

## **A REVIEW ON BEEKEEPING IN MALAYSIA: HISTORY, IMPORTANCE AND FUTURE DIRECTIONS**

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**Abstract:** This review aims to share the history of Malaysian beekeeping, in order to guide current developments in beekeeping. It is also intended to sustain and promote the local beekeeping industry. Beekeeping in Malaysia has been practised and first found documented since the Sultanate of Malacca. Today, both traditional and modern approaches to beekeeping are used locally. Beekeeping is crucial to the conservation and sustainability of the ecosystem. It offers natural pollination, future food security, high income generation, medicinal products, and research opportunities. However, bee domestication, problems with queen rearing, low honey production, inconsistency in quality and the high price of honey, dumping of adulterated honey on the local market, the lack of a Malaysian honey standard, and no existing body or centre to monitor beekeeping development have become a major challenge. The issues could address, with the establishment of a Majlis Lebah Negara and a one-stop centre, to guide, monitor and develop Malaysian beekeeping to an exceptional level, for the benefit of all.

Keywords: Economic value, ecosystem conservation, food security, Malaysian honey standard, traditional and modern beekeeping.

### **Introduction**

Albert Einstein is said to have stated, “If the bee disappeared from the surface of the Earth, man would have no more than four years left to live.” This statement reflects the major role played by bees in conserving the ecosystem and thereby sustaining human life. However, only a few realise the importance of bees, apart from the simple fact that they produce honey. In fact, bees perform a major function in indicating and maintaining a balanced ecosystem, as a natural pollinator, and consequently in supplying and securing food for humankind. In addition, bee by-products including honey, propolis, bee venom and beebread offer various applications for example as a natural sweetener and medical benefits.

In Malaysia, little information is recorded about bees, their by-products and related issues. Despite this, local apiaries and the beekeeping industry have experienced extensive growth in the past few years. This review will discuss the history of beekeeping in Malaysia; its functions in sustaining a balanced ecosystem,

supplying foods, enhancing agriculture sectors, and increasing socio-economic levels and Malaysia’s Gross Domestic Product (GDP); authenticity issues; and several suggestions for improving the sector in the future. The review aims to document information systematically regarding beekeeping in Malaysia, guide beekeepers, researchers and other authorities in accelerating their planning and activities related to the beekeeping sector.

### **History of Beekeeping in Malaysia**

#### ***Traditional Beekeeping***

Traditional beekeeping in Malaysia has been documented since the Malacca Sultanate (Hassan, 2003). However, it is believed that beekeeping was practised for a very long time ago. Villagers known as honey hunters harvested honey directly from beehives. The practice may have been similar to the method applied by the late Mr. Hj. Salleh Mohd Nor (Pak Teh, pers. comm), a traditional honey hunter based at Tasik Pedu, Kedah (FINAS

& Discovery Networks Asia-Pacific, 2014; Mardan, 2008). He preserved and applied the methods used by his great grandfather, which are now being continued by his grandson, Mr. Maslizam Mustafa, and his team. Basically, the honey hunters harvest honey from the hives of the wild bee, *Apis dorsata*, nested in a Tualang tree in the deep forest (Mardan, 1988). Thus the honey is named 'Tualang honey', even though bees collect nectar from various plants in the surrounding area. They harvest the honey in the middle of the night, with traditional apparatus including a bamboo ladder, a cow-bone knife and a cow-skin container, and they perform a special ceremony (FINAS & Discovery Networks Asia-Pacific, 2014; Mardan, 1988, 2008). This activity is performed once per year, usually between January and April. By contrast, in other places such as Terengganu, honey harvesting is performed whenever the honey is available, without using a specific method (Ismail, 2008).

### ***The Early Development of Modern Beekeeping***

Modern beekeeping began in Malaysia in the 1970s, when a beekeeper set up an apiary in Johor using imported commercial bees (*Apis mellifera*) from Taiwan. In 1981, the Malaysian Beekeeping Research and Development Team (MBRDT), which was funded by the International Development Research Centre (IDRC), was established and led by Dr Makhdzir Mardan from Universiti Pertanian Malaysia, to develop systematic beekeeping in Malaysia (Mardan, 2008). Also in the 1980s, the Malaysian Ministry of Agriculture through the Department of Agriculture (DoA) in Johor had sent one officer, Mr. Zakbah Mian, to Australia for beekeeping training. In October 1988, a national apiary centre was established at Parit Botak by the DoA to plan, develop and organise training in modern beekeeping. However, the centre is less exposed to the public (Ismail, 2012; Mian, 2009).

Modern beekeeping involves domesticated bees such as *A. mellifera*, *A. cerana*, and a few species of stingless bee including

*Geniotrigona thoracica*, *Heterotrigona itama*, *Lepidotrigona terminata* and *Tetragonula leaviceps* (Department of Agriculture, 2012; Jaafar, 2012). The apparatus used is also more developed than it was previously; for instance, a built hive, frame and centrifuge (Department of Agriculture, 2012; Jaafar, 2012), which assists the management and development of beekeeping for more rapid growth.

Beekeeping development in Malaysia during this period faced many hurdles. In 1996 and 1997, colony collapse disorder (CCD) occurred, destroying almost all the bees in Malaysia. A species of mite, *Varroa destructor*, carried by the imported *A. mellifera* bee, spread and kill the other bee colonies. Consequently, honey production decreased throughout Malaysia from 1996 up to 2008 (Ismail, 2008b). As an illustration, Malaysia's balance of trade (BOT) – the difference between the value of exports and value of imports – recorded honey trade deficits of between RM14.55 million in 2005 and RM2.63 million in 2008. Between 1996 and 2008, local honey production recorded was lower than the demand for honey (Ismail, 2008b). Surprisingly, some data published by Prof. Dr. Kamaruddin Mohd Yusoff and his team in 2006 showed that there were surplus of local honey during the period. This indicated the existence of adulterated honey in the local market (Mohd Yusoff, 2006). In addition, more honey was imported to fulfil the demand, which cost the country RM46 million in 2012 (Department of Agriculture, 2012). However, the purity and the quality of the imported honey were questionable.

The beekeeping industry in Malaysia was at its worst for almost 10 years before it slowly recovered from these problems. Honey production started to increase gradually; a positive BOT of RM5.26 million was recorded in 2009, and RM16.38 million in 2010 (Ismail, 2008b). At one stage, in 2008, the Federal Agricultural and Marketing Authority (FAMA) recorded large amounts of honey being dumped; in parallel, there was increased awareness among consumers of the existence

of adulterated honey, which made them more cautious when purchasing honey. Because of this, a research collaboration between FAMA and Universiti Sains Malaysia (USM), Kubang Kerian, Kelantan was established to investigate Tualang honey as a complementary medicine (Sulaiman, 2014).

### **Current Modern Beekeeping**

From 2010 to the present, the development of the modern beekeeping sector in Malaysia has been remarkable. After less than 10 years, the sector now attracts major attention from different authorities in various spheres. It began with an attempt to re-establish the MBRDT, which had slowed-down after the CCD crisis. The team grew bigger, started in May 2010 with the involvement of pioneer researchers from Universiti Putra Malaysia (UPM) (Prof. Emeritus Dato' Dr. Makhdzir Mardan, Prof. Dr. Muhammad Muid, Prof. Mohd Mansor Ismail); Universiti Malaya (UM) (Prof. Dr. Kamaruddin Mohd Yusoff); USM, Kubang Kerian (Prof. Siti Amrah Sulaiman); Universiti Perguruan Sultan Idris (UPSI) (Dr. Mai Shihah Abdullah); Mr. Zakbah Mian (Department of Agriculture, Parit Botak, Johor); and the author (Head of Project of Bee and Other Bee By-Products, PROBEE) during her tenure at Universiti Teknologi MARA (UiTM), Puncak Alam (Ismail, 2014; Mardan, 2008; Sulaiman, 2014).

The team started by bidding to be the hosts of the 11<sup>th</sup> Asian Apiculture Association (AAA) Conference, and secured the position in Korea in 2010. In 2011, they organised the National Bee Seminar and ApiExpo 2011, with the collaboration of the Yayasan Diraja Sultan Mizan (YDSM) and the DoA Terengganu, in preparation for the 11<sup>th</sup> AAA Conference in September 2012. The symposium was successfully organised, with the involvement of the new version of the MBRDT, YDSM, DoA Terengganu and Universiti Malaysia Terengganu (UMT).

The crucial, quantum leap for the development of modern beekeeping in Malaysia occurred in June 2013 at the National

Beekeeping Industry Seminar at Parit Botak, Johor, when the author raised the honey authenticity issue directly to the Minister of Agriculture, Tan Sri Dato' Ismail Sabri Yaakob. At the end of 2013, the Department of Agriculture launched a national initiative called the Young Agropreneur Scheme (YAS) to train young beekeepers across Malaysia to supply more pure honey to the local market. Moreover, the main objective of the YAS is to provide new agriculture projects particularly among adult for achieving high-income nation. For instance, through the development of agro-entrepreneurs in beekeeping, Malaysian farmers can achieve income RM5000 per month (Ismail, 2014). Simultaneously, stingless beekeeping was starting to attract major attention, as it is more easily set up and expanded for commercial purposes (Idris, 2013; Jaafar, 2011b).

Initially, local beekeeping focused on various species of *Apis*, including *A. dorsata* (the wild native giant bee), *A. mellifera* (commercial and imported bees) and *A. cerana* (a local bee). After stingless beekeeping was launched by the Malaysian Agricultural Research and Development Institute (MARDI) in 2011 in the Malaysia Agro Exposition Park Serdang (MAEPS), Selangor, together with the YAS, the total number of beekeepers increased tremendously, to about 1 000 people. The trend appears to be towards high honey production and increased honey demand and consumption.

The enthusiasm for stingless beekeeping has not diminished, despite many accidents occurring recently (some beekeepers have died during the stingless bee hive hunting and expeditions), log and hive pilferage, and the dumping of adulterated honey on the local market (Anonymous, 2014; Harian, 2015). These problems occurred because there is no systematic and regulatory body or centre to monitor and guide the beekeepers and related authorities.

### **The Importance of Beekeeping in Malaysia *Bees and the Ecosystem***

The beekeeping industry has great prospects to be extended, but except for honey production, other opportunities are seldom recognised. In fact, the major function of bees is to conserve our ecosystem. A recent tragic issue was the death of a two-month-pregnant tigress that was struck by a vehicle; it is speculated that it was on the road and not in its usual habitat due to the disturbance of its ecosystem (Harian, 2016). Intriguingly, bees show similar behaviour; at times, the natively-found stingless bee from the deep forest suddenly appears around the periphery (Brown & De Oliveira, 2014; Samejima, Marzuki, Nagamitsu, & Nakashizuka, 2004). We surveyed forest structure and flowering activity, and conducted a nest census and a bait-trap survey of stingless bees, both in primary forests and in forests disturbed by logging and shifting cultivation. The densities of late successional trees and large trees (diameter at breast height >50 cm. Thus, function of bees in conserving forest and balancing the ecosystem could be explored and exploited commercially.

Bees and the ecosystem are connected through the bee pollination. It is involved in the production of seeds and fruits, and increases the success rate for plant reproduction. It is common for beekeepers to protect the forest where beekeeping is practised, especially the tall trees preferred by the bees. This accelerates the regeneration of trees and the conservation of the forest's biodiversity (Heard, 1999; Lee, Sodhi, & Elmqvist, 2001). Other animal species such as bats, birds, monkeys and bears are also connected with bees – by food production, via bee-pollination; and the bee itself. Thus, it is demonstrated that bees and trees belong together, and that many species of plants and animals would not survive if bees were removed from the ecosystem. Separate studies conducted by Prof. Dato' Dr. Makhdzir Mardan and Prof. Dr. Ruth Kiew and their team showed that *A. dorsata* plays a major role in sustaining the forest at Pedu Lake, Kedah, and

also in pollination activities for various plants (Kiew, 1991).

### ***Bees and Food Security***

Another critical issue worldwide, including in Malaysia, is food security. Approximately RM13 billion per year is spent on importing food (Ismail, 2014, United Nation, 2002). Ismail (2008b) reported that the BOT for honey was negative from 2005 to 2008. This occurred in conjunction with the CCD problem mentioned earlier. It is less well known that bees can increase food production. Studies conducted by the DoA and MARDI reveal that coconut and pineapple productions were increased after bee pollination was introduced to the farms (Department of Agriculture, 2012; Jaafar, 2011a; Mian, 2009). Employing the bee-pollinator approach on all farms in Malaysia is a possible solution for increasing domestic agriculture production and may reduce dependency on imported foods, thereby improving local people's income and Malaysia's GDP. This approach is well established and is applied widely in the US, Australia and New Zealand (Abrol, 1993; Kato & Kawakita, 2004; Klatt *et al.*, 2014; Rader *et al.*, 2009; Robertson, Kelly, Ladley, & Sparrow, 1999)

### ***Bees and the Economy***

A few areas have been identified as suitable for deploying beekeeping for income generation, as shown below.

#### ***Tropical rain forest***

Diversity of floras in the tropical rain forest is a valuable natural resource to be preserved. Conservation and maintaining of the rain forest involved high expenses and need cooperation from many authorities particularly after human disturbance. One of the effective approaches is by applying conservation through the bee pollination (Härtel & Steffan-Dewenter, 2014). The state of Sarawak in Malaysia has implemented bee pollination method and proven successful in conserving its rainforest (Momose *et al.*, 1998; Roubik *et al.*, 2006).

### *Agriculture sector*

The major role of bees as a natural pollinating agent can actually be manipulated on the large scale of the agriculture sector. Bees will readily reside in a place with plentiful nectar and pollen sources for their food. At the same time, the beekeepers can provide a pollinating service sufficient for a large-scale farm. This can increase plant production, by the same increment as the pollination success rate; and also by shortening the harvesting period, from once per year to two or three times annually. This was observed on a pineapple farm in Johor, and was monitored by the DoA (Department of Agriculture, 2012; Mian, 2009). The similar practice was successfully implemented and reported in an apiary from Besut, Terengganu, Malaysia (Azmi *et al.*, 2015).

### *Side income*

“Honey is money.” This well-known saying about just one by-product of beekeeping has contributed to the misunderstanding that honey is the only commercial product to be gained from farming bees. In fact, bees offer many other by-products, such as propolis, bee pollen, beebread, beeswax, royal jelly, and bee venom. These can either be sold raw, or in different commercial guises. For instance, honey can be sold either fresh and raw, or treated to reduce water content for longer storage.

Various types of plant source can result in different kinds of honey, such as Gelam, pineapple, mango, coconut or Kelulut honey. Bee pollen, beebread and royal jelly can also be consumed orally, and each has a specific medicinal value. Propolis and bee venom can be applied topically as antibacterial agents. Beeswax can be used to create soap, lotion and candles. All parts of the bee, the bee by-products and the hive itself can be manipulated into other ‘downstream’ products to be used in baking, confectionery, nutraceuticals, health and body care, cosmetics, and the household (Crane, 2009).

Beekeeping can also offer stocks of queen bees, larvae, and beekeeping apparatus, for

example hives and frames. A plant nursery may be developed to supply plants for nectar and pollen sources for the bees. Professional advice, service and training are other aspects that could be explored.

### *Ecotourism*

Forest conservation for beekeeping purposes leads to the preservation of nature’s attractiveness. It would fascinate nature lovers to visit such places. Ecotourism is considered a dynamic and holistic approach, which encompasses maintaining the balance of and sustaining the ecosystem, economic value, food security, and recreation. It would also contribute to the local economy (Thapa, 2001).

### *Medicinal Value of Bee By-products*

Most people treat honey as a food or a natural sweetener, or as an instant energy booster (Bogdanov, 2014). In Malaysia, honey is mainly consumed for medicinal purposes (Ismail, 2014; Sulaiman, 2014). Thus, Malaysian consumption is considered low compared to other countries such as the US, the UK and the countries of Europe. Even so, local supply is still not enough to meet demand. However, daily consumption for various purposes has grown recently, requiring greater honey production and supply to the market.

The medicinal value of honey is well known; it is used as a dressing for healing wounds, and contains antimicrobial agents and strong antioxidant properties, and is potent enough to treat obesity, diabetes and cancers (Bogdanov, 2014). Other bee by-products – such as propolis, bee pollen, beebread, royal jelly and bee venom – have specific medicinal attributes, and are valued as anti-inflammatory agents, a source of nutrition, and for increasing male and female fertility (Ürünlerin, Önemli, & Hegazi, 2012). These by-products have medicinal values and may be consumed daily for prevention and treatment purposes. Thus, they maintain human health and reduce the chances of getting severe diseases.

### ***Bees and Research Development***

Research in local beekeeping from various fields was developed when the MBRDT (initiated by Prof. Emeritus Dato' Dr. Makhdzir Mardan) was established in 1981; at almost the same time as the promotion of beekeeping by the Malaysian Department of Agriculture. The involvement of Mr. Zakbah Mian (a DoA Johor officer) and Prof. Dr. Mohd Mansor Ismail (an economist from UPM) as team members of MBRDT accelerated the development of early modern beekeeping in Malaysia.

Another prominent name in beekeeping research is Prof. Dr. Kamaruddin Mohd Yusoff, a professor from UM. He studied the effects of Gelam honey as a wound dressing at the University Malaya Medical Centre (UMMC). This practice is still recognised at the UMMC today. Yusoff's most significant research was in detecting adulterated honey in the local market (77% of honey sold) (Mohd Yusoff, 2006). He published these findings in 2005 to create awareness among consumers, and to stop the production of adulterated honey. It was a great success. However, adulterated honey production has once again started to conquer our market. In certain areas of Malaysia, approximately 90% of the honey sold is adulterated (Razali, 2014).

In 2008, extensive studies on honey were conducted in the Medical School at USM Kubang Kerian campus. The research was led by Prof. Dr. Siti Amrah and her team, with the collaboration of FAMA. It was a great achievement when various grants, findings, publications and awards were secured by the team. The medicinal value of honey was revealed in its use for treating menopause syndromes and for increasing male and female fertility; and in its potential for treating diabetes and cancers (Erejuwa, Sulaiman, & Ab Wahab, 2012; Erejuwa *et al.*, 2010; Kadir, Sulaiman, Yahya, & Othman, 2013; Mohamed, Sulaiman, Jaafar, & Salam, 2011).

In 2010, UiTM Puncak Alam was involved in research to elucidate the mechanism of several types of honey in Malaysia in treating cancer,

and as an anti-obesity agent (Fadhli *et al.*, 2012, Samat *et al.*, 2014a, Samat *et al.*, 2015). In collaboration with Prof. Dr. Kamaruddin, honey analysis to detect honey adulteration was developed at the same institution until 2015. A toxicity study on adulterated honey was then conducted using animal models (unpublished data). From those findings, the author would suggest that honey analysis should be conducted first, before commencing any studies related to honey, in order to avoid any false-positive or false-negative results (Ismail, 2013, Samat *et al.*, 2014b).

Other research teams that have studied various aspects of honey are those of MARDI, DoA, UKM, UPSI and International Islamic University Malaysia (IIUM). However, most research focused on honey harvested from the *Apis* bee species. Other bee by-products, such as propolis, bee bread and bee venom, were left disregarded. Today, scientific and systematic studies on stingless bee honey have just begun. There are more institutions involved in larger-scale research using a variety of products and approaches, such as UMT, Universiti Sultan Zainal Abidin, Universiti Teknologi Malaysia, Universiti Malaysia Perlis, and Universiti Malaysia Pahang; as well as co-operative societies and non-profit government organisations, such as Persatuan Apiterapi Malaysia, Koperasi Pemungut Madu Lebah Asli Terengganu Bhd, Akademik Kelulut Malaysia, Persatuan Usahawan Kelulut Malaysia and Persatuan Usahawan Lebah Kelulut Darul Naim. This encouraging trend is expected to affect the beekeeping sector in a positive manner, in a variety of ways.

### ***Beekeeping Issues in Malaysia***

These stimulating developments should drive Malaysian beekeeping ever upwards, at least in supplying enough pure local honey of good quality. Unfortunately, it is possible this situation may not come about. There are a few problems that need to be solved promptly if local beekeeping is to prosper. This review focuses mainly on honey production, since

the other bee by-products are still in the early stages of commercialisation.

### ***Beekeeping Set-up and Techniques***

Beekeeping set-up from constructing a beehive and obtaining a colony of bees required techniques in selecting a healthy queen bee and bee colony, queen and bee rearing, harvesting the bee products from beehive and to sustain the hive up to the commercial value. However, local beekeepers are still facing the upstream problems in selecting suitable domesticated bees for their apiaries. This will decelerate the development of the industry.

The imported bee *A. mellifera* is commonly used, but this species is susceptible to mites and disease (Sapcaliu *et al.*, 2015). The native bee *A. cerana* requires a particular technique to breed high-quality queens, and to avoid high domestication failure rates (Mardan, 2008). On the other hand, stingless bees produce a low honey yield compared to the *Apis* species (Jaafar, 2012). This 'upstream' problem must be solved before commencing large-scale commercial beekeeping, to avoid loss and failures (Ismail, 2012). Other threats such as mites particularly *Varroa destructor* or predators such as birds must also be overcome if this activity is to be sustained in the long term.

### ***Lack of Honey Production, and Inconsistency in Quality and Price of Honey***

The problems listed above lead to low honey production, and higher demand for local honey than there is supply – even though more than 1 000 beekeepers have been trained on various courses, many through the YAS. The authorities involved must reflect on the effectiveness of their planning, from ground-level basics to final product. Another issue that has been raised is the inconsistent quality of existing honey production, since there is no quality standard enforcement for measuring the condition of honey, and a lack of techniques for preserving honey at the highest quality such as with low fermentation process. Even though, the International Honey Commission (IHC) has

set the quality assessment (Codex, 1993), the assessment has not been regularly practiced and implemented in Malaysia, and required some amendments based on the honey locality. For instance, the high water content and hygroscopic capacity of honey, combined with the tropical climate of Malaysia, accelerate the fermentation process in honey and will decrease quality of the honey (Moniruzzaman *et al.*, 2013). The price of honey sold on the local market is also not standardised; because of the inconsistency in quality, the price may not reflect the quality of the honey sold. This is problematic for consumers, who have a right to make purchasing decisions based on quality.

### ***Authenticity Problems and the Lack of a Malaysian Honey Standard***

Low honey production but high demand has caused the production of adulterated honey, which is cheaper, and available throughout the year. Consumers may be deceived about what they are buying, and importantly, they are not aware of the harm associated with adulterated honey consumption. A study conducted by the author's research group on rats revealed that in the long term, adulterated honey may be toxic, and cause liver and kidney dysfunction (Ismail, 2013). The enforcement of laws to stop the production of adulterated honey is challenging, as Malaysia does not have a local honey standard and low implementation for measuring the authenticity of the honey on the market.

According to Moniruzzaman *et al.* (2013), some of physicochemical data obtained from Malaysian honey (both honey harvested from species of *Apis* and stingless bee) was different compared to the parameters set by the IHC for example water content and sugar profile. This is because Malaysian honey is influenced by the tropical climate, which is different from other honeys originated from Europe (Moniruzzaman *et al.*, 2013). Thus, Malaysian honey standard is a must to control the local honey quality and authenticity.

### ***Lack of a Dedicated Body and One-Stop Centre to Monitor Beekeeping Development***

Currently, the Ministry of Agriculture monitors the beekeeping sector, from the set-up of hives to supplying the queen bee and providing funds, training, and certain commercialisation procedures through the Department of Agriculture, MARDI and FAMA. However, the ministry also oversees other agricultural sectors, such as the growing of rice and mushrooms, farmer-related issues, and product development and markets. These widespread responsibilities mean delays in attending to the many issues and problems concerning beekeeping. In addition, activities planned to develop the beekeeping sector may not be achievable, given the current infrastructure.

A body similar to the Majlis Herba Negara (expert panels to monitor and advice issues related to Malaysian herbs) has been proposed, to deal with all issues related to beekeeping as mentioned above. In addition, the board is responsible to develop a Malaysian Honey Standard, conduct honey analysis, and provide services to all beekeepers, researchers and consumers in Malaysia. A one-stop centre is also crucial to be proposed as one information centre associated to the beekeeping in Malaysia to facilitate and disseminate information to the society efficiently. This would promote proper and systematic future planning, which would be beneficial to our country and to others.

### **Future Direction of Beekeeping in Malaysia**

#### ***Majlis Lebah Negara and One-Stop Centre for Beekeeping and Bee By-products Information and Development***

The beekeeping industry in Malaysia has great potential. It could be explored (and profits could be made) from many angles. This could be successfully done with the establishment of Majlis Lebah Negara, a body to monitor and plan the beekeeping development similar to the Majlis Herba Negara, which has produced many excellent achievements. It should involve experts from the pioneers of the MBRDT

committee, beekeepers, funders, and related private and government agencies and policy-makers, who would guide the beekeeping industry to the same level as the other sectors. Similar body has been established abroad to fulfil the tasks such as American Beekeeping Federation, National Beekeepers Association, New Zealand and Canadian Honey Council. Meanwhile, a one-stop centre such as National Beekeeping Centre Wales and Centre for Bee Research and Development, Kenya, functions as a referral location in providing information related to the beekeeping to the community. National apiary centre in Parit Botak, Johor can be rebranded with more staff and financial assistance to provide beekeeping related functions more effectively.

#### ***Malaysian Honey Standard***

Malaysia has a diverse bee population (including *Apis* sp. and stingless bees), and also many floral sources. It is able to produce outstanding honey with a variety of tastes and aromas, as well as medicinal value. Local honey of premium quality could be produced and sold at a corresponding price, and it could even be marketed internationally. This would be achievable if Malaysia had its own honey criteria to classify and grade the honey such as Malaysian Honey Standard, enabling Malaysian honey to compete with other honey varieties such as Manuka honey from New Zealand. Moreover, Malaysia has various species of stingless bees. Honey produced by the bees is exceptional and not applicable with the international honey standard set by the Codex. This is due to the stingless bees are limited to the tropical countries such as in Malaysia. All authorities, including beekeepers, researchers and government agencies – especially the Malaysia Standard Agency – need to work together to complete this task.

#### ***National Blue Ocean Strategy (NBOS) in Malaysian Beekeeping***

Beekeeping is a large sector that includes ecosystem (forest) management, agriculture,

social and rural developments (economy-driven), industries and tourism. It is not only the Ministry of Agriculture's responsibility. But for the sake of the future development of beekeeping, all the relevant ministries in Malaysia should cooperate in establishing the sector, using the National Blue Ocean Strategy (NBOS). NBOS is a strategic planning designed by the Malaysian government to accelerate the development in Malaysia by setting intensive collaboration from different agencies. Other authorities – such as institutions, research groups, beekeepers, and co-operative societies – are also encouraged to work together to sustain the sector. With a controlling body and a one-stop centre, this strategy could be implemented effectively.

### Conclusion

The beekeeping industry in Malaysia has a bright future, if properly developed. The history of beekeeping should be used as a guide in local planning on the management and development of the industry. Governance and conservation gaps on the bee species and beekeeping in Malaysia need to be identified and addressed to ensure the industry can be sustainable and profitable. The establishment of Majlis Lebah Negara as the highest regulatory body and revival of National Apiary Centre as a beekeeping one-stop centre could provide significant improvement. The advantages of beekeeping far outweigh its problems; they are worth scrutinising, for the good of the systematic development and management of beekeeping in Malaysia.

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