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Review Article :

A Need for a Systemic Approach to Public Understanding of Biotechnology in Malaysia

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INTRODUCTION

Biotechnology industry is broadly segmented into agricultural, medical and industrial sectors, where each of these sectors has undergone revolution with the employment of various applications of modern biotechnology. This has led to development of new crops that is poised to ensure food security, address the challenges of climate change, and reduce the environmental footprints in the field of agriculture. In the medical world, biotechnology is leading the way to drug development, diagnostics, and various therapies. Industrial biotechnology which is the hottest field is revolutionising unlimited sectors such as production of biofuel and renewable chemicals, bioplastics, metabolites, enzymes, and sugars and alcohols.

Global Biotechnology industry revenue is expected to reach US\$228.6 billion in 2012, having increased at an average rate of 10.4% per annum over the past five years (IBISWorld, 2012). In 2016, the global biotechnology market is forecast to have a value of US\$453.3 billion, an increase of 60.9% since 2011 (Marketline, 2012). Medical/healthcare is the largest segment of the global biotechnology market, accounting for 67.4% of the market value (Marketline, 2012), whereas agricultural biotechnology accounts for 6.3% with transgenic seeds making up the bulk of this market (BCC Research, 2012). Industrial biotechnology is the rapidly emerging sector that is expected to be a major contributor to biotechnology global market value. King *et. al.* (2010) estimated that by 2020 the market for biofuels, biobased bulk chemicals and plastics, and bioprocessing enzymes would approach US\$95 billion.

Realising the potential of biotechnology, both developed and developing economies are investing huge amounts in this area. The leading nations are the USA, which

accounts for 45% of the global biotechnology market value (Marketline, 2012), followed by Europe, Canada and Australia (Ernst and Young, 2012). In Asia, Japan, Korea, China, India and Singapore are leading the way.

Biotechnology Initiatives and Status in Malaysia

Malaysia has a growing biotechnology industry and it is hailed as the new economic engine for sustainable development. According to government estimation, this sector is expected to employ 160,000 workers and will contribute 5% towards the national GDP, with a revenue of RM248 billion (US\$83 billion) in 2020 (National Biotechnology Policy, 2005). To realise this aspiration the government has established a number of policies, strategies and initiatives. The National Biotechnology Policy (NBP) was launched in 2005 to position biotechnology as the new economic engine to enhance prosperity and wellness of the nation by 2020. Upon launching of the NBP, the Malaysian Biotechnology Corporation was established to act as the lead agency to facilitate the development of biotechnology industry in Malaysia.

Under the New Economic Model (NEM), the Economic Transformation Programme (ETP) and the National key Economic Areas (NKEA) are expected to be catalysts to drive the biotechnology industry in Malaysia and to complement the NBP. A number of biotechnology projects

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have been identified under the ETP and NKEA and together with the other projects these initiatives are envisaged to generate US\$6.7 billion Gross National Income by 2020 (Performance, Management and Delivery Unit, 2012). The Ninth Malaysian Plan (2006-2010) focused on making biotechnology a growing source of wealth creation and targeted to double biotechnology companies to 400 by 2010. Whereas the 10th Malaysian Plan (2011-2015) targeted to establish at least 20 global biotechnology companies in accordance to the second phase of NBP (Economic Planning Unit, 2012).

However, the glaring missing link is an overarching National Policy for Science Communication that would be inclusive of biotechnology and other emerging technologies. In spite of the government's strong efforts in fostering innovation and making biotechnology a leading economic sector, lack of public engagement and understanding of biotechnology would pose as a bottle-neck for biotechnology and human capital development. For Malaysia to fully see the fruition of all these policies, initiatives, and investments, biotechnology should be communicated to the wider community using an integrated approach.

Why the Need for Public Understanding of Biotechnology

A good understanding and knowledge on biotechnology will power innovation and creativity. The importance of communication of science to the public has been widely acknowledged to be economic, democratic, utilitarian, and cultural and social (Stocklmayer, *et. al.*, 2001).

Economic reasons are the main driving force towards creating a science/biotechnology-literate society. A good understanding among politicians, policymakers, regulators, farmers, investors and bankers, and scientists is imperative for Malaysia to realise her goals towards transforming the nation into a biotechnology player. A good biotechnology understanding among politicians and policymakers would result in development of proper policies and its implementation. A reference to the parliament Hansard when the Biosafety Bill was deliberated shows confusion among Member of Parliaments where biosafety, biosecurity and stem cells were all interrelated and the terms used interchangeably. It would not be possible to develop a balanced regulatory framework if politicians, policymakers and regulators have shallow knowledge on biotechnology.

A number of areas in biotechnology such as genetic engineering, stem cell research, gene therapy, cloning and

nanotechnology require regulatory framework and it is instrumental to ensure these regulations are balanced that have consideration towards safety, ethics, and at the same time do not stifle biotechnology research and commercialisation. Lack of understanding of biotechnology could fuel many arguments against biotechnology among politicians, policymakers and regulators.

The utilitarian argument is viewed necessary as biotechnology has huge impact on the public in many aspects of their lives, ranging from the food and drugs that are consumed to biofuels, environmental impact, and ethical and religious concerns. Basic biotechnology understanding is pertinent in order to form opinion and decisions on biotechnology-based issues and be able to participate fully in modern society and to ensure the potential of biotechnology is harnessed while addressing valid concerns (Arujanan, 2012). Public acceptance ensures successful commercialisation of new technologies and products.

The democratic argument is to enable public to play a political role in society. Public participation in policy-making and in regulatory process is important but it requires some understanding of the technology so a conducive environment is created for emerging technologies to flourish. A good public understanding of biotechnology would also enable the public to differentiate science and pseudoscience. Misinformation and bad press on biotechnology is common on all media and these information play a role in shaping public opinion, which may translate in public opposing biotechnology.

Finally, as biotechnology permeates all aspects of human activities, it should be part of our everyday culture. According to a report by PricewaterhouseCoopers (2005-2006), Malaysians have a strong shopping fetish, especially during the weekends and on public holidays. Science centres and exhibitions should be made central to the lives of Malaysian just like what shopping means to us. This would create appreciation towards science and biotechnology. This is also crucial as the interest in science among students is dwindling and this has been reported by the Deputy Prime Minister and Education Minister, Tan Sri Muhyiddin Yassin early this year. Producing skilled workers for the biotechnology industry would be a challenge if the younger generation does not pursue science at tertiary levels and later careers in science.

In short, all the investments and policies would be a futile exercise if public understanding of biotechnology is not made a national priority. A number of countries have workable science communication strategies that could serve as adaptable models for Malaysia.

Biotech/Science Communication Models from Selected Countries

A number of countries have taken public understanding of science seriously by developing policies and strategies to encourage scientists to be more involved in engaging the public in the last few decades. In 1993, the UK government declared its commitment to the promotion of public understanding of science (HMSO, 1993) by establishing the Wolfendale committee. The committee required all scientists who receive grants from public funds to accept responsibility for explaining their work to the general public (Wolfendale, 1995). As a result of this initiative, by 1995, many scientists, engineers, and research students were engaged in promoting greater public appreciation and understanding of science, engineering, and technology (Pearson, 2001).

In Germany a coalition of scientific societies took the lead and was backed by federal funding. A project on Public Understanding of Science and Humanities (PUSH) was launched in 2002 to promote better dialogue between science and the public (Jasanoff, 2005). The programme was then renamed "science in dialogue" (Schnabel, 2003). Whereas, in Spain "Science Fairs" were common events that foment closest interaction between scientists and the public (Martin-Sempere *et al.*, 2008). The first science fair was held in A Coruna in 1996, and since 2000, annual fairs have been held in seven different locations: A Coruna, The Balearic Islands, Barcelona, Castilla-La Mancha, Madrid and Seville. According to Martin-Sempere *et al.* (2008), the motivation of scientists involved in the fair is related to the desire to stimulate the public's interest in and enthusiasm for science and scientists.

Science communication is a hot topic in Denmark as a result of the University Act which came into force in May 2003 (The University Act, 2003). The Act lists science communication as the third obligation for the universities, in addition to research and teaching. Consistent with European developments, the reasoning behind the new University Act is the government's desire to attract younger people to science education and to make the universities more socially accountable. The Ministry of Science established a science communication think-tank which immediately aligned itself with the new University Act in giving a lot of importance to the dialogue between researchers and the public (Nielsen, 2005). This basically supports the internationally widespread perception of Danish science communication as being dialogue-oriented and engaging, as it emerges from consensus conferences (Felt, 2003) and values understanding of science above appreciation of science when it comes to science communication.

Among the Latin American countries, Brazil seems to be the leader with about 100 science centres throughout the

country, most being small in size, which were set up in the last decade to communicate science. 1990 saw the creation of RED-POP, an interactive network that brings together about 70 members throughout the continent, including centres and programmes of science and technology in Latin America and the Caribbean (Massarani, 2004).

Australia's strategies on science and biotechnology communication are excellent models to emulate. Australia has strong biotechnology communication initiatives that are well coordinated with industry, research and educational groups working closely with government agencies, and this unified message ensures maximum effect with minimal duplication (Cormick, 2011). Science communication modules are offered by almost all Australian universities to students undertaking science courses. Science communication is also offered at post-graduate degrees. In 2010, the government took a very pragmatic approach towards community engagement with the launch of the "Inspiring Australia" report (Inspiring Australia, 2010) which was an initiative by the Department of Industry, Science, Research and Tertiary Education, that proposed a national approach for community engagement with the sciences. This report is expected to complement Australia's Innovation Agenda as a high-quality national strategy for public engagement with the sciences and seeks to increase appreciation of science in Australian culture, facilitate informed citizen participation in decision making and science policy development, boost confidence in the Australian Government's research investment, and ensure a continuing supply of well-qualified science graduates. Australia also has a distinctive programme for politicians to help them better understand the role of science in the development of public policy. Scientists-politicians get together is organized on a regular basis to ensure politicians are kept abreast with scientific developments.

The Way Forward for Malaysia

It is time for Malaysia to emphasise on public understanding of science. A National Science Communication Policy is timely, if not overdue. This would make it an obligation for scientists to engage with the various stakeholders, particularly the general public. It would also ensure funding is allocated for public understanding of science.

Another area that needs serious consideration is the inclusion of science communication modules/subjects into science degree programmes at the universities. Almost all universities in Australia offer science communication subject to science undergraduates, whereas post-graduates are required to take up community projects that involve public engagement with science.

A cadre of science communicators should be trained and all universities and research institutes should have at least one trained science communicator to assist the scientists and academia on public understanding of science. Currently public affairs officers are more involved in branding the institute and there is little public engagement or specialised events for targeted groups such as politicians, policymakers, investors, regulators, media and the general public.

An overarching science communication policy under the purview of Ministry of Science, Technology and Innovation would be ideal and would complement the various robust policies that have been developed. As presented in this paper, a number of countries are already leading the way by formulating national strategies on science communication. Malaysia has excellent ecosystem comprising of universities, research institutes and various agencies that could play an active role in this area. Science or biotechnology communication is a complex field as the public is a heterogeneous group and different groups require different strategies, media and messages. The change in media landscape is also a challenge as science communicators need to employ novel approaches to include the new media such as social network and internet. Thus, this area should not be taken for granted that anyone with science knowledge could also communicate and engage with the various stakeholders effectively. It requires special skills, a good understanding of the public and media, and a passion to connect with the public. National strategy on public understanding of science would certainly create a conducive environment for scientists and academia to reach to wider audience beyond their ivory towers.

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