ANNUAL REPORT 2016

BIOECONOMY TRANSFORMATION PROGRAMME

BIO ECONOMY MALAYSIA

Enriching the Nation, **Securing the Future**

ISSN 0128-245X

RATIONALE

ENRICHING THE NATION **SECURING THE FUTURE**

The design represents growth and economic sustainability through the bio-based industry. All elements involved in the design signifies the essence that make up the bioeconomy focus areas. The overall shape symbolises the dynamism of biotechnology as a national economic contributor.

BIOECONOMY TRANSFORMATION PROGRAMME

CONTENTS

01

INTRODUCING **BIOECONOMY**

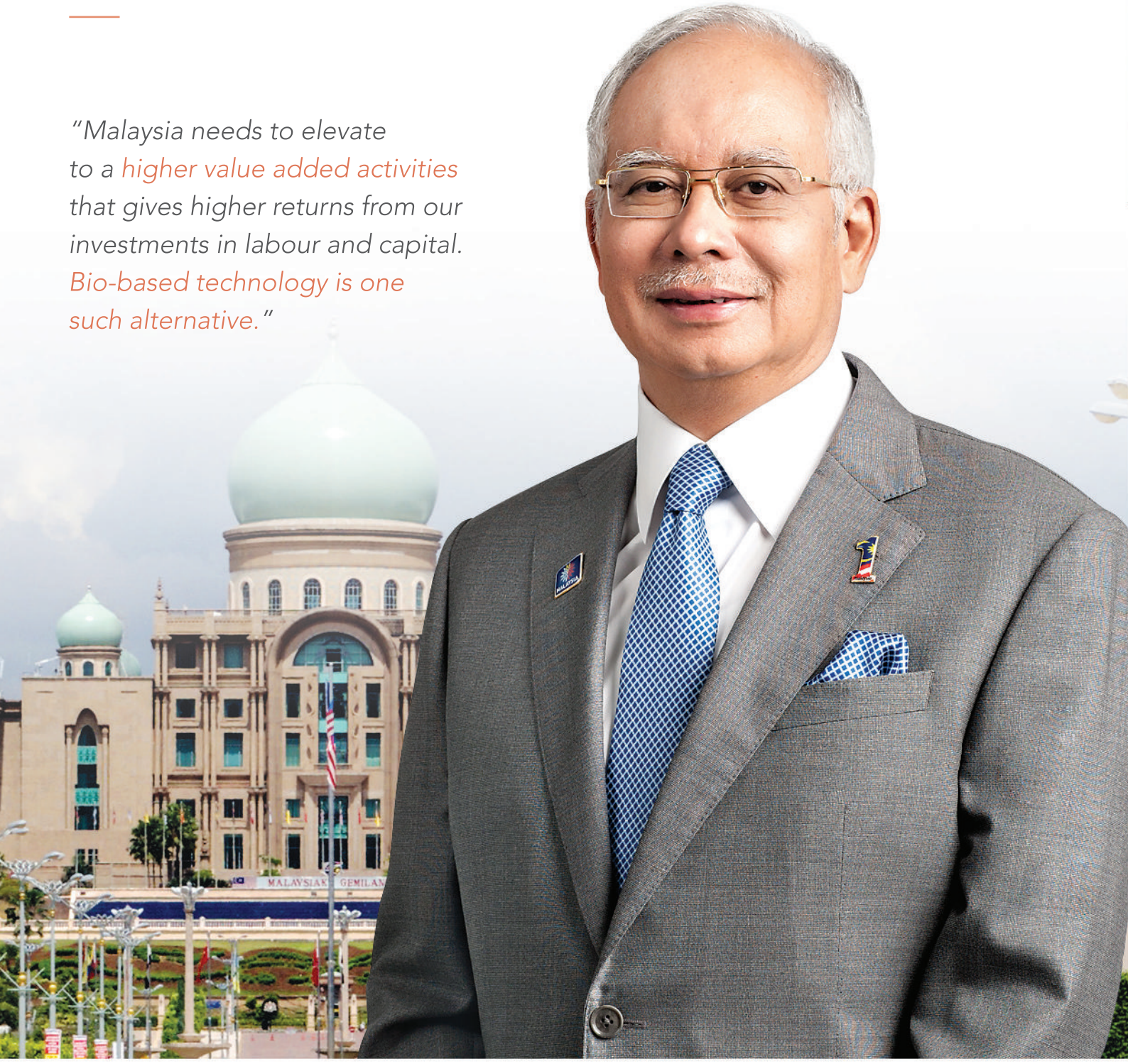
"Bioeconomy has been identified as a game changer for Malaysia's economic growth. With our biodiversity and the abundance of biological resources, bioeconomy has the potential to increase the country's economic competitiveness, create more job opportunities, enhance healthcare, ensure food security as well as address environmental and sustainability concerns"

- Prime Minister Dato' Sri Mohd Najib's speech at BioMalaysia & Bioeconomy Asia Pacific, 2014

MESSAGE BY

PRIME MINISTER OF MALAYSIA

"Malaysia needs to elevate to a higher value added activities that gives higher returns from our investments in labour and capital. Bio-based technology is one such alternative."



Y.A.B. Dato' Sri Mohd Najib Bin Tun Haji Abdul Razak
Prime Minister of Malaysia

In the context of building national prosperity, the Eleventh Malaysia Plan (RMK-11) represents one of the most crucial period in our history as it is the final leg of the 5-year plan before reaching the aspiration of being a developed nation. The country has overcome series of challenges for the past 59 years, yet the next 4 years will be the crucial period in determining our level of success.

The world is and will continue to be different from what we have experienced. The country can no longer depend on low cost, labour-intensive and low technology structure given the intensified global competition from China, India and other developing nations.

As such, Malaysia needs to elevate to a higher value added activities that gives higher returns from our investments in labour and capital. Bio-based technology is one such alternative. Though bio-based technology has been second nature to the development of civilisations, modern bio-based technology has only emerged a few decades ago with the onset of advanced technological methods. With that, comes great opportunities for countries that seek to utilise it.

The Bioeconomy Transformation Programme (BTP) seeks to take full advantage of these opportunities. The Malaysian Bioeconomy Development Corporation Sdn. Bhd. (Bioeconomy Corporation), as the lead implementation agency to develop bio-based industry, is on track in delivering the desired outcomes in terms of value-added, investments and jobs creation. Yet, many more needs to be done. The bio-based industry not only need to be able to stand on its own in the global arena, but able to make significant contribution towards national aspiration. These includes shifting towards green technology, conserving all elements of biodiversity, bolstering food and water security, reduction of fossil fuel, effective utilisation of biomass and healthcare wellness.

While Capital Economy is progressing, People's Economy needs to be enhanced too. The Bioeconomy Community Development Programme (BCDP) one of the initiative under the National Blue Ocean Strategy (NBOS), was formulated to improve the socio-economic well-being of the rakyat, targeting the bottom 40% household income group (B40) by generating higher income and more job opportunities in the country. It is hoped that with the effective implementation of BCDP, and in line with the objectives of RMK-11, the B40 household will move up to become middle-class by fostering community and social based enterprises as well as building capacity to participate in high-productivity, innovative, and creative economic activities.

The Government of Malaysia recognises the immense potential of the BTP and the BCDP in order to boost Malaysian companies' participation globally and position Malaysia as an internationally competitive player in the bio-based industry. These programmes are also in line with the RMK-11 plan to contribute to the capital and economy of the Rakyat.

I wish to congratulate the Ministry of Science, Technology and Innovation and Bioeconomy Corporation and thank all parties for the support, participation and cooperation towards ensuring the success of the bioeconomy agenda in Malaysia.

Y.A.B. Dato' Sri Mohd Najib Bin Tun Haji Abdul Razak
Prime Minister of Malaysia

MESSAGE BY

MINISTER OF SCIENCE, TECHNOLOGY AND INNOVATION

Y.B. Datuk Seri Panglima Madius Tangau
Minister of Science, Technology and Innovation

Since the launching of the National Biotechnology Policy (NBP) in 2005, I am confident that the biotechnology industry in Malaysia is now firmly anchored by the Malaysian Bioeconomy Development Corporation Sdn. Bhd. (Bioeconomy Corporation) to execute the objectives of the NBP. Several initiatives, such as the BioNexus programme for biotech start-ups have been implemented successfully in order to realise various aspects of the NBP.

Apart from ensuring that the biotechnology sector is turned into one of the key economic drivers in the nation, contributing five per cent of the nation's GDP by 2020, a comprehensive roadmap was designed to foster a conducive ecosystem for rapid growth in the biotech industry.

Science, Technology and Innovation (STI) oriented policies are envisioned to stimulate greater knowledge generation and produce highly capable human capital in order to complement the nation's aspiration to be a competitive, sustainable, and high income economy.

The Bioeconomy Transformation Programme (BTP) and the Bioeconomy Community Development Programme (BCDP), facilitated by Bioeconomy Corporation, are very much in accordance with this development goal.

In line with a people-centric economy, BCDP was designed to enlist rural farmers and the farming community to supply raw materials to BTP Trigger Project companies. Another hallmark of the BCDP is the application of bio-based technologies, a distinct advantage over the conventional contract farming.

To date, I am pleased that BCDP, as one of the National Blue Ocean Strategy (NBOS) initiatives, has made a positive impact on the lives of communities. BCDP achievements in 2016 include shrimp farming in Pitas, Sabah; kacip fatimah farming in Ledang, Johor; shiitake mushroom farming in Kimanis, Sabah; seaweed aquaculture in Langkawi, Kedah; and oyster mushroom farming in Nilai and Jelebu, Negeri Sembilan.

This is the vision that I wish to see prosper further as projects from the BCDP could also elevate the household income of the bottom 40 (B40) and help them develop bio-agropreneurial skills.

BTP is designed to be largely driven by the private sector and with the appropriate ecosystem, the private sector has access to various support to drive the bio-based industry forward.

The BCDP and its partner programme, the BTP, reflects a complete supply-chain approach to the production of downstream products, providing a consistent supply of raw materials. Through this approach, it is my desire to see many more BTP companies create more novel, innovative and high value-added products.

With that in mind, I look forward to more efforts from Bioeconomy Corporation as well as other agencies under the Ministry of Science, Technology and Innovation (MOSTI), to build Malaysia as a global powerhouse in Bioeconomy in the near future.

Y.B. Datuk Seri Panglima Madius Tangau
Minister of Science, Technology and Innovation

MESSAGE BY

CHAIRMAN OF MALAYSIAN BIOECONOMY DEVELOPMENT CORPORATION

"The implementation of these programmes by Bioeconomy Corporation contributes largely to the entire Bioeconomy value chain in the effort to create a conducive and sustainable economy."

Y.Bhg. Professor Tan Sri Zakri Abdul Hamid
Chairman

The Malaysian Bioeconomy Development Corporation Sdn. Bhd. (Bioeconomy Corporation) is the leading agency tasked to drive the nation's Bioeconomy agenda. Having gone through a rebranding exercise from BiotechCorp to Bioeconomy Corporation has strengthened our role in developing a competitive and diverse end-to-end value chain of the Bioeconomy Ecosystem.

The current year marks the transition into the third and final phase of the National Biotechnology Policy (NBP) - Going Global. Under this initiative, we have more than doubled our effort to internationalise Malaysian Bioeconomy by focusing on beneficial collaborations, emphasising on industry-driven research as well as aiding to create seamless transition from lab to the market.

Taking the cue from other advanced countries, we see Bioeconomy as a potential not to be missed. The NBP roadmap and the Bioeconomy Transformation Programme (BTP) provides a holistic framework to develop a sustainable ecosystem of R&D and commercialisation in the areas of agriculture, healthcare and industrial biotechnology. On the other hand, the Bioeconomy Community Development Programme (BCDP) provides BioNexus Status companies and BTP Trigger Project owners the avenue to source for sustainable raw materials with the enlistment of local suppliers or communities. The implementation of these programmes by Bioeconomy Corporation contributes largely to the entire Bioeconomy value chain in the effort to create a conducive and sustainable economy.

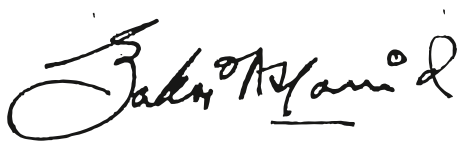
For Malaysian Bioeconomy to be more competitive globally and to help realise the NBP aspiration of creating 20 homegrown champions in the bio-based industry by the year 2020, numerous international ties have been forged.

Such effort includes our collaboration between Bioeconomy Corporation and France's Cosmetic Valley in the fields of bio-cosmeceuticals, wellness and pharma nutrition industry. We have also established a link with the U.S. biotechnology industry through the launching of our flagship office, BiotechCorp International Inc. (BII) in San Francisco. BII is the first Asian biotech incubator which serves as a landing pad for Malaysian bio-based entrepreneurs seeking to expand their businesses in the U.S. in line with the final phase of NBP.

The positive outcomes of Malaysian Bioeconomy's prowess are evident from our BTP Trigger Project recipients, for example Green & Smart Holdings; listed in AIM market in London and fruitfully managed to raise £4 millions (RM22 millions) for its biogas projects, while Orchid Life Sdn. Bhd.; also marketed its trademarked weight management herbal product 'Labeesity™' overseas. International market penetrations are also evident in a few other companies, for example Free The Seed Sdn. Bhd.; successfully marketed its biodegradable packaging products to the U.K., Flora Bee Hive Enterprise Sdn. Bhd.; made its mark through exporting honey products to markets in China, Europe and the U.S., a tropical and hybrid seed producer, Green World Genetics Sdn. Bhd.; successfully penetrated markets such as India, the U.S. and Europe.

These and many others have served to prove a point that our works here at Bioeconomy Corporation plays an important role in the nation's journey to establish Malaysia as a Bioeconomy hub in the Asia Pacific. Together we must continue to strive, never waver in our efforts, and not lose our sight to becoming a developed nation as a whole.

Finally, I would like to take this opportunity to express my gratitude towards the Honorable Dato' Sri Mohd Najib bin Tun Abdul Razak, the Prime Minister, as well as the Honorable Datuk Seri Panglima Madius Tangau, the Minister of Science, Technology and Innovation (MOSTI) for their continuous support and guidance, and most importantly the members of the Board of Directors for their valuable inputs in making Bioeconomy Malaysia a success.



Y.Bhg. Professor Tan Sri Zakri Abdul Hamid
Chairman

"Our works here at Bioeconomy Corporation plays an important role in the nation's journey to establish Malaysia as a **Bioeconomy Hub** in the Asia Pacific."

Y.Bhg. Professor Tan Sri Zakri Abdul Hamid
Chairman

02

THE IMPORTANT **PEOPLE**

"BTP and BCDP are prime examples where strategic promotion of bio-based technology has led to economic benefits for the players, communities and the industry as a whole"

- CEO's report, BTP Annual Report 2016

CHIEF EXECUTIVE OFFICER'S (CEO) REPORT

"(High Impact projects) have the potential to shape the future of Bioeconomy through innovative and ground-breaking technology and are capable of contributing significantly towards the Nation's development goal."

Y.Bhg. Dato' Dr. Mohd Nazlee Kamal
Chief Executive Officer

**Dato' Dr. Mohd Nazlee Kamal served as the Bioeconomy Corporation's CEO until 15 July 2016.*

Science, technology and **innovation** will always play an important role for any country to progress further in its economy or its well-being. As Malaysia's scientific discovery, technology management, and innovative creations grow, the state of her economy and its overall well-being are key to progressing into a developed nation.

Towards this goal, the Bioeconomy Transformation Programme (BTP) and the Bioeconomy Community Development Programme (BCDP) were created as initiatives to provide extended support and to enhance the capabilities of the existing National Biotechnology Policy (NBP). Currently, BTP boasts a total of 61 Trigger Projects, an increase from 48 Trigger Projects achieved last year. From the increase, we managed to raise the GNI contribution by an additional RM246 million, investments by RM383.8 million, and created up to 1,195 employment opportunities.

In addition, seven of the new BTP Trigger Projects have been identified as 'high-impact' based on GNI, investment and social contributions. These companies have the potential to shape the future of Bioeconomy through innovative and ground-breaking technologies and are capable of contributing significantly towards the Nation's development goal.

The seven high-impact projects secured in 2016 are as follows:

BTP Trigger Project Owners	Project Title
Olive Energy Sdn Bhd	Setting up of 10MW Palm Oil Biomass Power Generation Plant in Mukah, Sarawak
GLT Renewable Sdn Bhd	Setting up of a Biogas Power Generation Plant at Rompin Palm Oil Mill in Pahang Based on the Feed-in-Tariff Model
GLT Eco Sdn Bhd	Setting up of a Biogas Power Generation Plant at Setia Kawan Kilang Kelapa Sawit in Kedah Based on the Feed-in-Tariff Model
Majunaka Eco Energy Sdn Bhd	Setting up of a 9.95MW Rice Husk and Woodchip Biomass Power Generation Plant in Naka, Kedah
Metro Havana Sdn Bhd	Setting up of a Biogas Power Generation Plant at Sri Jelutong Palm Oil Mill in Pahang based on the Feed-in-Tariff Model
Asia Plantation Capital Berhad	Production and Commercialisation of High-Value Agarwood Products
Telic Paper Sdn Bhd	Development, Production and Commercialisation of Biodegradable Products

Meanwhile, the BTP Fund, a form of soft loan to eligible BTP Trigger Project companies has continued to facilitate the ongoing commercialisation of BTP projects. To date, RM27.25 million of the BTP Fund has been approved to qualified BTP Trigger Project owners.

At the upstream level, the BCDP has also reached further milestones through the inclusion of 405 farmers and cooperatives involved in the programme in 2016:

YEAR	NUMBER OF PARTICIPANTS
2015	342
2016	405
	TOTAL 747

This programme has been implemented throughout the country under five successful projects with Bioeconomy Corporation acting as the enabler for collaboration between the local communities and anchor companies. These projects are mushroom farming using spent coffee grounds, seaweed aquaculture, kacip fatimah farming, shrimp farming, and shiitake mushroom farming.

Another notable engagement is the handing-over of bee boxes to farmers in a BCDP project in Kuala Linggi. The association involved benefitted through receiving technical training, apiculture equipment, and 54 boxes of bee colonies from the anchor company, Flora Bee Hive Enterprise Sdn. Bhd. It is hoped that the project will lead to a positive impact on income and overall welfare of the participating association's members.

On a promotional front, the Malaysian Bioeconomy Development Corporation Sdn. Bhd. (Bioeconomy Corporation) is constantly raising awareness and educating the masses through public events. These includes the Bioeconomy Day conducted early this year in Sarawak as well as BioMalaysia & Asia Pacific Bioeconomy 2016 in May. Meanwhile, through the BCDP Workshop with the State of Pahang in February and the International Conference on Blue Ocean Strategy in August, BCDP has gained greater public visibility. Events such as these allows strategic collaborations and networking among potential and interested investors to create better understanding and recognition of the bioeconomy capacity for the future.

Meanwhile, under nurturing of BTP companies, the Trigger Project owners continue to demonstrate high commercial value of its products. This is proven by Algaetech International Sdn. Bhd., one of the BTP Trigger Project owners, launching Malaysia's very own Astaxanthin based skin care range, Astatude which is at par with its international counterparts in the cosmetics industry. Similarly, Green & Smart Sdn. Bhd., a biogas producer utilising palm oil mill effluent to produce electricity is now in the commissioning stage and is expected to connect to the National Grid by the end of third quarter.

In addition, in line with NBP's final phase Going Global, Bioeconomy Corporation has further strengthened its international partnership by signing a collaboration proposal with French-based association Cosmetic Valley. The agreement seeks to establish an international network for business development, facilitate collaborative research, development, and innovation (R&D&I) as well as supporting model cluster known as the Langkawi Cosmetic Island, with the aim in developing a dynamic herbal, cosmetic and perfumery cluster.

On industry monitoring, the Bioeconomy Contribution Index (BCI), developed as a comprehensive measure of bioeconomy, was further improved following feedback from relevant ministries, agencies, and academics. The BCI is aimed to be the standard benchmark of Bioeconomy and is being actively propagated to stakeholders and the public.

BTP and BCDP are prime examples where strategic promotion of bio-based technology has led to economic benefits for the players, communities and the industry as a whole. Initiatives undertaken by Bioeconomy Corporation has enabled the creation of several flagship companies to venture into the global market while helping to uplift B40 households, resulting in a positive impact through the provision of employment to the urban and rural areas, in line with Eleventh Malaysia Plan priorities.

Looking ahead, as we aspire with the successes of BTP and BCDP in shaping the national bioeconomy, I would like to express profound gratitude to the Government and Ministry of Science, Technology and Innovation for their consistent encouragement, BTP and BCDP companies and all stakeholders for endless support in forging the Malaysian bioeconomy agenda.

Y.Bhg. Dato' Dr. Mohd Nazlee Kamal
Chief Executive Officer

"**Bioeconomy Corporation** is constantly raising **awareness** and **educating** the masses through public events."

Y.Bhg. Dato' Dr. Mohd Nazlee Kamal
Chief Executive Officer

BOARD OF **DIRECTORS**

01 02 03 04 05 06 07 08 09

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CEO's Office

Pn. Nora Mohamed
Senior Vice President
BioNexus Development

03

BIOECONOMY **BIOSPHERE**

"Bioeconomy is the knowledge-based production and utilisation of biological resources, innovative biological processes and principles to sustainably provide goods and services across all economic sectors"

- Communiqué, Global Bioeconomy Summit 2015

GLOBAL
BIOECONOMY

Based on the Communiqué which was launched by the International Advisory Committee during the First Global Bioeconomy Summit in Berlin, November 2015, Bioeconomy is defined as "knowledge-based production and utilisation of biological resources, innovative biological processes and principles to sustainably provide goods and services across all economic sectors".

In the Communiqué, three areas of action had been agreed upon, that are crucial for the creation of a sustainable Bioeconomy:

- Promoting innovations for a sustainable Bioeconomy;
- Establishing good governance for a sustainable Bioeconomy; and
- Initiating and strengthening international dialogue and cooperation.

Bioeconomy is a reality and it has generated increasing interest in many parts of the world, including different groups interested in developing bioeconomy, e.g. the Global Green Growth Forum/3GF; the Ibero-American Network of Bioeconomy and Climate Change (REBICAMCLI) between Mexico, Honduras, Nicaragua, Colombia, Cuba and Spain; the EU Bioeconomy Panel, the EU-coordinated International Bioeconomy Forum (IBF); the Food, Fuel, Fibre and Forests/4Fs Dialogue; and the WBCSD Action 2020.

Several policies, strategies and programmes have been developed at international, national and regional levels. To date, Bioeconomy has gained momentum as a new strategy for fostering innovation, sustainable development and green growth in more than 45 industrialised and emerging economies. For most nations, the Bioeconomy addresses a number of key national goals, and is seen to meet the greater societal challenges such as achieving energy and food security, improving public health, combating environmental degradation and conserving biodiversity, while at the same time improving the ecological balance of industrial production, competitiveness and fostering economic growth.

Following the First Global Bioeconomy Summit in November 2015, the Food and Agriculture Organisation (FAO) was tasked to coordinate international work on the bioeconomy. FAO has identified five key categories for the development of a sustainable bioeconomy, which are:

- Environmental sustainability;
- Socio-economic sustainability;
- Synergies among biomass end-use sectors;
- Food security; and
- Enabling factors (institutions, markets & policies).

This will require significant efforts in terms of knowledge, policies and institutions, both at the national level and through international collaboration, which must be oriented in the right direction in order to ensure that bioeconomy can lead to long term sustainable development. It is therefore important to develop bioeconomy guidelines and strategies in a sustainable way. Some examples of such strategies are as follows:

Fostering Efficient Usage of Bio-based Resources

Natural resources are managed in different ways by various countries according to the amount of natural resources assets in every country. Countries well-endowed with biomass from natural resources such as China, Finland, Malaysia and South Africa promote the sustainability of the primary production and exploitation of biomass resources. On the other hand, in countries that do not have a lot of natural biomass but have a strong industrial sector such as Germany, UK and Japan, bioeconomy is more often viewed for its potential for innovation and industrial renaissance. Countries with scarce natural biomass resources also rely more heavily on biomass waste and residues. Some like Germany and Japan also wish to create partnerships with countries that have more natural biomass like in the German-Thai agreement signed in January 2016.

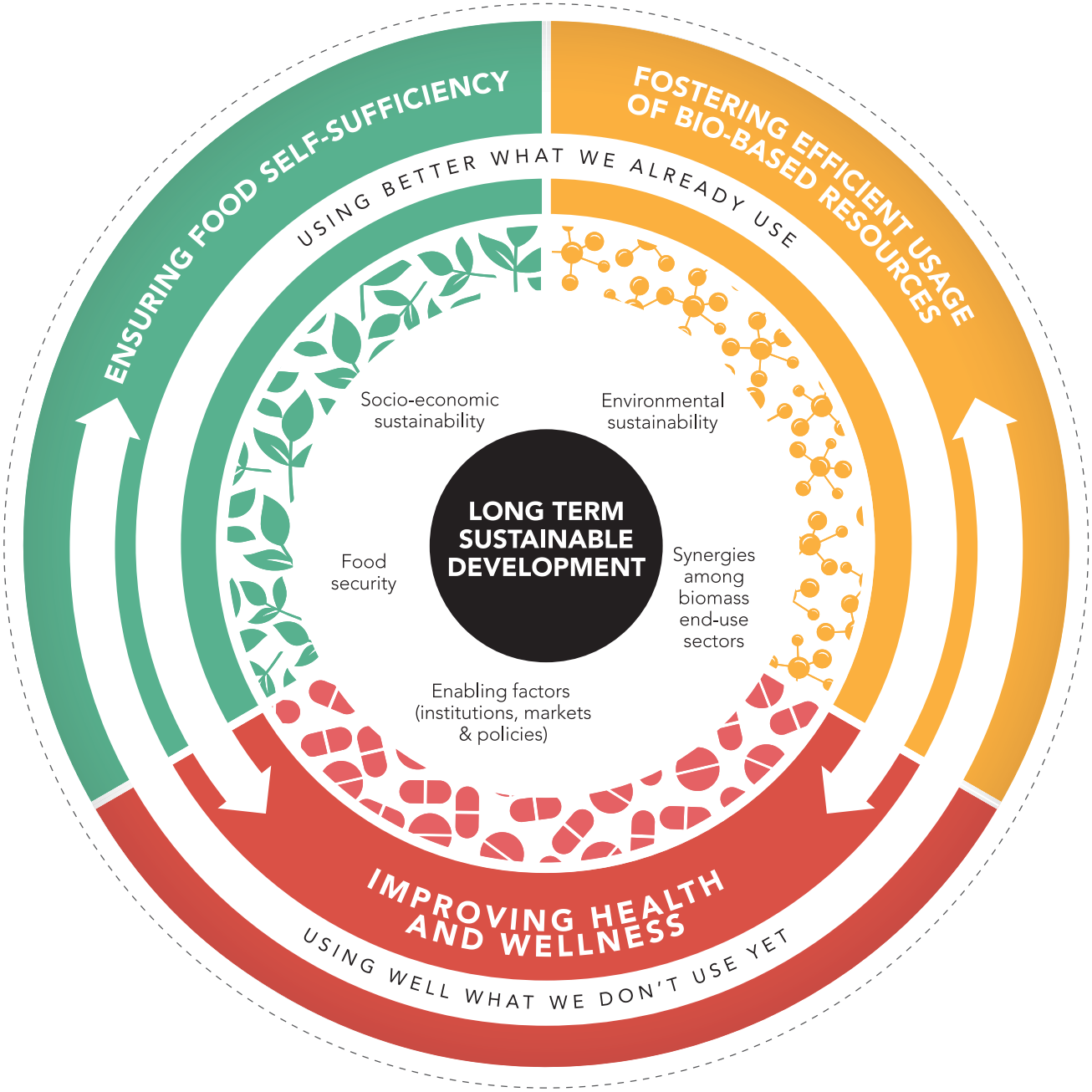
Ensuring Food Self-Sufficiency

Food self-sufficiency is widely addressed in the South Africa, China, Malaysia, Japan, Argentina and the EU. Japan endorses the food first principle as it considers only food waste as a type of biomass to be used for bio-industries. The Argentinian strategy expresses awareness and a willingness to ensure no competition with food and feed within their upcoming national strategy. The EU also addresses domestic food security through resource-efficient food supply chains.

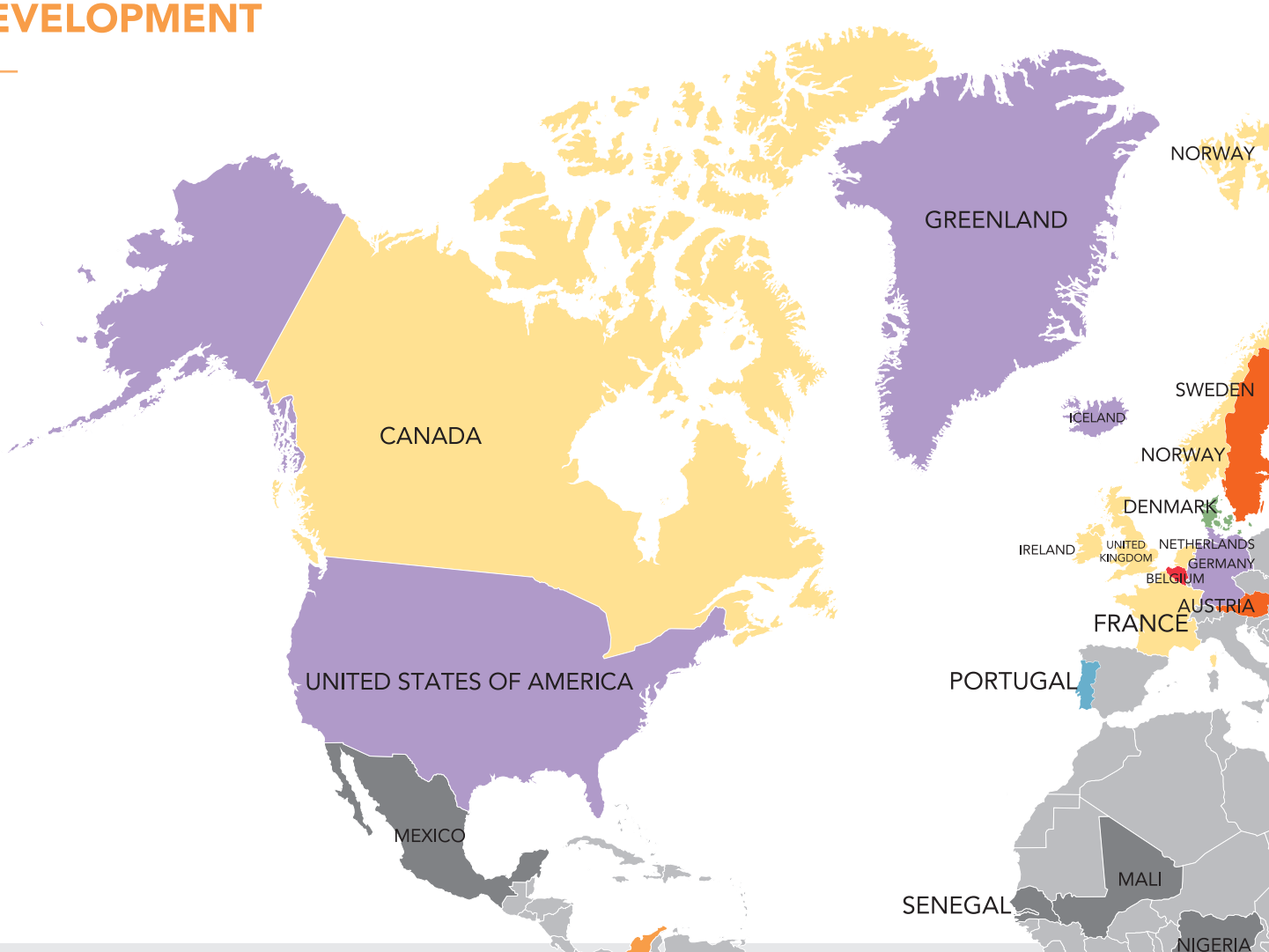
Improving Health and Wellness

In South Africa, the Bioeconomy Strategy's objective with regard to health is to support and strengthen the country's local research, development and innovation capabilities which enable the country to manufacture active pharmaceutical ingredients, vaccines, biopharmaceuticals, diagnostics and medical devices to address the disease burden, while ensuring a secure supply of essential therapeutics and prophylactics. In the United States, the ability to sequence and compare genomes of patients cheaply and quickly has given rise to the emergence of personalised medicines. Instead of the typical treatments based on group response to medication, treatments are beginning to be geared to each individual's specific conditions. Bioeconomy in Malaysia is also defined as the production of renewable biological resources and their conversion including into healthcare wellness products via innovative and efficient technologies.

In summary, bioeconomy's comprehensive and multi-sector approach offers a unique solution to the issue of sustainable development which can be illustrated in the following diagram:



GLOBAL BIOECONOMY
STRATEGIES FOR BIOECONOMY DEVELOPMENT



Focused Strategy:

GREEN ECONOMY

Renewable/ sustainable economy and environmental economy. Sustaining and advancing economic, environmental and social well-being

BLUE ECONOMY

Development of sustainable marine and fisheries

BIO-ENERGY

Renewable energy from biomass or organic matters to generate electricity or as biofuel

REGIONAL BIOECONOMY DEVELOPMENT

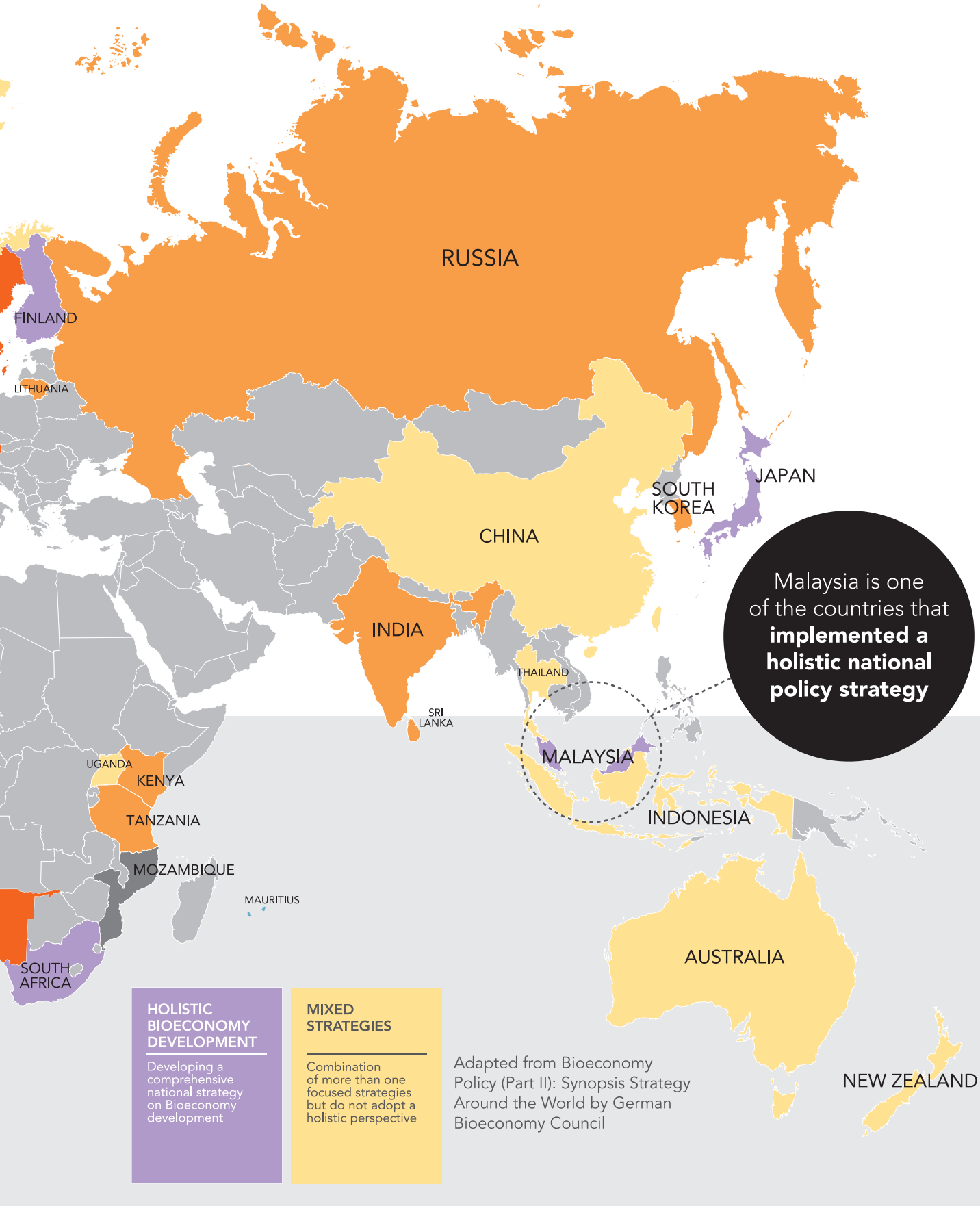
Specific initiatives and strategies in regional level

BIOECONOMY RESEARCH & INNOVATION

Analysis and strategies on Bioeconomy issue as well as implementation on the research development

HIGH-TECH

Biotech and converging technologies



Adapted from Bioeconomy Policy (Part II): Synopsis Strategy Around the World by German Bioeconomy Council

BIOECONOMY MALAYSIA
A COMPREHENSIVE APPROACH TO BIOECONOMY

Malaysia is the first ASEAN country to have launched its Bioeconomy agenda, following the move that was made by developed nations such as the United States, the EU Countries, South Africa, China, Australia, Canada, Finland and Russia. The vast socio-economic potential offered by bioeconomy has spurred these countries to launch their bioeconomy initiatives or roadmaps that offers attractive incentives, promising programmes and significant investments to boost the bioeconomy sector.

The OECD produced "The Bioeconomy to 2030: Designing a Policy Agenda", a report which provides a broad-based analysis of future developments in agriculture, health and industry sectors in which biotechnology has the greatest potential impact. Meanwhile, Germany developed the National Research Strategy Bioeconomy to implement programmes from 2011-2016, besides publishing many strategies and action plans that contain interfaces with bioeconomy. South Africa launched its Bio-economy Strategy in 2014 to improve the National Biotechnology Strategy for greater economic contribution by 2030.

Sharing the same views with other adapters of bioeconomy, Malaysia also recognises the benefits of having its own bioeconomy initiative. Through the Ministry of Science, Technology and Innovation and its agency Malaysian Bioeconomy Development Corporation Sdn. Bhd. (Bioeconomy Corporation), the Bioeconomy Transformation Programme (BTP) was launched by the Y.A.B. Dato' Sri Mohd Najib Tun Haji Abdul Razak on 30 October 2012 during the National Bioeconomy Council Meeting.

An Important Agenda in Driving the Nation's Growth

Malaysia envisions the bioeconomy to be a significant contributor to the nation's economy by 2020 and beyond. A national Bioeconomy has the potential to make Malaysia as an internationally competitive country by leveraging upon its abundant bio-based resources, while gearing the nations towards a greener economy through the reduction of carbon footprints and emission. Furthermore, the bioeconomy is expected to enable the country to achieve other nationalistic goals, such as enhanced domestic food security, improved health and well-being of rakyat and increase national income through greater and more sustainable economic growth. This necessitates a coherent and supportive policy framework, as well as implementation programmes. To this end, the Bioeconomy Transformation Programme (BTP) and Bioeconomy Community Development Programme (BCDP) developed by Bioeconomy Corporation plays a significant part of this comprehensive approach towards developing a Malaysian Bioeconomy ecosystem.

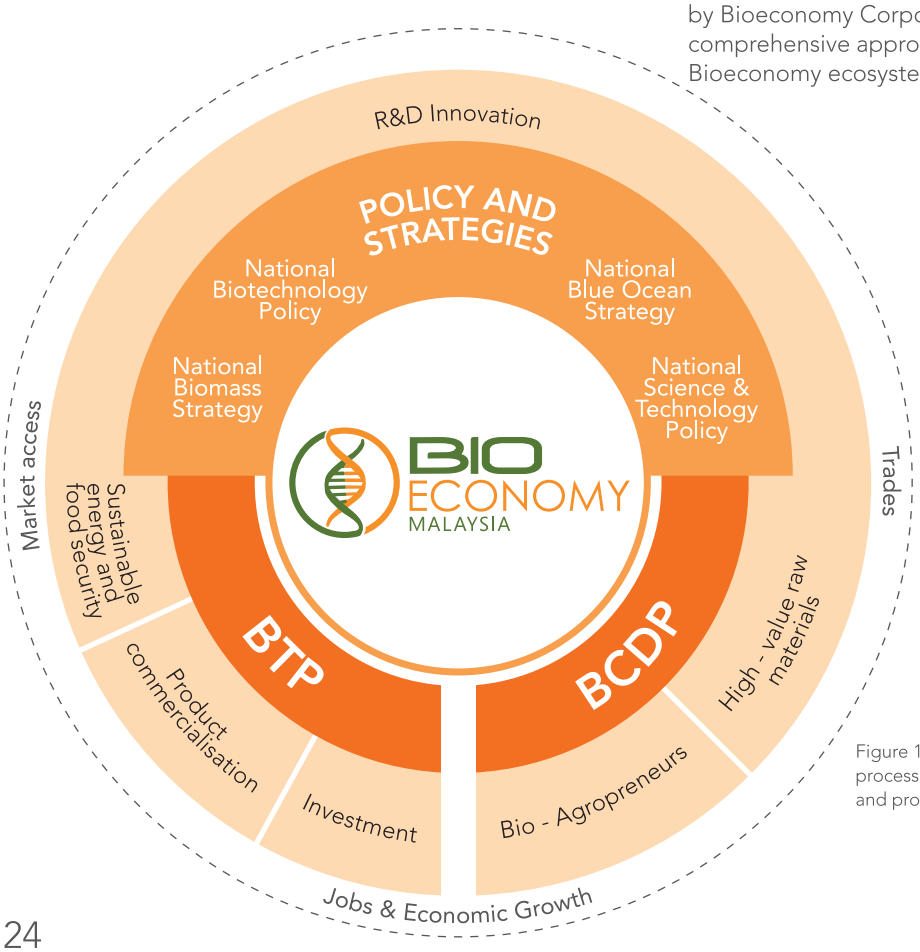


Figure 1: How BTP and BCDP tie in to the whole process of creating market access, increasing trades and providing jobs and economic growth.

BIOECONOMY MALAYSIA
A COMPREHENSIVE APPROACH TO BIOECONOMY

Implementation with a Focus

In the value creation, both the BTP and BCDP are dictated by four key principal focus:

01

GEOGRAPHICAL BALANCE IN **PROMOTION OF BTP AND BCDP PROGRAMMES**

Increase public awareness on BTP and BCDP equally across the states via stakeholder engagement with private and public sectors comprising the companies, relevant ministries/ states and agencies.

02

FOCUS ON HIGH GROWTH SECTORS **AND EXPANDING THE HORIZON OF ENTRY POINT PROJECTS**

Further develop sectors indicating promising growth such as Aquaculture, Food Crops, Food Processing, Biomass and Chemicals & Pharma sectors.

EPP M5: Bio-based Materials, was added to the existing 11 EPPs, resulting in 12 EPPs in total

03

LEVERAGING ON NATIONAL BLUE **OCEAN STRATEGY (NBOS) INITIATIVES FOR BCDP**

NBOS is a dynamic national strategy platform that brings together ministries and agencies in formulating and implementing the NBOS initiatives. BCDP will continue to leverage on NBOS to explore potential collaboration with stakeholders.

04

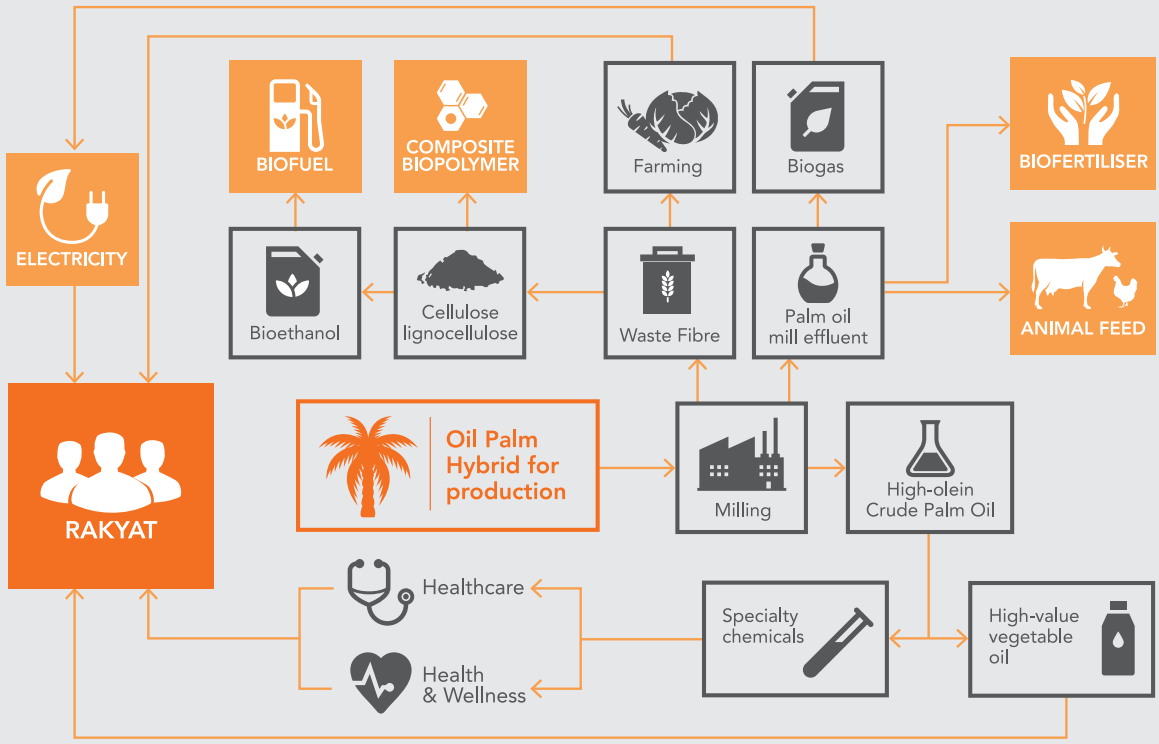
ONE STOP CENTRE FOR **BIOECONOMY DATA**

Compilation of accurate and up-to-date assessment of Malaysia's Bioeconomy to provide a comprehensive understanding of the needs of the industry. Providing periodical publication of economics data and articles as a promotional and awareness purposes.

BIOECONOMY MALAYSIA
THE MAIN PILLARS OF GREEN GROWTH, SUSTAINABILITY AND A CIRCULAR ECONOMY

The bioeconomy is the knowledge-based production and utilisation of biological resources, innovative biological processes and principles to sustainably provide goods and services across all economic sectors. In this regard, the bioeconomy is circular in nature, given its great emphasis over the optimal use of resources and the production of raw materials from renewably sourced feedstock.

The application of bio-based technologies and the efficient management of bio-based resources closes the loops in conventional industries, allowing for greater sustainability and green growth, and is the game changer that transforms commodity-based products into major contributors to the national economy.



Above is an example of how palm oil industry, through the use of biotechnology could create a multiplier effect throughout the value chain with the production of high-value intermediary and finished products, all for the benefit of the rakyat and the nation.

Various types of commodities can be used to produce high-value products via innovative, efficient bio-based technologies. Examples of these commodities and their alternative applications are shown below :

OIL PALM — Biogas, Biofertiliser, Nutraceuticals, Oleo-Chemicals, Biodiesel	**SAGO** — Biofertiliser, Animal feed, Paper coating, Bioethanol	**TIMBER** — Biocompost, Biomass pellets, Biochar	**COFFEE (GROUNDED)** — Biocompost, Biomass pellets
KENAF — Oil absorbent, Textile, Bullet-proof vest	**SUGAR CANE (BAGASSE)** — Biogas, Biopackaging, Bioethanol	**PADDY (RICE HUSK)** — Biopackaging, Building materials, Biomass pellets	**COCONUT** — Nutraceuticals, Biochar, Bio-cosmeceuticals, Mattress

04

TRANSFORMING **THE ECONOMY**

"Bioeconomy policy should not be fragmented into diverse policy areas or technology sectors, but comprise R&D&I, agriculture sectors, food, healthcare, biotechnology, converging technologies, renewable energy and conservation"

- Communiqué, Global Bioeconomy Summit 2015

BIOECONOMY TRANSFORMATION PROGRAMME (BTP) BY NUMBERS

GROSS NATIONAL INCOME
GNI IN 2020

RM48 Billion

INVESTMENT
BY 2020

RM50 Billion

JOB OPPORTUNITIES
BY 2020

170,000

CREATING ECONOMIC VALUE THROUGH BTP

BTP is estimated to increase Malaysia Gross National Income (GNI) of up to RM48 billion in 2020, with a total investment of RM50 billion and creation of 170,000 new job opportunities, thus enabling Malaysia to become a high income nation by year 2020.

Hence, BTP is capturing the nation's economic potential and contribution by amplifying bio-based technology via enhancement of productivity, yield and quality of outputs and successfully creating a ripple effect throughout the entire supply chain with the development of the upstream sectors.

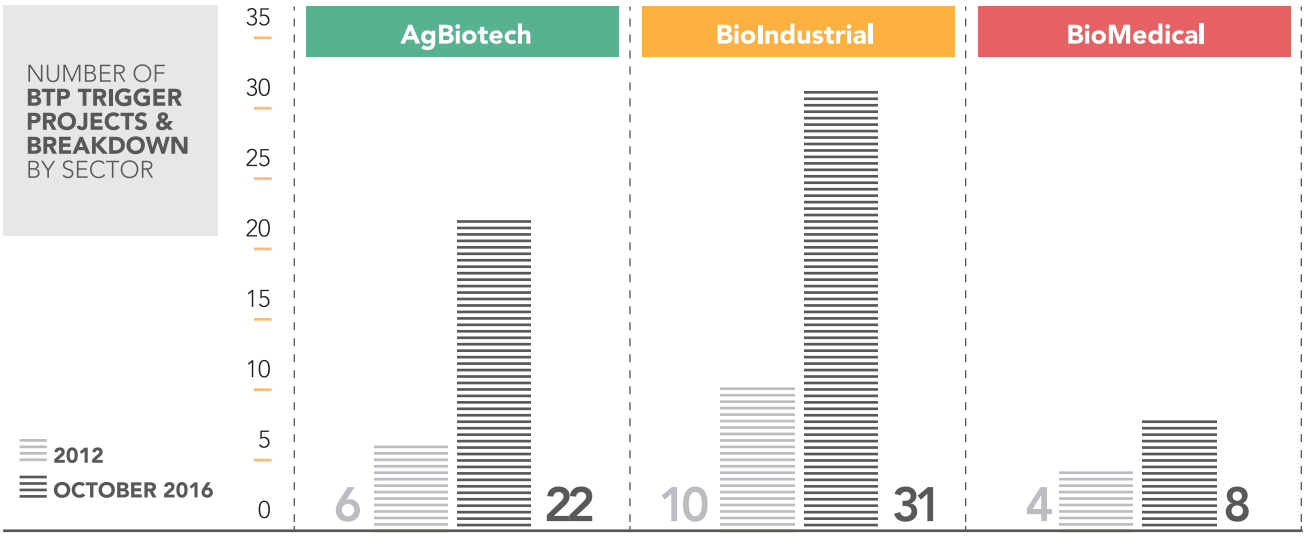
The BTP continued to record marked progress in 2016, led by an increase number of BTP Trigger Projects to 61 as of October 2016 from 48 as of December 2015. These 61 BTP Trigger Projects will contribute RM6.22 billion in GNI in 2020 and create 26,550 employment opportunities and RM18.6 billion in investment by 2020.

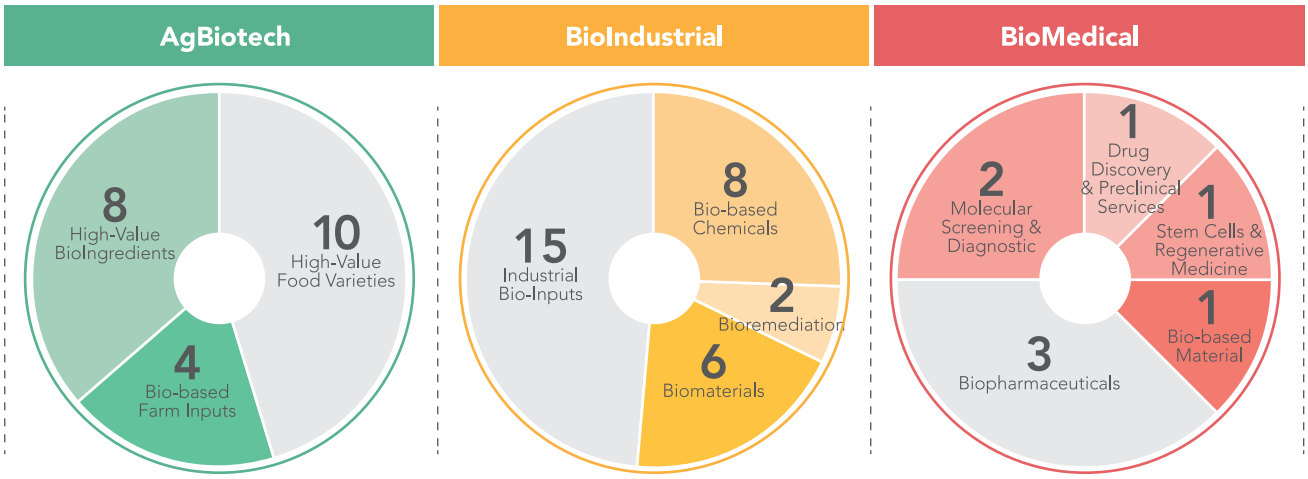
Of the 61 BTP Trigger Projects, 22 are AgBiotech projects, 31 are BioIndustrial projects and 8 are BioMedical projects.

BTP TRIGGER PROJECTS UPDATES
CURRENT ACHIEVEMENTS

NUMBER OF **BTP TRIGGER PROJECTS**	AS OF DECEMBER 2015	AS OF OCTOBER 2016
	48	61
GNI in 2020	RM5.97 Billion	RM6.22 Billion
Investment by 2020	RM18.21 Billion	RM18.59 Billion
Job opportunities by 2020	25,355	26,550

NUMBER OF **BTP TRIGGER PROJECTS & BREAKDOWN** BY SECTOR





BIOECONOMY
TRANSFORMATION PROGRAMME TRIGGER PROJECTS IN MALAYSIA

LEGEND **FOR EPP**

AGBIOTECH

- **A1** | Bio-based Farm Inputs
- **A2** | High-Value Bioingredients
- **A3** | High-Value Food Varieties

BIOINDUSTRIAL

- **I1** | Industrial Bioeconomy Upstream Inputs
- **I2** | Bioechemicals from Renewable Resources
- **I3** | Biomaterials from Renewable Resources
- **I4** | Bioremediation

BIOMEDICAL

- **M1** | Biopharmaceuticals
- **M2** | Drug Discovery & Preclinical Services
- **M3** | Molecular Screening & Diagnostics
- **M4** | Stem Cells & Regenerative Medicine
- **M5** | Bio-based Materials

PROGRESS OF
BTP TRIGGER PROJECTS AS OF OCTOBER 2016

AGBIOTECH

NO	PROJECT TITLE	EPP	LOCATION	PROGRESS
01	Converting Palm Oil Waste to Biofertilisers through the Implementation of Integrated Waste Treatment Plants	A1 : Bio-based Farm Inputs	Sabah	GOOD PROGRESS
02	Converting Agriwaste to Biofertilisers through Implementation of Integrated Waste Treatments Plants	A1 : Bio-based Farm Inputs	Sabah	MODERATE PROGRESS
03	Scale up Production and Commercialisation of Bio-Feed for Livestock Industry	A1 : Bio-based Farm Inputs	Selangor	LOW PROGRESS
04	Production and Commercialisation of High-Value Seeds	A1 : Bio-based Farm Inputs	Terengganu	GOOD PROGRESS
05	Research, Development and Manufacture of Emulsifiers and Stabilisers	A2 : High-Value BioIngredients	Johor	GOOD PROGRESS
06	Commercialisation of Bees Farming and Processing of Honey and its Byproducts	A2 : High-Value BioIngredients	Perak	GOOD PROGRESS
07	Cultivation and Processing of Haematococcus Pluvialis Biomass for the Production of Astaxanthin	A2 : High-Value BioIngredients	Wilayah Persekutuan Kuala Lumpur	GOOD PROGRESS
08	Mass Cultivation of Haematococcus Pluvialis for the Production of Natural Astaxanthin	A2 : High-Value BioIngredients	Kedah	GOOD PROGRESS
09	Production of Advanced Bio-Therapeutic Extract (ATE) from Cocos Nutrifera Milk for Health and Wellness Products	A2 : High-Value BioIngredients	Melaka	MODERATE PROGRESS
10	Develop Plantation, Extraction and Commercialisation of Mangosteen	A2 : High-Value BioIngredients	Selangor	GOOD PROGRESS
11	Production and Commercialisation of High-Value Agarwood-based Products	A2 : High-Value BioIngredients	Johor	GOOD PROGRESS
12	Scale up Plantation, Extraction & Commercialisation of Stevia as an Alternative Sweetener for Food & Beverage Products	A2 : High-Value BioIngredients	Negeri Sembilan	GOOD PROGRESS

LOW PROGRESS MODERATE PROGRESS GOOD PROGRESS

13	Premium Edible Bird's Nest & Downstream Products	A3: High-Value Food Varieties	Penang	
14	Development of Fully Integrated Multi-platform Finfish Aquaculture Facilities	A3: High-Value Food Varieties	Kedah	
15	Liquid Immersion Bioreactor (LIB) Method to Commercialise MD2 Pineapple Plantlets	A3: High-Value Food Varieties	Pahang	
16	Production and Commercialisation of MD2 Pineapple	A3: High-Value Food Varieties	Negeri Sembilan	
17	Development of Fully Integrated Shrimp Aquaculture Facilities	A3: High-Value Food Varieties	Sabah	
18	Expansion of Shiitake Mushroom Production	A3: High-Value Food Varieties	Sabah	
19	Commercialisation of High-Value Abalone Aquaculture through Applied Biotechnology	A3: High-Value Food Varieties	Perak	
20	Setting up a High-Value Fresh Mushroom Facility	A3: High-Value Food Varieties	Negeri Sembilan	
21	Develop, Produce and Commercialise Indigenous Hybrid Paddy Seed	A3: High-Value Food Varieties	Perak	
22	Scale up Production of High Value Mushroom Varieties	A3: High-Value Food Varieties	Selangor	

BIOINDUSTRIAL

NO	PROJECT TITLE	EPP	LOCATION	PROGRESS
01	Setting up of 2 Biogas Power Generation Plants at Kilang Sawira Makmur and Cheekah-Kemayan Palm Oil Mill in Pahang based on the Feed-in-Tariff Model	I1 : Industrial Bioeconomy Upstream Inputs	Pahang	GOOD PROGRESS
02	Biogas Power Generation based on Feed-in-Tariff Model in FELDA Kahang	I1 : Industrial Bioeconomy Upstream Inputs	Johor	GOOD PROGRESS
03	Bio-Compressed Natural Gas (BioCNG) from Palm Oil Mill Effluent	I1 : Industrial Bioeconomy Upstream Inputs	Selangor	MODERATE PROGRESS
04	Setting up 5 Biogas Power Generation Plants at FELCRA Mills based on Feed-in-Tariff Model	I1 : Industrial Bioeconomy Upstream Inputs	Johor	GOOD PROGRESS
05	Setting up a Biogas Power Generation Plant in Kapilit Palm Oil Mill	I1 : Industrial Bioeconomy Upstream Inputs	Sabah	GOOD PROGRESS
06	Setting up of 14 Biogas Power Generation Plants at FELDA Palm Oil Mills based on Feed-in-Tariff Model	I1 : Industrial Bioeconomy Upstream Inputs	Johor	GOOD PROGRESS
07	Establishment of an Energy Crop Plantation as Input for the Industrial Bioeconomy	I1 : Industrial Bioeconomy Upstream Inputs	Terengganu	LOW PROGRESS
08	Production of Syngas for Steam Generation from Solid Biomass	I1 : Industrial Bioeconomy Upstream Inputs	Terengganu	MODERATE PROGRESS
09	Production and Utilisation of Compressed Biomethane Gas (CBG) for Transportation and Industrial	I1 : Industrial Bioeconomy Upstream Inputs	Sabah	MODERATE PROGRESS
10	Setting up of a Biogas Power Generation Plant at Rompin Palm Oil Mill in Pahang based on the Feed-in-Tariff Model	I1 : Industrial Bioeconomy Upstream Inputs	Pahang	GOOD PROGRESS
11	Setting up of 10MW Palm Oil Biomass Power Generation Plant in Mukah, Sarawak	I1 : Industrial Bioeconomy Upstream Inputs	Sarawak	GOOD PROGRESS
12	Setting up of a 9.95MW Rice Husk and Woodchip Biomass Power Generation Plant in Naka, Kedah	I1 : Industrial Bioeconomy Upstream Inputs	Kedah	GOOD PROGRESS
13	Setting up of a Biogas Power Generation Plant at Sri Jelutung Palm Oil Mill in Pahang based on the Feed-in-Tariff Model	I1 : Industrial Bioeconomy Upstream Inputs	Pahang	GOOD PROGRESS
14	Setting up of a Biogas Power Generation Plant at Setia Kawan Kilang Kelapa Sawit based on the Feed-in-Tariff Model	I1 : Industrial Bioeconomy Upstream Inputs	Kedah	GOOD PROGRESS

LOW PROGRESS MODERATE PROGRESS GOOD PROGRESS

15	Setting up of 3 Biogas Power Generation Plants with Total Capacity of 7.5MW based on the Feed-in-Tariff Model	I1 : Industrial Bioeconomy Upstream Inputs	Penang	
16	Renewable Production of L-Methionine and Thiochemicals	I2 : Biochemicals from Renewable Resources	Terengganu	
17	Bio-based Chemical Production using Renewable Palm Oil Derivatives	I2 : Biochemicals from Renewable Resources	Johor	
18	Integrated Bio-Refinery Complex in Palm Oil Industrial Cluster	I2 : Biochemicals from Renewable Resources	Sabah	
19	Expansion of cGMP Stearic Acid and Medium Chain Triglycerides (MCT) Powder Plants	I2 : Biochemicals from Renewable Resources	Johor	
20	Production of Isobutanol from Cellulosic Feedstocks (Wood Chips)	I2 : Biochemicals from Renewable Resources	Terengganu	
21	Bioethanol and Biomethanol Production from Wood Chips	I2 : Biochemicals from Renewable Resources	Sabah	
22	Production of Cellulosic Sugars from Woody Biomass Produced by Energy Crop Plantations	I2 : Biochemicals from Renewable Resources	Terengganu	
23	Setting up of a 2nd Generation Heavy Duty Biofuel Plant	I2 : Biochemicals from Renewable Resources	Pahang	
24	Research, Development and Manufacturing of Biodegradable Packaging Products from Agricultural Biomass Waste Materials	I3 : Biomaterials from Renewable Resources	Kedah	
25	Establishment of Commercial Production of PHBH from Palm Oil and its Byproducts & Derivatives	I3 : Biomaterials from Renewable Resources	Pahang	
26	Agro-Based Bioresin Production for Bioplastics Use	I3 : Biomaterials from Renewable Resources	Selangor	
27	Production of Biopolyols for Biopolyurethanes from Palm Oil Derived Oleic Acid	I3 : Biomaterials from Renewable Resources	Terengganu	
28	Scale up Production and Promote Usage of Biodegradable & Compostable Packaging Products from Sustainable Agro-Waste	I3 : Biomaterials from Renewable Resources	Penang	
29	Development, Production and Commercialisation of Biodegradable Products	I3 : Biomaterials from Renewable Resources	Melaka	
30	Setting up Bio-based Waste Management Facilities in Iskandar Malaysia	I4 : Bioremediation	Johor	
31	Production of Biological Solution using Active Microbial for Bioremediation	I4 : Bioremediation	Selangor	

PROGRESS OF **BTP TRIGGER PROJECTS AS OF OCTOBER 2016**

BIOMEDICAL

NO	PROJECT TITLE	EPP	LOCATION	PROGRESS
01	Expansion of Sterile Infusion Solution Plant	M1 : Biopharmaceuticals	Penang	GOOD PROGRESS
02	Integrated Bio-based and Synthetic Pharmaceutical Plants for Intermediaries and Finished Products	M1 : Biopharmaceuticals	Kedah	MODERATE PROGRESS
03	Accelerate Development, Production & Commercialisation of Malaysian Made Biotech Drugs	M1 : Biopharmaceuticals	Negeri Sembilan	LOW PROGRESS
04	Drug Discovery Services and IP Development around Natural Products	M2 : Drug Discovery & Preclinical Services	Wilayah Persekutuan Kuala Lumpur	LOW PROGRESS
05	Research, Development and Manufacturing of Rapid Test Kits for In Vitro Diagnostic Application	M3 : Molecular Screening & Diagnostics	Johor	GOOD PROGRESS
06	Scale up Innovative Molecular Screening and Diagnostics (MSD) Products and Services	M3 : Molecular Screening & Diagnostics	Wilayah Persekutuan Kuala Lumpur	GOOD PROGRESS
07	Promote, Encourage and Ensure Progress of Stem Cells and Regenerative Medicine in Malaysia	M4 : Stem Cells & Regenerative Medicine	Wilayah Persekutuan Kuala Lumpur	MODERATE PROGRESS
08	Production and Commercialisation of Empty Capsules from Gelatine & Vegetable	M5 : Bio-based Materials	Penang	GOOD PROGRESS

LOW PROGRESS MODERATE PROGRESS GOOD PROGRESS

05

DEVELOPING **THE COMMUNITY**

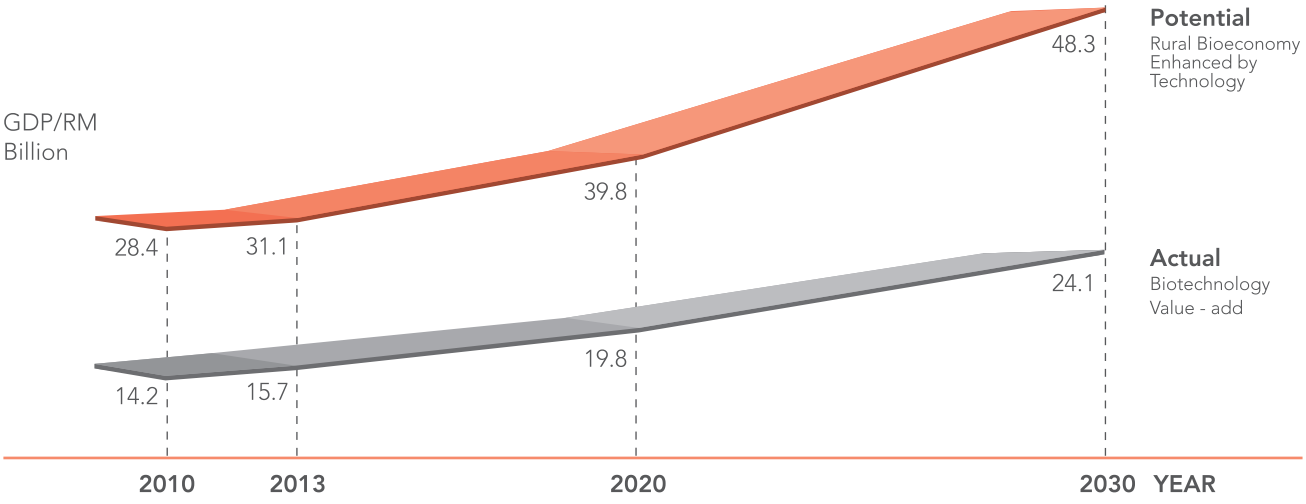
"The Bioeconomy Community Development Programme (BCDP), one of the initiative under the National Blue Ocean Strategy (NBOS), was formulated to improve the socio-economic well-being of the rakyat, targeting the bottom 40% household income group (B40) by generating higher income and more job opportunities in the country"

- Message from Prime Minister, BTP Annual Report 2016

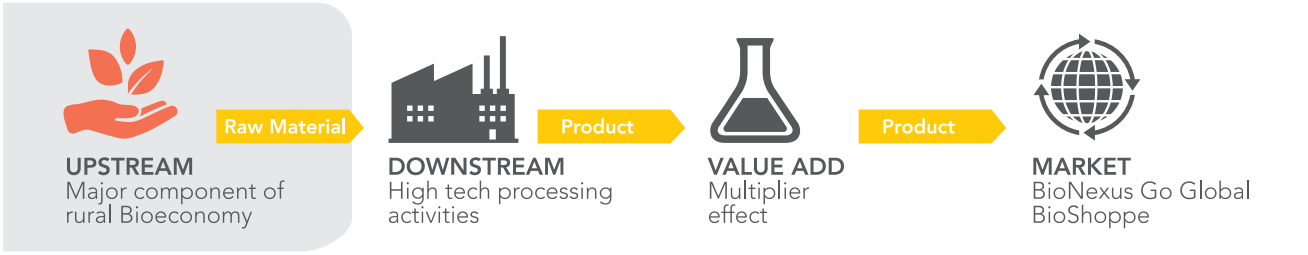
BIOECONOMY COMMUNITY
DEVELOPMENT PROGRAMME (BCDP)

Overview

Rural Bioeconomy can be developed further as a significant contributor to our economy. Based on stimulated growth rate at 15%, rural portions of bioeconomy (i.e. smallholder agriculture and aquaculture) can contribute up to RM24.1 billion to the Malaysian GDP in 2030 and may even double up to RM48.3 billion if advanced bio-based technology is applied across the sector with appropriate policy actions.



The implementation of the Bioeconomy Community Development Programme (BCDP) serves to bolster the upstream portion of the supply chain. Developing the upstream sector creates a ripple effect throughout the entire industry value chain. Bio-based technology can amplify the economic contributions of agricultural production sectors beyond current capacities by enhancing yield, productivity and quality of outputs. The creation of a secure, local, high quality source of raw materials enables capacity expansion for downstream ventures as well as improved market penetration.



Focus areas : High-value herbs, seeds production, aquaculture, mushroom farming, dairy farming and bee farming

BCDP involves the enlistment of rural farmers and settlers to cultivate raw materials potentially as inputs for BioNexus Status companies and BTP project owners. The proposed contract farming mechanism with guaranteed buyback will generate additional income for the programme participants. BCDP has been endorsed as part of the National Blue Ocean Strategy (NBOS) initiative on 27 April 2015.

BCDP Objectives

01

Ensure stable and consistent supply of raw materials and extracts of bio-ingredients

02

Increase revenue of BioNexus Status companies and/or BTP Trigger Projects through sustainable supply of raw materials from cooperatives/farmers through contract farming

03

Develop unskilled farmers into Bio-Agropreneurs and enhance social mobility through technology-based entrepreneurship

04

Provide facilitation on certification requirements through Malaysian Organic Scheme and/or Ecocert for sustainable development

05

Maximise idle lands through the application of biotechnology

Mechanism

01 Funding Agencies disburses funding for BCDP Project to cooperatives/associations/farmers

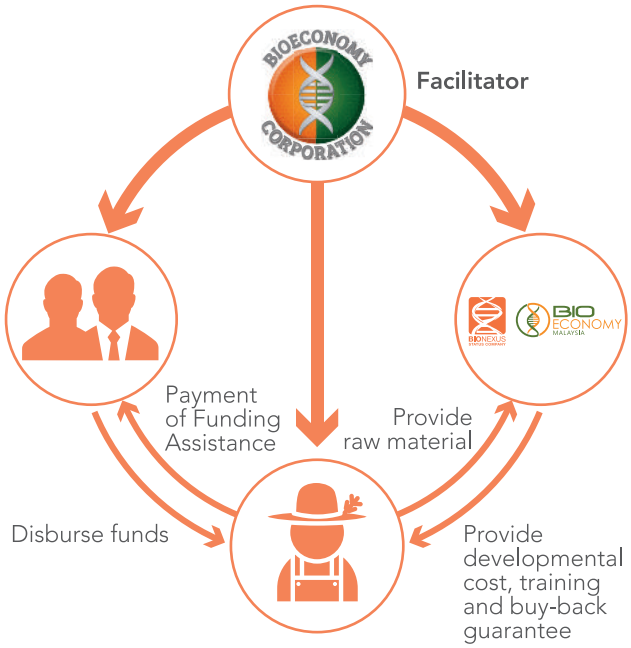
02 Cooperatives/associations/farmers will utilise funding for training and necessary farming purchases

03 Guaranteed buy-back by BioNexus Status companies/BTP Trigger Project owner from the farmers to ensure guaranteed income to the farmers

04 BioNexus Status companies/BTP Trigger Project owner will provide technical/training assistance to the cooperatives/associations/farmers

05 Cooperatives/associations/farmers will pay back the funding assistance to the funding agencies

06 Bioeconomy Corporation as the lead agency to facilitate BCDP



BIOECONOMY COMMUNITY
DEVELOPMENT PROGRAMME (BCDP)

BCDP Strategies

Enhancing Inclusiveness and Improve the Household Income of the B40 Through BCDP

Leveraging on BioNexus Status companies or Bioeconomy Transformation Programme (BTP) companies as anchor companies to provide guarantee buyback, training and technology for BCDP projects

Focus on strategic sub-sectors : High-Value Herbs, Seeds Production. Aquaculture, Mushroom Farming, Dairy Farming and Bee Farming

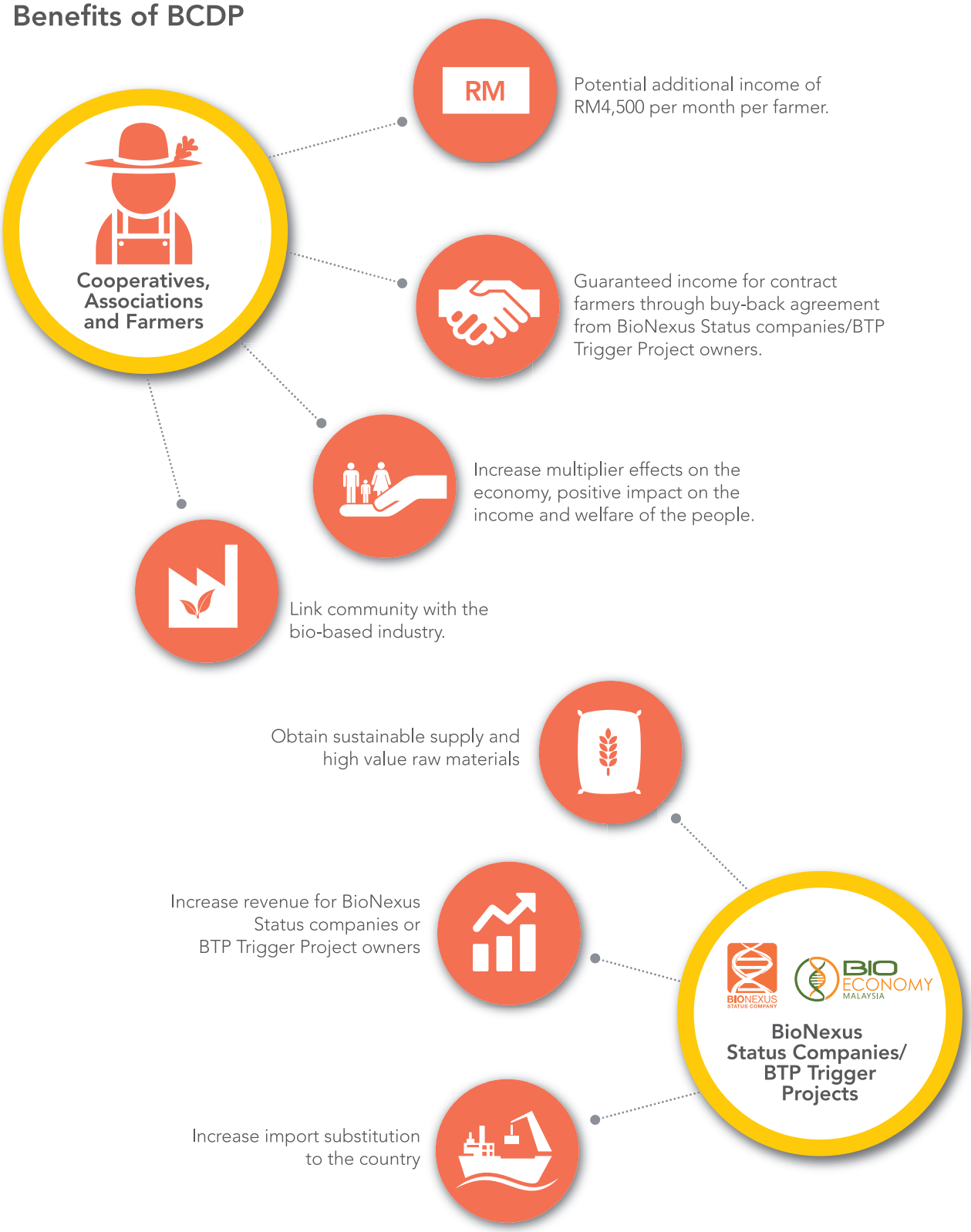
Increase participations of farmers, cooperatives or associations in BCDP through collaborations with relevant Ministries, Agencies, States, Corridors and Research Institutions

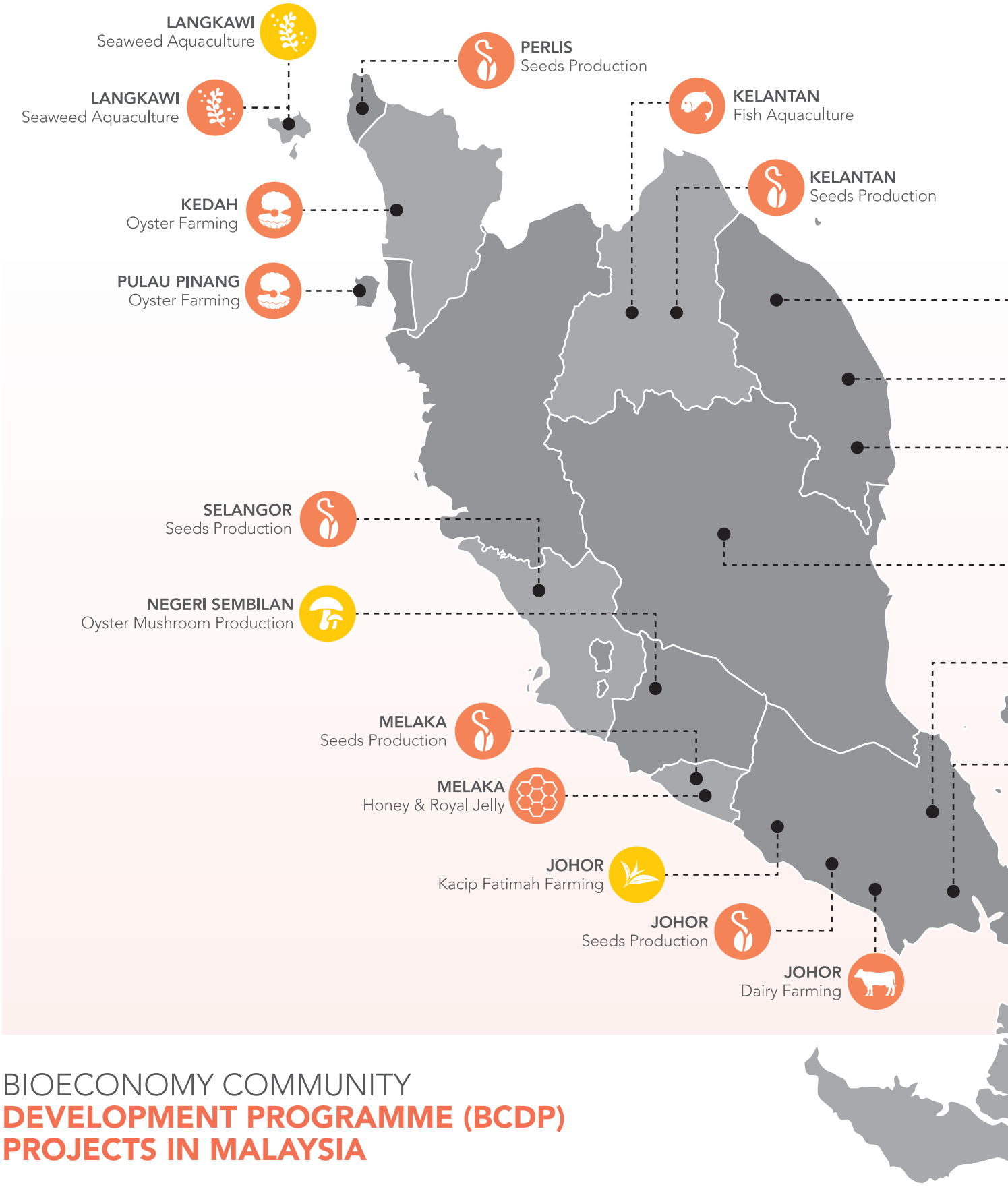
Inter-Ministry/Agency/State/Corridor collaboration is critical for the development and implementation of the BCDP. As part of NBOS initiatives that are based on the principles of high impact, rapid execution, low cost and sustainability, BCDP is implemented by breaking the bureaucratic silos and through collaborations between various ministries and agencies.

Secretariat : Coordinate, facilitate and monitor project development

Ministries / Agencies	UPENs - Provide land and identify potential Bioeconomy Projects	Facilitate project implementation	Technology support	NBOS initiatives
			Universities and RIs	NBOS 3

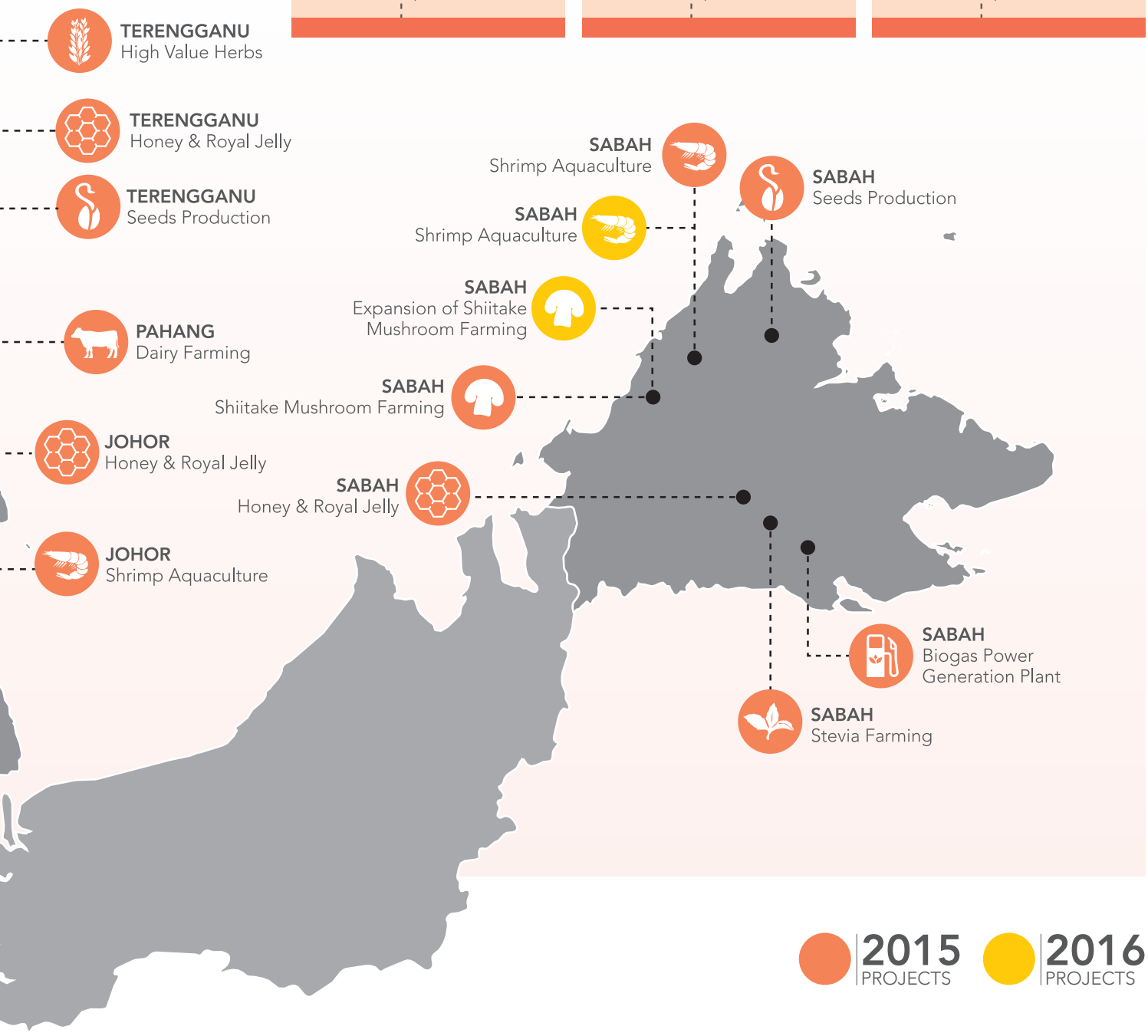
Benefits of BCDP





BIOECONOMY COMMUNITY DEVELOPMENT PROGRAMME (BCDP) PROJECTS IN MALAYSIA

2015		2016		2017-2020	
23	BCDP PROJECTS	30	BCDP PROJECTS	56	BCDP PROJECTS
342	Farmers	500	Farmers	3,051	Farmers
1,642	Lives directly impacted	2,400	Lives directly impacted	14,645	Lives directly impacted
RM 4,300	Additional Income Average per month/farmer	RM 4,500	Additional Income Average per month/farmer	RM 4,500	Additional Income Average per month/farmer



BCDP PROJECTS **PROGRESS**

Completed* In progress

2015 PROJECTS

NO	PROJECT TITLE	LOCATION	NO. OF PARTICIPANTS	PROGRESS
01	Bee Farming	Kuala Linggi, Melaka	8	
02	Bee Farming	Segamat, Johor	6	
03	Bee Farming	Terengganu	10	
04	Bee Farming	Sabah	50	
05	Stevia	Tuaran, Sabah	10	
06	High-Value Herbs Farming	Pasir Raja, Terengganu	15	
07	Shrimp Aquaculture	Kota Tinggi, Johor	20	
08	Shrimp Aquaculture	Pitas, Sabah	10	
09	Fish Aquaculture	Tok Bali, Kelantan	3	
10	Oyster	Kuala Muda, Kedah	19	
11	Oyster	Balik Pulau, Penang	6	
12	Dairy Farming	Desaru, Johor	15	
13	Dairy Farming	Muadzam, Bera, & Pekan, Pahang	15	
14	Shiitake Mushroom Farming	Kimanis, Sabah	30	
15	Seaweed Aquaculture	Langkawi, Kedah	10	
16	Seeds Production	Rhu Tapai, Terengganu	35	
17	Seeds Production	Batu Arang, Selangor	30	
18	Seeds Production	Padang Besar, Perlis	10	
19	Seeds Production	Alor Gajah, Melaka	10	
20	Seeds Production	Sabah	10	
21	Seeds Production	Kelantan	10	
22	Seeds Production	Mersing, Johor	10	
23	Biogas Power Generation Plant	Pitas, Sabah	250**	
			Total Participants – **342*** **	

2016 PROJECTS

NO	PROJECT TITLE	LOCATION	NO. OF PARTICIPANTS	PROGRESS
01	Seaweed Aquaculture (expansion)	Langkawi, Kedah	20	
02	Oyster Mushroom Farming	Nilai and Jelebu, Negeri Sembilan	20	
03	Kacip Fatimah Farming	Ledang, Johor	10	
04	Shiitake Mushroom Farming (expansion)	Kimanis, Sabah	15	
05	Shrimp Aquaculture	Pitas, Sabah	340	
			Total Participants – **405**	

*Contract farming has started
**Number of household benefited from free electricity provided by the plant
***Excludes Biogas Power Generation Plant project

06

VALUES OF **BIOECONOMY**

"In this increasingly complex world, the availability of high quality statistics is vital in facilitating decision making for both the private and public sectors"

- Tan Sri Zeti, Governor's Keynote Address at International Statistical Institute, 2014

Bioeconomy in Numbers • 46

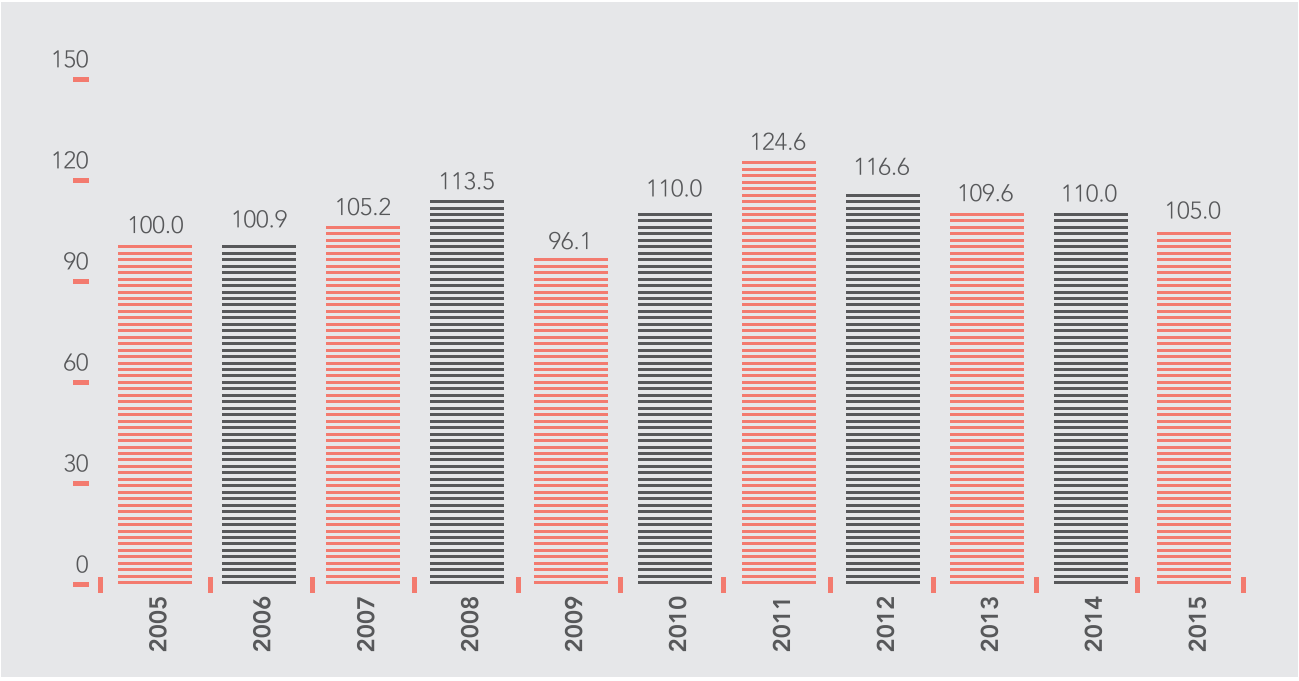
BIOECONOMY
IN NUMBERS

Bioeconomy refers to all economic activity that is derived from the continued commercial application of biotechnology. It encompasses the production of renewable biological resources and their conversion into food, feed, chemicals, energy and healthcare wellness products via innovative and efficient technologies. Under this definition, bioeconomy includes the sectors of agriculture, forestry, fisheries, as well as food production, organic chemicals, pharmaceuticals and renewable energy industries.

Estimating bioeconomy is a challenge for researchers as official statistics are limited to traditional sectors with little distinction made towards bio-based, or biotechnology-related productions. Therefore, indicators for the bioeconomy are estimated based on a combination of multiple sources. As a result, the calculation and estimation of the true value of bioeconomy may evolve over time to account for the full potential of bioeconomy such as the inclusion of bio-services.

The Bioeconomy Contribution Index (BCI) is a combination of 5 components related to the bioeconomy industry which are Investments, Value-added, Productivity, Exports and Employment. It is a comparative tool designed to provide a holistic look, encompassing multiple aspects of bioeconomy and are used to identify trends, patterns, and synergies within the industry. The index compares the performance of a specific component for a selected year against an expected base performance determined by a general equilibrium economic model. After series of strong growth especially during 2008 and 2011, the year 2015 has been a modest year for Bioeconomy as the BCI indicated a contraction. The moderation is due particularly to weaker performance in the Exports component.

The Bioeconomy Contribution Index[1]



[1] *For more information on the BCI construction, please refer to the paper Developing a Measure for Quantifying Economic Impacts: The Bioeconomy Contribution Index (2016) by Dr Quasem Al-Amin, available at the Malaysian Bioeconomy Development Corporation Sdn. Bhd.*

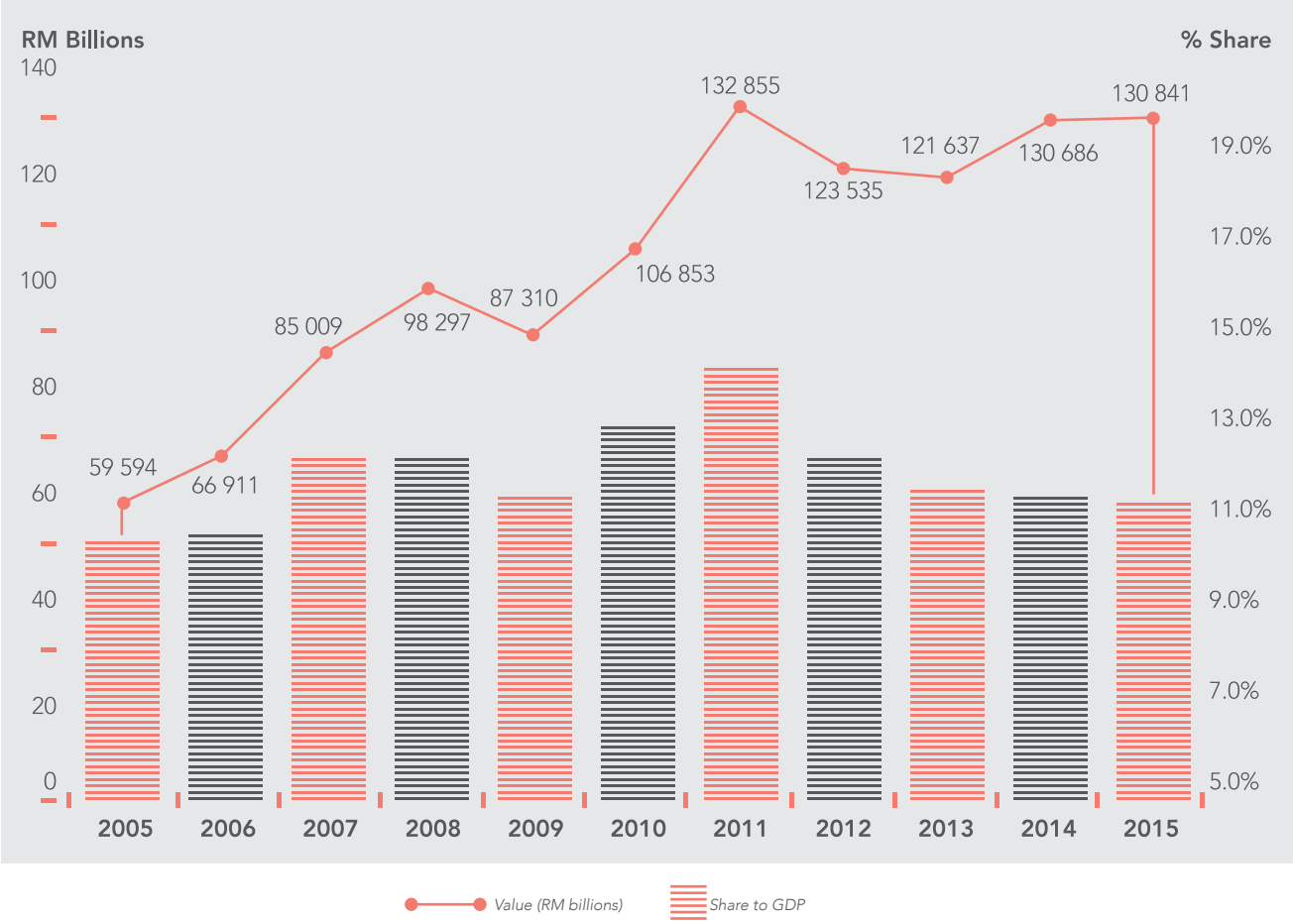
BIOECONOMY **CONTRIBUTION INDEX (BCI)**

Components of the Bioeconomy Contribution Index

A LOOK INTO THE BCI COMPONENTS

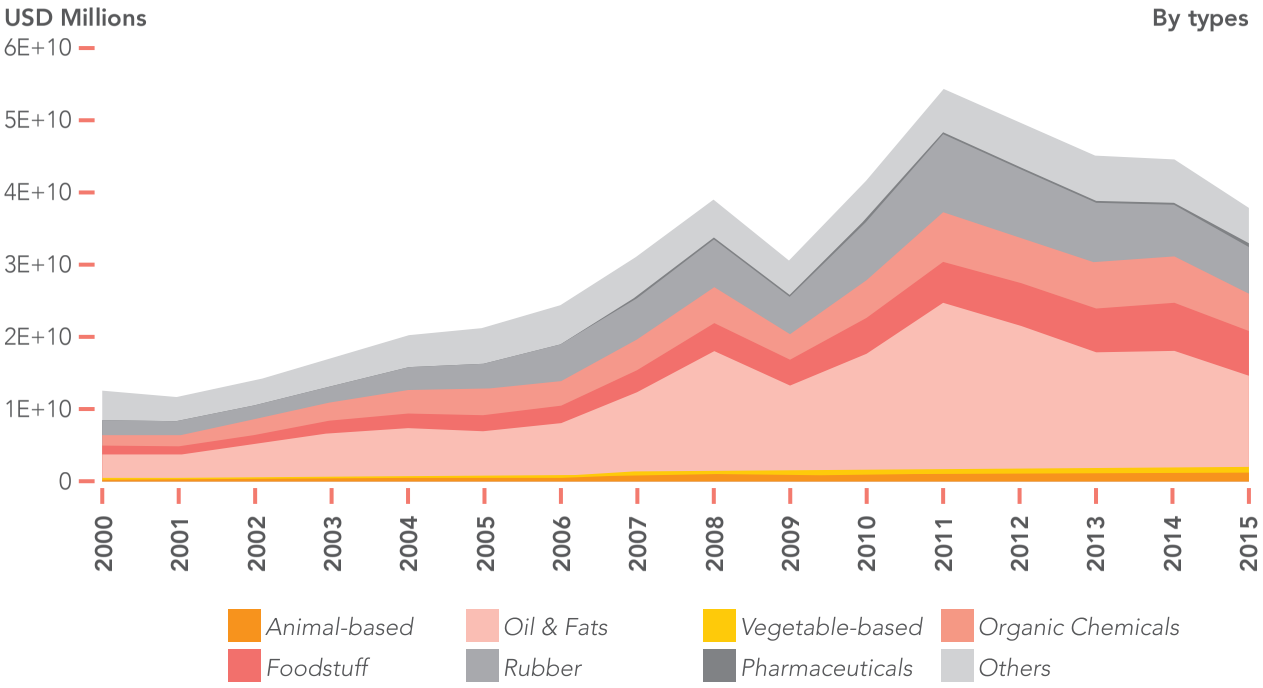
01 Bioeconomy Value-added

The Bioeconomy gross value-added (or gross domestic product, GDP) measures the value of production of bioeconomy-related sectors. Over the last 10 years, production of Bioeconomy has been increasing in value terms although the share to GDP contracted amid faster growth in other sectors of the economy. In 2015, Bioeconomy contributed about RM131 billion into the economy or at 11.3% of GDP. The major contributing sectors to production were palm oil, fruit & vegetables, livestock, and fishing industries.

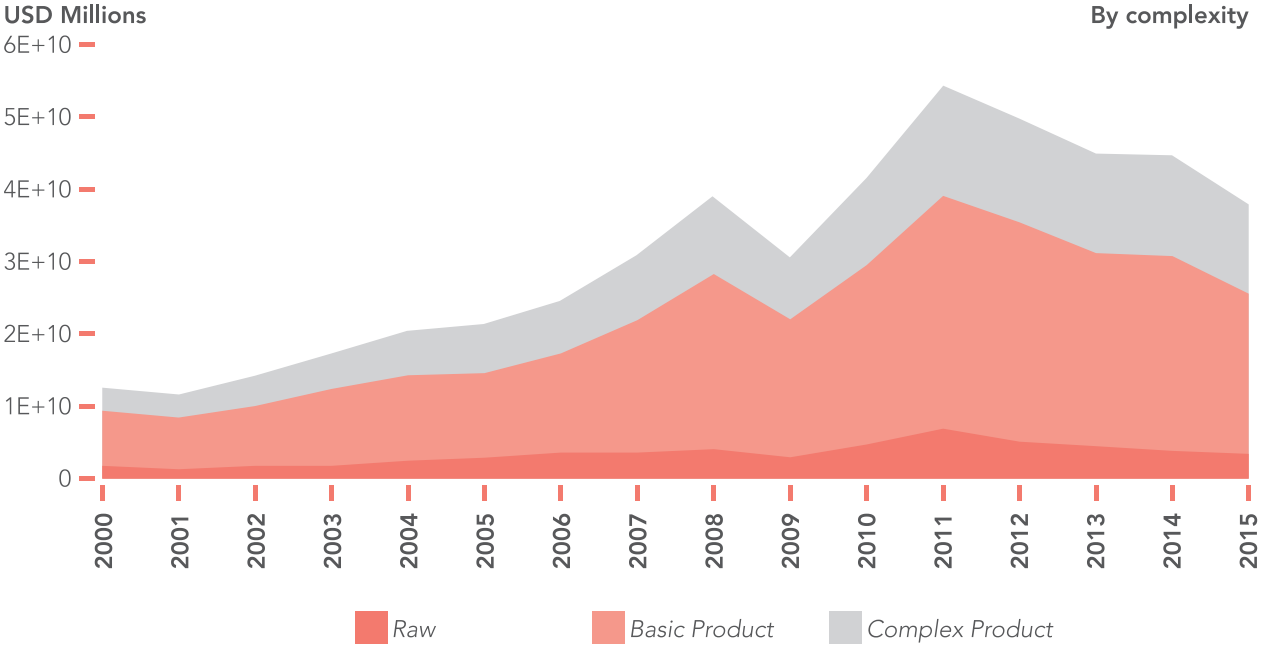


02 Bio-based Exports

The charts below highlight the performance of bio-based exports by types of products and by level of complexity. Bio-based products are classified as products that are derived from biological sources which excludes minerals such as petroleum and coal. By types of products, the oil & fats was leading the Malaysian bio-based exports at USD12.6 billion in 2015, followed by rubber products at USD6.2 billion. About 71% of bio-based products were directly derived from upstream agricultural sectors (animal-based, vegetable-based, rubber, and oil & fats).

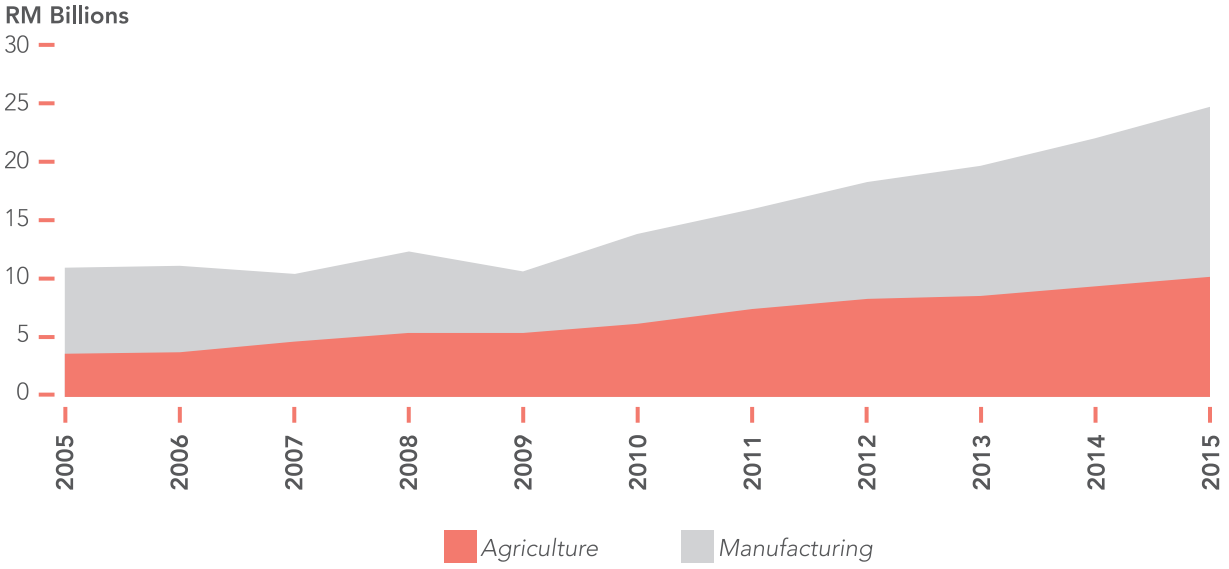


By level of complexity, basic product accounts for the majority of export value although the share of complex products were increasing gradually. Meanwhile exports of raw materials remain relatively low at USD3.4 billion. Raw products are product with limited or no processing involved (i.e.: boiled, cooked, salted etc.), basic product are classified as first level processing, typically simple (e.g.: fermentation, woven, etc.) and complex product undergoes second level processing which takes specified knowledge (e.g. hydrogenation, trans-esterification, vulcanisation, etc.)



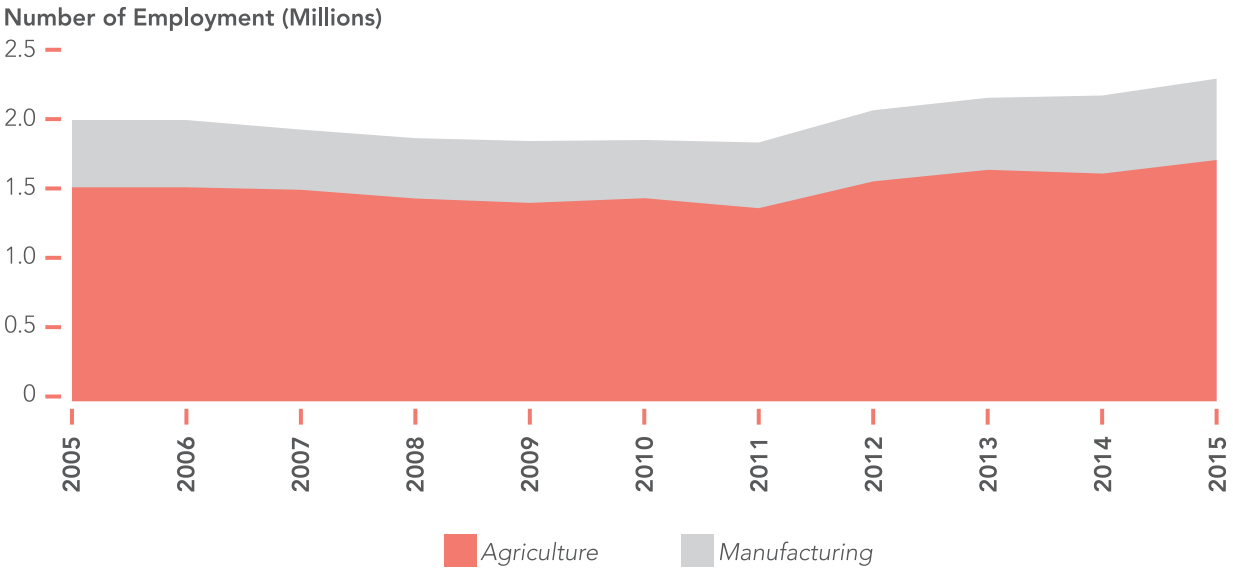
03 Bioeconomy Investments

Investment in Bioeconomy are measured by taking the sum of the gross fixed capital formation of all bioeconomy-related sectors. Data shows that Bioeconomy investment continue to increase gradually with agriculture-related sectors expanding at 11% annually on average compared to manufacturing sectors at 8% on average. In 2015, the overall investment in Bioeconomy accounted for RM24.7 billions with 42% in Agriculture-related (RM10.4 billions) and the rest in Manufacturing-related sectors (RM14.3 billions).



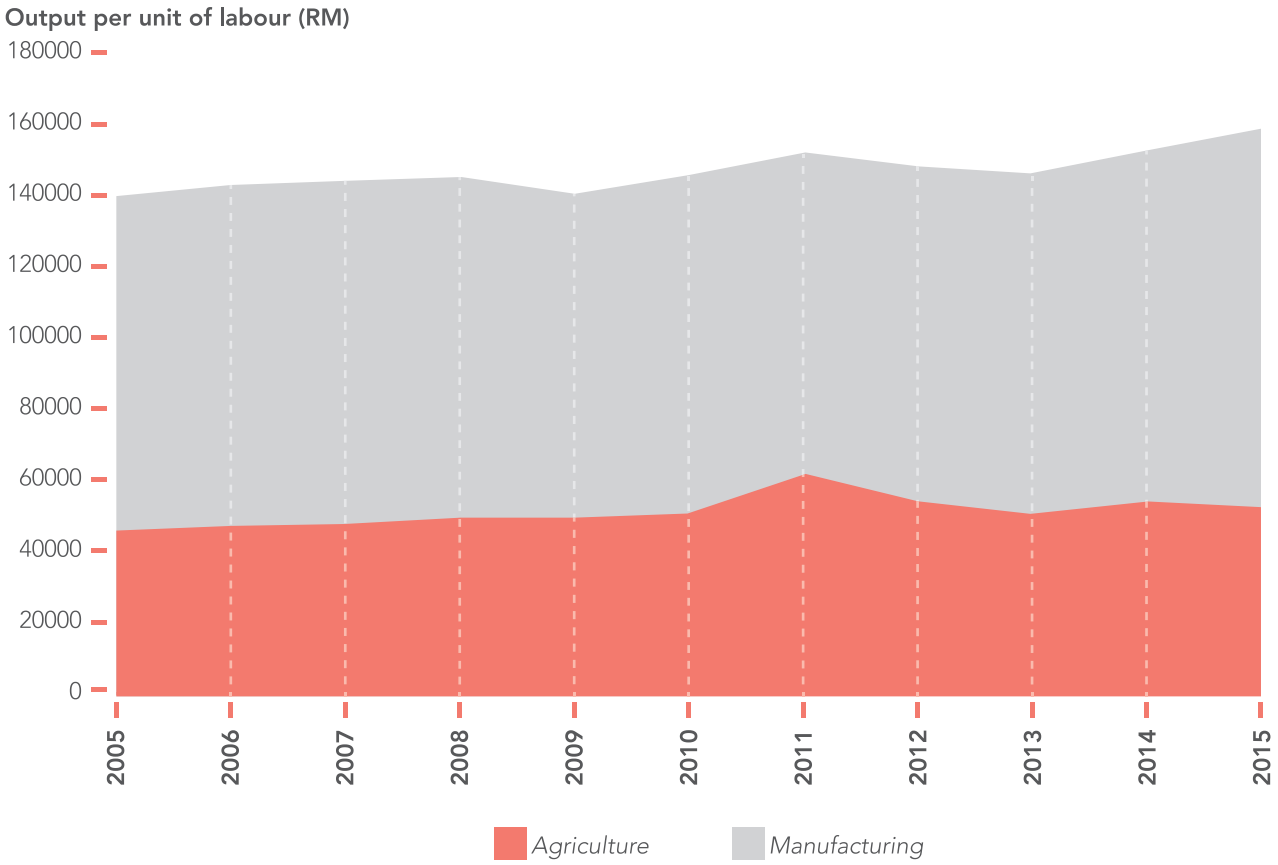
04 Bioeconomy Employment

Employment data, derived from the Labour Force Survey highlights the pattern of employment within bioeconomy-related sectors. Employment growth has increased markedly since 2012 at 5.6% growth on average annually. As of 2015, employment remained largely concentrated in the agriculture sector at estimated 1.75 million employed persons, while in the manufacturing-related sectors, employment stood at 0.59 millions persons.



05 Productivity Performance

Productivity is a measure of efficiency in production and are measured as the value of output (GDP) per unit of labour. It can be decomposed into three components, namely capital contribution, quality labour and technology. Productivity performance in Bioeconomy sectors indicates a large contribution coming from the manufacturing-related sectors which also have a higher growth trend. In 2015, productivity in manufacturing was recorded at RM105,158 per unit of labour while it was RM53,540 in the agriculture sectors.



07

BIOECONOMY **ACHIEVEMENTS**

"Creating a better world requires teamwork, partnerships, and collaboration, as we need an entire army of companies to work together to build a better world within the next few decades"

- Simon Mainwaring, businessman

KEY EVENTS AND **MILESTONES IN 2016**

8 JAN

BIOECONOMY DAY SARAWAK
Pullman Hotel, Kuching

To provide awareness about the BTP, BCDP and BioNexus Status as well as opportunities for the private and public sectors to participate in the bio-based industry in Sarawak

5 APR

25 FEB

SEMINAR BCDP NEGERI PAHANG DARUL MAKMUR 2016
The Zenith Hotel, Kuantan, Pahang

To provide awareness and increase participation in BCDP

23 FEB

BTP STEERING COMMITTEE MEETING
MOSTI Office, Putrajaya

To seek approval from BTP Steering Committee on the inclusion of new BTP Trigger Projects and BTP Fund recipients

31 MAY - 2 JUNE

BIOMALAYSIA & ASIA PACIFIC BIOECONOMY 2016
KL Convention Centre

Creating awareness for the public as well as showcasing BTP and BCDP projects and products

MAJLIS PENYERAHAN PROJEK MOSTI SOCIAL INNOVATION (MSI) 15035 BAGI PENGELUARAN MADU LEBAH MELALUI BCDP KEPADA PERSATUAN PENTERNAK MADU LEBAH KOMERSIAL KUALA LINGGI
MARDI Kuala Linggi, Melaka

To signify the completion of the project and to handover the bee boxes to the participants

13 JUNE

SIGNING AND EXCHANGE OF COLLABORATION PROPOSAL BETWEEN BIOECONOMY CORPORATION AND COSMETIC VALLEY FRANCE
Bioeconomy Corporation

To strengthen and support Malaysia-France Bioeconomy industry and private sectors, especially in the area of bio-cosmeceuticals and wellness industries

9 MAY

BCDP STAKEHOLDER MEETING
Bioeconomy Corporation

To update on BCDP project status and to presenton Bioeconomy Contribution Index (BCI)

14 - 20 AUG

NATIONAL BLUE OCEAN STRATEGY (NBOS) INTERNATIONAL WEEK 2016
Putrajaya International Convention Centre (PICC)

To provide awareness to the public on various NBOS initiatives by Ministries, Departments and Government Agencies including BCDP

MOVING **FORWARD**

The future holds many challenges from depleting natural resources to a fast growing population. As a player in the world's bio-based industry, Malaysia is set to effectively contribute to the betterment of the socio-economic well-being through its focus on the three sectors: agriculture, healthcare and industrial, with a strong focus on the application of biotechnology. These will eventually spur the expansion of other sectors and lead to an overall economic gain.

With the target for national development goal just right around the corner, Bioeconomy Corporation needs to be steadfast in delivering the targeted outcomes. To this end, the launch of BTP and BCDP is a step in the right direction. The programme has delivered a platform for companies to increase their economic contribution through breakthrough innovation and effectively maximising resources.

Effective Strategy

Ultimately, the drive towards greater bioeconomy involvement in the Malaysian industries will only be achieved when these key strategies are implemented:

DELIVERING VALUE

Despite the various project potential, there is a need to be selective with priority and focus given towards projects that can deliver maximum returns in terms of production, investment and employment.

STAYING FOCUSED ON THE OBJECTIVE

It is imperative that the programmes and efforts done must remain focused on the objective of prospering the nation both in terms of people and capital economy.

COLLABORATION AS THE KEY

The growing importance of coordinated efforts among multiple agencies, ministries, stakeholders and market players are crucial for effective implementation of the strategies.

CREATING A SUSTAINABLE FOUNDATION

The growth of bioeconomy needs to be guided by five elements which are environmental sustainability, socio-economic sustainability, synergies among biomass sectors, food security, and the enabling factors (i.e. policies, regulations & institutions).

Beyond-2020

While the 2020 targets are on track, the future beyond 2020 holds a much greater challenge for the Malaysian Bioeconomy. The milestones for future periods needs to be envisioned and set so that the momentum can be continued. Only with such vision that the Malaysian Bioeconomy could be on par or potentially surpass the level of the other advanced nations.

ACKNOWLEDGEMENTS

The development of the **Malaysian Bioeconomy** would not have been possible without the continuous support from our stakeholders including the ministries and government agencies, states, economic corridors, university and research institutes as well as Bioeconomy industry players.

For that, the Malaysian Bioeconomy Development Corporation Sdn. Bhd. would like to express its sincerest gratitude to all the parties involved.

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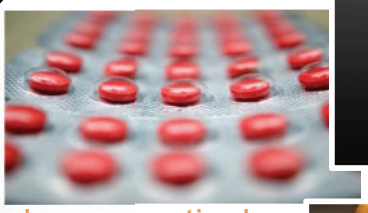

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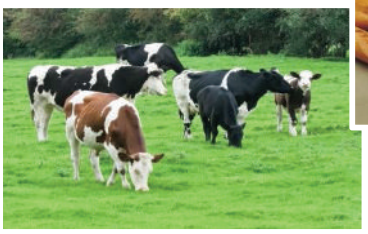

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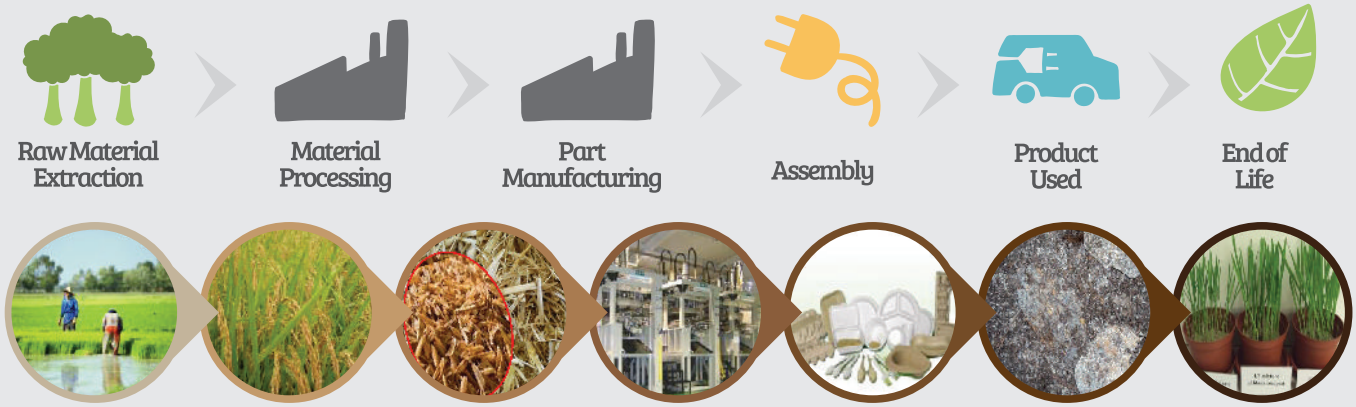

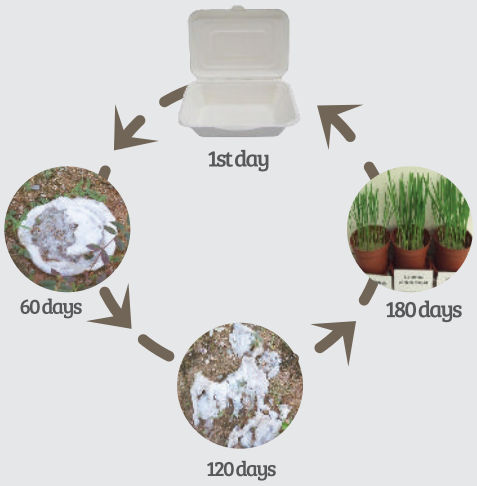

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