UNIVERSITI PUTRA MALAYSIA

BEHAVIOURAL DETERMINANTS OF RANCHERS TOWARDS SUSTAINABLE EDIBLE-NEST SWIFTLET RANCHING IN MALAYSIA

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By

SELVAKKUMAR K N VAIAPPURI

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

January 2017

This thesis is dedicated to every soul in this universe who strives to achieve their DREAM!

By
A Malaysian

Abstract of thesis presented to the senate of Universiti Putra Malaysia in fulfilment of the requirements for the degree of Doctor of Philosophy

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Chairman : Associate Professor Nitty Hirawaty Kamarulzaman, PhD
Faculty : Agriculture

The edible-nest swiftlet ranching is a unique industry in the agriculture sector in Malaysia, which also holds the same position in a global context. The edible-nest swiftlet ranching is an activity of which the edible-nest swiftlet birds are lured into a man-made building (bird house) which emulates a cave-like environment in order to provide alternative nesting sites to populate their colony. This edible bird nest (EBN) will be collected by a rancher after the young bird starts to fly. In the edible-nest swiftlet ranching, the birds will have the freedom to live in their natural "lifestyle" and will not be disturbed by the ranchers in any aspects. The development of the edible-nest swiftlet ranching in Malaysia has expanded rapidly when the Malaysian government gave special attention to the sector. However, this has led to an unplanned expansion among the ranchers which triggered several sustainability issues. If the sustainability issues are not handled well, the future of the sector will be at stake.

Thus, it is indeed important to study the ranchers' behaviour in the context of sustainable edible-nest swiftlet ranching in Malaysia. The assessment of the edible-nest swiftlet ranchers' behaviour in implementing sustainable ranching practices was established as the general objective of the study. The conceptual framework was designed based on the Theory of Planned Behaviour (TPB), Theory of Interpersonal Behaviour (TIB), and Theory of Organisational Knowledge Creation (SECI Model) to achieve the specific objectives of the study.

This study was divided into three stages, namely pre-test, pilot study, and actual study. The pre-test stage was carried out mainly in the instrument development and the research design. In the second stage, the pilot study was carried out with a sample of 107 respondents to determine the underlying determinants on each main construct. The final stage which was the actual study, a total of 650 respondents were interviewed to get their in-depth responses. Descriptive analysis, correlation analysis, reliability

analysis, chi-square analysis, exploratory factor analysis (EFA), confirmation factor analysis (CFA), and structural equation modeling (SEM) were used to analyse the data.

The socio-demographic background of the respondents and their involvement in the ranching sector were detailed out as part of the main findings of the study. The results further revealed that most of the respondents were involved in the ranching sector with the raw uncleaned EBN as their end product, while the type of bird house that widely used was the single lot. The structural equation modeling (SEM) was employed in this study to confirm the four factors namely externalisation, combination, socialisation, and internalisation have contributed to the ranchers' knowledge in terms of sustainable edible-nest swiftlet ranching.

Furthermore, it was found that four constructs namely attitude, peer factor, affect, and self-efficacy have influenced the ranchers' psychology to practise sustainable edible-nest swiftlet ranching practices. All these four constructs also influenced the ranchers' intention to practice sustainable practices. The second order confirmatory factor analysis (CFA) confirmed that six factors have influenced the role of governance in enhancing the sustainability of the edible-nest swiftlet ranching. Besides that, the perceive attributes of the sustainable practices have also influenced the implementation level of sustainable practices in the edible-nest swiftlet ranching. The study identified and confirmed that the ten perceived attributes of sustainable practices of edible-nest swiftlet ranching were relative advantage, image, perceived resources, compatibility, trialability, ease of use, perceived risk, visibility, voluntariness, and result demonstrability. All the constructs showed a positive effect on sustainable practices. Thus, by implementing these constructs into edible-nest swiftlet ranching practices, it could be part of the policy maker strategies for knowledge transformation among the ranchers and thus sustainable edible-nest swiftlet ranching could be achieved. Indeed, the role of the agriculture governance is really crucial in keeping the sustainability of the sector for a long term.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

PENENTUAN PERILAKU PENGUSAHA TERHADAP KELESTARIAN PERUSAHAAN BURUNG WALIT DI MALAYSIA

Oleh

SELVAKKUMAR K N VAIAPPURI

Januari 2017

Pengerusi : Profesor Madya Nitty Hirawaty Kamarulzaman, PhD
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Perusahaan sarang burung walit adalah industri yang unik dalam sektor pertanian, bukan sahaja di Malaysia malah di mata dunia. Perusahaan sarang burung walit adalah aktiviti di mana burung walit dipikat ke dalambangunan buatan manusia (rumah burung) yang menyerupai persekitaran gua, Rumah ini menyediakan tapak alternatif untuk burung walit bersarang serta membiak, dan sarangnya akan dikumpul hanya selepas anak burung walit mula terbang. Sarang yang dihasilkan oleh spesies burung ini dikenali sebagai sarang burung walit dan boleh dijadikan sebagai makanan manusia. Orang yang menjalankan perusahaan ini dikenali sebagai pengusaha sarang burung walit. Dalam perusahaan sarang burung walit, burung-burung walit adalah bebas untuk mengamalkan kehidupan semula jadi tanpa gangguan oleh pengusaha dalam apa jua aspek. Taburan utama populasi burung walit adalah di kawasan Asia Tenggara, di mana Malaysia telah dianugerahi oleh alam secara semula jadi untuk mengadakan industri ini dalam negara.

Pembangunan perusahaan sarang burung walit di Malaysia telah berkembang apabila kerajaan Malaysia memberi tumpuan khusus terhadap perkembangan sektor ini. Pembangunan pesat aktiviti perladangan yang tidak terancang telah menimbulkan beberapa isu kemampanan. Jika isu ini tidak dikendalikan dengan bijak, masa depan industri ini boleh diancam justeru, keinginan untuk mengkaji perilaku pengusaha terhadapamalan perusahaan sarang burung walit lestari di Malaysia adalah objektif utama kajian ini. Bagi mencapai objektif kajian ini, kerangka kerja konseptual untuk kajian ini telah direka berdasarkan Teori Rancangan Kelakuan (TPB), Teori Kelakuan Interpersonal (TIB) dan Teori Penjanaan Pengetahuan Organisasi (SECI model).

Kajian ini terbahagi kepada tiga peringkat iaitu pra-ujian, kajian rintis dan kajian sebenar. Pra-ujian, digunakan terutamanya dalam membangunkan instrumen dan reka bentuk penyelidikan. Kajian rintis dijalankan dengan sampel sebanyak 107 responden untuk mencari faktor-faktor bagi setiap konstruk utama. Seramai 650 responden ditemubual daripada Januari 2014 sehingga Mei 2015 pada fasa kajian yang sebenar.

Analisis deskriptif, analisis korelasi, analisis kebolehpercayaan, ujian khi kuasa dua, analisis faktor penerokaan, dan pemodelan persamaan berstruktur digunakan untuk menganalisis data. Latar belakang sosio-demografi bagi majoriti responden dalam kajian ini adalah lelaki, berbangsa Cina, berumur antara 41 hingga 50 tahun, memiliki diploma, berkahwin dan mempunyai saiz keluarga antara 3 hingga 5 orang ahli. Hasil kajian menunjukkan bahawa kebanyakan responden hanya terlibat dalam perusahaan sarang burung walit. Sarang burung walit mentah adalah produk terakhir dan kebanyakan daripada mereka mengunakan jenis rumah burung lot tunggal. Pemodelan persamaan berstruktur telah digunakan dalam kajian ini untuk menganggarkan kesan ke atas konstruk pendam pada pembolehubah endogen. Kajian juga mengesahkan bahawa empat faktor iaitu luaran, gabungan, sosialisasi, dan pengantarabangsaan adalah penyumbang kepada pengetahuan pengusaha sarang burung walit dari segi perusahaan sarang burung walit yang lestari.

Empat konstruk iaitu sikap, rakan sebaya, perasaan, dan efikasi-kendiri mempengaruhi psikologi dan niat pengusaha untuk mengamalkan amalan perusahaan sarang burung walit yang lestari. Peranan tadbir urus pertanian dalam menjaga sektor pertanian and pembangunan secara lestari adalah sangat penting. Pengesahan analisis faktor perintah kedua mengesahkan bahawa terdapat enam faktor yang mempengaruhi peranan tadbir urus dalam meningkatkan kelastarian perusahaan sarang burung walit. Selain itu melihat ciri-ciri amalan lastari juga akan menentukan tahap pelaksanaan amalan lestari bagi pengusahan ini. Kajian ini mengenal pasti dan mengesahkan sepuluh sifat-sifat amalan lestari bagi perusahaan sarang burung walit adalah seperti berikut; kelebihan relatif, imej, sumber dijangka, keserasian, kebolehcubaan, kemudahan penggunaan, risiko dijangka, visibiliti, kesukarelaan, dan kebolehan menunjuk hasilnya. Semua konstruk menunjukkan kesan positif terhadap amalan lestari. Maka, dengan menerapkan semua konstruk ini dalam amalan perusahan walit dengan strategi yang mantap oleh para pengubal polisi, ilmu alaman lestari dapat dipindahkan kepada para pengusaha. Pihak berkuasa perlu memainkan peranan mereka secara effektif untuk mengamalkan amalan perusahaan lestari dan mengekalkan industri ini untuk jangka masa yang panjang.

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I certify that a Thesis Examination Committee has met on 24 January 2017 to conduct the final examination of Selvakkumar a/l K.N.Vaiappuri on his thesis entitled "Behavioural Determinants of Ranchers Towards Sustainable Edible-Nest Swiftlet Ranching in Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in Rule 41 in Rules 2003 (Revision 2012-2013) were adhered to.

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ACT	Adaptive Character of Thought
ADB	Asian Development Bank
AFC	Asian Financial Crises
AFSIC	Alternative Farming Systems Information Centre
AGFI	Adjusted Goodness of Fit
AVE	Average Variance Extracted
BNM	Bank Negara Malaysia
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CR	Composite Reliability
DOA	Department of Agriculture
DOI	Diffusion of Innovations Theory
DOSM	Department of Statistics Malaysia
DSM	Department of Standards Malaysia
DVS	Department of Veterinary Services Malaysia
EBN	Edible Bird' Nest
EPPs	Entry Point Projects
ETP	Economic Transformation Programme
FAO	Food and Agriculture Organization
FOB	Free On Board
GAHP	Good Animal Husbandry Practices
GDP	Gross Domestic Product
GFI	Goodness of Fit Index
GMP	Good Manufacturing Practices
GNI	Gross National Income
HAPA	Health Action Process Approach
IRBM	Inland Revenue Board of Malaysia
JUPEM	Department of Survey and Mapping Malaysia
KMO	Kaiser-Meyer-Olkin
MCMC	Malaysian Communications and Multimedia Commission
MOH	Ministry of Health Malaysia
MP	Malaysia Plan

MPC	Malaysia Productivity Corporation
MT	Metric Tonne
NFI	Normed Fit Index
NKEAs	National Key Economic Areas
OLS	Ordinary Least Square
PBC	Perceived Behavioural Control
PBT	Local Council
PCA	Principal Component Analysis
PEMANDU	Performance Management and Delivery Unit
PGFI	Parsimony Goodness-of-Fit
PNFI	Parsimonious Normed Fit
PPM	Parts Per Million
R&D	Research and Development
RFID	Radio-frequency identification
RM	Malaysian Ringgit
RMCD	Royal Malaysian Customs Department
RMSEA	Root Mean Square of Error Approximation
SARE	Sustainable Agriculture Research and Education
SD	Standard Deviation
SECI	Socialisation, Externalisation, Combination, and Internalisation
SEM	Structural Equation Modeling
SMEs	Small and Medium Enterprises
SMI	Small and Medium Industries
SSA	Sub-Saharan Africa
SWCS	Soil and Water Conservation Society
TIB	Theory of Interpersonal Behaviour
TLI	Tucker-Lewis Index
TMC	Traditional Chinese Medicine
TPB	Theory of Planned Behaviour
TRA	Theory of Reason Action
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UOA	Unit of Analysis
USD	United States Dollar

CHAPTER ONE

INTRODUCTION

This chapter discusses the development of the edible bird's nest industry in Malaysia. The chapter also consists of the issues and challenges in the edible-nest swiftlet ranching, problem statement, research questions, research objectives, the scope of the study, the significance of the study, and organisation of the thesis.

1.1 Edible Bird's Nest Industry

The agriculture sector is important to the rise of civilisations development when cultivation, animal husbandry, and food surplus led to the next allowed development in an emergent number of population and classes among the community (Bauer, 2011). Agriculture enabled people to produce surplus food. They could use this extra food when crops failed or trade it for other goods. Food surpluses allowed people to work at other tasks unrelated to farming (Nugent, 2000). In the economic perspective, it is categorised as the primary sector as well as from mining and quarrying. Despite the rapidly increasing urbanisation and a lot of focus given to manufacturing and services, the majority of Southeast Asia's populations still inhabits rural areas (Heilig, 2012), and most of them depends on the agriculture sector as their main economic resource (Maclean, Dawe, & Hettel, 2002; Sheng, 2012). The agricultural economists in Malaysia have long focused on how agriculture can best contribute to the overall economic growth and modernisation, premised on their in-grained believe that robust agricultural growth and productivity increases are crucial to sustain economic development in the nation (Mukhlis & Sallehuddin, 2008; Wong, 2007).

Since the very beginning of Malaysia until this very day, the agriculture sector has been the strong backbone of the nation's economic, social, and political growth (Adger, 2000; Barlow, 2012). The sector was producing agricultural products for domestic consumption and international market as the earner of foreign exchange. According to the Department of Statistics Malaysia (DOSM) (2015), the population of the country had reached 30 million people with an average monthly household consumption expenditure about United States Dollar (USD) 894.50in the year 2014. Malaysia Productivity Corporation (MPC) stated that in the year 2014, the agriculture sector had contributed around USD 14,382 million to the nation's gross domestic product (GDP) which was about 2.6% of GDP. The total export value for the month of January to September 2014 was USD 20,530 million (MPC, 2015). The agriculture sector continued to contribute to the overall development of the economy and remained resilient despite the economic slowdown. The development thrust of the sector was to improve the levels of productivity, competitiveness, dynamism, and to enhance incomes through greater commercial orientation and a wider adoption of new technologies and modern management systems (Performance Management and Delivery Unit [PEMANDU], 2012; Wong, 2007).

The Malaysian government takes serious efforts in improving the agriculture sector by giving special attention to the 11th Malaysia Plan (MP), of which focuses on increasing resilience of the agriculture sector (MP, 2015; Siew Yien, Hamzah Sharaai, Mohd Kusin, & Mansor Ismail, 2015). The agriculture development programmes aim to expand the production of food commodities in the effort to improve the food trade balance, to increase export of industrial commodities, and to ensure a sustainable supply of raw materials. These efforts are in action to support the growth of domestic agro-based industries (Wong, 2007). The Malaysian agriculture sector is divided into two main subsectors which are food (paddy, crop, vegetables, fruits, fisheries, livestock, apiculture, herbal based, coconut, edible bird' nest (EBN), and so forth) (Selvadurai, 1978), and plantation and commodities (oil palm, rubber, timber, cocoa, pepper, and tobacco) (Ahmad & Ariff, 1998). Among the industries, EBN industry has been recognised as a unique industry in the global agriculture sector, including Malaysia (Suriya, Zunita, Rosnina, Fadzillah, & Hassan, 2004).

1.1.1 Edible-nest Swiftlet

Edible-nest swiftlets are small insectivorous bird, which could be found throughout Southeast Asia and the South Pacific (Looi& Omar, 2016). These birds usually live in large colonies and dark caves (cave-like environments) due to its ability to move in darkness with the assistance of echolocation (Medway, 1962; Chantler, 2010). Considerable confusion exists in the taxonomy of edible-nest swiftlet birds, including the segregation of genera (Sankaran, 1995) due to the great likeness in morphological characteristics among the species (Looi & Omar, 2016).

The genera of swifts and edible-nest swiftlets had been modified a couple of times based on several factors such as the archaeological evidence, the nest morphological characteristics, the ability to navigate in total darkness (echolocation), the nesting area, and the molecular indication (Mayr, 1941; Medway, 1962; Brooke, 1970; Lee, Clayton, Griffiths, & Page, 1996; Goh et al., 2001; Thomassen et al., 2003). These birds belong to the *Apodidae* family. There are still some arguments in classifying the genus for this species. Some studies classified the genus as *Collocallia* (Sankaran, 1995; Lau & Melville, 1994; Medway, 1962; Marshall & Folley, 1956), while others classified the birds as Aerodramus (Marcone, 2005; Abdul Kadir, 2011; Kamarudin & Abd Aziz, 2011; Shirish & Sankaran, 2011). Lim (2009) stated that *Collocallia* genus is fit for non-echolocation swiftlets, while the genus of *Aerodramus* is fit for echolocation edible-nest swiftlets. The author also classified the genus of edible-nest swiftlet as *Aerodramus*. According to Jordan (2004), the genus of this species is formerly known as *Collocallia* but is now classified as *Aerodramus.*

The Department of Veterinary Services Malaysia (DVS) classified the edible-nest swiftlet genus as *Aerodramus* as well. More than 24 species of insectivorous, echolocation edible-nest swiftlets are scattered all around the world, but only a few are able to produce edible nests (Lim, 2011). There are two main species of which are able to produce edible nests, namely white-nest swiftlet (*Aerodramus fuciphagus*) and black-nest swiftlet (*Aerodramus maximus*) (Jordan, 2004; Lim & Cranbrook, 2002a).

Among the swiftlet birds, only selected species (edible-nest swiftlet) are notable for their ability to produce edible nests. White-nest swiftlet *(Aerodramus fuciphagus)* species produces high-value nest (in economic terms) compared to the black-nest swiftlet (*Aerodramus maximus*). The nest of this species is made exclusively of salivary nest-cement predominantly embrace of mucin-like glycoproteins. The nest's cement is glycoprotein rich saliva, which is produced by a pair of sublingual gland located beneath the tongue of the edible-nest swiftlet (Medway, 1962; Marshall & Folley, 1956). Usually, the nests are built by both sexes during breeding seasons over a period of approximately 35 days (varies from species to species) (Clark, 1906; Lowe, 1939; Marcone, 2005). The complete nest on average will be 7 to 20 g exclusively (Marcone, 2005; Lim & Cranbrook, 2002b). The edible-nest swiftlet birds are mainly confined to South East Asia countries (Chantler & Driessens, 1995). These birds are also found in very small scale at other locations apart from Southeast Asia such as Adman Island in India (Sankaran, 1995) and the South of China (Hainan Island and Szechuan).

1.1.2 Development of Edible Bird's Nest Industry

The earliest journey of human exploitation of the edible-nest swiftlet's nests can be traced back to the chronicles of the Ming Dynasty around the year 1368 to 1644. This marks the beginning of an intricate association between edible-nest swiftlets and humans (Medway, 1963; Lau & Melville, 1994; Lim, 2009). The trade of EBN from Borneo to China was already in existence when the Dutch colony merchants began operating in the Malaysian and Indonesian regions (Cranbrook, 1984; Lim & Cranbrook, 2002b). These bird nests were consumed by human beings as a symbol of wealth, power, and prestige, as well as being used medicinally in Traditional Chinese Medicine (TCM) dating far back to the Tang Dynasty (618 to 907 AD) and Sung Dynasty (960 to 1279 AD) (Lim & Cranbrook, 2002a).

The bird's nest is also called "Yan wo" or sometimes referred to as "the Caviar of the East". The bird's nest became popular in China due to two main reasons, namely high price and the fact that it is treasured as a delicacy (Chan & King, 2008). The EBN plays an important part in the treatments and therapies of TCM. The Chinese community also believes that the consuming of birds nest could keep the lungs, stomach, and kidney healthy, improve appetite, and also skin complexion (Chan & King, 2008). The EBN is also an important medicine for health, enhancing effects ranging from improving complexion, alleviating asthma, and strengthening the immune system (Lim & Cranbrook, 2002b).

The bird's nest was mainly collected from the limestone caves where the edible-nest swiftlets originally inhabit. In Malaysia, one of the limestone caves and original habitat of the edible-nest swiftlet birds is the Niah cave. In the Niah cave, the exploitation of black nests began fairly recently, less than 200 years ago (Harrisson & Jamuh, 1958; Lim & Cranbrook, 2002a; Medway, 1969). According to Cranbrook (1984), Niah cave became a major centre of black nest production, which peaked at

18,500 kg per year in 1931. The author also explained that 70% of the total production of black nests in the state of Sarawak is produced in Niah cave.

The nest-harvesting job in caves is difficult and deadly as well. The nest collectors risk their life to collect the nest because the birds usually build their nests on top of the cave wall. The environment of the cave would usually be very dark. The stairs are built from bamboo and they will not last for a long time due to the high moisture level in the cave. Strategically positioned bamboo poles and ladders made from ironwood "belian" are evidence of the presence of the bird's nest collectors who are also the locals who have been practising this dangerous occupation for generations. The ladders that seemingly defy the laws of physics towers over the cave floor as high as 90m, reaching up all the way to the cave's roof from where the nests are collected. Even though the job is deadly and fatalities are not uncommon, the price of raw bird's nests is also high (over USD 1,000 per kilo for the best quality) that the risks seem worthwhile. Obviously, such a valuable commodity is a magnet for poachers and over-harvesting is a constant worry. In order to overcome the problems in EBN harvesting at the cave, people turn their interest towards edible-nest swiftlet ranching as a source of EBN production.

1.1.3 Edible-nest Swiftlet Ranching in Malaysia

The entrepreneurs often refer to EBN as the "*gold from sky*". Most of the techniques used in Malaysia for ranching were adapted from Indonesia; pioneer country of the edible-nest swiftlet ranching (Mardiastuti, 2011), which has the history of more than a century (Lim, 2011). The development of edible-nest swiftlet ranching in Malaysia is still in a development stage, as compared to it's pioneer producer, Indonesia.

The edible-nest swiftlet ranching is a relatively new industry in Malaysia as compared to other established and long-standing industries such as rubber, oil palm, oil and gas, timber, cocoa, pepper, tobacco, financial services, and small and medium industries (SMI) (Merican, 2007). In Malaysia, EBN industry is considered as agriculture sector, yet some other countries in the world categorised it as forestry sector. The Malaysian edible-nest swiftlet ranching went to another paradigm and undergone drastic development for the past 10 years (Lai, 2010). The momentum of the edible-nest swiftlet ranching in Malaysia started to boost after the AFC from the year 1997 to 1998. During that period, many businesses, especially small and medium enterprises (SMEs) had experienced hard times and a great number of businesses closed down throughout the country (Goldstein, 1998). As a result of the depressed economic environment at that time, the premises were left empty because no other businesses sprung up to take their place (Merican, 2007).

Rather than leaving their properties such us buildings and shop lots idle, some of the property owners decided to convert their untenanted properties into edible-nest swiftlet bird houses. At that time, the technology and the idea of edible-nest swiftlet ranching were mainly adopted from Indonesia. Back in the 1990's, a forest fire in

Indonesia has created an excellent opportunity for Malaysia. The resultant haze and the open burning in Indonesia have led to millions of the edible-nest swiftlet birds migrating to West Malaysia. At the same time, the Malaysia's cave edible-nest swiftlet birds had chosen a better habitat and changed their habitat from cave to bird house (Mardiastuti, 1996, 2011). The Malaysian SME executives, property owners, and investors began to realise the financial viability of the edible-nest swiftlet ranching and the availability of edible-nest swiftlets in Malaysia. They also realise that the demand for the EBN in the world market is very high but the supply is limited. The investment in ranching started to rise and new bird houses were established. Since then, the number of bird houses has increased tremendously (Merican, 2007). At that point of time, most of the edible-nest swiftlet ranching were carried out in secondary and tertiary townships, where food source for the bird is abundant and pollution levels are relatively at the minimum. Table 1.1 shows the earliest active locations for the edible-nest swiftlet ranching in Malaysia.

Table 1.1: Earliest Active Locations for Edible Nest Swiftlet Ranching In Malaysia

State and Name of Place	
Johor	Rompin
Bukit Pasir	**Pahang**
Jemaluang	Pekan
Kampung Air Papan	**Perak**
Kampung Sawah Datuk	Bagan Serai
Kampung Seri Pantai	Bruas
Kulai	Cangkat Jering
Mersing	Pantai Remis
Pontian Kecil	Parit Buntar
Senai	Lumut
Tai Hong Village	Selama
Tangkak	Setiawan
Ulu Tiram	Slim River
Kedah	Tanjung Malim
Jitra	Teluk Intan
Kampung Pinang	**Perlis**
Kampung Tanjung Radin	Kampung Banat Bawah
Kuala Ketil	Kampung Tasoh
Kuala Nerang	Kampung Tebing
Kulim	**Pulau Pinang**
Lunas	Bukit Mertajam
Legong	Cangkat Kledang
Pokok Sena	Kepala Batas
Sungai Petani	Nibong Tebal
Kelantan	**Selangor**
Pasir Mas	Kepong
Melaka	Kuala Kubu Bharu
Alor Gajah	Rawang
Ayer Pasir	**Terengganu**
Durian Tunggal	Kuala Besut
Kampung Machap	Kuala Terengganu
Negeri Sembilan	Tok Soboh
Jelai	**Wilayah Persekutuan Kuala Lumpur**
Kampung Baru Paroi	Cheras

Note: Active locations accounted before the year of 2007
Source: Adapted from Merican (2007)

The major demand for the EBN comes from China, Hong Kong, Taiwan, Macau, and other Asian countries (Merican, 2007; Lai, 2010). The international trade for bird nest is getting wider. The Malaysian government has boosted the growth of the industry by funding more R&D works on the edible-nest swiftlet ranching. A guideline was drafted for the edible-nest swiftlet ranching by the DVS. The guideline is named as "Good Animal Husbandry Practice for Edible-Nest Swiftlets Aerodermus Species Ranching and It's Premise'' and was published in 2011. The guideline mainly describes the location of the bird house, sound playing time, transportation of bird, animal welfare, and much more. It helps the ranchers to conduct the ranching activity in the right way and without harming the environment (DSM, 2012). The expansion of the edible-nest swiftlet ranching is magnificent. In the year 2013, the total bird houses in the country were estimated to be about 60,000 (PEMANDU, 2013, 2014). However, the total registered bird houses for that year is only 9,275 units (Table 1.2)

According to the DVS, ranchers prefer to use their own method and most of them choose not to register their premises with the local council or the state veterinarian office. Until the end of the year 2015, the number of registered bird house across Malaysia was only 10,306 units. As reported in Table 1.2, the highest number of bird houses registered was in Johor, which accounted for 2,581 units followed by Perak and Sarawak with 1,480 units and 991 units respectively.

Table 1.2: Total Registered Bird Houses in Malaysia from 2009 - 2015

State	Year(units)						
	2009	2010	2011	2012	2013	2014	2015
Johor	28	28	265	1,267	1,545	2,241	2,581
Perak	1	1	75	1,288	1,405	1,464	1,480
Sarawak	0	5	22	408	616	741	991
Selangor	0	0	346	533	710	845	896
Pahang	10	10	47	396	437	830	894
Terengganu	0	0	41	460	509	676	756
Sabah	0	0	2	6	306	584	746
Negeri Sembilan	1	1	12	249	454	570	577
Kedah	0	0	1	161	229	448	460
Kelantan	0	0	4	102	215	380	403
Pulau Pinang	1	1	2	29	138	264	271
Melaka	0	0	0	90	101	111	111
Perlis	0	0	16	29	76	84	103
Labuan	0	0	0	5	17	37	37
Wilayah Persekutuan	0	0	0	0	0	0	0
Total	41	46	833	5,023	6,758	9,275	10,306

Source: DVS (2015)

The EBN industry in Malaysia has generated high economic returns to the country with a return of USD 250 million in 2008 (Eco Park, 2010) and proved to be a booming industry with a high potential to develop in Malaysia.

1.1.4 Economic Value of Edible Bird's Nest

By the end of the 18th century, the collection of EBN had successfully placed itself in the list of the world's most expensive animal products and had become widespread throughout its range (Medway, 1969; Lau & Melville, 1994; Lim & Cranbrook, 2002a; Nguyen, Yen, & Voisin, 2002). The price of EBN exclusively varies from USD 1,000 to USD 10,000 per kilogramme (Looi & Omar, 2016). Facets such as grade, shape, type, nesting place (cave or bird house), colour, cleanness, size, and origin (country) have become the determinant factors for the EBN price. Malaysia currently holds the title as the third largest EBN producer in the world which produces about 9% of the global demand, here after it's pioneer producer, Indonesia (60%) followed by Thailand (20%) (Looi & Omar, 2016). The EBN industry has contributed a total value of USD 1.13 billion to the nation's gross national income (GNI) (PEMANDU, 2012) and China, Hong Kong, Taiwan and Macau are the major importers of EBN (Tan, Chia, & Alan, 2014).

Figure 1.1 shows the amount of exported EBN and free on board (FOB) value from the year 1990 to 2015. It clearly shows that after the year of 2012, the export value of EBN kept increasing progressively and reached its maximum limit in the year 2015 with an export value of USD 14.41 million (57.64 MT). The data shows that the export of EBN has increased from 2006 until the year 2011. The glory of EBN export has fallen after China imposed a total ban on Malaysian EBN in the early of August 2011 (Sharifuddin, Ramalingam, Mohamed, & Rezai, 2014; Paydar et al., 2013). As the world largest importer (Marcone, 2005), China's ban have affected the Malaysian EBN industry very badly which caused the export value to drop drastically. The total export value of the year 2012 dropped drastically to USD 1.88 million, which was only 39.17% of 2011.

The ban was imposed mainly due to the nitrite level in EBN (Kadir, 2012; Lim, 2011; Thorburn, 2015). Nitrite is a common food preservative which is carcinogenic if consumed beyond safety levels (Merrill, 1978), and China found that its content in the Malaysia's EBN is beyond its safety levels (Kadir, 2012; Lim, 2011, Selangor Times, 2011). According to MS 2334:2011, the permitted level of nitrite in EBN is 30 parts per million (ppm) (DSM, 2011), and is accepted by the Chinese government. After two years of "suffering", Malaysia's EBN was able to penetrate China's market again after the ban was removed officially.

Malaysia also aimed to remain the second world largest EBN producer and gain more global market share for EBN products. Until the year 2010, a total of 41 associations has been established in the EBN industry which led to the gross income of USD 0.75 million and contributed to more employment opportunity reaching up to USD 0.131 million (Wan Ibrahim & Yaacob, 2013). The Malaysian government also introduced several programmes, especially for EBN industry to support the growth of the industry.

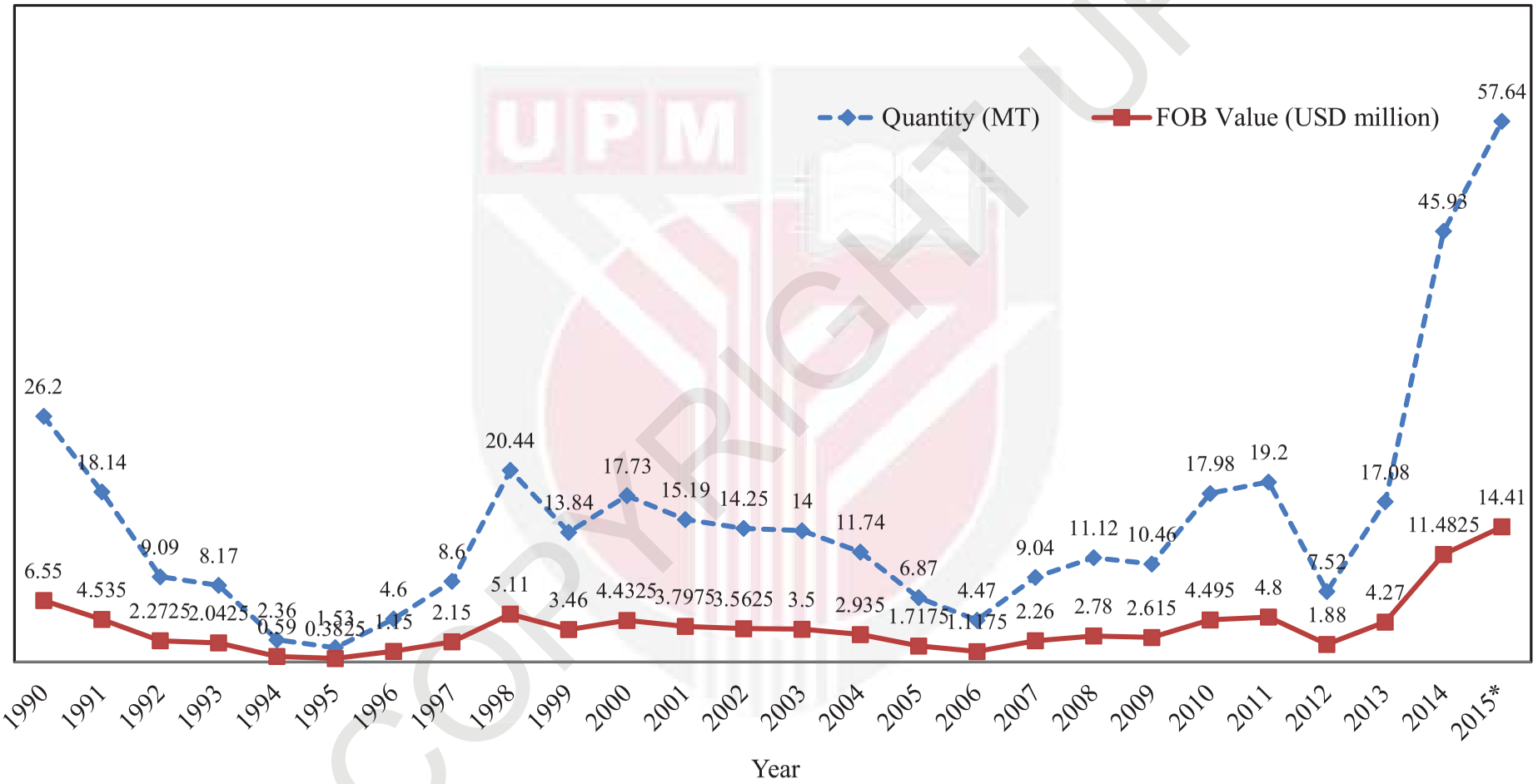

Figure 1.1: EBN Export Quantity and FOB Value, 1990-2015

Note:*January - November 2015; MT = metric tonnes
Source: DOSM (2016)

1.1.5 Edible Bird's Nest Industry in Malaysia's Economic Transformation Programme

Generally, the agricultural policy could be described as an official document which defines strategic directions to enhance and increase the domestic agriculture production (Harron, Shamsudin, & Latif, 2001), while minimising the dependency of agriculture based products from other countries (Kivimaa & Mickwitz, 2011). This blueprint document is wisely formulated by the government to improve the Malaysian agriculture sector in the context of economy, social, and environment for the long term, which will be drafted for a certain period of time. There was no specific policy meant for the EBN industry in Malaysia until the government gazette the Economic Transformation Programme (ETP).

ETP was introduced in 2010 to realise Malaysia's glorious aim, which is to achieve the "developed nation" status by 2020 with GNI per capita of USD 15,000 under the supervision of PEMANDU. ETP is part of the National's Transformation Programme, which works to build and upgrade Malaysia to another level. ETP aims to create 3.3 million job opportunities by attracting investments worth USD 44 billion.

Twelve (12) National Key Economic Areas (NKEAs) were addressed by ETP as a mechanism to achieve its target. The NKEAs comprise of Kuala Lumpur/Klang valley; oil, gas, and energy; palm oil and rubber; wholesale and retail; financial services; tourism; electrical and electronics; business services; communications content and infrastructure; education; agriculture and healthcare. Every NKEA encompasses of several Entry Point Projects (EPPs), which discovers potential areas to grow, ignite business opportunities, and enhance the development of each sector.

ETP found that the edible-nest swiftlet is an industry with high growth potential and could be beneficial to the nation in the social and economic term. EBN industry was included as the 2nd EPP under the agriculture region in NKEA with a great target of reaching GNI of USD 1,135.3 million and 20,800 new jobs by 2020 (PEMANDU, 2011). It is expected that by the year 2020, Malaysia would be able to export more than USD 1.25 billion worth of EBN (Kadir, 2012). DVS is in charge of this EPP and strives to increase upstream production of EBN. Under EPP, the government sets a target of building an additional of 2,000 bird houses yearly and six collection centres while guiding the industry towards developing downstream, value-added products.

The EPP also encouraged the involvement of private sector and four anchor companies, namely Golden Silver Processing Sdn Bhd, PT Swift Marketing Sdn Bhd, Yanming Resources Sdn Bhd, and Duta Sialin Biotechnology Sdn Bhd. These anchor companies were identified and have committed to invest in the developing processing capacities of EBN products in this nation (PEMANDU, 2013). The effort of EPP such as enhancing tractability in the EBN industry, registering bird house premises, enforcing Good Animal Husbandry Practices (GAHP) and Good Manufacturing

Practices (GMP) could nurture the development of the EBN industry and increase its competency.

1.2 Issues in Edible-nest Swiftlet Ranching

Malaysia's EBN industry was hit hard by China's ban and a series of scandals (nitrate contains, alteration, and contamination) in 2011. The issue of nitrite contamination was very serious and the ranchers struggled to keep it minimal (Ramli & Azmi, 2012). Although both nitrite and nitrate were naturally present in the environment such as water, soil (Quek, Chin, Yusof, Tan, & Law, 2015) and even in raw EBN (Kamarudin & Aziz, 2011) it should not exceed the permitted level. Several investigations showed that some of the processed EBN that is available in the market contained an excessive amount of nitrite and nitrate (Kamarudin & Aziz, 2011; Lim, 2011). This is suspected to happen mainly due to the mismanagement and some irresponsible party in the supply chain that aimed to achieve a large portion of the economic profit. China's ban on 2011 caused negative effects to the Malaysian EBN industry. The industry suffered from the surplus of supply. The demand for EBN has dropped drastically and the price fell to the range of RM500-800 per kilogramme from the market price. During its glories time, the raw EBN price hit up to RM5,000 per kilogramme. The price fall was a great impact to the industry and the rancher's income dropped as well. Some ranchers could not generate profitable income due to the low market price and shut down their bird house operation (Alias, Poh, Zahirah, & Azizi, 2013).

Some studies also revealed that there were adulterations in the nest (Wu et al., 2007). Due to its high economic value, greedy players in the supply chain often incorporated adulterants such as tremella fungus (Tremella fuciformisis), karaya gum (Sterculia urens), red seaweed, pig skin, egg white, and vermicelli rice (Looi & Omar, 2016; Wu et al., 2007) into the product. Increasing the mass and size of the EBN were the ultimate goal of these irresponsible actions. The adulteration most of the time succeeded due to its compounds, which is similar in colour, taste, and texture with the genuine EBN salivary cement and made it difficult to be detected by the naked eyes (Marcone, 2005).

Limited information about the existing bird house profile is another issue this industry is facing. Most of the ranchers choose not to register their bird houses with the legal authority and obtain proper licencing (PEMANDU, 2011). Some of the ranchers are still practising this to avoid additional income tax from the Inland Revenue Board of Malaysia (IRBM). Total registered bird houses in Malaysia until the year 2015 was 10,306 units which are just about 17% of the actively operating bird houses around the country. At the end of 2013, about 60,000 units of bird houses were expected to activity operate in Malaysia. Merican (2007) also stated that until the year 2006, there were about 36,000 units of bird house premises in Malaysia. This shows that most of the ranchers have not registered their bird house premises with the respective legal authorities. Legal authorities such as DVS possesses very limited information on the existing bird houses in Malaysia.

Malaysian ranchers are always under pressure in order to produce high-quality EBN as requested by the import countries (Kadir, 2012). The product must be in premier quality in order to win the global market share. Inconsistent quality will affect the entire EBN market. Ranchers sometimes tend to produce a better quality of EBN in a short term using unsustainable practices. They tend to implement a wrong harvesting (force harvest) method such as harvesting the nest before the eggs are laid, harvest with one egg, harvest with two eggs, and harvest when the chick (young bird) are not ready to fly. Early harvesting will produce cleaner nest but will be very harmful for the edible-nest swiftlet's population (Shirish & Sankaran, 2011). This harvesting method will cause negative effects to the population of the particular bird house for it might lead to the migration of the birds to other bird houses or to another place as well. Wrong harvesting methods can seriously endanger the edible-nest swiftlet species and could lead to population degradation (Lim & Cranbrook, 2002a).

Another alarming issue is related to the sound pollution caused by ranchers which have also become a great threat to the sustainability of the industry (Kamarudin, 2012; Lim, 2011; Shaw, 2014; Siti-Nabiha, Jalaludin, & Ahmed, 2013; Sulaiman, Yahaya, & Khalid, 2012). According to Kadir (2012), the "harmony" of the edible-nest swiftlet industry was disturbed due to the sound pollution and it became an environmental disturbance to the public surrounding the bird house premises. The ranchers commonly use 'birds' calling sounds to lure the edible-nest swiftlets to build their nests in the bird house. The ranchers continue to play the sound from the morning until late evening to attract more birds to come to their bird house and some do not follow the time and volume level permitted by DVS (Lim, 2011). According to DVS, the birds calling sounds are only allowed to be played twice a day (morning and evening). As for Peninsular Malaysia, the allocated time is in the morning from 7.00 a.m. to 10.00 a.m. and in the evening, from 5.00 p.m. to 8.00 p.m. In the states of Sabah and Sarawak, the timing slightly differs due to the geographical location which is 6.00 a.m. to 9:00 a.m. in the morning and 4.00 p.m. to 7.00 p.m. in the evening respectively. Some birdhouses around the residential area (especially those built-in shop lots) still do not follow the recommended timing for bird call and therefore is troublesome for the public and nearby residents (Kadir, 2012; Lim, 2011).

Most of the heritage cities are literally becoming home for both humans and edible-nest swiftlets. Protecting the heritage tourism industry has become an obstacle for the edible-nest swiftlet ranching sector. The birdhouses located at the heritage cities in Melaka and Penang states (Gorge Town) caused trouble to the heritage tourism (Siti-Nabiha et al., 2013). The edible-nest swiftlet ranching in George Town receives considerable attention because they are located in the United Nations Educational, Scientific and Cultural Organisation (UNESCO) world heritage site. It is very important to be part of the UNESCO listing and it is an achievement for the city to receive the "heritage status" which will boost the nation's tourism industry. When a birdhouse is built in a heritage building, ranchers could not avoid from making certain changes in the building structure. For example, a hole in the wall needs to be made for air ventilation purposes of which will change the outlook of the building if not done properly. The rancher's improper management and unsustainable practices could jeopardise the heritage tourism industry in the country (Sulaiman et al., 2012).

It was estimated about 200 to 300 bird houses were in George Town and 10% to 20% of the houses were in shop lots inside the heritage buildings, both within the core heritage and the buffer zones (Siti-Nabiha et al., 2013). Most of the ranchers had already received the order to relocate their bird house to another suitable agriculture area (Duckett-Wilkinson, 2010). Legal authority kept pressuring the ranchers to move out from the heritage site (Eckhart, 2010), albeit earliest record shows that some heritage site is habitat for the edible-nest swiftlets since 1771 (Harvey, 2011).

Besides that, the quality of life for the community-surrounded birdhouses had become an important aspect to look into (Sulaiman et al., 2012). This issue mainly arises from birdhouse in shop lots and others that are located near the residential areas. Most of the birdhouses were left with unattended electrical kits and appliances, which may also constitute a fire accident (Emmanuel, 2010). If the electrical works are done by non-electrician (non-competent person) the chances of a fire incident occurring are high.

Surrounding communities were also affected by the incorrect waste management by the bird house operators (Lim, 2011). Guano or bird droppings is a by-product of the edible-nest swiftlet ranching. Waste management is an issue that needs to be seriously addressed by the ranchers (Kamarudin, 2012). When large numbers of edible-nest swiftlets are confined in a small place with accumulated droppings and bad air circulation, the quality of nests will certainly drop (Lim, 2011). The birds' droppings and bird house cleanliness (Kamarudin, 2012) can influence the nitre level in EBN (Ministry of Health Malaysia [MOH], 2012).

The odour released in the bird house could cause discomfort to the surrounding community (Mamduh et al., 2012). The accumulated bird droppings produces odour and contributes to air pollution (Lim, 2011), Water pollution, on the other hand, occurs when untreated sludge is released into drainage (Bofill-Mas et al., 2016). Improper waste management in birdhouses also attracts unwanted insects in the surrounding of the birdhouses and ultimately contributes to hygienic issues in the residential areas. Some birdhouses are located very near to clinics and food processing places which resulted in discomfort among the residents (Sulaiman et al., 2012). Bird houses that failed to implement recommended practices cause problems to nearby clinics, food processors, and residents.

Furthermore, the existence of bird houses nearby residential areas brings various public health concerns, such as dengue, H5N1 bird flu, and bird mite fever (Siti-Nabiha et al., 2013). Such troubles have resulted in many of the disappointed residents to move out, while, at the same time, the rental price and property value of these buildings have dropped which consequently reduced the intangible value of the area (Emmanuel, 2010). Meanwhile, studies revealed that the edible-nest swiftlet ranching also faces high failure rate at an upstream level (Alias et al., 2013). The cost of a set of three (3) storey stand-alone bird house can reach up USD 75,000. Alias et al. (2013) stated that about 70% to 80% of the bird houses in the country failed to generate proper

economic profit due to the lack of understanding and knowledge regarding sustainable edible-nest swiftlet ranching.

Most of the issues that is discussed in this section such as: nitrite and nitrate contamination in EBN (Kamarudin & Aziz, 2011; Lim, 2011); adulterations in EBN (Wu et al., 2007), volunteering in bird house registration (PEMANDU, 2013), accelerated expansion of the edible-nest swiftlet ranching (PEMANDU, 2013) wrong harvesting method (Shirish & Sankaran, 2011), sound pollution (Kamarudin, 2012; Lim, 2011; Shaw, 2014; Siti-Nabiha et al., 2013; Sulaiman et al., 2012); jeopardising the heritage tourism industry (Sulaiman et al., 2012); maintenance of heritage status (Siti-Nabiha et al., 2013); life quality of the surrounding community (Sulaiman et al., 2012); fire hazard (Emmanuel, 2010); waste management (Kamarudin, 2012; Lim, 2011; Lim, 2011); air pollution (Lim, 2011; Mamduh et al., 2012); water pollution (Bofill-Mas et al., 2016); hygienic issues (Sulaiman et al., 2012); health issues (Siti-Nabiha et al., 2013); property value (Emmanuel, 2010); and high failure rate (Alias et al., 2013) occurred at a farm-level (bird house-level) behaviour.

The future of the industry will be greater if the development focuses on the environmentally friendly aspects without losing the social and economic perspective in the long run. The increment in the number of the bird houses in Malaysia is evidence that this industry does receive high attention from the players. However, the sustainability problem also rises along with that which need proper attention to sustain the industry for a long term.

1.3 Problem Statement

The edible-nest swiftlet industry in Malaysia has a very long historical background. Earlier EBN is only harvested in caves which are the original inhabitant of the edible-nest swiftlets. Once humans have found a method to lure the edible-nest swiftlets into the bird house to build their nest, the edible-nest swiftlet ranching became popular. The edible-nest swiftlets are free range animal and are not captive birds (wild bird), so the ranchers need to focus on how to keep these birds in their natural habitat and collect their nest via providing a place for them to propagate. The edible-nest swiftlet ranching mainly relies on the nature and the environment for most of the aspects, especially for feed.

Realising that the potential for this industry in Malaysia is vast, the government encouraged the public to be involved in the EBN industry. The geographical location of Malaysia is where most of the edible-nest swiftlet birds are distributed with plenty tropical forest to provide insects as feed source. This attracted a lot of investors to be part of the EBN industry. Most of them choose to be involved in the edible-nest swiftlet ranching as part of the EBN industry. Most of the recent campaigns are directed in such a way that it increases the number of bird houses and EBN production in the nation. The number of bird houses in Malaysia rose tremendously, which has

resulted to the increase of the EBN production as well. Despite that, sustainable issues also rose along with the development of the edible-nest swiftlet ranching.

Most of the issues are at a bird house level and every bird house operations are fully controlled by the ranchers themselves. The gap that has been identified in this study is the implementation of the sustainable practices and the ranchers' effort to implement it in their own bird house. There are recommended sustainable practices for the edible-nest swiftlet ranching, which could keep the EBN industry going for a longer period of time if duly implemented in every bird house in Malaysia.

The ranchers' behaviour is to bridge the gap between available sustainable practices and implementation of those practices in their bird houses. Human behaviour is extremely complex and complicated even until today's advanced world and most of the available behavioural theories do not holistically describe about human behaviour in which becomes a bit difficult to further understand it. The understanding of ranchers' behaviour is vital in overcoming the addressed sustainability issues. Besides that, until the starting point of this study there were not much scientific studies carried out on edible-nest swiftlet ranchers' behaviour in terms of sustainable ranching. Even though this study was focused on the sustainability of edible-nest swiftlet ranching, but behaviour of the ranchers was also treated as the main scope of the study.

The behaviour starts with knowledge regarding the subject matter. Knowledge became fundamental for most of the psychological aspects such as attitude, subjective norm, affect, self-efficacy, and intention. Besides that, the external factors such as governance and perceived attributes of a particular behaviour also influences the human behaviour. Good governance is very important to guide the ranchers on the right path. The perceived attributes of sustainable ranching practices among the ranchers will explain the characteristics of the sustainable practices that would motivate them to comply with the sustainable practices.

In the light of the above discussions, the factors that affect ranchers' behaviour in terms of sustainable practices is still not very clear. The sustainable practices in the edible-nest swiftlet ranching are a vital part of driving the industry for a long term. Psychological aspects always influence someone's behaviour and the influence factors that are associated with the sustainable edible-nest swiftlet ranching needs to be identified. By looking into internal and external factors that motivate ranchers to practice sustainable practices in their bird houses, a depth understanding of the ranchers' behaviour can be developed. Based on that depth understanding, an effective strategy for handling the sustainability problems can postulate and develop the industry in a sustainable manner.

1.4 Research Questions

In this study, five specific research questions are addressed. The entire research questions are developed based on the sustainability of Malaysian edible-nest swiftlet ranching practices.

1. What are the factors that contributed to the rancher's knowledge in terms of sustainable edible-nest swiftlet ranching?
2. What are the factors that affect the rancher's psychology to practise sustainable edible-nest swiftlet ranching practices?
3. What are the elements that influence the rancher's intention on sustainable edible-nest swiftlet ranching practices?
4. What are the rancher's perceptions on good governance that lead to sustainable edible-nest swiftlet ranching practices?
5. What are the perceived attributes of sustainable practices for the edible-nest swiftlet ranching?
6. What is the current sustainability level of swiftlet ranchers in terms of sustainable edible-nest swiftlet ranching?
7. What is the effect of the factors that is associated with sustainable edible-nest swiftlet ranching practices?

1.5 Objectives of the Study

The general objective of this study is to assess the ranchers' behaviour in implementing sustainable edible-nest swiftlet ranching practices in Malaysia.

The specific objectives of this study are as follows:-

1. To determine the factors that contributed to the rancher's knowledge, psychology, and intention to practise sustainable edible-nest swiftlet ranching practices.
2. To assess the rancher's perceptions on good governance that leads to sustainable edible-nest swiftlet ranching practices.
3. To determine the perceived attributes of sustainable practices for the edible-nest swiftlet ranching.
4. To develop sustainability index and ascertain sustainability level of ranchers in terms of sustainable edible-nest swiftlet ranching.
5. To evaluate the effect of factors that is associated with the sustainable edible-nest swiftlet ranching practices.

1.6 Significance of the Study

1.6.1 Policy Suggestion

This study will assist policy makers to design appropriate policy for the ranchers to improve their level of understanding in the sustainable edible-nest swiftlet ranching. By identifying the ranchers' internal and external factors that affect rancher's behaviour on the sustainable practices, a specific policy could be developed for ranchers based on their needs. The success rate of the policy implications could be increased if the policy is designed based on the rancher's needs. The policy will be more meaningful to ranchers and can work more efficiently to supress the sustainability issues while increasing the EBN production.

The sustainability index can be used to assess sustainability level of each bird house. The rapid growth of EBN industry can always be monitored by the sustainability index. With more in-depth details about the current sustainability level, future policies can be developed or modified accordingly to enhance the growth of the industry. The findings of this study will help improve the upstream (bird house-level) activities in the edible-nest swiftlet ranching, which will retain the industry sustainability long term and continue to encourage economic gain without trading off the environmental or social values.

1.6.2 Academic Relevance

The current model that is proposed in this study has the potential to test its relevance in different fields or sectors. The variables that are used in this study are merged from a few theories and is used to fill the gaps in these theories. In the current complex world, a single theory does not possess the capacity to explain the human behaviour completely. In the advanced world, human behaviour is becoming more complex and heterogeneous in every society. The proposed constructs and conceptual model in the current study can be utilised in the future studies via testing and verifying in different fields. The sustainability index that is developed in the current study can be used in different regions and be verified further. The proposed model and sustainability index would be able to provide new insights for the agricultural sector and the academic arena.

1.7 Scope of the Study

The scope of the study will cover the factors that affect implementation of sustainable practices by ranchers in edible-nest swiftlet ranching. The study will identify the sub-constructs of knowledge, attitude, peer factor, self-efficacy, perceptions on good governance, and perceived attributes of sustainable edible-nest swiftlet ranching in Malaysia. The ranchers' knowledge level, attitude level, and practices level towards

sustainable practices in the edible-nest swiftlet ranching also will be calculated. Special attention will be given to developing the sustainability index and the ranchers' sustainability level will be assessed based on that. Sample population within ranchers who were registered with the DVS will be selected to test and confirm the proposed model.

1.8 Organisation of the Thesis

The thesis comprises of five chapters. The first chapter begins with the introduction which includes an overview of the Malaysian agriculture sector and the edible-nest swiftlet industry in Malaysia, issues in the edible-nest swiftlet ranching, statement of the problem, the research questions, and the objectives. The second chapter empirically reviews the literature on the past studies and information which are pertinent to the study. The third chapter explains the research methodology, including the conceptual framework, hypothesised research model, development of measurement model, development of structural equation model, sources of data, the process of sampling, instrument development, pilot study, and data analysis techniques. The fourth chapter provides an in-depth discussion on findings of the study. In the last chapter, the conclusions and limitation of the research are discussed. In addition, recommendations for future research are also addressed.

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