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Review

The biotechnology and bioeconomy landscape in Malaysia

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ABSTRACT

Since 1990s Malaysia aspired to make biotechnology and bioeconomy as her engines of economic growth to utilise the abundance of natural resources and biodiversity. The public sector plays an integral role in developing the sector and various incentives are in place for the private sector to be actively involved and to forge collaboration with the public sector. The country launched its National Biotechnology Policy in 2005 and later launched its National Bioeconomy Programme in 2010 to become the first country in South East Asia and second in Asia after China to have such an initiative. Malaysia is also very proactive in its biosafety law and regulations and has most of the related legal instrument in place. A lot of success has been recorded since the inception of the National Biotechnology Policy in terms of job creation, contribution to GDP through biobusinesses and investment from foreign companies, but the sector is not spared from challenges too. Due to the nature of the discipline that is multidisciplinary and that requires huge amount of investment, expertise and political will, there are a lot of barriers before the country emerges as a bioeconomy player. This paper discusses the public policies, initiatives and funding mechanisms in place in Malaysia that drive its research, development and commercialisation in the area of biotechnology and bioeconomy. The authors also discuss the challenges faced in Malaysia in implementing the policies.

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Contents

The government's biotechnology agenda: a historical background	00
Biotechnology related policies, regulations and initiatives in Malaysia	00
The National Biotechnology Policy (NBP)	00
BioNexus companies	00
The Biosafety Act	00
The Bioeconomy Transformation Programme (BTP)	00
Biotechnology-related agencies under the Ministry of Science, Technology and Innovation	00
Other players in the biotechnology space	00
The achievements	00
The missing links	00
Why is biotechnology innovation so critical and yet challenging in Malaysia?	00
Key ingredients to transform a biotechnology idea to a product	00
Jobs and careers	00
Funding options for commercialisation of biotechnology in Malaysia	00
Challenges for bioeconomy in Malaysia	00
Opportunities for bioeconomy in Malaysia	00
Conclusion	00
References	00

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The government's biotechnology agenda: a historical background

The biotechnology initiatives in Malaysia commenced in mid 1990s where the government committed significant amount of investment, time and energy to make the country an international biotechnology hub. The biotechnology agenda was developed to capitalise Malaysia's rich natural resources and biodiversity and turn them into biobusiness and wealth.

Historically, Malaysia has been actively pursuing agricultural research through a number of world recognised research institutes to promote higher yield and better quality of rubber, oil palm and agricultural commodities [1]. The country also boasts a strong manufacturing sector with the presence of multinational companies. These were seen as a pre-requisite to build the biotechnology sector.

The *modus operandi* to make the country a biotechnology hub might have changed due to change in leadership in early 2000, but the commitments remained strong which is seeing various initiatives being rolled out by the government to strengthened biotechnology and bioeconomy to make these the pillars of economic engine. In Malaysia, government institutes and agencies continue to play a central role in accelerating the biotechnology and bioeconomy agenda.

Biotechnology related policies, regulations and initiatives in Malaysia

The government realised from the beginning that there is a need to provide a strong policy direction to invigorate this economic sector. Since 2005 the government has shown its commitments through the development of a number of policies, regulations, programmes and initiatives that are aimed to support the biotechnology and bioeconomy development.

The National Biotechnology Policy (NBP)

The strongest boost for the biotechnology sector in the country was the launch of the National Biotechnology Policy (NBP) in 2005. The main aim of NBP is to develop biotechnology sector into one of the key economic drivers for the nation, contributing 5% of the nation's GDP by 2020. NBP was designed to provide a

comprehensive roadmap that would foster a conducive ecosystem for accelerated growth in the biotechnology industry.

The policy identified three main biotechnology areas (agricultural biotechnology, healthcare biotechnology and industrial biotechnology) and the peripheral areas that are critical for the development of biobusiness such as R&D and technology acquisition; human capital development; financial infrastructure development; legislative and regulatory framework development; strategic positioning; and government commitments as shown in Table 1 [2].

The implementation of the policy is divided into three phases: Phase 1 for Capacity Building (2005–2010), Phase II on Science to Business (2011–2015), and Phase III to develop Global Business (2016–2020). The key national development goals for implementation of the NBP over the three phases are shown in Table 2 [3].

Upon launching the NBP, the Malaysian Biotechnology Corporation (now renamed Malaysian Bioeconomy Corporation) was established to serve as a one-stop agency to facilitate the involvement of companies in biotechnology industry, implement government policies and initiatives, encourage research, development and commercialisation and create a robust investor ecosystem.

BioNexus companies

In order to encourage bioentrepreneurship among locals and to attract foreign companies, BioNexus status was introduced. BioNexus is a special status awarded to qualified foreign and Malaysian biotechnology companies. The status bestows fiscal incentives, grants, capacity building programmes and other guarantees to assist growth. This status is awarded to qualified companies undertaking value-added biotechnology and/or life sciences activities. Apart from the overall benefits and support, BioNexus companies are assured a list of privileges as stipulated in the BioNexus Bill of Guarantees [4].

To date, there are 268 BioNexus companies, out of which 141 are involved in agriculture, 82 in healthcare, and 45 in industrial biotechnology [4].

There is a set of criteria a company should fulfill to be eligible for the BioNexus status. The main criteria are the company's business should be based on life sciences or substantially utilise biotechnology processes; the company should be involved in continuous research works and has access to the required infrastructure and

Table 1
Malaysian National Biotechnology Policy and its nine thrusts (2005).

No.	Policy thrust	Aim
1	Agriculture Biotechnology Development	Transform and enhance the value creation of the agricultural sector through biotechnology.
2	Healthcare Biotechnology Development	Capitalize on the strengths of biodiversity to commercialize discoveries in natural products as well as position Malaysia in the bio-generics market
3	Industrial Biotechnology Development	Ensure growth opportunities in the application of advanced bio-processing and bio-manufacturing technologies
4	R&D and Technology Acquisition	Establish Centres of Excellence, in existing or new institutions, to bring together multidisciplinary research teams in coordinated research and commercialization initiatives. Accelerate technology development via strategic acquisitions
5	Human Capital Development	Build the nation's biotech human resource capability in line with market needs through special schemes, programs and training
6	Financial Infrastructure Development	Apply competitive 'lab-to-market' funding and incentives to promote committed participation by academia, the private sector as well as government-linked companies. Implement sufficient exit mechanisms for investments in biotech
7	Legislative and Regulatory Framework Development	Create an enabling environment through continuous reviews of the country's regulatory framework and procedures in line with global standards and best practices. Develop a strong intellectual property protection regime to support R&D and commercialization efforts
8	Strategic Positioning	Establish a global marketing strategy to build brand recognition for Malaysian biotech and benchmark progress. Establish Malaysia as a center for contract research organizations and contract manufacturing organizations
9	Government Commitment	Establish a dedicated and professional implementation agency overseeing the development of Malaysia's biotech industry, under the aegis of the Prime Minister and relevant government ministries

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