resistance from the farmers, so they set out to educate the farmers and consumers on the benefits of this type of mushroom. They also had to find ways to help the farmers adapt to the technology and motivate them to use it. Eventually, they came around to using it and believing in its benefits.

The beauty and potential of this mushroom project is not limited to the food industry. With proper and careful planning, the mushroom house can become a tourist attraction, increasing the farmers' income as tourists pay to learn and experience how mushrooms are produced.

Dr. Azhar believes this project will continue to prosper because of the growing demand for good quality mushrooms, which in turn would create job opportunities and contribute to economic development. His dream is to create a commercialised smart mushroom farming house that can produce mushrooms year-round.

Dr. Azhar hopes that with this technology, more people will see the benefits of mushrooms as a source of food and a substitute for medicine or medicinal products.

Therefore, entrepreneurs in the mushroom farming industry are encouraged to utilise advanced technology and innovation in their production processes. At the same time, the industry needs to innovate and improve the packaging of mushrooms and be more active in digital marketing.

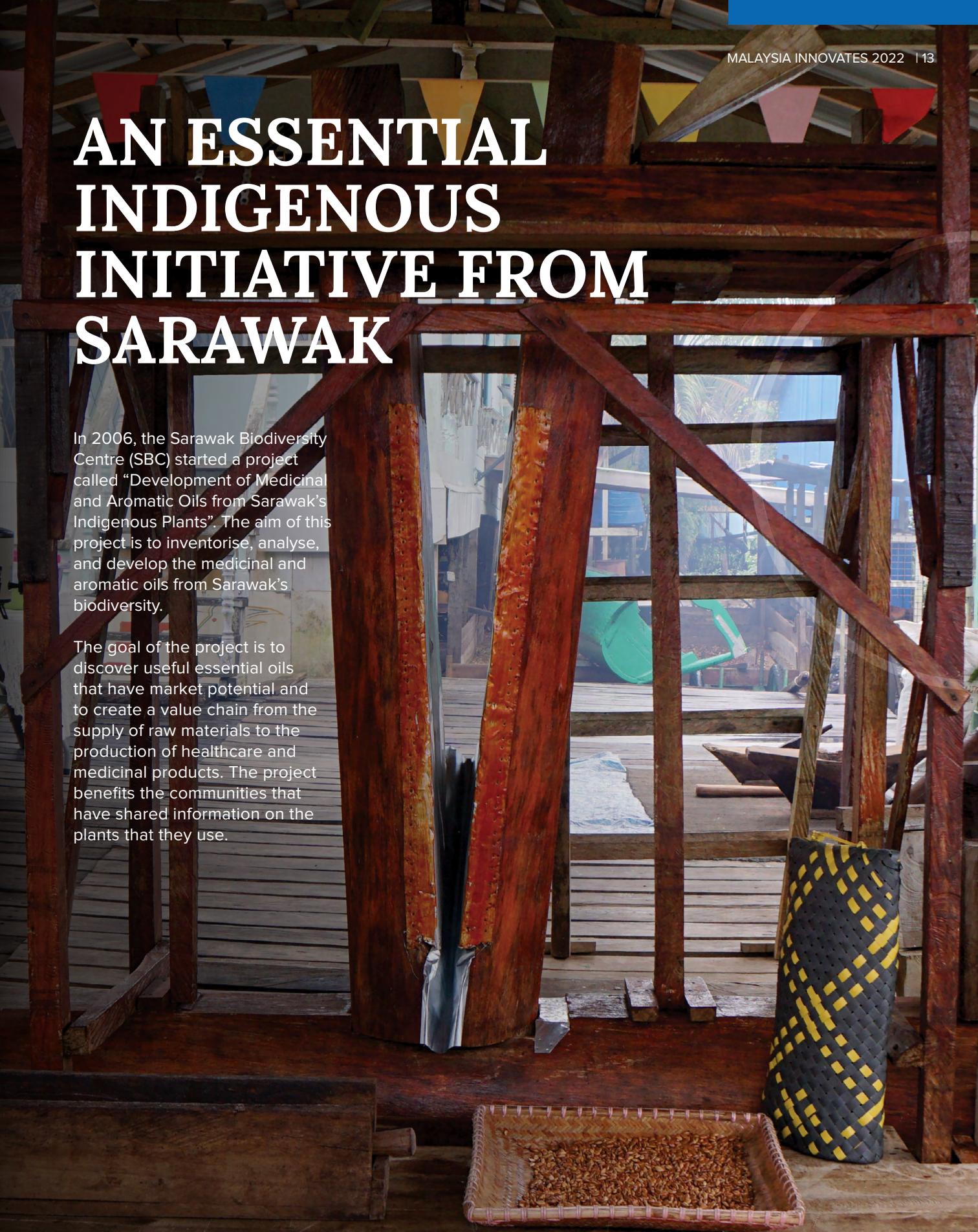
This is important in attracting consumers to try mushrooms produced using this technology.



AN ESSENTIAL INDIGENOUS INITIATIVE FROM SARAWAK

In 2006, the Sarawak Biodiversity Centre (SBC) started a project called “Development of Medicinal and Aromatic Oils from Sarawak’s Indigenous Plants”. The aim of this project is to inventorise, analyse, and develop the medicinal and aromatic oils from Sarawak’s biodiversity.

The goal of the project is to discover useful essential oils that have market potential and to create a value chain from the supply of raw materials to the production of healthcare and medicinal products. The project benefits the communities that have shared information on the plants that they use.





To date, SBC has collected, analysed and deposited more than 600 oils in its essential oil database. SBC is exploring partnerships with multinational companies to evaluate their potential application in healthcare, fragrances, and flavours. Ms. Cynthia Seta, Research Officer at SBC, shares her insights with us on the centre's essential oils project.

Can you tell us more about this project?

In this project, communities were introduced to entrepreneurship and digital skills to explore starting an online business (e-commerce), especially to market local bioproducts typically readily available such as Sekiu oil and Engkabang butter. We worked with the Melanau community of Kampung Jemoreng, Mukah on Sekiu oil. For Engkabang butter, we worked with the Tabun community of Kampung Kuala Medalam; as well as the Limbang and Iban communities of Rumah Emak, Kapit; Rumah Janang, Selangau; Rumah Machup, Roban; and Rumah Bajau, Julau.

To produce Sekiu oil, which smells like bitter almond, the community used traditional tools to extract the oil from its kernel. The dried kernel is first pounded into fine powder and then cooked using a traditional method called “pais”. The kernel powder and “Lalang Tebu” leaves are layered onto a type of tree bark called “Kayu

Is”. The layered tree bark is then rolled and placed over an open stove. “Lalang Tebu” leaves are used to check the presence of the oil. After that, the cooked kernel is placed inside a clean cloth before placing it into a traditional tool called “Kapisen”. The “Kapisen” that contains the kernel is then placed in the “Ales” to squeeze or press the oil out. An “ales” is a tool made up of two wooden logs that are clamped and slowly knocked together to close the gap in between. One litre of oil can be produced from three kilogrammes of dry kernel from this method.

Meanwhile, the delicious Engkabang butter is rich in nutrients. To experience this buttery taste, one must wait close to 20 years. It is a very slow-growing species, and the trees bear fruits once every four to five years.

Community engagement and capacity building workshops were conducted to convey the importance of digitalisation and online businesses, as well as



enhance the community's digital and e-marketing skills. This was done through a combination of in-person and online sessions. There was also an onboarding programme that enabled the community to sell their products through Facebook, WhatsApp Business, and the TIMOGAH digital platform, a local e-commerce platform that was used specifically for this project and is designed to connect farmers, traders, and local product dealers directly to consumers or customers in Sarawak.

What inspired SBC to engage with local communities on both Sekiu oil and Engkabang butter?

When the COVID-19 outbreak hit us, local communities in Sarawak in the informal sector or micro, small and medium enterprises (MSMEs) had to shut their business operations because of the Movement Control Order (MCO). This hindered their mostly brick-and-mortar businesses and face-to-face transactions. Because of that, SBC and the United Nations Development Programme (UNDP) collaborated to improve the livelihood of these community-based businesses, with support from partners including the Ministry of International Trade, Industry and Investment (MINTRED) Sarawak and the Sarawak Digital Economy Corporation (SDEC).

The bioproducts that we worked on are rare and can only be found in certain areas in Sarawak. Sekiu, which the Melanau community has used for many generations, can

only be found at swampy forest vegetation sites such as Matu. Meanwhile, Engkabang butter is extracted from the fruit of a tree that is endemic to Borneo. It is also known as Sarawak vegan butter, as it is an alternative for vegans and lactose-intolerant consumers. The communities' dedication to expanding the market for these bioproducts inspired us to engage with them to develop this project.

How was this developed?

The Sekiu and Engkabang projects were the brainchild of the Traditional Knowledge Documentation programme spearheaded by SBC. To pivot the development of these bioresources in the communities, we first had to identify villages in Sarawak to carry out an ethnobotanical survey. We were interested to know the availability and sales of the communities' bioproducts and verify the availability of internet connectivity.

How has society at large benefitted from this project?

We have equipped the community with entrepreneurship and digital skills so that they are ready to enter the e-commerce and digital lifestyle markets. This project also empowers women and youth, as they are able to participate in the processing, production, and selling of products through e-commerce platforms and can utilise their knowledge gained from the project in their online businesses. This led to improvements in how they marketed and expanded their very traditional and unique bioproducts.

What makes the products in the project better than others in the market?

We focus on specific bioproducts such as Sekiu oil and Engkabang butter that are indigenous to Sarawak and specific to the villages we worked in. Under this project, communities have and continue to play an important and responsible role in conserving both their traditional knowledge and these natural resources. In a way, communities ensure that the resources are ethically sourced where these are implemented in an environmentally sustainable manner. Few other products manufactures can say the same. Through this project, participating communities are empowered in digital and e-commerce skills in order to promote social inclusiveness. Participants of different ages and genders have been actively involved in this project, which speaks volumes about how much the project means to them.

Who are SBC's target audiences for this project?

The public is our target. It is a pleasure to share and create awareness at both local and international levels about unique bioresources from Sarawak. Sekiu oil is limited and unique, with only a few people in Sarawak being aware of it. By introducing these bioresources to the public, we hope to spread awareness and garner support for conservation.

We also hope to reach industry players looking for alternative food flavouring and functional ingredients, such as those used in cosmeceuticals and nutraceuticals. Additionally, we want to collaborate with corporate agencies, Non-Governmental Organisations (NGOs), and other organisations that may want to contribute and help improve the livelihood of the Indigenous communities, while achieving their Environmental, Social and Governance (ESG), and the United Nations Sustainable Development Goals (SDGs).

What were some of the challenges faced when the innovation was created?

The first challenge is the sustainability of the bioproducts, as they are produced from seasonal plants unique to certain villages in Sarawak. Next, stable internet connectivity is very crucial for e-commerce. Finally, receiving support from the private sector to market these bioproducts was also a challenge.

What is needed to ensure the sustainability of the products involved in this project?

Bioresources conservation — in terms of propagation and inventory — is especially important to ensure the sustainability of raw material supply to meet market demand. Communities also need to actively and creatively promote their products to reach wider markets, which we can help them with through much-needed empowerment programmes.

What are SBC's hopes for the future?

It is our hope that the communities involved in this project will continue to promote and market their products online as there is more potential for these beneficial products to reach the masses. They are the product, not only of traditional knowledge, but also of traditional tools — a heritage we can benefit from.





DEHYDOME™ HELPS SME ENTREPRENEURS IN THE STINGLESS BEE HONEY INDUSTRY

In the past, the stingless bee honey industry experienced some bleak moments. Entrepreneurs in this industry not only face excessive production and commercialisation costs, but also have to maintain product quality according to the Malaysian Standard set by the Ministry of Science, Technology, and Innovation (MOSTI). However, now the tides have slowly turned as producers of stingless bee honey are able to generate a good and steady income in the industry, and produce high quality stingless bee honey which adheres to MOSTI's standards. This is all thanks to DEHYDOME™, an innovation

by the Malaysian Agricultural Research and Development Institute (MARDI) which ensures high-quality production of stingless bee honey.

Stingless bee honey is a superfood as it contains phenolics and antioxidants that are beneficial to our health. However, it is not easy to produce stingless bee honey considering the high cost of production. By nature, stingless bee honey goes through rapid hydration and a high moisturising rate (over 30%). This makes it difficult storage-wise, because alcohol fermentation quickly occurs when

the moisturising rate of honey is high. The optimal moisturising rate for honey is not more than 20%.

To address stingless bee honey's high moisturising rate, producers have employed dehydration methods that not only affect the honey's beneficial active compounds, but also reduce the product's shelf life. Some of these methods include double boiling, open drying and cabinet drying. To make matters worse, dehydrators in the market are often expensive, large-scale models for commercial use. For instance, a single dehydrator with a 20kg capacity can cost as

much as RM15,000. Commercial, large-scale dehydrators are thus not suitable for many small and medium enterprises (SMEs) as well as amateur entrepreneurs in the local stingless bee honey industry. These small-scale producers need to balance cashflow needs with profitability targets, and thus will not be able to sustain their business with such high equipment costs.

Enter MARDI's new innovation: DEHYDOME™, a portable tool, perfect for stingless bee honey producers and entrepreneurs. Not only is it smaller and cheaper than conventional methods in the market, its dehydration capabilities are also remarkably efficient. DEHYDOME™ can reduce honey's water content to below 20% in six to 10 hours, faster than the 24 hours it would take with common methods. Each DEHYDOME™ costs less than RM1,000, a massive 93% cheaper than commercial dehydrators available in the market. Thus, DEHYDOME™ empowers stingless bee honey producers and entrepreneurs with its super-low costing, while enabling them to save time with its super-high efficiency. The result? Higher profit margins and better sustainability for their businesses.

DEHYDOME™ is the brainchild of the Trigona Tech team, led by Dr. Chua Hun Pin at MARDI. They initially planned to identify problems entrepreneurs faced in the stingless bee honey industry in Sarawak, and then come up

with solutions to help overcome these problems. Several industry players informed MARDI about the problems they faced such as the quality of stingless bee honey, problems with tree logs, packaging, handling, and most important of all, shelf life. The team overcame these problems by using DEHYDOME™ to dehydrate stingless bee honey at its most optimum level, and from there, extract the highest quality stingless bee honey.

With the inception of the DEHYDOME™, these innovators successfully managed to create the first small-scale, portable dehydration tool in the market, making it widely available so that many SMEs in Malaysia can own one. Its small, compact, and portable features allow entrepreneurs and producers to manage DEHYDOME™ easily. Maintaining the quality of stingless bee honey is important, and the DEHYDOME™ can dehydrate the honey at 40°C to maintain product quality.

Another interesting fact about the DEHYDOME™ is that it has Internet of Things (IoT) capabilities that allow it to be operated from a mobile app. This makes DEHYDOME™ so much easier to control and monitor remotely as long as there is internet connectivity. The DEHYDOME™ IoT control features include a live/dead tool, operation period set, electric-use data, and even an electric bill. These added features make DEHYDOME™ an

irreplaceable and valuable tool to the stingless bee honey industry.

Dr. Chua's Trigona team's innovation took almost three years to come to fruition, with at least three different prototypes, before it became a success. The MARDI innovators also faced challenges in terms of safety, structure, storage, and the need to maintain the quality of processed honey. After producing the final prototype, DEHYDOME™ was tested by stingless bee honey producers in selected districts in Sarawak. Each producer was given two to three weeks to use and test the DEHYDOME™. After testing, the producers gave positive and encouraging feedback to Trigona Tech, while expressing their willingness to purchase the DEHYDOME™.

With all its features and advantages, it is no wonder that DEHYDOME™ has raked in numerous awards and accolades. To date, MARDI has received more than 350 pre-orders for DEHYDOME™. Meanwhile, four companies are currently in talks with MARDI with regards to becoming stakeholders in



commercialising DEHYDOME™, whether as manufacturers or distributors. DEHYDOME™ already has its own trademark, and emerged as Champion at both the MSTE2019 and AUM2018, bagging the 4-Star Award at ArISe 2021, as well as the Gold Awards at RISTEx 2021 and AIC 2019.

Safe to say, DEHYDOME™ boasts massive potential to uplift and revolutionise the livelihoods and lives of stingless bee entrepreneurs, by giving them a cost-effective path to profitability and sustainability. Should all 717 producers of stingless bee honey who have registered with MARDI purchase at least one DEHYDOME™ machine, and if

processed stingless bee honey is priced at RM200 per kilo, then these producers will be able to achieve sales of more than RM43 million* (**This is assuming that each one of the 717 producers sell 300kg of stingless bee honey per year*), compared to just RM13 million if the honey does not go through the dehydration process (RM60 per kilo).

Rest assured, the future for DEHYDOME™ is in good hands. The Trigona Tech team plans to expand DEHYDOME™'s revolutionary applications across multiple industries while focusing on different variations of honey. Furthermore, many doors to wider markets have been opened where SMEs can reap benefits.

DEHYDOME™ is able to bring a positive impact globally in the near future, especially where honey-collecting and processing activities are generating income and driving the economy.



FROM WASTE TO WEALTH: UNIMAP'S JOURNEY TO PRODUCE GRAPHENE FROM OIL PALM TREE WASTE

Graphene is 200 times stronger than metal. It is also the best conductor of heat and electricity known to man. You would be surprised to hear that it is very real and Malaysia is in the running to become the first country in the world to produce it commercially, using our oil palm tree waste as the raw material.

Malaysia has been well known for palm oil production for a long time. In the early 1970s, the refining of crude palm oil began in response to the government's push towards industrialisation. According to

the Malaysia Palm Oil Council (MPOC), Malaysia accounted for 25.8% and 34.3% of the world's palm oil production and exports, respectively in 2020.

R&D to Produce Graphene

Graphene is a carbon-based material that has attracted the attention of governments, scientists and industries globally due to its unique chemical and physical properties.

In response to the aspiration for the country to be the first graphene

producer in the world, universities and companies have stepped up to the challenge to make our nation's dream a reality.

At the forefront of exciting graphene research and development (R&D) is Universiti Malaysia Perlis (UniMAP). According to Associate Professor Dr. Muhammad Mahyiddin Ramli, who specialises in nanotechnology at UniMAP, graphene research officially began in his laboratory at the university in 2016.

With the tagline "Waste to Wealth", their research focuses on the utilisation of oil palm tree wastes, such as oil palm trunk (OPT), empty fruit bunch (EFB) and palm kernel shell (PKS) to produce graphene, using a chemical exfoliation route. So far, some applications for graphene have been identified by the UniMAP team, including gas sensors and biomedical sensors. Over the past few years, numerous technical papers were published, and several awards were won through research and innovation exhibitions.

Beneficial Collaborations

Dr. Muhammad further explained that UniMAP was awarded a RM300,000 research grant by NanoMalaysia Berhad in 2021 to carry out the production of graphene using oil palm trunk, to be used for gas sensor production. UniMAP will be awarded a new research grant in September 2022 from the same company. With their support, UniMAP will continue the pursuit of graphene production derived from oil palm trunk wastes.

In addition, UniMAP also signed a Memorandum of Understanding (MoU) with Institut Teknologi Sepuluh Nopember



(ITS), Surabaya, Indonesia as a commitment to strengthen partnership, cooperation and collaboration on potential new opportunities for the production of graphene from agricultural wastes.

UniMAP also worked closely with FELCRA Berhad, as the company is the main source of oil palm tree wastes. This effort is in line with FELCRA's goal to ensure environmental conservation and biodiversity are included in the company's operations towards a sustainable future. Besides that, UniMAP also collaborated with Universiti Sains Malaysia (USM) and Universiti Putra Malaysia (UPM) in utilising their graphene for electronic applications such as biosensors and organic thin film transistors (OTFT).

Overcoming Challenges

According to Dr. Mahyiddin, the main challenge was to produce graphene on a large scale at the same quality. There are a few critical parameters that the UniMAP team has to control precisely and closely in order to maintain the high standard and quality necessary for graphene production.

Welcoming More Support

The UniMAP team welcomes more support from the private sector interested in doing graphene R&D.

Expanding Horizons

Apart from turning waste into wealth (OPT to graphene), and getting rid of oil palm tree wastes, graphene applications can potentially provide new solutions to existing problems. This amazing material has unique properties, which can be used to detect toxic gases and also to detect cancerous cells through biosensors. Moreover, it can be used as organic solar cells to rival traditional silicon solar cells. Through these applications, graphene can help to address three SDGs, namely SDG 7 - Affordable and Clean Energy, SDG 3 - Good Health and Well-being, SDG 9 - Industry, Innovation and Infrastructure, as well as many more.

The sky is the limit, and more exciting discoveries and applications await.



VRT TAKES THE BIRD'S-EYE VIEW OF MALAYSIA'S RICE SECTOR

The bigger picture of food security is often taken for granted. Variable rate seed and fertiliser application systems are variable rate technologies (VRT) used in cultivating rice, a staple in the Malaysian diet.

In the rice-production sector, the seed application system is used to provide data which has been collected through sensors and satellites on land levels (like the surface of land) where seeds are planted. This is helpful as there are differences in land levels which can affect the quality and quantity of rice produced. For instance, some areas are fertile and suitable for seeds to germinate, but there may also be areas with puddles that result in lower seed growth rates, compared to seeds sown on even ground. By using a farming software to identify the conditions and land levels of each land area, farmers can identify and calculate

the optimum amount of seeds needed to be planted on an uneven ground to produce just as many germinated seeds as on even land areas. This enables optimum planting of paddy plants.

Another important step for an optimum harvest is the nurturing process, which is related to how paddy plants are fertilised. Data about soil fertility from the fertiliser application system can help farmers and other users make more informed decisions on the amount of fertiliser required at a given area. For instance, if a specific area already contains enough nutrients for

the plant's growth, less fertiliser is needed. This can save labour costs by up to 50% and reduce the use of chemical fertilisers, which can be harmful to the environment, by 25%.

Although the VRT system mentioned above has come a long way since its inception, there are challenges in its implementation. For instance, it has been difficult to get buy-in from landowners and farmers with large cooperatives that cater to more than 100 acres of land. Additionally, there was a lack of scientific data on precision farming as well as data on soil fertility and ways to optimally grow paddy seeds.

VRT can be further enhanced with constant technological updates in the field. This will

improve the efficiency and productivity of the rice production sector. After all, using advanced technology such as VRT is not only sustainable but also provides optimal yield. This is where collaboration and buy-in from different parties are encouraged and needed to ensure the continuous use of VRT in rice production. While there has been tremendous support from the government, continuous support is still needed from various other parties, including the private sector, to ensure widespread adoption of VRT by industry stakeholders.

Malaysia's rice production sector — like many other blue-collar industries — is facing labour shortage issues due to high foreign labour dependency and the lack of interest among

young Malaysians. Moreover, the average age of farmers in Malaysia is 50 years. Hence, the adoption of new technology is important not only to increase productivity, but also to draw youth looking for jobs to join the modern agriculture sector. Agricultural innovation can make the rice industry an attractive career choice for Malaysian youth.



RICEFERT: HIGH-TECH FERTILISER AS A WAY FORWARD WITH NEW AGE FARMING

Traditional use of chemical fertilisers is known to improve rice yield by 59% to 69%, but its use with organic nutrient sources can help improve rice grain yield and soil carbon storage. The use of organic and inorganic nutrients is responsible for obtaining 0.78% to 117%* higher yield compared to chemical fertilisers alone. The Malaysian Agricultural Research and Development Institute (MARDI) Soil Science, Water, and Fertilize Research Centre principal research officer Theeba Manickam shares how RiceFERT is changing the way fertiliser is managed in rice production.

Can you share briefly what RiceFERT is about?

The project is about site-specific fertiliser management for rice production in Malaysia. It has been ongoing since 2017 and will continue under the 12th Malaysia Plan. This project is funded by the Ministry of Agriculture and Food Industry (MAFI) to improve the Government's fertiliser subsidy scheme for rice cultivation. Rice is a staple food in our society, and we have a rice cultivation area of 300,000 hectares in Malaysia. Unfortunately, a huge amount

of nitrogen, phosphorus, and potassium (NPK) fertilisers is used in those areas. Thus, emphasis should be given to research and development on how to improve paddy production via an efficient input management system. In this regard, our focus is on fertiliser management.

RiceFERT is a computerised software and decision support system that provides location-specific fertiliser recommendations according to a soil test-target yield approach. The recommendation on fertiliser rates is based on four essential components: indigenous soil nutrient status, soil fertility status, crop nutrient requirements, and target rice yield. The variety of rice used will also affect the recommendation. So far, we have completed site-specific recommendations for all major granaries in Malaysia and we are currently working on rice fields owned and managed by individual farmers and companies outside the major granaries.

What inspired you to create RiceFERT?

There is a critical need to recalibrate from using the current blanket rate of fertiliser, which has been in use for more than two decades in rice cultivation, towards a precision fertiliser management system. This is important to ensure that rice crops and soil receive the exact amount of nutrients needed to achieve optimal health and productivity. This is in line with the effort to review and revise targeted fertiliser subsidies.

What was the journey like in coming up with RiceFERT?

Our technology was based on preliminary work done by scientists in MARDI, which was much easier than starting from scratch. Our team consists of experts in soil fertility, soil survey, and soil mapping. The team gathered available secondary data from previous studies and generated primary data to fill in gaps. We worked closely with the Department of Agriculture for our primary data collection purposes, as they have direct access to granaries.

* Source: <https://www.sciencedirect.com/science/article/pii/B9780128132722000094>



What were some of the challenges faced and how did you overcome them?

We faced challenges in data collection because of the amount of data required. We worked on 100,000 samples altogether to develop a complete soil status database, and maps that include soil fertility and fertiliser content. This stage was very time consuming and labour intensive, and we had to work with internationally certified laboratories to get swift results.

How has RiceFERT been impactful to society at large?

This technology recommends more efficient amounts of fertiliser, typically 10% to 15% less than the current blanket rate used in rice granaries. Further research is being conducted in larger scale rice granaries so that this technology can be adapted to the government fertiliser subsidy scheme.

What gives RiceFERT the edge over other comparable technologies in the market?

This technology has been used and developed successfully by International Rice Research Institute (IRRI) of the Philippines, India, and China based on need and location. For Malaysia, this is the first computer software powered technology successful at calculating fertiliser needs from the key elements I mentioned earlier.

Who is your targeted audience for RiceFERT?

We have a small target audience. First, policymakers as they are decision-makers on the fertiliser subsidy scheme. Second, granary managers as they are the ones who will need to adopt this technology. Third, individual farmers, to help them as they proactively seek ways to improve rice productivity.

What is your biggest goal for RiceFERT?

It is our hope to revise the current fertiliser rate for rice production in Malaysia from the present blanket rate to a precise, site-specific,

fertiliser recommendation. Apart from that, this technology will be an effective way for Information and Communication Technology (ICT) to penetrate the agriculture sector to improve input management and agricultural productivity.

What is next for RiceFERT?

RiceFERT will continue to undergo modifications as needed based on new varieties and diverse types of fertilisers. We also plan to expand our reach to benefit more granaries outside of Peninsular Malaysia. It is our hope that this non-profit technology, funded by the government, will be shared with our target groups for the public good.

Any words of motivation to those who are starting a career in a similar field?

We hope to see young innovators working on technologies that integrate ICT in the agriculture sector and enable precision farming. In the near future, this can save costs and overcome labour shortages. This is the way to move forward considering digitalisation, internet of things (IoT) and other similar mechanisations will be incorporated in the field of agriculture to ensure food security.

ORGANIC FARMING IMPROVES ORANG ASLI LIVELIHOODS

Photo credit: francescabras@fiad



Mr. Kon Onn Sein,
Managing Director of YKPM,
OA Organik

Marketing cooperative OA Organik was set up in 2016 by Yayasan Kajian dan Pembangunan Masyarakat (YKPM), a non-profit that aims to empower poor communities in both rural and urban areas, by working alongside them. This marketing cooperative was designed to put people and planet at the centre of the business. The typical top-down business model was turned upside down such that the lion's share of OA Organik's profits was given to the Orang Asli (OA) farmers. The purpose of this project was not only to strengthen the economic livelihoods of the OA but also to empower them to preserve their forest and environment. The first project was based in Tasik Chini, Pahang. YKPM together with the Indigenous Peoples Assistance Facility (IPAF) created this organic farming project, which has grown from the initial eight farmers to 40 today. This achievement would not be possible without the help of various parties, including Jaya Grocer, one of the largest supermarket chains in Malaysia.

YKPM Managing Director Kon Onn Sein said OA Organik had the opportunity to penetrate the local market on a premium scale because Jaya Grocer assisted farmers under the OA Organik project by transporting their produce from Kuantan to Kuala Lumpur using the supermarket chain's chiller trucks. Every month, Jaya Grocer transports three tonnes of produce from the farm. Additionally, the OA community and farmers are not expected to pay high down payments to promote or market their produce. In addition, Jaya Grocer pays them reasonable prices for their produce. Therefore, the farmers not only get to reduce their production and promotion costs, but they also get to enjoy a higher profit margin.

Jaya Grocer also benefits from its partnership with OA Organik, as the brand is able to create a positive image among the *rakyat* through this corporate social responsibility (CSR) project. By assisting the farmers under the OA Organik project, both the OA Organik and Jaya Grocer brands have become more reputable in towns and metropolitan cities.

The way in which the OA perceive the world and manage their resources is embodied in OA Organik. They have the knowledge of living in harmony with the environment, passed down from generation to generation. For example, the OA only take what is necessary and will not exploit the land such that it is not sustainable. Felled trees are replanted and the meat from their hunting are shared with the community. The OA hold egalitarian values and live in harmony with one another, with the forest and with the spirit world. This creates a sense of togetherness and community spirit that can be inculcated in other communities. Because they believe that the forest is a gift from the creator and that it is their duty to sustain Mother Earth, they do not waste or exploit resources. Instead, they value and cherish their resources immensely.

As a result of being able to generate income through this project, the OA are also able to conserve forests without needing to compromise in giving their lands away to illegal logging or leasing land out for oil palm development. The OA believe that they are given the responsibility to take care of their lands to sustain life, thus they manage their forest in a sustainable way.

Studies show that where indigenous people manage or occupy land, the forest is better preserved and water catchment areas remain sustainable. Malaysia is indebted to the OA community and their indigenous knowledge in keeping our air and water clean.

Mr. Kon shares that, even though this project has recently expanded to two new sites, it is paramount that this project continues to

receive sufficient funding to grow and become more successful.

While the project is now concentrated among the OA in Pahang, there is no reason it cannot be replicated in other places in Malaysia too. Currently, OA Organik participants earn a respectable RM2,000 per month, thanks to a combination of traditional farming skills and knowledge combined with modern production and a people-before-profit model.

The approach taken by YKPM with OA Organik — and the benefits described above — are in line with SDG 17 - Strengthening the means of implementation and revitalise the global partnership for sustainable development. This project is proof of the power of SDG 17 in Malaysia that creates value for both stakeholders and for the wider society.



Sustainable Business

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A REMDII FOR ECZEMA

Sometimes all it takes is someone or something after a long period of sadness to really wake us up and get us back on our feet. That was what happened to Professor Dr. Lai Oi Ming, the innovator of Remdii creams – creams that treat eczema. In fact, it was her husband who played such a role in her wake-up call almost seven years ago.

Prior to that pivotal moment in 2014, it wasn't always a smooth sailing journey for Dr. Lai. Longing for a child for a couple of years, she finally got what she wished for when she bore a beautiful baby boy in 2013. However, he suffered from severe eczema and as she could not find a cure to ease his discomfort despite searching high and low, she fell into depression. Her husband, understanding the ordeal that she

was feeling, encouraged her to focus her energy on creating her own remedy.

That was when she mustered the courage and used her best resource yet – her grace and intellect in finding a remedy for eczema. After religiously reading through journal articles, reports and books, she discovered that eczema is actually an inflammatory skin condition. So, when she was advised to use steroidal creams by experts, she knew it wouldn't be beneficial in the long run and so she decided to check out creams in the market.

To her dismay, many of the creams failed to have anti-inflammatory properties. Even if they had any, they were used only for moisturising and hydrating the upper layer of the skin which

would not treat eczema thoroughly and effectively. Also, she discovered that the vitamins used in the creams were cheap and synthetic ones, which would not effectively help treat eczema.

Where eczema is concerned, the dermis layer is where allergens enter the skin causing the body's immune system to take over which would then cause the flare-ups. With her diligent research, she discovered and began to incorporate a very beneficial element called tocotrienol in her creams, something she noticed other available creams did not have. Even though its chemical properties may be hard to stabilise, and it is slightly more expensive, she knew that working with tocotrienol would be the way to move forward.



She then founded Lipidware Sdn. Bhd. to produce Remdii creams. What was initially a five-member team, grew to 17 members and she later successfully founded three companies to manage not only research, but marketing and manufacturing.

She has since filed two patents related to her research. When she had her first press conference and product launch in Universiti Putra Malaysia (UPM), the room was filled with people who happened to be in her shoes as before, struggling to find a cure for eczema.

When she learned that mothers would drive a long distance just to see her, or when a burn victim and cancer patient visited her to learn more about her creams, she knew she had to commercialise her product and share it with the world.

Dr. Lai with her colleagues have also created the Malaysian Eczema Support Community on Facebook, where it has at least 49,000 followers. To this day, her product

has reached Singapore and even some European markets as well, proving that her Remdii products in combating skin conditions and eczema are forces to be reckoned with. This is not at all surprising since she has managed to help treat more than a thousand successful cases.

Of course, there were some bumpy roads along the journey of her amazing story. Before deciding to build her third company to manufacture her own creams because none were willing to work with her at first, Dr. Lai had to persevere and think creatively of contingency plans. Not only that, till today, she still finds it challenging to convince the general public, including local doctors that her product is just as good, if not better than what is out there to treat eczema.

According to Dr. Lai, in coming up with all her creams, what comes to mind first is if her son is able to benefit from them. This is what inspires her mainly and also allows her to produce top-notch creams. Her creams, which have already reached an extraordinary level of success, can be found in more than 500 pharmacies, 34 clinics and two hospitals in Malaysia. It has been very effective so much so she has even created other kinds of creams to suit a wide variety of needs.

This speaks volumes to the quality of her creams, but also the years and dedication she has put into the creation of Remdii. To date, Dr. Lai and Remdii have won the 2019 Star

Golden Heart nomination, Malaysia Commercialisation Year (MCY) Award for Research and Business Partnership, 2019; National Academic Award for Innovation and Commercialisation category, 2019; Gold Medal, National Intellectual Property Award for Patent Category (AHIN), 2018; WIPO: IP Gold Medal Award, 2018; Gold Medal, ITEX 2017; and Silver Medal, PECIPTA 2017.

While she hopes that more and more people will believe in the research outputs of our local universities, she also strives to continue to help people from all walks of life who have gone through similar experiences as her. This is so that eczema patients may have a better quality of life. "I hope that one day when people think of eczema, they will think of Remdii", her son Min Ho said to Dr. Lai, and this is exactly what she hopes to achieve.





GENERATING ENERGY AND EMPOWERING PEOPLE FROM ALL WALKS OF LIFE WITH BATERIKU.COM

Most automotive batteries now do not require regular maintenance, but we can extend a battery's lifespan by checking and cleaning the car battery, as well as charging it when needed. A modern car battery has a life expectancy of around one to two years, but we never know when it will leave us stranded. Bateriku.com was created to assist us wherever we are. Mr. Azarol Faizi, the Chief Executive Officer of Bateriku.com explains what makes his business go.

Can you explain in essence what Bateriku.com is about?

Bateriku.com is a battery delivery and installation system which is based on a sharing economy model, which also contributes to environmental sustainability. To date, Bateriku.com has helped train almost a thousand B-Heroes (our

mobile battery installers). We have also successfully recycled almost 15 tonnes of used batteries in the span of eight years.

What inspired you to start Bateriku.com?

The inspiration came to me around 2006 when I was a first-level vendor for the national car manufacturer, Proton OEM, PERODUA OES, and then later Mitsubishi OEM. I was also involved with installing, restoring, and supplying uninterruptible power supply (UPS) batteries to telecommunications companies. While I was doing this, I found that the economy was slowly transitioning to more on-demand services like Uber, MyTaxi (Grab), Foodpanda, and others in 2012. I observed that more and more people were using their smart

phones to search for products and request for online services, which were easier and faster.

At that time, I realised that there were advantages to the on-demand battery business model. Prior to this, batteries were mostly sold in workshops or specific battery shops. Bateriku.com's transitional model has helped consumers save money and time, as well as overcome other inconveniences of getting batteries themselves.

How has the journey been like in creating this innovation?

The journey has been a challenging one. This is because Bateriku.com is more than a business, as we are also trying to set up a formidable ecosystem. In order to provide exceptional customer

service 24/7, we must be able to deliver our services and respond to our customers in the shortest time. Besides that, we need to build up customers' trust in us. Hence, our efforts to keep improving will continue as long as Bateriku.com exists.

What were some of the challenges faced and how were they overcome?

The main challenge was learning how to stay successful in this business. We are determined to create an ecosystem where we provide front liners to deliver and install batteries all over Malaysia. To achieve this, we created two programmes – B-Hero and B-Preneur. The B-Hero programme was created to train mobile battery installers based on a sharing economy model. This programme has successfully reduced our overhead costs and enabled us to stay relevant in the business. On the other hand, B-Preneur offers Bateriku.com licensing to new and up-and-coming entrepreneurs. Thankfully, this has led to the opening of almost 100 new business premises, which has increased our brand exposure nationwide.

With every business, there are bound to be similar products and services offered by competitors. Even though it may be easy to penetrate this market, the RM2 billion car battery market is still dominated by workshop owners. To capitalise on this, Bateriku.com

imports its own premium batteries and sells these batteries directly to workshop owners. Moreover, we have introduced the Nationwide Battery Assist (NBA) programme to assist workshop customers to access a range of Bateriku.com services like jumpstarting, troubleshooting, floating batteries, and even tow-truck services.

Another challenge we need to overcome is the issue of lead-acid batteries. Irresponsible disposal of lead-acid batteries may negatively affect our health and the environment. On the bright side, almost all lead-acid batteries can be recycled, which is why Bateriku.com has kickstarted a programme called “Go Recond, Save the World” to recycle these batteries. In this programme, batteries will undergo a thorough selection process for reinstallation and restoration purposes, and a discount will be given to used-car dealers, workshop owners, and others who may find them useful for their businesses. This is how we contribute to the preservation of the environment as well.

What are the impacts of Bateriku.com to the general public?

Bateriku.com offers free training and has created job opportunities especially for the B40 community via the B-Hero programme. Participants from this programme managed to earn at least five times more than their peers in similar service delivery companies.

In addition, with B-Preneur, we have cultivated an entrepreneurial spirit among those interested in becoming business owners. This has helped Bateriku.com expand to 100 new locations all over Malaysia.

Furthermore, we are proud of our “Go Recond, Save the World” programme because now we are able to recycle almost 200 tonnes of battery scrap every month. We employ the right disposal process in collaboration with a dissolution factory that is licensed by the Department of Environment.

How does Bateriku.com fare compared to other comparable innovations in the market?

Bateriku.com is the number one Connected Roadside Assistance Services (CRAS) provider in Malaysia and we are a one-stop solution provider, offering battery changes, damage repairs, workshop services, and bazaars, through our programmes like B-Hero, B-Preneur, and B-Buddy (which serves the roadside assistance market).

On top of that, we have our very own call centre which operates 24/7. Besides Bateriku.com customers, we also provide our services to two insurance companies in Malaysia that control 40% of the motor policy insurance market.

To ensure we offer the best and most reliable services, our internal software developmental team always makes sure that the software used in Bateriku.com is constantly updated to cater to the current and future needs of our customers.

Who is the target audience for Bateriku.com?

We offer automotive products and services directly to vehicle owners. Because of that, our target groups can be categorised into internal and external customers. The latter consists of private vehicle owners, commercial vehicle owners and API platform owners. The former would include entrepreneurs who wish to join the B-Preneur programme, trainers under the B-Hero programme, and automotive parts suppliers and service providers under the B-Buddy programme.

What are the next steps for Bateriku.com?

Bateriku.com wishes to expand from just depending on batteries to venturing into become a Vehicle Ownership Experience (VOE) platform. We would also like to make sure that the platform is ready to be part of the roadside assistance function for electric vehicles (EV).

Besides that, we are in the process of setting up a training academy that provides valid certification to EV mechanics and one which does EV modification to ensure acclimatisation to the market as soon as possible.

Any words of wisdom to those starting out in the same field?

You should venture into a field where you are motivated to work hard continuously day and night to achieve the success you desire. This is more important than only aiming to become rich. Instead, focus on creating a remarkable innovation or service until it becomes the talk of the town, particularly among family members, friends and customers. Do believe in the power of services or products where customers help to spread the news by word-of-mouth. It is not only effective but cost-saving too, where marketing is concerned.





QUEEN OF THE FOREST: THE ELITE KACIP FATIMAH

Over the years, there has been a high demand for herbal resources to be used for herbal health products such as supplements and other products. Although this has been a boon for our country because of our rich forest resources, unfortunately, the bane is the unsustainable ways in which resources are extracted from the wild for these purposes.

This did not sit right with Dr. Farah Fazwa Md Ariff from Forest Research Institute Malaysia (FRIM), who has been researching the elite *Kacip Fatimah* clone for more than a decade in her role as a senior research officer. Hence, she produced a two-step method

to extract the resources needed to meet the demand for herbal health products. The steps are to identify and select the highest quality herbs and plant species, after which a process called mass production takes place, where seeds are taken from its superior mother plant to be planted in various locations to produce top notch herbs and plants.

What is advantageous when employing such a method is that its yield is of better quality due to its mass production technique, and it has a biomass active element too. In addition, it can produce more as compared to traditional methods.

This elite *Kacip Fatimah* is better than those found in the forest due to its superior propagation rate, yield per hectare, biomass, survivability, and bioactive compounds. The elite *Kacip Fatimah* can produce 15% more yield as compared to the normal or wild variety, thanks to over 10 years of research findings.

Dr. Farah says that deep research outputs like this, especially those done locally, should be valued. This is because it does not only prove *Kacip Fatimah's* sustainability and ability to yield better results than others, but it speaks volumes to how it can benefit society. For instance,

with the goal of mass production, FRIM has been able to support many B40 communities including farmers and planters to generate better incomes by planting these elite *Kacip Fatimah* clones for them to be extracted and harvested on a wide scale.

Seeing how this impacts the community and industry positively, Dr. Farah is determined to continue achieving greater heights with this and is planning to venture into other herbs and plants like *pokok kapal terbang*, *cucur atap*, *gelenggang*, and *merunggai*.

Whilst she has earned many laurels including Winner of the Japan International Award for Young Agricultural Researchers in 2018, Silver Medal at the 28th International Invention, Innovation and Technology Exhibition in 2017, Gold Medal at 29th International Invention, Innovation and Technology Exhibition in 2018, Gold Medal at

SIRIM Invention, Innovation and Technology Expo (Si2TE) in 2018, R&D Champion in Life Sciences Cluster at Selangor Research, Development and Innovation Expo in 2019, she stays gracious and humble, and continues her pursuit of doing research, impacting the community and finding sustainable ways to meet industry demands. This does not only speak volumes of her calibre, but also of the potential of our local products, locally and internationally. Dr. Farah and her innovations are forces to be reckoned with, which hopefully will inspire others to follow suit.





PDMX: FIGHTING GERMS IN AN EFFICIENT, ECO-FRIENDLY WAY

Forest Research Institute Malaysia (FRIM) and Nature Profusion Sdn Bhd recently renewed an agreement to develop and commercialise environmentally-friendly germicidal products. Dr. Mastura Mohtar of FRIM shares about the initiative and its goal to realise an R&D output.

What is your innovation or product?

Ciēra® multi-purpose, eco-friendly germ buster (CMPGB) is a range of accredited (Halal – *Jabatan Kemajuan Islam Malaysia (JAKIM)*; Eco Certification – Standard and Industrial Research Institute of

Malaysia (SIRIM) and My Hijau Mark – Malaysian Green Technology Corporation) surface care products for cleansing, sanitising, and deodorising. Polydimethylsiloxane (PDMx), the active ingredient, is a unique blend of plant-derived compounds and has won numerous local and international innovation accolades. The CMPGB formulation is proven to be a non-irritant, non-corrosive, non-toxic, biodegradable, and eco-friendly.

How does it compare with other similar products in the market?

Most similar products in the market are flawed with health

and environmental issues due to their micro-biocide content. Skin dehydration, intoxication, respiratory problems, hormonal imbalance, and carcinogenic effects, among others, have been associated with the usage of alcohol, hypochlorite, and triclosan, as micro-biocides.

The usage of triclosan, for instance, has been restricted or banned in many countries including Sweden, Japan, and the US. CMPGB on the other hand, mainly consists of non-toxic, plant-based ingredients. PDMx is a proprietary blend of plant-derived compounds proven to be effective in eliminating

99.99% of germs including the infamous superbug, methicillin-resistant *Staphylococcus aureus* (MRSA).

CMPGB is lab-tested to be a non-irritant and non-toxic with low-volatile content, and is biodegradable. All in all, the commendable safety features of this range of products are the result of incorporating nature-inspired formulations. Practicality wise, a single concentration of CMPGB (as per manufacturer instruction) would suffice to effectively cleanse, sanitise, and deodorise the intended surfaces.

What were the challenges that you experienced up to this point with commercialising your product?

Being a researcher, I'm lucky to be in the position where one can always read, dream, experiment, and turn ideas into reality. Commercialisation of R&D output however, is a different ballgame altogether. I am indebted to Mr. Mohd Ramdan Parman and Ms. Wan Sabariah Shuib of Nature Profusion Sdn Bhd who have tirelessly worked hand-in-hand with an idealist like me to embrace a necessary paradigm shift upon learning the many facets of commercialisation.

Notwithstanding the financial limitation, other commercialisation challenges include consumers' limited commitment to empower the green economy, competition from cheaper chemical or non-accredited products, as well as the rising cost of production and manufacturing.



As such, an ecosystem that is supportive of the complex chain of research, development and commercialisation (R, D & C) initiatives is crucial to ensure the sustainability of local technopreneurs.

What are your hopes in the near future for your product?

There is always an urgent need to bio-prospect and develop micro-biocide as our silver bullet against the unseen enemy both for prevention (disinfectant and antiseptics) and treatment (antibiotics). CMPGB in its various product forms has been in the Malaysian market for almost a decade. Various ranges of newer products are already in the pipeline to be offered to the public. Serious discussions with several parties are also already in place to spread the benefit to larger stakeholders via a facility management company in Dubai and the Amazon platform.

Over the years, awareness amongst the public is increasing as translated via income generated through the consumer market segment. Institutional and industrial purchases (often by awarded cleaning contractors) however remain unsatisfactory. Hence, continuous support from various parties with regards to introduction, implementation, and enforcement of relevant policies and acts (vis-a-vis green technology, R&D output commercialisation incentives, and the empowerment of homegrown technopreneurs remain crucial to ensure sustainability of the related economic sectors.

Blessed with mega biodiversity, a potpourri of traditional knowledge as well as local expertise, I strongly believe that this initiative will inspire the development and commercialisation of many ensuing eco-friendly technologies and products to benefit mankind. Support local R&D initiatives and empower our homegrown technology. *Malaysia Boleh!*



MR. FIRDAUS FLEXES HIS HEART OF GOLD THROUGH FLEXSILK

Steve Jobs was once quoted as saying, “**Innovation is the ability to see change as an opportunity, not a threat.**” This quote embodies Mr. Firdaus Noh, the creator of a wonderful and beneficial innovation called FLEXSILK. The FLEXSILK is a machine which is made to mainly print T-shirts. It can also print frames for photos, khat designs and woven bags.

What inspired Mr. Firdaus to create such an innovation was to help his students at Kolej Kemahiran Tinggi MARA Kuantan, who were experiencing financial constraints. His innovation is not only meant to help his students but also people from all walks of life, particularly the wheelchair-bound as well as the B40 households and single parents.

The structure of FLEXSILK is created in a way that it can be folded and adjusted to a suitable height for the wheelchair-bound. This makes it easier to transport it around and be used in many places such as night markets, at home as well as for car-boot sales.

It is safe to say that Mr. Firdaus' efforts and vision have not been in vain. This innovation has been distributed to the wheelchair-bound and B40 communities in hopes that business opportunities will unfold for them and increase their income. Moreover, FLEXSILK has successfully produced more T-shirt-printing entrepreneurs after 12 units of FLEXSILK machines have been distributed to the B40 community via High Impact Programme 6 (HIP6) funding worth RM48,000 courtesy of Yayasan Inovasi Malaysia (YIM) in 2020. After this, he started the FLEXSILK Programme, which teaches people how to print T-shirts and sell their products offline and online via eCommerce platforms.

He felt ecstatic hearing successful testimonies. For example, one of his students who only knew how to design T-shirts at the beginning, was able to increase his income later by learning to print and sell his T-shirts. He then turned that into a business of his own and even converted a room beside his house specifically for his business. In another scenario, a family who was already running a

T-shirt-printing business was also able to increase their earnings to a whopping RM10,000 per month with FLEXSILK.

Whilst these are just a couple of success stories that Mr. Firdaus shared, he also had to overcome some obstacles along the way when he started out. First, there were trials that came in the form of personal and professional matters. For instance, while pursuing a PhD, he is also managing his business.

He was still able to thoroughly think about the design and technology of the FLEXSILK, which was a challenge, in ensuring it will benefit the B40 households.

Even with such obstacles, he was able to rise above the challenge by incorporating materials which were not costly. What gives his silkscreen technology the cutting edge over other newer technologies like the sticker technology used for the machine is that his innovation lasts longer, and is able to print more than 100 T-shirts a day.

To make the product accessible to B40 households, he had to keep the price affordable. While a T-shirt-printing machine costs at least RM8,000 in the market, his innovation with similar quality is almost half of that price, at RM4,500.

Together with his FLEXSILK programme where training is included as mentioned above, it only costs RM6,000. Mr. Firdaus is quick to share that one can apply and receive possible grants of up to RM5,000 from MARA and Jabatan Kebajikan Masyarakat (JKM). Therefore, this can be very helpful to anyone planning to kickstart a T-shirt-printing business.

Mr. Firdaus hopes that he is able to expand his innovation nationwide. Moving towards that goal, he is currently working with a promotional agent before planning for future production, training and marketing. This is so that this innovation may be able to reach and benefit many others, especially B40 households.





MAD ABOUT IMPACTING A MILLION WOMEN'S LIVES

There are many admirable qualities in Aizah Shamsul Baharin, Managing Director of a startup called Madcat World. One of which is going the distance to alleviate the financial problems of women. Though charismatic and compassionate, she nonetheless worries about the consequences of following her heart. "I tend to get too involved when I hear sad stories that people share with me and have learnt to bring in people who can be more objective in selecting who we are able to help within our capacity".

Still, her compassion and desire to serve has helped women without capital develop successful businesses. This is the story of

how Ms. Aizah started MADcash when COVID-19 hit Malaysia.

MADCash, which stands for Multiply, Assist and Donate Cash, is a platform that allows donors to channel their money to B40 women entrepreneurs launching new businesses. The donated funds are disbursed as loans of between RM1,000 to RM2,000, and treated as a perpetual cash fund. MADCash also raises a separate fund to run an entrepreneurship development programme that equips these women to strengthen their businesses. Through the MADCash programme, women receive the benefits of mentorship and training by the Academy of

Women Entrepreneurs to learn the ins and outs of running a business.

"Instead of giving your money to charity, donate it to MADCash. You can impact lives and track who your funds are helping at any one time." Ms. Aizah pitches this idea to banks, foundations, NGOs and the corporate social responsibility (CSR) arms of corporate organisations for them to help women become financially and digitally included. As the women entrepreneurs pay back their no-interest loans within 10 months, these funds will go on to other B40 businesswomen. There is a saying by the Prophet Muhammad pbuh that it is better to be the hand at the top than the

one at the bottom; which is the concept MADCash hopes to instil as when the women pay back the funds every month, it is then given to the next woman in waiting.

Ms. Aizah stresses that MADCash is not a bank and does not operate like one. MADCash is straightforward, which gives her the edge compared to other micro-loan programmes. MADCash follows the Islamic Social Finance Model, and in Islam, there is a loan model called Qard Hasan which translates to benevolent loan and is given without interest. Every beneficiary to date has repaid their loan, though the payment period had to be restructured in a few cases.

Another aspect of the MADCash programme that sets it apart is that it is a holistic support system. The women in the programme may also experience difficulties in personal areas. Because of this, Ms. Aizah says that “everything needs to work as a whole” and that “we know that women need support in other parts of their lives as well, if only they have someone to talk to”. Seeing how this programme has successfully supported women, Ms. Aizah hopes that the women who have been helped come back as mentors and coaches to subsequent batches.

The MADCash programme has come a long way since its inception. Starting with just RM3,000 donated by some friends, there is now RM266,000

in the coffers, with over 300 women in 10 states benefitting from it. However, Ms. Aizah’s goals do not stop there. She plans to expand this to the ASEAN market and reach 150,000 entrepreneurs with 100,000 mentors in place because one woman can impact five lives, thus reaching the goal of touching one million lives. She is working on raising RM5 million in the next two years so she can build the loan coffers to RM4 million to service more women, escalate platform development, build up the credit score algorithm for the underbanked, and enter the ASEAN market. MADCash is shaping itself as a Fintech platform, servicing organisations working to create and track impact within their communities. For example, the platform can be used at just RM2 per person a month where reports can be generated for tracking of business growth and credit scoring purposes based on profile behaviour and performance.

MADCash is a Fintech platform that creates an ecosystem that builds successful women entrepreneurs. However,

more work needs to be done to ensure the sustainability of the programme. Ms. Aizah believes that all work involved in developing women should include menfolk as agents of change in reshaping our society to accept the changing landscape of women contributing to the family income.

According to her, our society grows and flourishes when everyone participates and plays an active part in facilitating the role of women entrepreneurs as key contributors to Malaysia’s economy. MADCash believes that gender equality (SDG 5) can be achieved via supporting women in entrepreneurship, thus helping families generate decent income (SDG 8), and eventually creating sustainable communities, which is the pillar of SDG 11.

Lastly, Ms. Aizah would like to invite everyone to support the programme. You can be a donor, a mentor, a partner, or an impact creator. She firmly believes that we need to be the architects of our future and realise the vision of women playing a significant role in building a prosperous Malaysia.





SOARING TO GREATER HEIGHTS WITH ALPHASWIFT

Much ink has been spilled about the increased use of Unmanned Aircraft Systems (UAS) — widely known as drones — be it for parcel deliveries, medical supplies, emergency rescue and disaster management services, agricultural or manufacturing use. Yes, public awareness of drones and the many, many things they can do are high, but what is less known is that equipping drones for different functions and industries requires a degree of specialisation and design acumen that is hard to find.

Enter Alphaswift Industries. A relatively new entrant to Malaysia's lively UAS industry, Alphaswift was founded in 2020 by CEO Dr. Shian Lee, who boasts a PhD in Aerospace Engineering from Nanyang Technological University. Alphaswift provides a unique service for industrial clients looking to adopt drone

technologies; specialised UAS design and modification. The startup helps retrofit and modify drones from other brands to achieve higher performance or to complete other specialised tasks.

The use of fossil fuels still dominates the aviation and air mobility industry. This in turn has resulted in the increase of carbon dioxide emissions, exacerbating air pollution and other greenhouse gases which further harm the environment. The biggest polluters, like it or not, come from the heavy industries like aircraft.

This is where Dr. Shian decided to draw the line and vowed to become the change he wanted to see: advancement in the use of sustainable energy in air mobility. "We are on a mission to increase the adoption of advanced sustainable air mobility,"

he said. Alphaswift is able to deliver multi-functional UAS for use in light aviation, cargo and agricultural activities. Dr. Shian hopes to empower everyone to fly remotely, regardless of flying experience. He believes this slashes costs by at least 90% and make flying a cheaper alternative.

Based on clients' requirements, Alphaswift can provide the best combination of drones, robots, ground control stations, and specialised payloads to maximise efficiency. In particular, Alphaswift drones have helped clients transport goods to hard-to-access locations such as remote towns in dire need of medical supplies, food, and water.

Alphaswift UAS are also being used as crop sprayers in the agricultural sector, helping farmers and plantations spray fertilisers, pest-control chemicals, and other

compounds across wide swathes of land while cutting down on manhours and machinery costs. These agricultural drones leverage artificial intelligence to fertilise plantations and farms incredibly efficiently, resulting in higher yields for Alphaswift's clients while helping to support the country's food security resilience in the long run. Dr. Shian said Alphaswift clients save even more if they use electric drones: "If you're flying electric, the cost per km goes down drastically, in some cases dropping more than 90%."

Malaysia's agriculture sector has long been plagued by labour shortage issues, even prior to the pandemic. From dependence on blue-collar foreign labourers to a general disinterest from local talents in agriculture, farmers and planters have been forced to turn to automation. Those who do can either invest in tractors or drones. However, not only are tractors big and bulky to operate, they may also do more harm than good when used for delicate areas such as in paddy fields. Alphaswift drones, on the other hand, are customised to transport goods or spray crops without risking any harm to seedlings.

A major part of all retrofitting and innovations undertaken by Alphaswift engineers is the payload consideration. Thus far, Dr. Shian said Alphaswift has built and sold drones that can carry 50kg. Now, the company is looking to build even larger payloads, of up to 100kg. Needless to say, doubling payload capabilities while maintaining drone efficiency is bound to open

up Alphaswift's services to new applications and new industries.

Even though Alphaswift is one of the pioneers in the field of specialised drones, Dr. Shian said the journey thus far has not been smooth. Two key challenges include difficulty in obtaining hardware materials for his innovations, and the evolving face of drone regulations in Malaysia. On the latter point, Dr. Shian hopes to see more support for drone technologies and innovations from the government, as specialised drones require larger funds to research, design, develop and eventually take off.

Despite these challenges, Dr. Shian has persevered towards the bigger picture he has envisioned for Alphaswift in the aviation, cargo, and agricultural sectors. "I wouldn't have come this far if I did not believe that Alphaswift's technology is able to be sustainable in the near future, reduce operational costs and time, and improve overall efficiency in performing tasks. Today, our operation remains very lean. Our drones go in, do the work in the shortest amount of time, while taking the shortest flight path," he said.

Two years on, Alphaswift has already achieved a return-on-investment exceeding RM500,000 and gained the distinction of being a participating exhibitor during the launch of the DRZ Iskandar drone test site in January 2022. Located in Medini, Johor, DRZ claims to be the largest drone test site in Malaysia and Southeast Asia.

The company also received approval from the National Technology Innovation Sandbox and completed over 400 hours/10,000 km drone cargo delivery pilot test flights, including night flights, between December 2021 and April 2022. In November 2021, Alphaswift and AirGo Design agreed to collaborate on innovative drone delivery solutions.

Alphaswift is also a member of the Drone Logistics Ecosystem, a global multidisciplinary "quadruple helix" network of companies, universities, public sector/governments, and investors to stimulate innovations, collaborations, and standardisations in the drone logistics industry.

However, Dr. Shian is not resting on his laurels. Innovation can never stop. Alphaswift engineers are already hard at work developing a wearable device that can track health indicators and convey this information visually via augmented reality (AR) goggles and through audio via earphones. Alphaswift aims to further develop this into a wearable ground control station, so one day drone operators and clients will be able to control Alphaswift drones with AR just like Iron Man.

To newcomers in the drone industry, Dr. Shian advises them to improve their knowledge on sustainable energy and sustainable flying, as these areas will affect various aspects of future communities and businesses.

Sustainable Community and Green Cities

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SELLING A SOLUTION WITH AEDESTECH



“I’m not here to sell a product, I’m here to sell a solution.” This is the mindset of Mr. Lim Chee Hwa, Managing Director of One Team Networks Sdn. Bhd., who aims to combat dengue in Malaysia and across the globe, eventually. Almost 10 years ago, Mr. Lim met an entomologist who conceived the idea for the AedesTech Mosquito Home System (AMHS) to contain the spread of the *Aedes* mosquito. Mr. Lim immediately was on board with the idea, and consequently formed an alliance with his entomologist partner. From day one, he believed in the project and the potential AedesTech had. However, five years after his project began, sales were not as what he had expected and shortly afterwards,

his partner left. However, that did not break Mr. Lim’s spirit.

“I just want to do something great and contribute to society.”

Thinking of reducing the burden of the *rakyat*, he persevered and is still determined to spread the word of AedesTech. AedesTech is an invention that reduces the population of *Aedes* mosquitos in an effort to reduce the number of dengue cases. It can also be used as a surveillance and monitoring tool. Designed to be placed anywhere, AedesTech has been proven to reduce 75% of dengue cases and 50% of labour costs. Its specialty also lies in a chemical liquid within the device itself. After carefully studying the behaviour of *Aedes* mosquitos and backed



by scientific research, Mr. Lim claims his product is superior to similar products in the market. Furthermore, AedesTech functions as a tool to control *Aedes* mosquitos and it also utilises Fourth Industrial Revolution (4IR) technologies.

“Single products cannot stop dengue, you have to create a multidisciplinary product, then only (one) can stop dengue.”

As *Aedes* mosquitos are attracted to the AedesTech trap to lay their eggs, the life span of those hatched eggs will be shortened. This is because they would not be able to make it to the adult stage, which in turn helps combat the spread of dengue. Not only that, because *Aedes* mosquitos do not lay their eggs in one place, they most certainly would travel elsewhere and lay their eggs

there as well. When they leave the trap, they would carry along with them the chemical liquid which has been implanted on them, and that is how they are able to contain the spread of dengue; by auto-dissemination.

One might think that chemicals used in the trap may be harmful but after dedicated research and a goal to create not only a sustainable device but an eco-friendly one, Mr. Lim said this innovation is not harmful in any way. In fact, one is able to pour it into drinking water and still drink it without being negatively affected. It does not pollute the water or air. It also offers 24/7 protection and one only needs to refill the chemical liquid in the machine after a month.

“...you will get protection every day.”

The public may be more familiar with fogging as a method to combat *Aedes* mosquitos but what is not known extensively is how dangerous it can actually be. Fogging is only supposed to be used as an emergency, and its effects only last a day or two. In addition, fogging is not environmentally-friendly. Though it helps to kill *Aedes* mosquitos, it also negatively affects other insects such as bees and butterflies.

Mr. Lim has won several reputable awards for AedesTech such as *Anugerah Usahasama Penyelidikan dan Perniagaan (Utama), Tahun Pengkomersialan Malaysia 2021; Anugerah Terbaik Organisasi Cemerlang Sektor Swasta, ARISe 2021, Malaysia Productivity Corporation; and Dengue Tech Challenge 2016, Agensi Inovasi Malaysia.*



He has received funding amounts of RM192,000 and RM357,000 respectively from the likes of innovation-focused agencies in Malaysia, and formed valuable networks with distinguished research institutes and agencies from Mauritius, Thailand, and Indonesia.

Even with the success he has accumulated over the years, Mr. Lim wishes that one day, he is able to build connections with ministries like the Ministry of Health and the Ministry of Housing and Local Government. He goes on to say that this has been one of the main challenges he has faced previously besides funding because it is not easy to build rapport or convince many of his innovation. Mr. Lim hopes to

receive more positive testimonials to be able to disseminate the use of AedesTech more widely in Malaysia. He also believes that more research may do the trick in convincing the population about his innovation's effectivity. Mr. Lim says, "Without scientific research to justify the benefits of any product, no one will listen to you." Recognition from the World Health Organization (WHO) compounded with successful penetration into the Southeast Asian and global markets, would be a dream come true for him.

"To control dengue, it will be a long journey, it might take 100 years."

"You cannot make it (dengue cases) zero, it's impossible."

Though Mr. Lim is getting ready to pass the baton to his successor in the near future, he continues to hope that in combatting the spread of dengue, public engagement will be strengthened. The general public should understand what dengue is about and why it is important to contain its spread, otherwise adverse effects, including death, may ensue. Although Aedes mosquitoes may be around for another 100 years, we need to constantly engage with those on the ground. All of this proves that Mr. Lim is indeed a man of his word, where he is determined to sell a solution. He not only thinks of how he can support the Ministry of Health against the battle of dengue, but he also intends to reach out to the masses.

"Public engagement and community involvement is very, very important."

ASSISTING SOCIETY TO MAKE INFORMED DECISIONS WITH BIOGENES APTSENS



Mr. Adrian Joseph, as Co-Founder of Biogenes Technologies Sdn Bhd, please tell us what is Biogenes APTSENS?

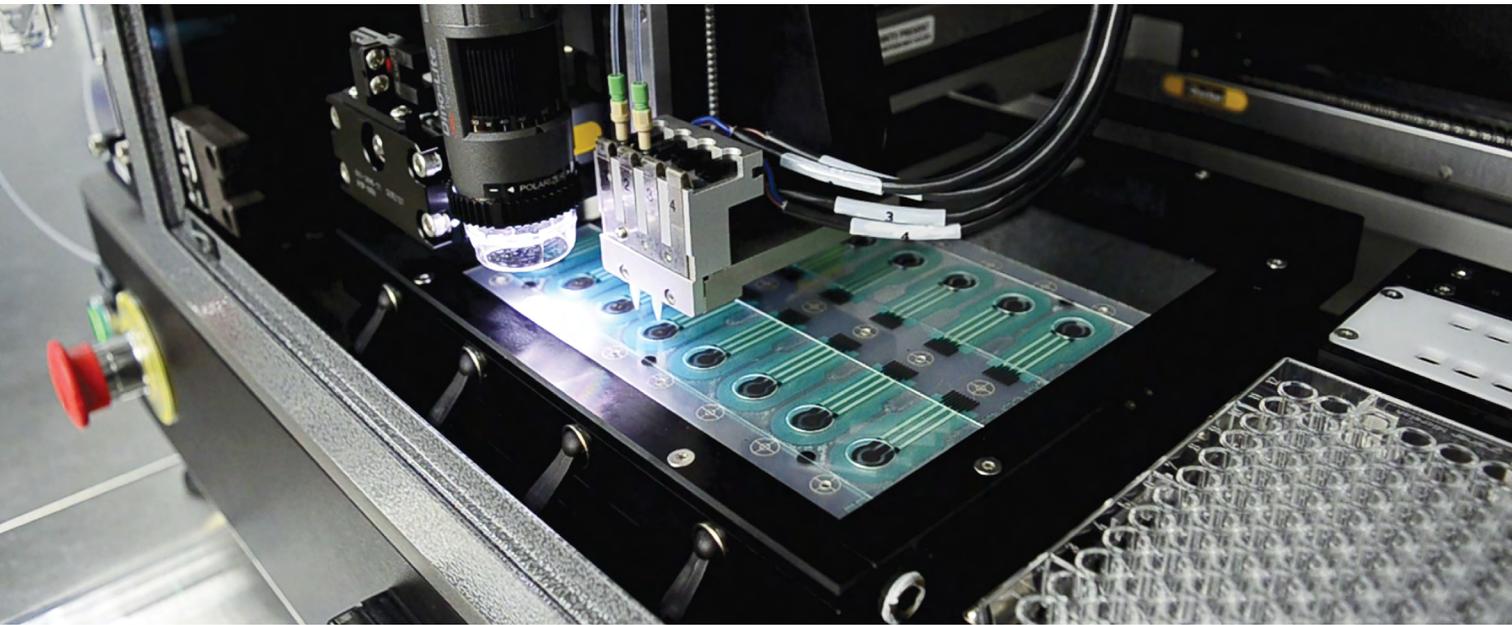
Biogenes APTSENS is a portable diagnostic technology that can be easily used by anyone with a smartphone. APTSENS provides informative disease diagnostic testing to hospitals, clinics, workplaces and even in the comfort of your home. Building on the scientific principles of a glucose test, APTSENS offers convenience to patients and their families, where they are able to perform tests in the comfort of their own homes. APTSENS aims to revolutionise the diagnostic industry, making disease testing and data management easy for old and young alike. The APTSENS mobile app enables people to keep track of their health history, thereby enabling more informed treatment decisions.

At the heart of this technology is a revolutionary ingredient called an aptamer. An aptamer is a DNA-based construct that mimics the functionality of animal-derived antibodies. Each aptamer is uniquely designed to selectively bind only to one specific biomarker, and this enables the detection of a specific disease or health condition related to the particular biomarker. Every year, animals are killed in antibody research. Biogenes' aptamer technology eliminates the need for animals in this process by using software to design aptamers. To date, Biogenes has designed over 200 aptamers to capture biomarkers for glucose, COVID-19, bacterial sepsis, dengue, cancers, hormones, toxins and pathogens. Biogenes' technology enables us to design aptamers quickly, run tests and integrate aptamers with APTSENS.

In a nutshell, Biogenes is able to produce many different tests with our core sensing technology using aptamers instead of animal-derived antibodies.

What was the inspiration behind the creation of Biogenes APTSENS?

It all started when my co-founders and I realised that current healthcare practice necessitates even the elderly to put up with the hassle of travelling all the way to clinics and hospitals just to undergo a five-minute blood and urine sampling. When your parents live on their own, it is often difficult to know if they are testing or taking the right medicine. This is followed by weeks of waiting before the test results are ready for doctors to interpret the data and prescribe the follow-up treatment. Medical records are also still being recorded and accessed manually without much analytics available



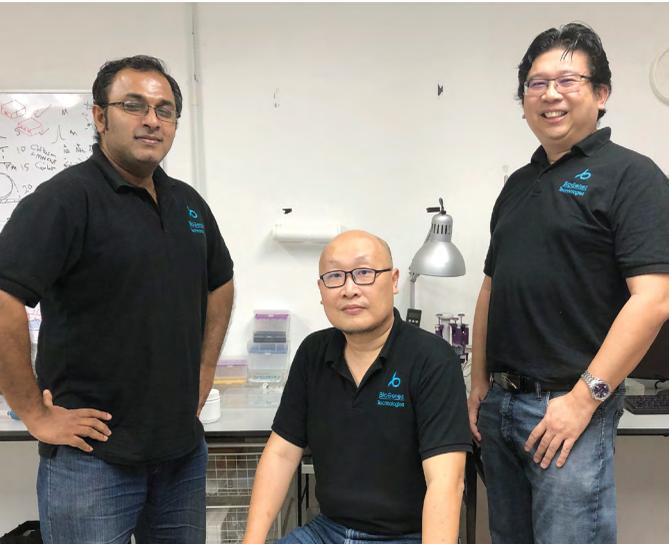
to support the doctors. We wanted to help our elderly parents who live miles away from us. That is why we believe we can provide better and faster ways to do all these, so that our elderly could live hassle-free and risk-free, and we could monitor and record their health conditions remotely.

The Biogenes founding team began to ideate on different ways to make this process simpler. Another issue we discovered is that current diagnostic tests do not offer any digitalisation of testing data records. APTSENS enables data to be captured as tests are being done with little input from the person performing the tests. All test records are kept secured for access by the person taking the test. We believe this is the next step in helping digitalise healthcare.

What are some of your aspirations and how does Biogenes APTSENS impact society at large?

The COVID-19 pandemic proved that people are able to manage their testing at home. Everyone, young or old, was able to do a simple rapid test for COVID-19. So why stop with COVID-19? Biogenes imagines a world where one can simply use their smartphone to order a test, perform the test at home and manage their own testing history. Imagine going to your doctor with digital records of your testing throughout the year. Doctors will be able to use the data to better understand their patients and better prescribe medication. Regular testing will also empower individuals to gain insight into

their own personal health history, thereby enabling better health management. Biogenes wants to ensure APTSENS will enable people to perform their own tests with minimum training and hassle. These people can be the mother who tests her sick child for possible viral or bacterial infection, the woman who tests herself for human papillomavirus (HPV) infection to monitor for risks of cervical cancer, or the daughter who regularly tests her father's prostate-specific antigen (PSA) level to monitor for early signs of prostate cancer. People who are aware about their health and those of their loved ones will be more proactive to maintain a healthy lifestyle and seek early treatment before it becomes too late.



What were your proudest moments with Biogenes APTSENS where achievements are concerned?

Biogenes was the first company in Malaysia to complete the National Technology and Innovation Sandbox (NTIS) in 2020 with the help of the Malaysian Technology Development Corporation (MTDC). Biogenes was also selected by Cradle Fund in its inaugural CIP Accelerate programme to enable aptamers synthesis in Malaysia via Biogenes APTFAB technology platform. In addition, we have won several awards such as First Runner up for the IEEE COVID-19 challenge. We were the first Malaysian start-up to be selected for the MERCK Accelerator Programme and the first Malaysian start-up to receive an investment from the ANTLER SEA FUND. We were also finalists for the Asian

Entrepreneurship Awards 2020. In 2022, Biogenes began to export our products and solutions to the Southeast Asian region, Australia, UK and the US.

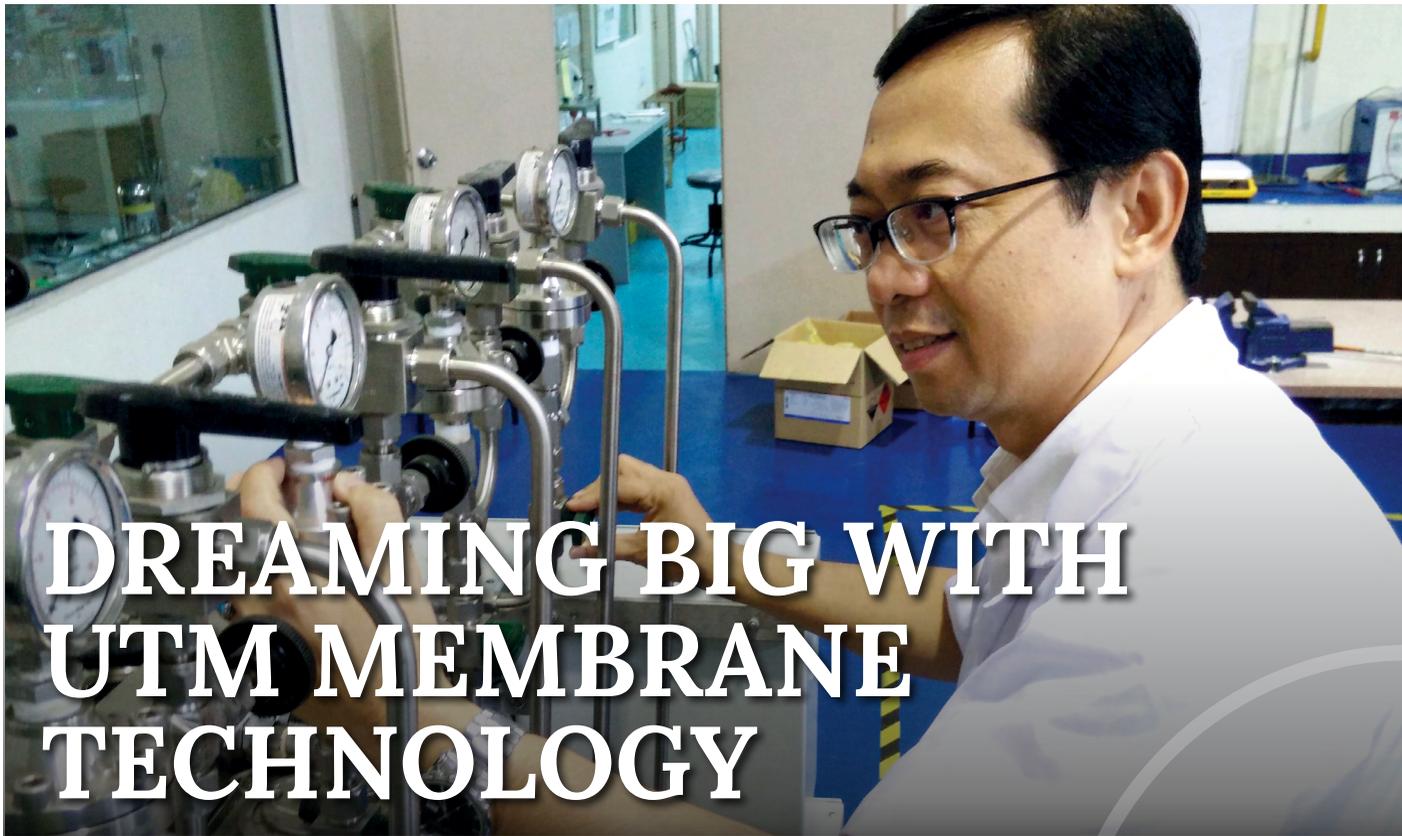
What are some of the challenges and hopes you have for Biogenes APTSENS in the near future?

Biogenes is deeply passionate about translating disease R&D into medical products. We invest in Malaysian researchers and help accelerate their R&D by removing barriers of time, money and resources. Our challenge is to bring these tests out from research labs into commercial use in the healthcare sector.

We aim to enable the use of our technologies in parts of the world that need it the most including the Lower-Middle-Income Economies. To this end, Biogenes is digitalising

our assets and using the internet as a means of transforming the aptamer design to a diagnostic kit production. This will both lower the costs of production and enable manufacturing of these technologies in these countries. In the near future, someone on the other side of the globe will be able to buy our devices and produce test kits for their village, district or state, by utilising an ever growing library of disease tests.

Finally, at Biogenes we are constantly frustrated and saddened with news that treatable diseases continue to take lives because of late detection. As such, we design all our tests to take no more than 20 minutes to produce results and can be done at the lowest cost. We hope to see a reduction in the number of deaths in treatable diseases such as sepsis, tuberculosis (TB), HPV and many more.



DREAMING BIG WITH UTM MEMBRANE TECHNOLOGY

Advanced Membrane Technology Research Centre (AMTEC), Universiti Teknologi Malaysia (UTM) defines membrane as a selective barrier between two phases, usually a solid film and occasionally a fluid film of a small but observable thickness. Generally speaking, membrane is attractive because of its unique ability to let specific components past through it. This ability was being exploited for quite a number of applications and still growing for new commercial purposes.

Membrane technology developed by Universiti Teknologi Malaysia (UTM) was initially meant for wastewater treatment in the event of water pollution. Today, UTM Membrane Technology

boasts a wide array of industrial applications including water, food, gas, and pharmaceuticals.

Developed 25 years ago with the goal of helping Malaysia's rural communities, UTM Membrane Technology has been installed in 60 water purification systems in rural schools across the country. This way, targeted communities have access to clean and sustainable raw water, which subsequently results in healthier communities.

The lead innovator for UTM Membrane Technology is the university's vice chancellor Professor Datuk Ts. (Technologist) Dr. Ahmad Fauzi Ismail. In developing new applications

for this flexible membrane technology, Ahmad Fauzi and his team have weathered manufacturing and funding challenges, as well as in upscaling the membrane capacity (membrane size).

Cognisant of how many industries could benefit from widespread application of UTM Membrane Technology, the team hopes to become the country's premier membrane manufacturer. The team continues to enhance the sustainability of its membrane manufacturing process, including utilising materials from alternative sources like waste.



UTM Membrane Technology is living proof that the adage “Dream Big” works. Research officer Mr. Mohamad Sohaimi Abdullah has seen the membrane technology improve in leaps and bounds since the very beginning in 1996. Today, the team has grown into AMTEC and even owns a UTM spin-off company – Membrane Technology (M) Sdn. Bhd. (MTMSB) – focused on this technology.

Mohd Sohaimi said, “It was truly a one-of-a-kind experience to witness this idea progress from lab to market. I hope MTMSB serves as an inspiration for other start-ups and local innovators, that local technologies and products can be developed and attain success in Malaysia.”



WHEN BIOHAP DOESN'T SOUND SO FISHY AFTER ALL



Climate change, coupled with economic and population growth, is leading to grave problems like resource depletion and pollution of groundwater. The United Nations (UN) says that one in three people lack access to safely managed drinking water and most of them are living in rural areas. Prof Ts. Dr. Ismail Zainol of Universiti Pendidikan Sultan Idris (UPSI) shares about Manik BioHAP, a special water filter.

Q What is your innovation about?

This innovation is a special water filter which uses beads made from hydroxyapatite from tilapia fish scales as its basic material. I discovered that hydroxyapatite has a high content of calcium ions, and when infused with water through the water filter for consumption, this can benefit consumers. This is because they would also be drinking water high in calcium and on top of that, clean and filtered water too. In essence, this can be used as a calcium supplement, and a source of filtered water.

This creation started off as a powder-based product to one which focuses on beads, for two reasons. One is regarding consumer concerns about components having uncertain or unverified halal standards, status, or origins; while the other is related to health benefits for babies and pregnant women. For the former and where other comparable products in the market are concerned, animals' bones are used as a filter component. This is a concern for the Muslim community in terms of whether or not such products were halal. To overcome such fears, I decided to go with fish scales. Fish scales are the best choice as it also contains another element called beta-tricalcium phosphate which is able to produce even more calcium ions. As you can tell, I am all for having the increase of calcium in one's body for overall health purposes. So, if there is a way to do that, I will try my best to incorporate it in my product. I also wanted to help pregnant women counter osteoporosis because nowadays more and more of them lack calcium in their bodies.

This is what I envisioned when contributing to society as well.

How does this compare with other similar products in the market?

Where function and quality are concerned, I am confident that this product is many levels above the rest. Other products out there may only rely on filtering purposes and eliminate many of the minerals required by our bodies. I noticed the gap, and this is how Manik BioHAP does the complete opposite in making sure there are enough minerals and calcium ions in our bodies.

What were the challenges faced in your journey of commercialising your product?

Firstly, it was a challenge to get or source for raw materials because the main component in this product is the tilapia fish scales. This is an essential step to produce the beads to be used in the water filters. Hence, this made the mass production of beads a difficult hurdle to pass through. Once that got out of the way, there was also another issue to think about; commercialisation. While things became smoother after some time, I must admit that there were some head-scratching moments with regard to ways to better commercialise this product which comes with the challenge of convincing people of the benefits of this product.

How has your product impacted society at large?

Even with the many challenges faced, I am ecstatic because this product is able to benefit society in many impactful ways. Not only has business been good on my end, but there is a higher purpose than just seeing sales being made at the end of the day. For one, where the benefits of Manik BioHAP are concerned, the health of society at large can be improved on a wider scale – so much so that I am inspired to keep the momentum up with this product. I also hope that this product can help reduce the rate of osteoporosis in pregnant women and babies.

Also, I'd like to share a tip. Please do not throw away fish scales blindly. Boil them instead and after that, grind them till it becomes fine and smooth. Once that is done, boil the grounded fish scales again and thereafter, what you will see in front of you is collagen. That is how collagen is made. There are many advantages to collagen intake too which, includes but is not limited to maintaining a healthy gut barrier, improving the appearance of hair, skin and nails, and supporting bone formation.

What are your hopes and dreams for the future as far as your business and product are concerned?

I wish to diversify the applicability and uses of calcium apatite in a variety of other products. At the same time, I am also aware of the nano-products taking various

markets and industries by storm. This is why I also have engaged in and jumped on that bandwagon in producing nano-sized calcium products. Some examples of this include producing supplements, toothpaste, bone fillers for the medical industry and medical purposes, and even cosmetics as all these products depend highly on calcium ions. Because of that, I wish to also come up with effective strategies on how to modify the dissolution of materials in order to generate more quantities of calcium – this would be an important facet of my goals in the near future.

Do you have any last words to add to everything that has already been said?

It is high time that we learn to trust local researchers and their products instead of assuming they are inferior to overseas products. There are many beneficial local products and technologies that are so deserving of our support because they have the community's best interest at heart. In relation to that, I hope that there will be more community research outputs that will also be able to better serve and prioritise community building. Last but not least, whilst we try to improve and increase research outputs that serve our local communities, it is also paramount that we pay much more attention in upscaling our local products through the use of high technology. This will not only show what our country is capable of in terms of development, research and modernity, but the capacity in which our local products can be further supported in the long run.



WHEN MONEY (AND IDEAS) GROW ON BANANA AND CATAPPA TREES

If someone were to walk up to you and tell you that you would be able to make a fortune out of raw materials that may be found on the roadside, would you believe it? Many of us would be skeptical but that was not the case for Ms. Noor Liza, who created *My Filtro Aqua Natsponge*.

Having had the idea to leverage the power of banana leaves at the back of her mind for four years and having been discouraged at first almost made her give up a brilliant idea of not only generating a side income but more importantly, saving the environment. Thankfully she did not give up and did whatever she took to see *My Filtro Aqua Natsponge* come to life.

My Filtro Aqua Natsponge is a filter that is used to filter wastewater, which can be used at home and even in restaurants. Ms. Noor Liza knew she had to do something as she often came across issues of waste clogging up pipe holes, which consequently resulted in water and air pollution.

According to Ms. Noor Liza, in the *kampungs*, culturally, the Malays would soak their cutlery in a basin filled with water and banana leaves. This is done because the banana leaves can absorb grease and oil from the cutlery, which would then make it easier to clean. This led Ms. Noor Liza to use banana fibers from the banana

tree stem to create a sponge that would be part of the first layer in her innovative wastewater filtration system.

In the process of improving her wastewater filter's design and function, Ms. Noor Liza added another magic element: Catappa leaves. When this happened, what transpired was an even better and holistic product in terms of functionality. The upgraded version not only filters clean and clear water as a by-product, it also prevents clogs and bacteria build-up after wastewater has been filtered.

What also gives the *My Filtra Aqua Natsponge* an edge over its peers is that it is relatively cheaper and it does not use synthetic sponges that are harmful to the environment. On top of that, the filter can even be connected through a smartphone app to indicate and record the pH levels of filtered water. This will help consumers plan ahead for when they need to replace the first layer of the wastewater filter. This can be done by anyone without calling service providers to come in and change parts, which may incur extra costs. For a price of only RM600 for the *My Aqua Filter Natsponge*, consumers only need to change the first layer of the sponge after at least six months, making it a good bargain in the long run.

Ms. Noor Liza has also successfully created a range of skin care products alongside hand and room sanitisers using this technology. She shares that this has been useful because 60% to 87% of the main ingredients used to create these products are filtered water. In the future, she also plans to apply this technology to the sewage system.

She now plans to collaborate with external companies interested in marketing her products. Seeing how sustainable this product is, and the potential it has, she is proud of herself and doesn't look back, only forward. Similarly, this is why she also advises those thinking of starting a business to never give up on an idea or a creation, even if it may be ridiculed at first. Instead, she says it is wise to use that experience as an inspiration to keep improving and hopefully all else will fall into place.



ACHIEVING ZERO LATE BIRTH REGISTRATIONS WITH A MOBILE COURT

Imagine having a legal issue, which requires you to present yourself at court or other legal authorities to resolve it. However, due to lack of transport, childcare, or other reasons beyond your control, you are unable to resolve your legal issue on time. Instead of penalising you, the court instead is willing to go the extra mile and literally come to your doorstep to work things out. No, this is not a dream. This is the reality in Sabah, which has utilised a mobile court for over a decade.

Since its inception in 2007, the mobile court in Sabah has gone through many challenges to address late birth registrations in the state. Late registrations, unfortunately has been quite a challenge to overcome due to limited geographical terrains, transportation and other documentation difficulties.

Whilst Sabah is a beautiful state that is rich in biodiversity, there are many areas which are naturally

hilly and where some, if not many, communities live. What makes it slightly more challenging is access to these communities as some of them may be located in remote areas and can only be accessed using vehicles with a four-wheel drive or by boat. Besides that, even though citizens are given 42 days to register their children's births with the National Registration Department, many are unable to comply as they face challenges as mentioned earlier or are unable to prepare documents such as marriage certificates in due time.

The mobile court has also been effectively reaching out to those affected by this predicament - cities like Sandakan, Tawau, Lahad Datu, Keningau and Kota Kinabalu. Ms. Elsie Primus, a Sessions Court Judge in the State Court of Sabah, said this is because, of the 97,000 late registration cases reported in Sabah as of 31 May 2022, 60% are from urban areas. The mobile court has since been extended to urban areas by launching the

Urban Mobile Court in 2019 and it had fully utilised the Mobile Court Bus to cater to the needs of urban communities facing similar problems.

Proper planning between the team from mobile court with the district office and native chiefs is of paramount importance before visits are done. This is so that more viable and valid data about the community and its population is recorded for this exact purpose.

Once planning and data extraction is done, the mobile court team will prepare a schedule for visits for the whole year, and this will be disseminated amongst all the district offices concerned for them to inform the villagers in their respective districts. Next, it is also important to have stable internet connection especially when traveling to rural and remote areas. This is made possible with the availability of satellites used by the mobile court team during their visit.

When the mobile court initiative began, its initial focus was on late birth registrations. However, there are also simple cases like traffic and other similar civil cases which are heard. What the court does is that it first registers the case it hears in the system, after which they would then be able to decide which court within its jurisdiction has the powers to hear and take the cases further, be it the Sessions, Magistrate or High Court for instance. This makes the mobile court very efficient, holistic and multi-functional. Apart from that, with the help from different relevant agencies, awareness on issues such as the environment, are spread to the communities. The Sabah office of the World Wildlife Fund for Nature (WWF) has been a formidable collaborator during mobile court visits. The

reason why other matters on top of late registrations are also targeted is so that they can feed two birds with one seed considering how it may not be so easy to get across important public service deliveries during visits to communities in hilly terrains or remote areas in a short span of time.

It is hoped that in time to come, the mobile court initiative will be able to reach its goal of having zero late birth registrations. This is where there must be continuous efforts in raising awareness about the importance of not delaying the process of registering the birth of one's child. This is because if this is delayed beyond 42 days, then problems may ensue which will affect the child in the future.

The mobile court tries to overcome late registrations creatively and effectively. Hopefully, its efforts will bear good fruit in due time so that many more inspiring and remarkable success stories may arise from the amazing state that is Sabah.





IMPROVING TRANSPARENCY AND PUBLIC CONFIDENCE WITH AI SENTENCING

Artificial intelligence (AI)-based systems are helping magistrates in East Malaysia deliver more consistent sentencing in court cases.

In 2020, the High Courts of Sabah and Sarawak began using AI technology for sentencing by test piloting it on select offences. The system uses data from past cases in the two states from 2015 to 2019 as references for machine learning.

Q What is AI Sentencing?

AI Sentencing is a machine learning-based AI system developed by Sarawak Information Systems Sdn. Bhd. (SAINS), which generates sentence recommendations in court cases. There can be wide discrepancies in terms of sentencing given out by courts for the same offense. For example, Magistrate Court A might levy a fine of RM3,000 for an offense whereas Magistrate Court B may impose an imprisonment sentence for the same offence.

This is because sentencing is not a straightforward mathematical formula. Instead, it lies within the magistrate's discretion, and the human element—while important to justice—can cause sentences to vary between courts.

AI recommendations for sentencing has been introduced to reduce discrepancies in sentencing between courts. This does not mean that the AI passes the sentence. Instead, it provides the magistrate with a benchmark based on past sentencing trends across all the courts. The power to make a final sentence decision remains within

What offences can this be applied for?

AiCOS (AI Court Sentencing) is currently deployed for possession of scheduled drugs, an offence under section 12(2) punishable under section 12(3) of the Dangerous Drugs Act (DDA) 1952. The decision to start with this offence is partly attributed to the higher volume of cases and a better learning environment for the AI. This means that AI Sentencing has plenty of data to draw on. AI Sentencing will be expanded in the resolution of personal injury claims arising from road traffic accidents.

What is the process like in an open court system where the AI Sentencing is used?

For AI Sentencing to be used, the accused must first agree to it. While a case is being heard and the facts are keyed-in into the AI Sentencing System, it will analyse data from previous registered cases to determine the sentencing trend based on the parameters that have been selected. These cases have been filtered by the AI committee to ensure their validity, accuracy, and non-biasness. What the AI Sentencing System will suggest is the type of sentence and amount of fine or duration of incarceration based on the percentage of probabilities. The accused will also have the right to challenge the recommendation by the AI System.

The magistrate will then make a final decision, taking into consideration the parameters highlighted and the recommendation provided by the AI Sentencing System. When deciding the sentence, the magistrate will need to state the reasons for following or departing from the recommendations of the AI Sentencing System. This information will then be used to further improve the AI system. The AI committee will study, analyse, and verify such feedback before using it to further improve the AI.

What is the future for AI sentencing and the courts in Sabah and Sarawak?

There are plans to expand the use of AI Sentencing to Section 380 of the Penal Code, which covers theft in dwellings, as well as other criminal offences. The use of AI Sentencing System is increasing as magistrates become more familiar with the process and observe the outcomes. Over time, as a majority of magistrates adhere to the recommended baseline, this innovation will help to synchronise common grounds among the magistrates, thus promoting consistency in sentencing. In the long run, it is expected to increase effectiveness and transparency in the delivery of justice.

the discretion of the magistrate. By making the sentencing process more consistent across courts in different locations, AI sentencing can support a more equitable justice system the public can believe in.



Eureka Hub
- Kolej Vokasional Keningau, Sabah

Piezoelectric Energy Harvester
- SM Sains Selangor

Most of us have come across these popular sayings: “Be the change you wish to see in the world,” and the quote by former U.S. president John F. Kennedy to “Ask not what your country can do for you – ask what you can do for your country.” Here are five innovative projects created by school children who have taken these sayings to heart, and are applying this same energy to projects in the technology, energy, environment, business, and learning spaces.

Kolej Vokasional Keningau, Sabah

Youths from Kolej Vokasional Keningau, Sabah have created a programme called the Eureka Hub. It is designed to assist and to encourage youths to sharpen their skills and help them reach their goals in areas like Information and Communications Technology (ICT); Science, Technology, Engineering and Mathematics (STEM); and entrepreneurship. Eureka Hub youths are also able to participate in international exchange programmes. Some of the activities that come under

this project include 3D printing, robotics, event management, and preparing business plans. This shows that multidisciplinary collaborations and ideas can help realise youth aspirations. The youths who created Eureka Hub have won awards like the YSEALI Seed for the Future (USA) in 2020, a grant worth RM44,000. The project was also listed as a finalist of Science, Technology, Engineering, the Arts, and Mathematics (STEAM) Curriculum Development organised by NAYTEA, which is based in China.

“My mission is to inspire women to excel in traditionally male-dominated fields.” - Alesyah Asa, a construction technology youth from Keningau Vocational College, Sabah and one of the 50 finalists for the Chegg.org Global Student Prize 2022.

SM Pendidikan Khas Vokasional Indahpura, Kulai, Johor

The list of school children’s innovations does not stop there. Can you imagine our children creating the next “Monopoly”

game? Well, children from SM Pendidikan Khas Vokasional Indahpura in Kulai, Johor created HO Easy Poly. This game helps special needs students understand, learn, and apply skills and knowledge from the “Housekeeping Operations” curriculum in their daily lives. The game reveals questions via a code scanner on a smartphone and awards points for correct answers. Through this exciting learning process, users say that they are better able to retain what they have learnt because of the game and look forward to more learning sessions. As this game was primarily created by special education needs children for others like them, they were able to bring their experiences to create a fun and effective product.

SM Sains Selangor

The next innovation is the Piezoelectric Energy Harvester by students from SM Sains Selangor. It generates electricity through a unique and unconventional way as cars go over speedbumps. This innovation shows not only



Chaco-Ban - SM Sains Sultan
Muhammad Jiwa, Sungai Petani, Kedah



HO Easy Poly - SM Pedidikan Khas
Vokasional Indahpura, Kulai, Johor



GRASPAC - SMK Kubang Bemban,
Pasir Mas, Kelantan

creativity but also thoughtful observation. This innovation is in line with SDG 9 - Industry, Innovation and Infrastructure, SDG 11 - Sustainable Cities and Communities, and SDG 13 - Climate Action. This innovation also generates new job opportunities and energy from urban transport infrastructure.

The youths in this project have won five awards including the ASEAN Innovative Science Environmental and Entrepreneur Fair (AISEEF) 2021 as well as the International Young Scientists Innovation Exhibition (IYSIE) 2021.

SMK Kubang Bemban, Pasir Mas, Kelantan

Another sustainable and environmentally-friendly innovation is the GRASCPAC, short for Sustainable Packaging from Cocopeat and Grass Fibers, by the students from SMK Kubang Bemban in Pasir Mas, Kelantan. This innovation reduces the dependence on plastics for food packaging. It accomplishes this through three natural resources:

lemongrass, cocopeat, and cogon grass. These materials are boiled with soda ash before being processed into pulp fibers and moulded with a papier-mache technique. The students did not stop at alternative materials but also made sure that this alternative packaging is better than using plastic. They conducted experiments to test the material against conventional plastic food packaging in strength, water absorption rates, biodegradable rates, and preservation of food. The alternative material is stronger and absorbs water from food, thus increasing its shelf life, and is able to reach 27% biodegradation after two weeks.

SM Sains Sultan Muhammad Jiwa, Sungai Petani, Kedah

The final innovation highlighted here is the ChaCO-Ban: The Revolutionary Eco Charcoal, by students from SM Sains Sultan Muhammad Jiwa in Sungai Petani, Kedah. Today, charcoal is a crucial part of many industries and households. While

important, this can be harmful to the environment as charcoal in Malaysia is typically made from mangrove trees. Mangrove habitats are vital to protect coastal areas from storms, erosion, and flooding, thus demand for more charcoal can threaten these habitats. The students from SM Sains Sultan Muhammad Jiwa came up with an alternative source for charcoal using natural waste products such as orange peels, banana peels, and paddy husks. These environmentally-friendly alternatives allow a more sustainable use of the industry-enabling charcoal.

Thinking sustainably is the way forward. As such, it is reassuring to know that these mindsets are being inculcated in Malaysian youth. The innovations shared here reflect the impact these children are able to bring to the environment and society. These and other innovations from schools across the nation should inspire the rest of society to put their minds, ideas, questions, observations, and thoughts to good use.

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