

STAKEHOLDERS PERCEPTION AND ACCEPTANCE TOWARDS APPLICATION OF BIOTECHNOLOGY IN AGRICULTURE BASED INDUSTRIES IN MALAYSIA

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Abstract

Biotechnology and agriculture based sectors have been identified as important drivers of economic development in the State of Johor. These sectors are regarded as the new-wave of wealth creation and economic activity characterized by high economic value addition. The progress of biotechnology development in the state of Johor is highlighted in this report. In addition the study provides a robust strategic direction and action plan for creating a strong biotechnology ecosystem. This study used stakeholders based approach to investigate public perception on application of agricultural biotechnology and stakeholder interest in Malaysia particularly in State of Johor. The results suggested that agriculture based industries strongly believed the creation of vibrant biotechnology ecosystem is needed to jump-start the biotechnology industry. Moreover, most of the companies are looking forward for new technology to improve their business by reducing their operating cost and increasing their productivity. Instead, they claimed the state government should reclaim stewardship of the industry and proactively synergise with the current players to place Johor as the leading biotechnology state in Malaysia. The paper mentioned that state of Johor has become a leader in prospering biotechnology and bioeconomy activities while Iskandar Malaysia, most developed region in Southern Peninsular Malaysia that is expected to act as a prime growth catalyst and complement Johor's overall economic contribution to the Malaysian economy constitutes 45.6% of the Johor population and half of total employment. Biotechnology awareness need to be revitalized to a new level through encouraging the adoption of biotechnology innovation and establishing a synergistic framework for acceleration of agro based industrial development towards sustainable market driven, commercially oriented and environmentally friendly.

Key words: Malaysia, Agricultural biotechnology awareness, stakeholders perception, framework, ecosystem.

INTRODUCTION

Biotechnology has been advanced significantly in the past ten year. Current advancement in biotechnology has focused towards economy driven by biotechnology based activities that expected to reach US\$262 billion, with an average annual increased rate of 11.0% over the past five years. Globally, agriculture has become a more market-driven sector, with a slow but gradual economic recovery to an average growth rate of 1.9%. Growth prospects for the OECD (Organisation for Economic Cooperation and Development) area in the short term are assumed to remain relatively weak, with an overall growth rate of 1.38% in 2013 just above the low rate of 1.3% in 2012. EU15 members, as a group, are expected to exhibit minimal growth averaging 0.3% in 2013. However, in the medium term, prospects appeared to be better growth (OECD-FAO, 2013).

The term agricultural biotechnology encompasses a variety of technologies used in food and agriculture, for a range of different purposes such as the genetic improvement of plant varieties and animal; genetic characterization and conservation of genetic resources; plant or animal disease diagnosis; vaccine development; and improvement of feeds (FAO, 2009).

Globally, factors such as pest, poor soil quality and unfavorable condition (drought, flooding etc.) reduced crop yields up to 30%, but the impact can be much higher in developing countries because the climatic conditions favor the survival and breeding of insect pests and disease vectors. Therefore, development of high-yielding genetically engineered varieties that are resistant to abiotic and biotic stress can help to increase crop yield. Therefore, it could help stabilize crop production and significantly contribute to food security and economic prosperity.

The agriculture biotechnology is the second largest contributor to the overall biotechnology sectors revenues after the healthcare segment, accounting for 11.5% or around USD 14 billion in 2007. There are an

increasing number of biotechnology companies growing globally. Asia Pacific alone is expected to house 57 % of the total number of biotechnology companies by 2014 (Frost and Sullivan, 2009).

Malaysia has targeted biotechnology as a national priority to enhance productivity and sustainability, as well as build wealth and economic growth by 2020 contributing 5% of the nation's GDP. Under this National Biotechnology Plan, agriculture biotechnology, R&D acquisition and financial infrastructure development are given priorities. It is worth noting that FRIM (Forest Research Institute of Malaysia) has been studying jungle plants that potentially could be used as medicine. IBD UTM (Institute of Bioproduct Development) also is looking forward to venture a new dimension in herbal processing and downstream to uplift the national herbal industry.

The biotechnology development in Johor is further boosted by the establishment of Bio-Xcell biotechnology park and ecosystem facility in the new developing region of Iskandar Malaysia (IM). It has attracted a number of key investments from companies including Biocon, Stelis Biopharma, GlycosBio and Metabolic Explorer. In addition, the state government has alienated 10,000 acres of land for Bio-Desaru Organic Food Valley initiative to facilitate the creation of an environment that leads to the industry to flourish in Agriculture Biotechnology.

Although Malaysia has identified biotechnology and agriculture as key economic drivers, the commercialization of local grown technology is still at infancy. Scientists are striving to translate their bench work into dollars and cents, however the success rate of the technology transfer to local entrepreneurs and industry need to be improved. Hence, there is a real need for all those involved in this industry to address the challenges in order to enhance the biotechnological growth in the Malaysia, particularly in agricultural biotechnology (Ismail, 2012).

Industrialized countries seemly have been well versed on public discussion on agricultural biotechnology that ultimately aimed to improve the livelihood of developing countries. However, the discussion regarding advent of biotechnology are less explained probably due to the risks in threatened life rather than potential long term hazard of new advancement (Gaskell et al., 2004).

The objective of this study is to access the current status of biotechnology development in the state of Johor. In addition, to investigate the perception of the stakeholders involved particularly the agriculture based industries about adoption of biotechnological tools in their R&D and manufacturing activities. Furthermore, the study provides a robust strategic direction and action plan for creating a strong biotechnology ecosystem.

METHODOLOGY AND SURVEY DESIGN

2.1 Description of study area

Johor is located in the southern peninsular of Malaysia known as the “Southern Gateway” being south of Malacca, Negeri Sembilan and Pahang and north of Singapore from which it is separated by the Straits of Johor. Johor is the second largest state (19,984 km²) and also one of the most developed state in Peninsular Malaysia (1.4872° N, 103.7811° E). Johor has a population of 3.5 million. An increased economic activities and expanding population is expected to become reality when IM was established in 2008. Iskandar Malaysia (IM) is the third largest metropolis (2,217 km²) and the most developed region in the state of Johor with five flagships zones: Zone A (JB city centre), Zone B (Nusajaya), Zone C (Western Gate Development), Zone D (Eastern Gate Development), and Zone E (Senai-Skudai).

In Johor, the agriculture sector has been identified as the third engine of growth after manufacturing and service sectors. This sector experienced a moderate growth of

performance of 12.3% in 2012 in which the Gross Domestic Product (GDP) increased from RM8.14 billion in 2011 to RM8.45 billion (Statistic Malaysia, 2013). The Johor state's GDP size of RM53.2bn is the third-biggest contributor to Malaysia's GDP (9.3-9.8% each year) with 60% coming from the Johor Bahru area. The state's economy expanded 3.7% p.a. in 2005-10, moderately below the national real economic growth of 4.4% p.a. In line with this, Johor is set to lead in agriculture research and development (R&D) activities in the country, with agriculture poised to become one of the main revenue earners for the state.

From this sense, this study was designed as the targeted population in this region meets the requirement of the diverse background (R&D institutions, biotechnology related industries) to access the needs and industries response on the development of biotechnology in Johor.

2.2 Survey Data Collection

This study used the stakeholders-based approach suggested by Aerni (2005) to investigate public perception and relevant stakeholder interest. All the sample selection was all agricultural based industries. Twenty two stakeholders were invited to participate in this questionnaire. Sample selection was covered the three main sectors which was crops, livestock and fisheries industries. Participants were selected from relevant stakeholders that were mainly active and contribute to the development of biotechnology in Johor with the assistance of Johor Biotechnology and Biodiversity Corporation (J-BIOTECH). This selection of participants was accordingly matched with Laumann and Knoke methodology (Laumann and Knoke, 1987). The selected stakeholders were contacted personally. After agreeing for being as one of respondents by telling them the purpose of the survey, field and site visit were conducted to access them. The stakeholder representatives were given an early introduction of current development of biotechnology and examples of latest achievement in Johor State Government.

This approach was recommended by Kelley (1995) to reduce measurement errors and provision of adequate information prior to survey. They were also assured that their views and opinions would be kept confidential. The selected stakeholders have their right either to accept or reject to participate or preferred to a replacement with same size of their business operation. The selected stakeholder representatives were asked based on the questionnaires provided that contained of eleven items. The participants were asked about the basic information and history of their operational business since establishment. The data were analyzed using Microsoft Office Excel statistical package.

RESULTS AND DISCUSSIONS

3.1 Background analysis

22 respondents from different respective organizations completed the questionnaire. The majority of industries in this survey are operating small business activities (50%), followed by micro (22%), large (17%) and medium business activities with 11% (based on SME Corp. classification SME Corp, 2013).

The respondents were categorized into the following institutional groups:

Government agencies: four respondents from research institutions and government state agencies related to agriculture, livestock and fishery.

Industries: 17 respondents from local companies (fields of agriculture, aquaculture, agrotourism businesses, producer of organic farming food, herbal based product manufacturing, plant tissue culture, oil palm plantation and bio-based fertilizer manufacturing).

The first part of the questionnaire began with the general information of particular industries regarding on their identification of geographical scope based on R&D, manufacturing and marketing. This included the accreditation status secured, raw material supply, total average annual R&D invest-

ment and capability of their product to penetrate the market.

The second part was about the supported institutional network collaboration, selection of business location, availability of skillful human resources, business climate and technology provision. This part had to be assessed on a scale ranging from one to five. The third part contained the future plan and their recommendation for the improvement of the development of biotechnology in state of Johor as well as for whole nation Malaysia.

3.2 Descriptive analysis

Most of stakeholders participated in the survey involved in manufacturing activities. These companies are accredited under Malaysia Good Agriculture Practice (MyGAP), ISOs (9001: 2000, 9008, 17025, 2200) and Competency of Oil Palm Nursery (COPN) for their agriculture business. Of all companies surveyed, seven are awarded with Bionexus status by Biotech Corp. All companies acquire 100% of their raw material locally thus restricting their manufacturing capacity. Acquisition of semen from abroad has guaranteed the good quality potential for goat breeding purpose. The artificial insemination technique was utilized to produce high quality of progeny with the controlled environment. In other aspect for consumer preference towards organic food, some organic vegetable producers have been gone beyond a leap abound by accreditation from Malaysia Organic Scheme (SOM), National Association for Sustainable Agriculture Australia (NASAA) and International Organic Standard (IFOAM). These accreditations are included under good agriculture practice to ensure their products remain competitive internationally (Salleh et al., 2005). Livestock based industries improved the milk station facilities for the bulk fresh milk production to capture the regional market demand. Most of the stakeholders voluntarily adopt a secured accreditation status to avoid any economic loss from foodborne illness and improved market accessibility 20 out of 22

respondents conduct their own R&D activities to add value of their products. However, some of the government agencies still preferred to practice conventional methods. Their approach is basically to help smallholder farmers in solving agronomic problems with new technologies and services. Engagement in collaborative research with other research institutes and universities has promoted technological innovation and transfer into certain industries for the betterment of long term benefit. Moreover, most of the stakeholder representatives are looking forward for new technology to improve their business by reducing their operating cost and increasing their productivity.

The strategy to have a network collaboration is encouraged to embrace and enhance synergy between the four key mainstays – Government, youth, institutes of higher learning (IHL) or public research institutes (PRI) and industry. The ISAAA (International Service for the Acquisition of Agribiotech Application) and USAID (United State Agency for International Development) are the examples of smart partnership of participation of NGO's that facilitate the acquisition of agricultural biotechnology application in pursuit of enhanced food security of developing countries (Horsch and Montgomery, 2004). Even, a prominent private company such as Monsanto is committed to contribute for the benefit of innovative agriculture in farming worldwide.

The awareness level of biotech companies on J-BIOTECH and BIOTECHCORP presence is at 86.4% (19 out of 22) and 68.2% (15 out of 22) respectively. 26.3% (5 out of 19) and 46.7% (7 out of 15) of these companies engaged J-BIOTECH and BIOTECHCORP in research and development activity respectively. However, only one company engaged with local university in carry out research activities. Stakeholders acknowledged that the Malaysian biotechnology industry is “only in its infancy,” and BIOTECHCORP is needed to nurture a supportive environment

and build capability in this area. It is intended to be the principle agency coordinating institutional support that includes tax incentives, research and technology parks (e.g., Bio-Xcell), talent immigration visas, venture capital financing, and industry trade representation. This “institutional strategy” embraced by Malaysia has been adopted previously by many developing countries where institutional instruments tend to play a significant and central role at the firm and national levels of innovation. This strategy has been shown to confer positive effects such as enhanced focus, inter-firm coordination and efficiency.

Previously, In 2005 Johor proposed a visionary ten-year masterplan for the development of niche biotechnological area in the state while biotechnology was still in its infancy in Malaysia. This ground breaking effort even preceded the national agenda and the inception of BIOTECHCORP. It was recommended that Johor focused on the multi-trillion global market of wellness products, such as herbal, nutraceutical, and phytopharmaceutical products. In JMP (Johor Master Plan) 2005, a bioproduct validation centre, first of its kind in Malaysia that was proposed to add value to local bioproducts did not materialized. Therefore, the masterplan suggested that agriculture based industries strongly believed the creation of vibrant biotechnology ecosystem is needed to jumpstart the biotechnology industry.

In the JMP 2005, the main focus was on agrobiotechnology. However, with the rapid development in Johor particularly the establishment of Iskandar Malaysia (IM) and Bio-Xcell, the Johor biotechnology industry is now more diverse and has included pharmaceutical and biomedical biotechnology. The entry of Biocon Ltd. with an investment of RM500 million at Bio-Xcell, Nusajaya is a testament to this development. A number of Johor-based biomedical companies are now producing pharmaceuticals as well as traditional medicines. However, not many of the respondents know about the implementation

of this masterplan alongside the current achievement of biotechnology in this region. This indicates that ongoing discussion and workshop on this appropriate matter continues to be an issue.

All respondents selected Johor as their business location due to the lower land cost in comparison to other state in Malaysia, the availability of skilled workers and vicinity to the international port, as well as the accessibility of raw materials. In addition, Johor is a strategic business location by the presence of Iskandar Malaysia (IM) and neighbouring Singapore. The proximity of Johor region to Singapore has been exploited to improve in bilateral ties and the inception of Iskandar Malaysia (IM) plans to leverage on each country's strengths and resources. This concern of business location encouraged the respondents to have active network collaboration among the related technology providers and key players within state of Johor as this region offered many opportunities for long term investment.

In addition, Iskandar Malaysia (IM) has offered various incentives through agencies to attract investors to come to Iskandar Malaysia (IM). This myriad of opportunities requires a focal agency to conduct local facilitation. This is the respondents' hope for any state agencies specially J-BIOTECH to facilitate to become a one stop center for all information regarding this matter. Johor state government through J-BIOTECH should promote a more enterprise-friendly culture that supports entrepreneurs, not only financially but also through networks, training, and business information systems. This also could create the availability of support services and networks deemed critical in developing a sustainable biotechnology industry with the capacity to start and manage IP-based ventures with specialist skills such as patent attorneys, venture capitalists, and contract research organizations.

A major issue highlighted by agriculture related industries is the availability of general workers in Johor. 45.5% (10 out of 22) of the companies prefer to employ local

staff whilst 54.5% (12 out of 22) of the companies hire foreign workers. The processing time for work permit for foreign workers is between three to six months and most of the companies are satisfied with the service provided by the immigration department.

There is high availability of management staffs category for the agricultural biotechnology related industries. However, the employment of appropriate R&D staff category is very limited that directly impacts the growth of the companies. Malaysia exhibited a low ratio of R&D personnel to the general population compared to Singapore with 15:10,000 and 83:10,000 respectively although there is increment in pattern from year to year (MASTIC, 2004).

Higher education has a strong presence in Malaysia particularly in state of Johor. Studies have shown that the lack of human capital and essential skill sets was the major barrier for the biotechnology industry that is knowledge driven to grow in Malaysia (Abuduxike et al., 2012). The state of Johor should take a proactive step in assisting the engagement between IHL and biotechnology and bioeconomy industry within the unique context of IM and Johor. The engagement should generate inputs from industry that are applicable through immersion basis throughout the years of study in IHL. The respondents also tended to agree that state government should provide a platform to the young graduate in order to nurture them with biotechnology skill and create a sustainable pool for human capital for Johor state. This skilled talent could be channeled to the required companies to ensure the needs of human capital in every single of biotechnology level are fulfilled.

From the survey, 50% (11 out of 22) of the respondents stated that it is challenge to obtain government funding to support their business activities. Their view on the current government funding procedures is complicated and cumbersome paperwork. Some of the companies also are not aware of what type of funding provided by the government. On the other hand 27.3% (6 out

of 22) of the respondents stated that they have no problem with funding as they have adequate capital. Significant funding for R&D activities in Malaysia especially in Johor is required to promote the cutting edge technological innovation in the country. Majority of the respondents are categorized as small industries and struggle to secure funding. They do not have the expertise and the technical know-how to apply for the grant. Large companies do not have this problem as they are funded privately. In China, a substantial financial capacity from USD10.5 million (1995) to USD38.9 million (2000) had been allocated to create a competitive biotechnology research, indicating this effort becomes one of the priorities area in promoting human wellbeing (Huang and Wang, 2002).

The current regulation on minimum wages, the product grading system and complex protocol for export hinders the company activities. For instance, one of the companies stated that, to export pineapple flour from Malaysia, Korea's government insists the products to go through food radiation treatment. Higher regulation compliance is important if the company decides to export their product. The regulations that have an impact are the minimum wage, accreditation status food radiation treatment, product grading system and detailed protocol for export purposes. Majority of respondents also agreed on these regulations to be followed.

From this sense, the recommendation for the selected stakeholders is to create the synergistic ecosystem for all agricultural biotechnology key players and stakeholders to form this integrated biotic farming system. Main activities of each companies is inter related from upstream level to optimize the downstream process for mass production from biodiversity resources (Ronald and Adamchak, 2008). Agriculture biomass waste could be converted to produce high value product such as biofuel through fermentation and bioconversion towards

sustainable economic development (Hautea and Escaler, 2004). They claimed the state government should reclaim stewardship of the industry and proactively synergise with the current players to place Johor as the leading biotechnology state in Malaysia.

CONCLUSIONS

The research findings provide as a basis database for understanding public acceptance of biotechnology in the developing countries. The involvement of Johor stakeholders in biotechnology is positive and could be improved and many of them are aware of biotechnological tools for enhancement of their performance. Respondents also are pleasant towards acceptance of biotechnology in order to place Johor as the leading biotechnology state in Malaysia. Stakeholders also consider biotechnology in agriculture sector is strategically significant tool for achieving national food security. Biotechnology awareness need to be revitalized to a new level through encouraging the adoption of biotechnology innovation and establishing a synergistic framework for acceleration of agro based industrial development towards sustainable market driven, commercially oriented and environmentally friendly policy outcomes.

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