EMPOWERING YOUTH THROUGH INNOVATION IN THE FOOD INDUSTRY

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ABSTRACT

Members of our youth and the children are the future of our countries. Empowering youth through innovation in the food industry will ensure that they are equipped to succeed in food production, handling, processing, storage and marketing in this challenging era of business. Innovation in the food industry should be throughout the value chain and innovation in technologies, promotion methods, knowledge dissemination, technology transfer and ways of doing business are vital to encourage, motivate and support the youth to engage and sustain them in the agriculture and agro-based businesses. The Malaysian Agricultural Research & Development Institute (MARDI) has a important role in Malaysia to empower youth through innovation in the agriculture and the agro-based industries so that the youth will be interested to work and make profits from activities in this sector. Innovation is vital to transform the agriculture and agro-based industries to modernize it as well as to change the mind-set of the young generation. Empowering youth through innovation in the food industry is necessary to ensure the latest technologies and knowhow is available to them to be competitive. This paper will share some of the innovations brought about by MARDI in their role to empower youth in the agriculture and agro-based industry.

Introduction

Innovation is a new way of doing something and it can be incremental, radical, and revolutionary changes in thinking, products, processes, or organization. It is about creating values from ideas.

Joseph Schumpeter’s famous economic conceptions of innovation (“new combinations”) was summarised by Śledzik (2013) to define innovation as the following

1. Launching of a new product or a new species of an already known product;
2. Application of new methods of production or sales of a product (not yet proven in the industry);
3. Opening of a new market (the market for which a branch of the industry was not yet represented);
4. Acquiring of new sources of supply of raw material or semi-finished goods;
5. New industry structure such as the creation or destruction of a monopoly position.
According to Śledzik (2013), in Schumpeter’s theory, “the possibility and activity of the entrepreneurs, drawing upon the discoveries of scientists and inventors, create completely new opportunities for investment, growth and employment”. Thus, through innovation, young people in agriculture and the agro food industry can be empowered to venture and develop successful businesses based on new science-based technologies and know-how.

Innovation need not be confined to scientific research and technologies development only. Services, engagement methods, promotion methods, transfer of technologies can also be innovated to transform the agriculture and agro-based industry into a productive and profitable business for youths who finish their education and are looking for an alternative career choice.

Agriculture has not been perceived as an attractive field for youth in Malaysia and many other countries. They tend to stay away from agriculture as it is perceived to be dirty, difficult and dangerous; preferring to do business in other areas. The number of those employed in agriculture as a percentage of total employment in 2015 showed the following: Brunei 0.6%, Malaysia 12.47%, Philippines 29.15%, Thailand 32.28%, Indonesia 32.88%, Vietnam 43.62%, Cambodia 54.14% (Roser, 2018). Agriculture and its related industries are still perceived as a rural activity and involve the poor. Thus, innovation is vital to transform this sector to change the mindset of the young generation.

ASEAN with its ten Member States having a population of 634.5 mill people with a combined Gross Domestic Product (GDP) of US$2.6 trillion, the seventh largest economy in the world, offers a big opportunity for the food businesses (ASEAN 2017). With fairly similar food culture in the ASEAN Member States, many opportunities are there for those involved in food production and manufacturing such as in the production and supply of raw materials, equipment, packaging, workforce, marketing and services, especially with the establishment of the ASEAN Community on December 31st, 2015. ASEAN aspires to have a single market and production base with free flow of goods, free flow of services, free flow of investment, freer flow of capital, and free flow of skilled labor which enterprising agropreneurs can capitalize on to grow big. The ASEAN advantage is its biodiversity of raw materials and the new products based on these new resources.

MARDI and its role in food, agriculture and agro-based industry in Malaysia

The Malaysian Agricultural Research and Development Institute (MARDI) is a statutory body which was established to develop technologies for the advancement of food, agriculture and agro-based industries. MARDI is managed and guided by the regulations and policies set by the MARDI Governing Board and consented by the Minister of Agriculture and Agro-Based Industry.

MARDI is mandated to fulfil the following functions:-
- To conduct research in the fields of science, technical and economics with regards to:
  - Production, utilization and processing of all crops (except rubber, oil palm and
cocoa), livestock and food and
- Integrated farming

- To serve as a center for collecting and disseminating information and advisory services pertaining to scientific matters, technical and economy related to food, agriculture and agro-based industry. These functions are accomplished through various methods inclusive of publication of reports, periodicals and related papers and organising of exhibitions, conferences and seminars, and lectures
- To serve as a center that provides expert services in food, agriculture and agro-based industry such as consultancy services, laboratory analysis, quality assurance and contract research and development (R&D)
- Provision of various forms of training to cater for the development of the food, agriculture and agro-based industry
- Provision of assistance for R&D in the field of pure and applied science, and economic research related to the food, agriculture and agro-based industries
- To establish linkages with local and foreign public and private organisations engaged in scientific, technical, economic and social research related to the food, agriculture and agro-based industries
- To conduct research and commercial production
- To develop, promote and exploit the research findings
- To provide extension services to the agriculture, food and agro-based industries

MARDI’s aims are:
1. Strengthening agriculture value chain through R&D.
   - Strategy 1 - Empowering local agricultural production with innovative R&D
   - Strategy 2 - Diversifying agricultural market through creative R&D
   - Strategy 3 - Intensifying futuristic and frontier research for agricultural sustainability
   - Strategy 4 - Developing sustainable agricultural ecosystem and environment

2. Ensuring successful diffusion and adoption of technologies.
   - Strategy 5 - Enhancing technology diffusion
   - Strategy 6 - Intensifying technology adoption
   - Strategy 7 - Enhancing product positioning

3. Enriching internal capacity.
   - Strategy 8 - Intensifying human capital development
   - Strategy 9 - Developing state-of-the-art facilities and infrastructure
   - Strategy 10 - Strengthening financial resources enablers

4. Enhancing organizational visibility.
   - Strategy 11 - Strengthening institutional networking
   - Strategy 12 - Internationalising MARDI

Technology development
MARDI’s research for nearly 50 years has successfully generated many new crop varieties and clones, animal breeds and developed many local food processing industries. Cutting edge technologies in food processing and post-harvest handling
have been developed for horticultural and livestock products. Other technologies include bio-fertilizers, biosensors, DNA fingerprinting for different commodities, animal feed and agriculture inputs. Methods and techniques in crop and animal production as well as pest and disease management for increased productivity have been produced for farmers of different commodities. Creating wealth from agro waste is also an area MARDI works on eg conversion of guava pulp waste into high dietary fibre supplements, virgin coconut oil by product into non-dairy yoghurt, rice husks into fertilizZer, pineapple leaf fibres and durian skin for packaging. Exploitation of microbes and enzymes for new products in food and non-food applications is another area of interest in MARDI.

Mechanization plays a vital role in improving productivity. In farming, operations can be more efficient in improving timeliness of operations and minimize labor. It also helps to reduce qualitative and quantitative damage enabling value adding and establishment of agro food processing industries. The traditional food processing industry in Malaysia has undergone major changes over the past two decades with the demand for more nutritious and safe food that conform to international standards and requirements such as Good Manufacturing Practice (GMP) and Hazard Analysis And Critical Control Point Food Safety System (HACCP). Where before, SMEs were producing food with inconsistent quality and low production volumes through manual methods, with the introduction of mechanisation and automation tools and equipment suitable for local products by MARDI, agropreneurs have progressed tremendously in Malaysia. Through mechanisation, youths can become productive agropreneurs. Examples are durian opening tools, jackfruit opening and bulb extraction tools, young coconut shaping machines, mobile young coconut opener, roti jala forming machine.

In modernising the agriculture and farming operations to make farming attractive to youths and increase productivity, MARDI has undertaken research to develop special interchangeable implements for tractors to tackle the different field operations for different crops, mapping soil fertility using drones and developing software and equipment for land levelling, variable rate application of seeds and variable rate application of fertiliser based on soil fertility.

ICT technologies are being exploited in farm management and operations such as “precision farming” technology for rice estate, and yield estimation, using imaging technology and drones. Early warning systems are being developed to tackle pest and disease with the application of ICT, besides techniques in environmental management and optimum utilisation of agricultural resources particularly soil, water and genetic resources. Plant factory setups together with customised lighting are being developed to modernise agriculture such that agriculture takes place under controlled environment with reduction in labour.

These innovations are geared towards modernising the agriculture and agrofood industries and the youth can be empowered through these innovations to engage in productive agro-based businesses.
**Technology promotion**

MARDI has evolved from just conducting training, exhibitions, demonstrations and providing technical advice to other means of promotion especially when the young agropreneurs are the target groups. The use of ICT and social media such as facebook, twitter, whatsapp groups, and also the dissemination of knowledge using youtube and mobile applications have helped to reach the young agropreneurs more effectively. Newer efforts have been through competitions, agrotourism and concerts. MARDI has also participated in various science and technology events in Malaysia as well as internationally in order to promote its technologies.

MARDI’s agrotourism agrotechnology parks contribute towards bridging knowledge with the different communities. Agriculture beyond R&D has been demonstrated through these parks which provides opportunities for the general public to gain knowledge through participatory learning, as well as for them to be able to appreciate nature.

MARDI has been involved in the national space food program in 2007 when Malaysia sent her first astronaut to space as a means to generate interest amongst children and the public in science and technology. MARDI’s involvement in producing Malaysian food specially prepared and packaged for the Malaysian astronaut to conduct experiments in space on the effect of microgravity on taste perception allowed the food industry to understand the protocols involved in preparing and sending food to space as well as provide opportunity for business spin-offs. MARDI was also involved in a joint project with Japan in sending chilli seeds to space to study the effect of microgravity on the seeds and the plants produced from the seeds.

**Technology transfer**

As an organization doing research in science and technology as its core business, MARDI provides a pool of experts in relevant fields and contributes significantly to the knowledge bank. Through the transfer of new technologies, MARDI aims to increase the use of new technologies amongst farmers, build a young generation of creative farmers, and encourage commercialization of new technologies by private companies. The knowledge and technologies that have been created in MARDI are transferred directly to the farmers and entrepreneurs and also to extension agents of other agencies in improving the productivity of the target groups. Farmers and entrepreneurs that have adopted MARDI technologies have contributed to the development of the national food, agriculture and agro-based industries. This has made the agricultural sector a compelling contributor to the national economy. Since its establishment in 1969, MARDI has assisted agropreneurs in the country in terms of research and development and commercialisation (R&D&C).

Various methods have been used in transfer of technology to agropreneurs. Training has been provided through basic and advanced short courses as well as attachment training to target groups. Besides publications, training and organisation of seminars and conferences, transfer of technology has been conducted through various programs such as client’s day, testbeds, technology incubators, model farms, as well
as education programs for different age groups such as School of Green Shoots for young children, Tani Warriors for older children, Youth Agropreneur Program. Technology test beds for production of various products such as strawberry jams, spreads, sauces, beverages; fish products, virgin coconut oil, bakery products, snacks are available for agropreneurs to test the technologies and test the market before setting up their own factories. Incubators for producing essential oils, bakery goods and extruded snacks and frozen sweet potato products are also available for agropreneurs to produce on a commercial scale.

Model farms for semi-commercial production of various produce are available where technologies developed by MARDI are applied and can result in real business entities. Technology transfer through model farms and testbeds have been demonstrated to be effective and have resulted in real businesses as proven by several entrepreneurs who have ventured into strawberry processing after attachment at the model farm and testbed in Cameron Highlands. Model farms at Langkawi have benefitted several agropreneurs in the production of fruits and vegetables using fertigation and hydroponic techniques under the expert guidance of researchers.

The technologies offered are reviewed from time to time to cater for the technology clusters that are current and in line with stakeholder’s needs. Businesses setup after attachment continue to receive technical guidance such as quality improvement, product diversification, and getting certification from the authorities. This would eventually lead to the growth of technology-based ventures that would provide jobs and generate income for the community.

AZAM Tani is a project to help those in the low income group registered in the e-Kasih system to increase their income by providing assistance through economic development projects in the agricultural sector and agro-based industries. The economic development projects are ‘quick win’ projects that brings quick results within three to six months of implementation. Activities involved under this program are projects based on crops, livestock, fisheries, processing, farm business and marketing facilities. Between 2011 and 2015, 1,033 participants benefitted through this program with more than 34% being able to generate additional income and up to 70% surpassed the poverty threshold level. Assistance was given in kind through provision of kiosks, infrastructures and technologies. Those who succeeded in becoming successful entrepreneurs were absorbed into the “Beyond 1AZAM” program, where participants were further guided to develop and expand their business.

The Youth Agropreneur program is a national initiative to expose those between 18-40 years to the fundamental agricultural and agro-based industry practices and skills. It aspires to produce young agropreneurs who are progressive, competitive, creative, innovative with high income. Besides training and technical advice, assistance of grants of up to RM 20,000 is given in kind to kick start a business. Special funding loan packages up to RM 200,000 are also provided through Agrobank and TEKUN to encourage upscaling and expansion. Amongst these agropreneurs, enterprising candidates who qualify are selected to enrol under MARDI’s Entrepreneur Guidance Program responsible for assisting, guiding and formulating entrepreneurship.
packages customised to their needs. Being registered under this Program gives access to bigger grants and the permission to use the MARDI logo on products. Selection into this group requires a certain level of annual earnings and production capacity involving the use of premises that are certified (GMP, halal, HACCP).

The National Blue Ocean Strategy (NBOS) is a national programme that contributes new ideas to change the thinking and perception of government officers so as to translate best practices that will benefit the public and the community through the government delivery system. Therefore, more than 80 ministries and public and private agencies collaborated in the formulation and implementation of various programmes. Under NBOS 3, ‘Engaging Rural Labour for High Value-added Economic Activities on unused Government Land’, the Ministry of Defence (MINDEF) collaborated with the Ministry of Agriculture and Agro-based Industry (MOA) to develop idle land for agricultural purposes using financial support from the Azam Tani programme. MARDI was appointed as the lead agency to implement and ensure sustainability of the project to achieve the targeted goals of developing the land and agro-based skills among youths and retirees.

With the commitment of all parties involved in the project, 7 acres of unused state land under MINDEF located in Sepang was developed within 12 months. The development involved land clearing and installation of greenhouses and fertigation system. Through constant monitoring of project implementation and practical training at the Test Bed, phase 1 of the project achieved 10 cycles of rock melon production with total yield of 73.4 metric tons and an average yield of 10-12 metric tonnes/cycle. This project successfully trained 17 youths as young agricultural entrepreneurs in 2013, after which two of them have managed to have their own rock melon farm with a monthly average income of RM 5,000. In 2014, five (5) youth members and five (5) military retirees were developed into competent agropreneurs in rock melon production using MARDI fertigation technology. Thirty participants were also assisted for crop production involving urban farming. The success of the project is not only measured in production capacity but also the ability to attract the public towards efficient modern agricultural technologies that provide high value to the agricultural practices.

Technology commercialization
MARDI’s approach in technology development through planned innovation is to ensure that the developed technology has high level of competitiveness. Every generated technology will undergo a selection process, screening, evaluation and is re-packaged. These processes are to determine whether the technology requires improvement, up scaling, commercialisation or to be declared as public good. An improved MARDI Act in year 2002 has enabled MARDI to strengthen its commercialisation method and identify appropriate commercialisation mode for each technology generated. In 2015, eleven (11) technologies were successfully commercialised through various modes such as licensing, pre commercialisation, distribution agreement, original equipment manufacturing (OEM), direct sales and consultancy.
Conclusion

Transformation of the agriculture and agrofood industry is needed to make this sector attractive to youths. Innovation is vital to achieve this. Youths are the future of our countries and empowering them through innovation will provide for a career in agriculture and the agrofood industry which is productive and viable.

References