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CRITICAL SUCCESS FACTORS ON SMALL RUMINANT FARMING

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Small ruminants belong to the Family: Bovidae, Subfamily: Caprinidae, and Genus: Ovis and Capra. In general the word small ruminant refer to sheep (*Ovis aries*), goats (*Capra aegagrus hircus*), and their exotic relatives of the genus ovis and capra. In Malaysian economy, livestock industry plays a vital role in terms of value-added and employment. Small ruminants are the fourth major livestock after swine, chicken and cattle. The contribution of the small ruminant industry to the agriculture output growth is becoming more important and requires highly significance. Problems confronting the small ruminant farming in Malaysia include, feed price, breed and stock, price of meat and live small ruminant, ranchers' skills, farm management and capital for rearing small ruminants. However, the local breed is less suitable for commercial or large-scale production. Lack of feed quality and feed processing technology in the local market to support the growth of import breeds. Although there is a suitable technology for breeding, the government is still not ready to adopt the technology at this time to improve the productivity of local breeds. The government is giving more emphasis on commercial agriculture with plantation crops such as rubber, oil palm and coconut, which has been proven to increase the national economy. The above mentioned problems and issues are the factors that may influence the success of farming in Malaysia. The general objective of this study was to identify the critical success factors of small ruminant farming among the selected small ruminant ranchers in Peninsular Malaysia. In addition, the specific objectives of this study were; to determine the respondent' perception and perception level toward successful factors on small ruminant farming, to clarify the relationship between socio-economic characteristics and the respondents' perception level towards successful factors on small ruminants farming, to identify the relationship between selected farm profile and successful factor on small ruminants farming and to examine which are the Critical Success Factors on small ruminant farming. Therefore, data for this study was collected through field work undertaken during 2013 to 2014 from the different states of Peninsular Malaysia such as Kelantan, Terengganu, Pahang, Johor, Negeri Sembilan, Melaka, Selangor, Perak, Kedah, Perlis and Pulau Pinang. The respondents were small ruminant ranchers and using a structured questionnaire as a research instrument. A total of six hundred (600) respondents were interviewed to obtain their perceptions towards success factors that influence on small ruminant farming. However, there were constraints in the process of survey to identify the respondents and obtain their positive cooperation. Ranchers were categorized according to the number of breed and stock that are owned by ranchers

such as small-scale (below 50), medium-scale (51-100), large-scale (100-150) and extra large-scale (150 and above). From this study it was found that almost 84.7 % of ranchers were below 50 years and almost 67.7 % of respondents reared small ruminants as a part time occupation. The result from mean ranking analysis showed that the highest success factors were technical skills (4.255), followed by feed source (4.246), while the lowest factor was recognized as neighbourhood relations (2.353). The chi-square analysis has been done to examine the association between the socio-economy and the respondent' perception level of factors that influence the success on small ruminant farming. From the study several critical success factors were identified which influenced the small ruminant farming in Malaysia trough the exploratory factor analysis. The results revealed that the critical success factors on small ruminant farming were labelled as family support, government support and policies, labour, production system, farm management, extension services, disease and prevention management, technical skill, farm operation, marketing tool and strategies, neighbourhood relationship, feeding strategies and feed sources. These finding emphasized the need for ranchers to consider the critical success factors related to success on small ruminant farming. The results also displayed an overview of the opportunities and potential of the small ruminant that can be referred by individuals who want to participate in this industry. In conclusion, this study has been given a better understanding and knowledge to the livestock extension agents, policy makers and researchers about the critical successes factors which are family support, government support and policies, labour, production system, farm management, extension services, disease and prevention management, technical skill, farm operation, marketing tool and strategies, neighbourhood relationship, feeding strategies and feed sources that have been found in this study to solve the problems and plan the strategies to increase self-sufficiency level of small ruminant industry in Malaysia.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains

FAKTOR KEJAYAAN KRITIKAL DALAM PENTERNAKAN RUMINAN KECIL

Oleh

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Ruminan kecil tergolong dalam Famili: Bovidae, Subfamili: Caparinadae dan Genus: Ovis dan Capra. Amnya, ruminan kecil di seluruh dunia terdiri daripada bebiri (*Ovis aries*) dan kambing (*Capra aegagrus hircus*) dan mempunyai hubungan eksotik dengan genus Ovis dan Capra. Di dalam ekonomi Malaysia, industri ternakan memainkan peranan penting terutamanya dalam nilai tambah dan tenaga kerja. Ruminan kecil adalah ke empat terpenting di sektor ternakan selepas khinzir, ayam dan lembu. Sumbangan industri ruminan kecil kepada pertumbuhan pertanian menjadi lebih penting dan berimpak tinggi. Masalah yang dihadapi oleh ruminan kecil di Malaysia termasuklah harga makanan, induk dan baka, harga daging ruminan kecil dan ruminan kecil yang hidup, kemahiran penternak, pengurusan ladang dan modal untuk menternak ruminan kecil. Walau bagaimanapun, baka tempatan kurang sesuai untuk dikomersialkan dalam skala yang lebih besar untuk pulangan yang cepat. Kualiti makanan yang rendah dalam kandungan makanan tempatan dan teknologi pemprosesan yang sesuai tidak dapat membantu dalam pertumbuhan baka yang diimport. Walaupun terdapat teknologi yang sesuai untuk pembiakbakaan, kerajaan tidak bersedia untuk menerima pakai buat masa ini bagi meningkatkan produktviti baka tempatan. Kerajaan lebih banyak memberi tumpuan kepada pertanian komersial seperti tanaman perladangan iaitu getah, kelapa sawit dan kelapa yang mana ia telah terbukti meningkatkaan ekonomi negara. Masalah dan isu yang disenaraikan di atas adalah faktor yang mempengaruhi kejayaan penternakan kambing di Malaysia. Objektif utama kajian ini adalah untuk mengumpul maklumat mengenai faktor kejayaan kritikal yang menyumbang kepada kejayaan penternakan ruminan kecil di kalangan penternak ruminan kecil di Semenanjung Malaysia. Spesifik kajian ini adalah untuk memeriksa persepsi dan tahap persepsi yang mempangarui kejayaan penternakan ruminan kecil, menentukan hubungan antara ciri-ciri ekonomi sosial dan tahap persepsi responden terhadap faktor kejayaan kritikal yang menyumbang kepada kejayaan penternakan ruminan kecil, menentukan hubungan antara profil ladang dan faktor kejayaan kritikal yang menyumbang kepada kejayaan penternakan ruminan kecil dan menjelaskan faktor kejayaan kritikal dalam penternakan ruminan kecil. Oleh itu, data yang dikumpulkan dalam kajian ini melalui kerja lapangan yang dilaksanakan antara tahun 2013 dan 2014 di negeri-negeri Semenanjung Malaysia iaitu; Kelantan, Terengganu, Pahang, Johor, Melaka,Negeri Sembilan,Selangor, Perak, Pulau Pinang, Kedah dan Perlis. Responden adalah di kalangan penternak ruminan kecil dan menggunakan soal

selidik berstruktur sebagai instrumen kajian. Seramai enam ratus (600) responden telah di temu bual bagi mendapatkan persepsi mereka terhadap faktor-faktor yang mempengaruhi kejayaan penternakan ruminan kecil. Walau bagaimanapun, terdapat masalah dalam proses kajian yang dijalankan untuk mendapatkan kerjasama positif dari responden. Penternak diketogorikan kepada bilangan induk dan baka yang diternak oleh penternak iaitu skala kecil (bawah 50 ekor), skala medium (51-100 ekor), skala besar (100-150 ekor) and skala ektra besar (150 ekor dan ke atas). Dapatan kajian mendapati 84.7% penternak berumur 50 tahun dan lebih kurang 67.7% responden menternak ruminan kecil sebagai pekerjaan sampingan. Berdasarkan kedudukan purata menunjukkan faktor kejayaan tertinggi adalah kemahiran teknikal (4.255), sumber makanan (4.246), manakala faktor terendah yang dikira adalah hubungan kejiranan (2.353). Chi-square analisis dijalankan untuk melihat hubungan antara sosial-ekonomi dan level persepsi responden terhadap faktor-faktor kejayaan dalam penternakan ruminan kecil. Melalui analisis faktor penerokaan dari kajian ini, beberapa faktor kejayaan kritikal dikenalpasti dalam penternakan ruminan kecil adalah sokongan keluarga, polisi dan sokongan kerajaan, pekerja, sistem produksi, pengurusan ladang, perkhidmatan pengembangan, pengurusan dan pencegahan penyakit, kemahiran teknikal, operasi ladang, strategi dan alat pemasaran, hubungan kejiranan, strategi pemakanan dan sumber makanan. Penemuan ini memerlukan penternak menekankan faktor yang menyumbang kepada kejayaan dalam penternakan ruminan kecil. Keputusan kajian juga menunjukkan gambaran keseluruhan mengenai kelebihan dan potensi ruminan kecil yang boleh dirujuk oleh individu yang ingin menceburi industri ini. Kesimpulanya, kajian ini memberikan pemahaman yang lebih baik dan pengetahuan kepada ajen pengembangan penternakan, pembuat polisi dan penyelidik berkenaan faktor-faktor kejayaan kritikal iaitu sokongan keluarga, polisi dan sokongan kerajaan, pekerja, sistem produksi, pengurusan ladang, perkhidmatan pengembangan, pengurusan dan pencegahan penyakit, kemahiran teknikal, operasi ladang, strategi dan alat pemasaran, hubungan kejiranan, strategi pemakanan dan sumber makanan yang dijumpai dalam kajian ini untuk mengatasi masalah dan merancang strategi untuk meningkatkan tahap sara diri dalam industri ruminan kecil di Malaysia.

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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 Master of Science. The members of Supervisory Committee were as follows:

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
DOSM	Department of Statistic Malaysia
DVS	Department of Veterinary Services
EFA	Exploratory Factor Analysis
EPU	Economic Planning Unit
ETP	Economic Transformation Program
FAMA	Federal Agriculture Marketing Authority
FAO	Food and Agriculture Organization
FELCRA	Federal Land Consolidation and Rehabilitation Authority
FELDA	Federal Land Development Authority
GDP	Gross Domestic Product
KMO	Kaiser-Mayer-Oklin
MOA	Ministry of Agriculture and Agro-based Industries
NAP	National Agriculture Policy
NGO	Non-Governmental Organization
NKEA	National Key Economic Area
R&D	Research and Development
SD	Standard Deviation
SPSS	Statistical Package for the Social Science

CHAPTER 1

INTRODUCTION

This chapter introduces the small ruminant (goat and sheep) industry including agricultural sector, livestock industry and ruminant industry in Malaysia. The opportunities, constrains, issues and challenges in the Malaysian small ruminant industry which have been focused on the critical successful factors. Additionally, the problems that often occur in the small ruminant industry have been highlighted in the problem statement. The research question and objectives of the study have been mentioned. Finally at the end of this chapter, the structure of this thesis is discussed in detailed.

1.1 Agriculture Sector in Malaysia

Malaysia has newly industrialized market economy that is relatively opened and state-oriented consisting of fourteen states namely Johor, Kedah, Kelantan, Malacca, Negeri Sembilan, Pahang, Perak, Perlis, Penang, Selangor, Terengganu and the Federal Territories of Kuala Lumpur, Labuan and Putrajaya; Sabah and Sarawak on the island of Borneo (EPU, 2013). Malaysia is a country that has an equatorial climate with temperature ranging from 21°C to 32°C daily and very rich in biodiversity in terms of flora and fauna. Malaysia is a unique country due to its ethnic, racial and language diversity (EPU, 2013). The Malaysian population is now almost 29.9 million in 2013 and is increasing drastically year by year (DOSM, 2014). The growth in population is very significant in relation to increase the rate of food sufficiency. Ironically, food supplies must be available from the present agricultural sector as Malaysia is now categorized as an emerging country in the agricultural sector (DOSM, 2010). Agriculture is the third engine of Malaysia's economy after service and manufacturing sectors (Austin and Baharuddin, 2012). The agricultural sector has significantly contributed to the country's growth and is a major contributor to national income and export earnings. Malaysia is one of the well known as a developing country with a variety of agricultural products especially rubber and palm oil. Agriculture sector contribute to the national economy since before independence until present.

The agricultural sector is initially derived from the increase in the production of livestock, fisheries and miscellaneous crops and could enhance the income of farmers, fishermen, ranchers and other agriculture related industries players, and confirm the national food resources that could sufficiently sustain it. In line with the government's emphasis on the agricultural sector, the processed food and beverages industry had become an important component of the agro-based industry (DOSM, 2010). The government through Third National Agricultural Policy (3rd NAP, 1998-2010) was focusing on the transformation of agriculture into a modern sector, more dynamic, scalable and sustainable force where growth and development are based on the market and human resources. The agriculture sector is becoming more dynamic and vibrant, when agribusiness, plantation and cultivation work efficiently. Therefore, development

of agriculture is based on the level of innovation in the production and processing, increased productivity and greater technology absorption (3rd NAP, 1998-2010).

The government is continuing its focus on transforming the agricultural sector in National Key Economic Areas (NKEA) plan from traditionally small-scale, production-based sector into a large-scale agribusiness industry that contributes to economic growth and sustainability. This transformation is based on an integrated and market-centric model that comprises four key themes: capitalizing on competitive advantages, tapping premium markets, aligning food security objectives with increasing gross national income, and participating in the regional agricultural value chain. In addition, the paddy and livestock sub-sectors were selected due to their strategic nature in ensuring national food security. The eight (8) sub-sectors identified above generated total domestic production worth approximately RM 16.6 billion in 2009 and account for 82 % of the Gross National Income contribution from the agriculture sector (ETP, 2014a). The share of agriculture to gross domestic product (GDP) increased slightly from 8.7% in 2000 to 11.2% in 2014. Nevertheless, total agricultural value added increased in 2013 to 2.1% from 1.0% in 2012. Rest of other agricultural commodities contain vegetables, fruits and rice accounting for 7.4% whereas, livestock was the highest with 10.4% in final quarter of 2013. In contrast, the growth of oil palm, fishery, and forestry remained low during the same period (DOSM, 2015). Favorable growth noticed by other agricultural industries which has maintained the role for agriculture was 0.2%. The agricultural commodities including vegetables, fruits and paddy expanded to 7.4%. However, livestock (poultry and cattle) displayed higher growth of 10.4% in the last quarter of 2013 (ETP, 2014a).

Furthermore, government allocated RM 6 billion for the agricultural sector in 2014 budget with a difference of 0.2 billion compared to 2013 budget. This budget was provided for the implementation of high value-added and commercially viable agriculture programs. About RM 2.4 billion was allocated for actual food yield improvements such as rice, vegetables and fruits. In comparison, about RM 243 million were allocated to improve yield in the palm oil, rubber and cocoa tree industry. The government had also allocated RM634 million under the national key economic areas to improve productivity and production of highly demanded agro-products. However, there was no specified budget for the development of livestock industry (MOF, 2013).

1.2 Livestock Industry in Malaysia

In the Malaysian agriculture sector, livestock is an important component of the agricultural industry; which helps to create employment and provide essential animal protein as food for the Malaysian. Livestock sub-sector was selected in NKRA due to its strategic nature in ensuring national food security (ETP, 2014b). According to the 3rd NAP, private sector led commercial production will be actively encouraged to adopt modern approaches and farming on large-scale basis. Smallholder livestock activities will continue to be transformed into larger commercial operations to improve efficiency. Efforts will be undertaken to strengthen the linkages of these operations with suppliers, processors and marketers to further enhance the vertical and horizontal integration of the industry. Livestock integration with the plantation crops will continue

to be promoted. Therefore, efforts will be undertaken to develop and exploit Malaysia's potential as an international halal food hub. Capability for inspection, monitoring, standardization and certification for Malaysian Halal Standard for livestock products and industrial livestock-based inputs will be strengthened and this standard will be promoted internationally. The international marketing of branded halal livestock products and industrial livestock-based inputs will be undertaken (3rd NAP, 1998-2010).

The agriculture sector can be categorized as a highly commercialized among the ruminants sector. The sector has been proven with a stable progress since many years mainly recognized to the dynamic involvement of the private predominantly in the other sub-sectors. The pig and poultry sub-sectors have been comparatively capable of improving from lower to the higher levels with a modern commercialization and high efficiency performance within a limited time period. The ruminant sectors still lag far behind with the majority of cattle, small ruminant still owned by individual farmers. A total of 53.78% ranchers have poultry (chicken and duck) farming, followed by cattle ranchers 27.18%, while small ruminant ranchers were 16.01% with only 0.56% ranchers that rear pig (Table 1.1). Furthermore, an insufficient entrepreneur rearing deer, ostriches are commonly related to leisure industrial activities (MOA, 2011).

Table 1.1: Estimation of Ranchers in Malaysia

Commodity	Cattle	Buffalo	Small Ruminant	Chicken*	Duck**	Pig	Total
Total	43,310	3,925	25,509	76,925	8,779	887	159,335
Percentage	27.18	2.46	16.01	48.28	5.50	0.56	100

***** Chicken broiler, layer, breeders, free range
**Ducks broiler, layer, breeders, free range
Source: Ministry of Agriculture and Agro-Based Industry, 2011.

The livestock industry consists of the production of cattle-beef, dairy cattle, buffalo, mutton, poultry meat, eggs, pork, and milk as diet. According to Department of Veterinary Services (DVS, 2014a) statistical data, the gross output value of livestock in Malaysia has been increasing year by year (Table 1.2). However, livestock constituted an important contributor at 6.1% rate due to a greater demand for the consumption of domestic poultry. The poultry and pig industry improve the commercial divisions that already have achieved their self-sufficiency levels on the local and abroad levels. This is all because of their competent skills and successful shifting technologies into the production systems. In dissimilarity, the ruminants industry is not performing well, highlighting the dichotomy between the monogastric sectors. The domestic feed production is not economically viable at the current level of yield. Nevertheless, the high research and development are needed to rectify and enhance the grain varieties in order to uniform indigenous agro-climatic conditions and to extra yields. Government should provide more encouragements and support to boost ranchers to improve varieties of feed grain and to reprocess livestock manures as an efficient fertilizer. These all are the important before Malaysia could hope to minimize its dependency on imported grain feed and recover the competitiveness of its livestock industrial production (DOSM, 2010).

Table 1.2: Ex-Farm Value of Livestock Products in Malaysia (RM Million), 2004-2013

Year	Beef	Mutton	Pork Meat	Poultry	Poultry Egg[2]	Milk	Raw Hides & Skins	Total
004	464.59	33.51	1,424.80	4,135.06	1,512.58	52.97	6.43	7,629.76
2005	535.41	37.06	1,701.91	4,369.38	1,544.60	52.96	7.16	8,248.48
2006	580.74	40.61	1,836.68	4,616.15	1,621.36	61.62	7.85	8,765.01
2007	637.04	50.46	1,371.52	4,904.16	1,968.27	79.17	8.61	9,019.23
2008	696.67	55.52	1,728.64	5,183.12	2,091.65	87.56	9.42	9,852.58
2009	768.22	61.29	1,825.73	5,358.91	2,225.11	118.37	10.38	10,368.01
2010	847.11	67.66	2,073.62	5,776.21	2,358.62	127.29	11.45	11,261.97
2011	889.47	77.80	2,047.04	5,949.50	2,614.35	134.68	12.02	11,724.86
2012	929.17	83.08	2,053.60	6,866.31	3,143.39	150.00	12.63	13,238.18
2013	1,043.54	101.63	2,047.04	7,072.30	3,664.33	158.70	12.83	14,100.38

Source: Department of Veterinary Services, 2014a

The manufacture of selected livestock products like beef, mutton, poultry meat, chicken/duck eggs and milk continuously upsurges during 2006-2013. On the other hand production of pork declined in 2007 and 2008 before rising again in 2009 and 2010. Between 2004-2009, the production of livestock has rised with beef attaining 56.3%, mutton 69.2%, pork 2.9%, poultry meat 29.6%, chicken/duck eggs 28.1% and milk 60.6% (Table 1.3). In 2013, the distribution percentage of documented slaughter was noticed on many states on their types of livestock like buffalo (Perak and Terengganu), cattle (Kelantan, Johor and Selangor), goat (Selangor), sheep (Kelantan and Selangor) and swine (Johor, Perak and Sarawak) (MOA, 2014).

Table 1.3: The livestock Production in Peninsular Malaysia (2004-2013)

Year	Beef	Mutton	Pork Meat	Poultry	Poultry Egg	Milk
	----------(Metric ton) ----------				(million)	(Million liters)
2004	27.0	1.3	200.2	927.5	434.0	38.8
2005	29.4	1.5	218.3	980.1	443.0	41.1
2006	32.0	1.6	216.7	1035.4	465.0	45.5
2007	35.0	1.8	200.1	1,100.0	492.0	51.1
2008	38.3	2.0	195.1	1,162.6	523.0	56.5
2009	42.2	2.2	206.0	1,202.0	556.0	62.3
2010	46.5	2.4	234.0	1,295.6	590.0	67.0
2011	48.8	2.7	231.0	1,334.5	621.5	70.9
2012	51.2	3.2	233.2	1,374.5	642.6	75.0
2013	53.8	3.6	231.0	1415.7	664.4	79.4

* Estimated average weight of chicken/duck egg= 60gm/egg
Source: Department of Veterinary Services, 2014b

Among the livestock sub-sector, Malaysia is self-sufficient in poultry, pork and eggs, but imports of beef (70.23%) and mutton (86.55%) are required (Table 1.4). Malaysia is the third largest producer of poultry meat in the Asia Pacific region. However, the dairy products like milk powder, sweetened condensed milk, pasteurized or sterilized liquid milk, ice cream, yoghurt and other fermented milk products have shown an increasing trend in the import bill year by year. Hence, ruminant industry needs attention to produce this by-product (MOA, 2014).

Table 1.4: Self-Sufficiency in Livestock Products (%) in Malaysia, 2004-2013

Year	Beef	Mutton	Pork Meat	Poultry	Poultry Egg	Milk
2004	17.95	8.76	99.56	107.80	111.70	2.98
2005	21.15	8.60	98.85	124.74	108.70	4.59
2006	21.78	8.99	98.85	124.94	109.06	4.66
2007	24.17	10.17	98.73	104.90	114.58	5.74
2008	28.22	10.30	98.35	104.00	119.38	8.68
2009	28.26	11.20	97.20	104.72	117.53	8.79
2010	30.12	12.13	95.36	105.55	114.63	8.49
2011	29.17	11.73	94.57	105.36	115.35	13.17
2012	29.50	12.87	93.87	101.92	114.50	9.29
2013	29.77	13.45	101.95	103.06	117.77	9.30

Source: Department of Veterinary Services, 2014c

1.3 Ruminant Industry in Malaysia

Ruminants are classified on the basis of their stomach that is divided into four compartments (rumen, reticulum, omasum, and abomasum), and chew a cud containing regurgitated, partially digested food. In Malaysia, ruminants consist of large ruminant (cattle and buffalo) and small ruminant (sheep and goat). The ruminant industry in Malaysia has not improved; despite the significant importance attached to it in terms of planning for the development of the industry (Devendra, 2006). The animal's such as cow, buffalo, goat and sheep are known as ruminants and smallholders are the main producers within this industrt. Ruminant industry in Malaysia still remains at the small scale and has high potential to develop to contribute in food security and help reduce imports. The use per capita meat, eggs and milk are also expected to rise in the same period (NAP, 2011-2020a). The country is capable of achieving its own supplies for pork, poultry meat and eggs but still needs to import milk, beef and mutton from other countries (Table 1.3). The meat is a significant product of farm animals and is possibly important for human wellbeing and productivity as well as for the life recreation. The growth for meat production still unsufficient and fulfills only 29.77% (beef) and 13.45% (motton) of the total requirements for the country domestic demand. The milk produced at the same increased at an average rate of 8.2%, respectively. The self-sufficiency level for milk was recorded only 9.3% in 2013 (Table 1.4). Therefore, it has a great reliance on the commodities like milk and milk related materials to fulfill the local requirements (DVS, 2014c).

Current population of large ruminants such as cattle and buffalo is riddled with uncertainty due to the fact that the total animal population is about 751,781 and 118,045 heads respectively. Production of local beef in 2003 comes from 54 percent feedlot, 12% integration and 34% traditional. In addition, a small local meat production is also contributed by dairy cattle population which was 36,000 heads. The amount contributed by the large domestic ruminants for meat production is 180,835 tons.
This contribution represents only 29.77% of the beef and buffalo nation consumption ,while per capita consumption rate is 6.29 kg in 2013 (DVS, 2014c; DVS, 2014d). The remaining 71.33% meat imports come from the USA, Australia and New Zealand, while frozen buffalo meat is imported from India. Production of processed meat products is encouraged and there is need to add value to the existing products in the market (MOA, 2014).

Based on 3rd NAP, ruminant production was expanded and promoted with integration with permanent crops such as oil palm and rubber especially in the plantation. These efforts have been supported by increased production of the appropriate imported breed and increasing the number of local breed through intensive research. However, production in this sector is still dominated by traditional ranching small scale operations. Production of meat from ruminants and small ruminants have been enhanced in the Plan Balance of Trade (BOT Plan) with a more aggressive emphasis on the policy thrusts of the 3rd NAP and aiming to increase livestock production is higher than the target 3rd NAP. The 3rd NAP target was revised based on new developments and the current status of the country to be targeted for BOT action plan for the period 2006-2010 (3rd NAP, 1998-2010).

1.4 Small Ruminant Industry in Malaysia

Sheep and goats belong to the group of animals called small ruminants. Small ruminant belong to the Family: Bovidae and Subfamily: Caprinidae. In general, small ruminants consist of sheep (*Ovis aries)*, goats (*Capra aegagrus hircus*), and their exotic relatives of the genus ovis and capra (Hentati, 2014). Goat meat refers to the meat obtained from domestic goat. Mostly it is called *Chevon* from 5 to 18 months of age and *Cabrito* if it is of young age. In Malaysia, the word "mutton" mostly refers to the goat and lamb meat, while theoretically the term denotes only to sheep meat. Similarly, the statistics for the data of small ruminant meat in Malaysia are mostly collected by one word mutton (Bisant, 2010).

In the Malaysian economy, livestock industry plays a vital role in terms of value-added and employment incentives. Among the livestock, small ruminant is the fourth major livestock after swine, chicken and cattle. The contribution of the Malaysian small ruminant industry to the Malaysia's agricultural growth output is becoming more important and significant. In 3rd NAP, government gives more emphasis on the production of fresh beef, mutton and milk to be enhanced for the domestic market (3rd NAP, 1998-2010). Live small ruminant has a very strong market position to supply the Muslim ritual slaughter supplies for the majority of Muslim population. In addition, Indian have same demand but with different ritual.

1.4.1 Small Ruminant Farming

The small ruminant industry is being continuously promoted by Malaysian government agencies in an effort to fulfill sufficiency of food production, there by opening up opportunities for small ruminant farming under oil palm and rubber plantations in large scale. In the world, this farming has lots of importance especially the farm management, production and feeding systems (Devendra, 2006). There are three (3) types of the farming system namely, (1) intensive, (2) semi-intensive (3) traditional. The extensive and integration with cropping systems are the traditional methods widely owned by small scale farmers for their side income.

Generally, small ruminants are kept in rural villages, in the cultivation of rubber and palm oil, in the fruit orchards, rice fields and vacant land. Mostly ranchers keep livestock for different purposes which are meat, milk and organic fertilizer. Small ruminant farming is not limited only economically, but these animals are important in terms of socio-agriculture, as it has long been observed by rancher (Devendra, 1982). Ranchers in Malaysia are categorized into four groups such as breeder, cross-breeder, traders and importer. The farming of small ruminants occurs on a small scale basis with a few enterprises trying to participate on a commercial basis. Boer, Dopper and Ktjang are usually reared for meat consumption, while Anglo Nubian, Jamnapari and Saenan are for milk. Boer and Dopper are highly demanded in the market because of their high quality meat. Besides these, more hybrids from different breed come without proper breeding program. It appears that ranchers do not get much knowledge about small ruminant breeding (Sithambaram and Hassan, 2014).

1.4.2 Number of Ranchers and Small Ruminant Population

In Malaysia, 16.01% of ranchers engaged in rearing small ruminants after chicken (48.25%) and cattle (27.18%) (MOA, 2010). The number of small ruminant ranchers in Malaysia' states showed in Table 1.5. The highest numbers of ranchers are found in Kelantan with 15,212, followed by Melaka, 1,726 and Negeri Sembilan, 1,511. However, the population of small ruminants in Kelantan is less than Johor, even though Johor have just about 925 ranchers.

Table 1.5: Number of Small Ruminant Ranchers in Malaysia

State	Rancher
Johor	925
Kedah	947
Kelantan	15,212
Melaka	1,726
Negeri Sembilan	1,511
Pahang	983
Pulau Pinang	334
Perak	963
Perlis	277
Selangor	804
Terengganu	1,004
Wilayah Persekutuan (Kuala Lumpur)	4
Semenanjung Malaysia	24,690
Sabah	142
Sarawak	677
Malaysia	25,509

Source: Ministry of Agriculture and Agro-Based Industry, 2011

Table 1.6 presents the population of small ruminant in Malaysia from 2007 to 2013. There was slight fluctuation of small ruminant population in Malaysia. Statistic shows that small ruminant population increased to 20.1% from 2007 to 2009 from 2009 to 2012, it decreased by 10.8% and increased again by 5.2% in 2013 (Table 1.6). During Tun Abdullah Ahmad Badawi's tenure as Malaysia's Prime Minister (2004-2009), agriculture sector become one of the highlighted issues for economic development where this sector is believed to generate national income and reduce poverty particularly in small ruminant industry.

Table 1.6: Small Ruminant Population in Malaysia ('000 heads)

Year	2007	2008	2009	2010	2011	2012	2013
Goat	428.3	477.5	514.2	496.2	476.4	458.6	482.3
Sheep	126.0	131.3	136.4	123.5	126.4	131.9	129.9
Total	554.3	608.8	650.5	619.7	602.8	590.6	612.1

Source: Department of Veterinary Services, 2014e

The sheep population increased to 17.4 % from 2007 till 2009 and decreased to 9.2 % and increased again to 3.6% in 2013 (DVS, 2014e). The population of ruminants in Kelantan is 84,130 compared to Johor which totals 99,213 (Table 1.7). It shows that ranchers in Johor have large scale farm, while in Kelantan they are engaged in small scale farming.

Table 1.7: Small Ruminant Population in Each State of Malaysia ('000 heads), 2011-2013

State	2011	2012	2013[P]
Johor	86,208	89,521	86,674
Kedah	58,040	55,122	57,871
Kelantan	69,183	75,501	76,362
Melaka	57,404	56,220	52,412
Negeri Sembilan	70,403	60,621	60,231
Pahang	47,989	47,665	53,595
Pulau Pinang	11,959	11,978	14,179
Perak	49,983	48,100	42,885
Perlis	9,286	9,522	5,253
Selangor	35,828	32,309	23,417
Terengganu	38,670	35,587	33,377
Wilayah Persekutuan (Kuala Lumpur)	202	430	236
Peninsular Malaysia	**535,155**	**522,576**	**506,492**
Sabah	53,519	55,080	52,673
Sarawak	17,182	16,777	16,955
Malaysia	**605,856**	**594,433**	**576,120**

Source: Ministry of Agriculture and Agro-Based Industry, 2014
[P]: Provesional

1.4.3 Production of Small Ruminant

The production of small ruminants is growing rapidly in Malaysia but production still remains insufficient. It stands far behind the self-sufficiency level due to population growth and increase in per capita consumption of small ruminant meat (DVS, 2014d).

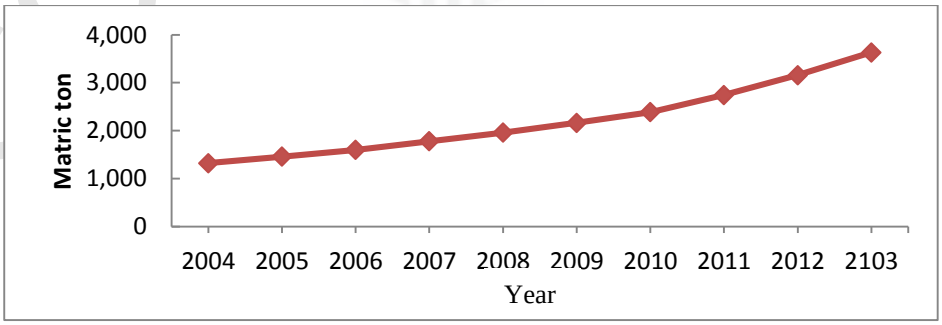

Figure 1.1: Output of Small Ruminant Products in Malaysia, 2004-2013
Source: Department of Veterinary Services, 2014b

Increasing trends for small ruminant production are given in Figure 1.1. The small ruminant meat production has increased rapidly over the last 10 years. Total production of meat from small ruminants increased by about 175 % over the period 2004-2013, with an average increase rate of 10.79 % per year (Figure 1.1).

1.4.4 Self-Sufficiency in Small Ruminant Outputs

In the past 10 years, livestock production in Malaysia has been confronting uncertainty where it shows a declining trend over the years. Although mutton production increased from 1320 000 tons in 2004 to 3630 000 tons in 2013 (Table 1.4), this amount is insufficient to meet the demand for consumption of 15,072000 metric tons in 2004 and 26,000 000 tons in 2013 (DVS, 2014d). The local self-sufficiency level remained only at 13.45% in 2013, increasing marginally from 8.76% in 2004 (Figure 1.2). Consequently, Malaysia has been dependent on imports to fulfill shortage for the local industry. In 2003, the total import was 10,707 tons of mutton valued at RM89 million. By 2007 it rose to 16,303 tons valued at RM160 million. Hence, there high probability that the import of mutton will continue to increase as a result of increasing population and rising privileged circumstances (MOA, 2014).

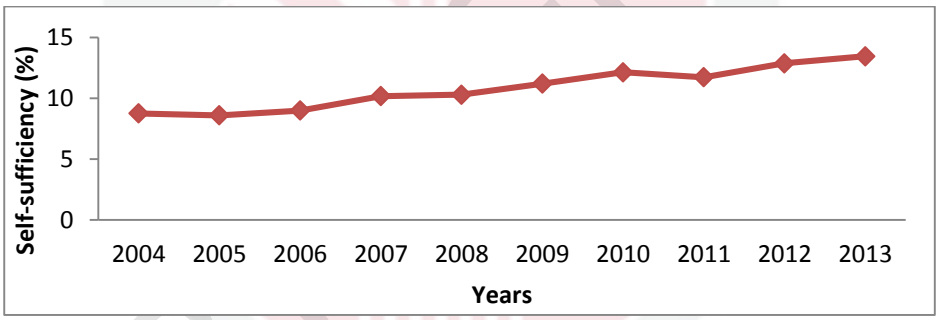

Figure 1.2: Self-sufficiency of Small Ruminant in Malaysia
Source: Department of Veterinary Services, 2014c

Small ruminant farming industry contributes about 8.76% to 13.45% of mutton consumptions in Malaysia from 2004 to 2013 (DVS, 2014c). About 95% of small ruminants are kept for meat production, while the remainder is either for the production of milk or for used as pets. Rearing of small ruminant has a very strong role to play in efforts to achieve the Muslim ritual slaughter requirements for majority of Muslim population.

1.5 Opportunities for Malaysian Small Ruminant Industry Development

The development of livestock industry in South East Asia is going towards commercialization where smallholders and backyard ranchers are taking it financially profitable to improve their livestock farming. The production of small ruminants in

Malaysia is also not left behind, especially the production of meat. This sector is growing rapidly in Malaysia although production still remaining insufficient and increasing its demand. The rapid increase has made openings for ranchers, particularly the small scale ranchers to integrate their existing production system and generate profitable income (NAP, 2011-2020b). There are certain challenges for ranchers that must be emphasized to ensure the successful development of small ruminant farming. However, there are numerous opportunities to develop a small ruminant farming that include the rising demand, various outputs, generate income, nutrient, and price, consumption, less start-up cost, the less labour requirements and the prolific nature of small ruminants.

1.5.1 Rising Demand for Small Ruminant

The 2014 census revealed that the population of Malaysia reached 29.9 million showing a significant increasing trend, compared with 28.3 million, 23.3 million, 18.4 million and 13.7 million in 2013, 2000, 1991 and 1980, respectively. The population is growing fast with the rate of 2.6% per annum during 1991-2000. The rate was higher compared to that of 2.0% for period 2000-2010. Meanwhile, the results of the Household Income Survey (HIS) 2012 revealed that the mean monthly household income for Malaysians increased from RM 4,025 in year 2009 to RM 5,000 in year 2012 and with a nominal increase of 7.2% per annum. In addition, urban population increased to 71.0% in 2010 as compared with 62.0% in 2000 (DOSM, 2010). The rapid growth of population is partly triggered by urbanization and this growth will increase the demand for high quality proteins requirements from animals (Bisant, 2006; Devendra, 2006). This boost up in demand will present opportunities for ranchers to venture into small ruminant production. The predictable requirements for the small ruminant meat industry and the shortage of enough supply have developed opportunities for ranchers with limited resources to improve their production (Luginbuhl, 2000). Islam (61.3%) is the majority religion in Malaysia. As a multi-racial nation, there are other religions such as Buddhism (19.8%), Christianity (9.2%) and Hinduism (6.3%) (DOSM, 2014). Majority of the Muslim populations use small ruminants for their religious festivals, weddings ceremonies, and birthday parties. The highest domestic demand for small ruminants for especially for Muslim rituals occurs for Akikah and Qurban. In the future, the demand for both live small ruminant and meat is predicted to increase with the increase of populations with their purchasing power. In addition, a prospective group of the consumers of products of small ruminant is the health cognizant by people. The people in this category usually look for various meats for health reasons.

The food services sector, consider meat from small ruminant as a vital element on the daily life of people. One of the additional benefits of the local food industry over imported meat that people like local meat rather than imported one even though imported meat is much cheaper than the local one (Bisant, 2010). However, the experiential focus is needed for the local meat sector and this attention is still not given by the country particularly in the earlier stages (Nik Mustapha *et al*., 2000; Ishida *et al*., 2003; Tey *et al*., 2008). Currently, Malaysia has unavailable authentic data for goat milk production. The milk yield from the dairy mostly varies, depending on the farm features including size and production. Beside this, the nutritional values of milk also

need to be focused on due to concerns about the health benefits. Nowadays there is slow increase recorded for the demand of milk mostly for the local customs and beliefs. The supply of milk is usually handled by the farm ranchers and it needs more efforts to develop and enhance its supply. Goat milk is used for other purposes like use in cosmetic items, soaps etc.

1.5.2 Outputs from Small Ruminant Production

Small ruminants are multi-purpose animals producing products, by-products, indirect and intangible benefits (Figure 1.3).

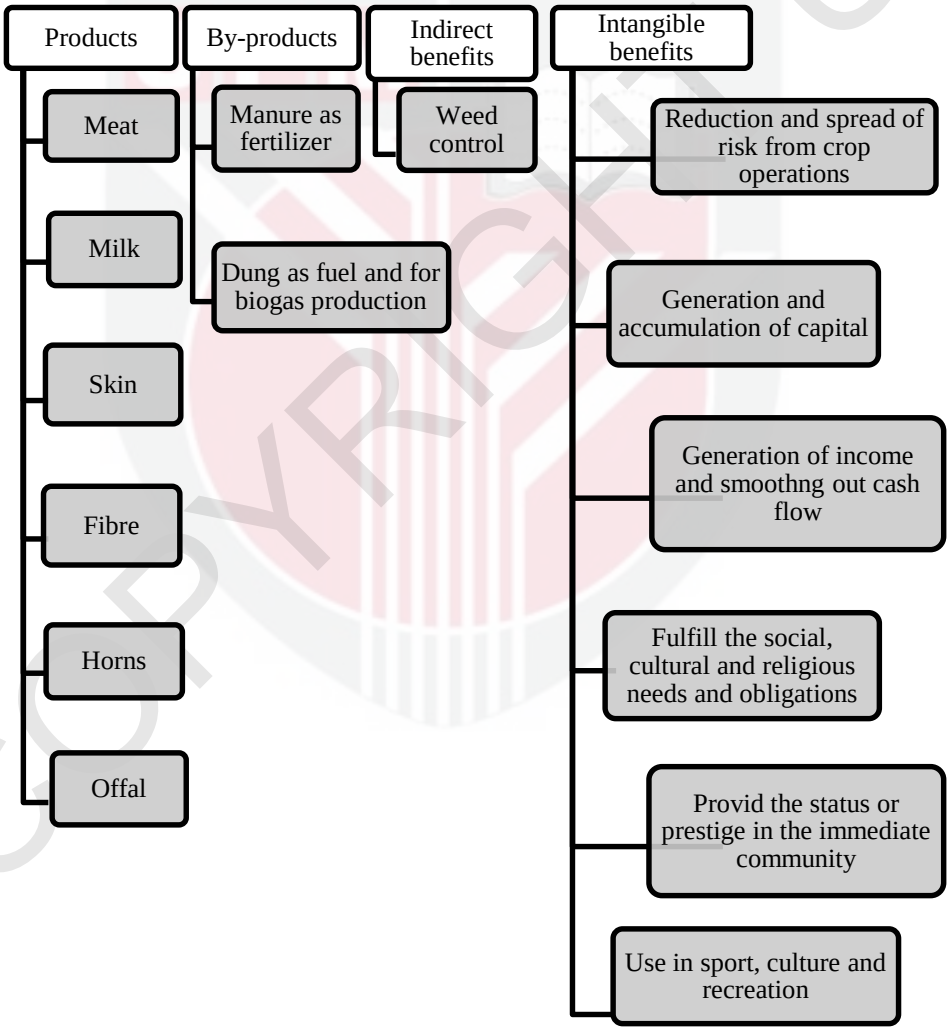

Figure 1.3: Utilization of Small Ruminants for Human Benefits
Adopted from Pollott and Wilson (2009)

Small ruminants farming have potential to be increased in such a way that it could be sustainable and economically beneficial for the ranchers. The immediate products include meat and milk and their processed products like, cheese, wool, hair, skins and other things (De Rancourt, 2006). However, the main products for domestic demand in Malaysia's small ruminant industry are rearing and consuming meat and live small ruminant especially for Muslim rituals. Firstly, the meat from goats and sheep and milk are very valuable for household nutrition and food security in the rural areas. Particularly, goat milk is valuable for the children, the malnourished, pregnant mothers and the elderly in areas where cow or buffalo milk is not available, mainly due to sales to urban areas. Secondly, there are no religious taboos against meats and milk of goat and their products respectively (Devedra, 2006). Furthermore, there are several products and by-products that come out from the small ruminants such as meat, milk skin, fibre, horns and offals (Figure 1.3). Manure and dungs for biogas are common by-products used in farming (Lebbie, 2004). Besides, there are certain other indirect benefits like weed control, income generations, and using for religious and sports purposes associated with the rearing of ruminants (Dubeuf, 2004).

1.5.3 Increasing Income

Small ruminant rising is one of the very important agricultural enterprises particularly in rural areas and very useful to human throughout the ages, largely because of their adaptability to varying environmental conditions under the breeds and strain types that are evolved for the maintenance. Small ruminants have tremendous ability to survive, and often thrive on sparse vegetation unsuitable for feeding of other livestock (Kosgey, 2008). Small ruminants can be profitably raised with low investment under intensive and most extensive forms of nomadic grazing. The vast majority of this poor people of rural areas depend on small ruminant rearing for their income generation. Moreover, certain amount of meat and milk for home consumption is acquiring to fulfill their basic demands and sustain their food cost. The growth in the consumption of the commodities has been created an occasions for the producers, particularly the small farmers observing for a grabbing profit from other ways to integrate into their current industrial system (Pender, 2006; Panin, 1997). In addition, rearing of small ruminants in rural areas mostly participated by the women and their children. Although the number of their ruminants is not high but atleast they could develop and keep this as a side source of income. This type of farming can enhance their income and impower their status with sustainable income generation (Budak *et. al*, 2005; Devendra and Chantalakhana, 2002).

1.5.4 Nutrient Content and Meat Characteristic of Small Ruminant

The importance of goats as sources of meat and dairy products has been discussed and documented in many recently at national and international statures (Gruner and Chabert, 2000, Boyazoglu and Morand-Fehr, 2001, Haenlein, 2004). However, less research has been done for sheep. Goat meat has been established as lean meat with favorable nutritional quality. Goat meat tends to be less tender and less juicy than sheep meat because of some possible mitigating factors that are discussed. Goat meat has a species-specific flavor and aroma (Webb et al, 2005). In terms of appearance, goat

meat tends to have a slightly but indications are that the color is acceptable to consumers. Food acquires from the animal sources can deliver a high quality and rich in other essential elements like micronutrients (Devendra, 2006). Commonly, meat is flavored through several religious groups but their concept has been slightly stained through awareness among the people in relation to more health care parameters (FAMA, 2009). On the other hand, goat meat has lower calories, total fat, saturated fat, and cholesterol than others meats like pork, chicken and beef (Table 1.8). Less saturated fat and less cholesterol mean healthier red meat for the health-conscious consumer. Additionally, goat meat has higher levels of iron (3.2 mg) when compared to a similar serving size of beef (2.9 mg), pork (2.7 mg), lamb (1.4 mg), and chicken (1.5 mg) (USDA, 2001). Comparatively, goat meat also contains higher potassium content with lower sodium levels.

Table 1.8: Evaluation of Various Meats of the animals (3 oz. roasted)

Animals meat	Calories	Total fat	Saturated fat	Protein	Cholesterol
		---------- (grams) --------			(mg)
Goat	122	2.6	0.79	23	63.8
Beef	179	7.9	3.0	25	73.1
Pork	180	8.2	2.9	25	73.1
Lamb	175	8.1	2.9	24	78.2
Chicken	162	6.30	1.7	25	76

Source: USDA Nutrient Database, 2001

Regarding essential amino acid composition, goat meat closely resembles that of beef and lamb. Goat meat offers more nutritional value, greater health benefits, and is an ideal choice to be considered as "the other red meat." As the health benefits of goat becomes more widely known among the general population, the demand for alternative low fat red meat should also continue to increase (USDA, 2001).

1.5.5 Increasing on Price

The small ruminant meat prices are increasing annually about 97.7% for 10 years (Figure 1.4). Imported mutton price increased from RM10.67 in 2003 to RM21.10 in 2013 per kilogram (DVS, 2014). Similarly costs of local mutton have enhanced 68% (RM18.78) in 2003 to RM31.55 in 2012 (Figure 1.4). The small ruminant meat is reasonably at higher price in relation to the others like poultry (RM6.25) that can be with mean values of RM31.55 in 2012 (Figure 1.4). Generally costs have somewhat become higher than the previously for example; RM11.92 in 1997 to RM23.30 in 2008 and RM28.25 in 2012. The goat's milk has lot of scope to occupy the market share, but at this stage still it keeps higher price around RM 20/liter (USD 5.56) in the comparison with cow's milk at RM2.20/liter (USD 0.61). The huge variation in rates of milk deceptively by low accessibility and other custom related health benefits (DVS, 2014f).

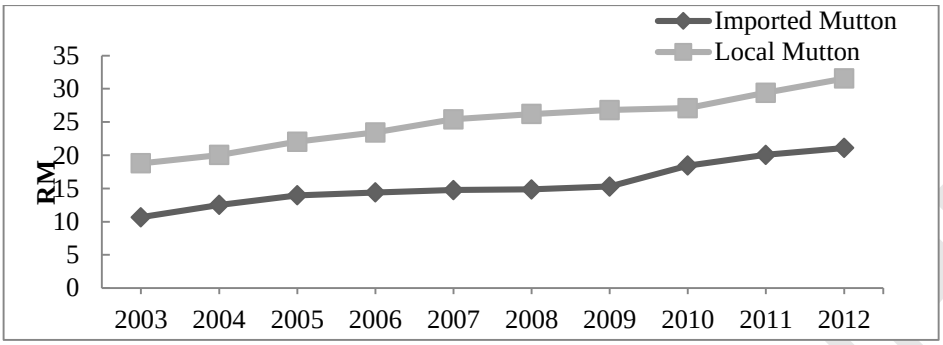

Figure 1.4: Retail Meat Price (kg) of Small Ruminant in Malaysia
Source: Department of Veterinary Services, 2014f

1.5.6 Consumption

The country food demand is going to be increased, gradually as diverse and consumers are more concerned about the quality, safety and nutritional content of their food (Ishida *et al*., 2003; Liana, Radam and Yacob, 2010; Rezai, Mohamed and Shamsudin, 2011). The experiential research would be the first priority for the utilization of meat and its availability is the main cause to be noticed accordingly. Therefore, many studies have been focused on the collectively to surpass the requirements for the meat in Malaysia (Nik Mustapha *et al*., 2000; Ishida *et al*., 2003) and as well as for beef (Tey *et al*., 2008). Furthermore, small ruminant market is still far behind from the other sectors hence, it has a great gap among the development and utilization. Consumption of small ruminant meat increased from 15,072.0 metric ton in 2004 to 26,990 metric ton in 2013 (DVS, 2014d). Hence, the efforts will be useful to raise some suggestions for the development of the potential market of small ruminant meat.

1.5.7 Low Startup Cost of Farming Project

The low startup cost is component that makes an option for the growth of a small ruminant farming especially for the farmer who has less resources of income generation. The initial price for a small ruminant farming is considerably below as other farming such as cattle farming. As firstly the five small ruminants do can usually be attained for a price of one cow. Secondly, small ruminants are required having less land area as compare to the cattle farms, six small ruminants could be reared through the equal amount is required to rear a cow. Third, small ruminants can be able to do well on low quantity of forage diets and flourish to severe in relation to safe environment using with less and cheaper expenses. Nevertheless, the shelters for the animals required to prepare not needed huge money, which can be made up from not very expensive materials. There will be no any specific or special or exclusive equipment is required for the farms as having equipment for young calves can be transformed for small ruminant usage.

1.5.8 Less Labour Intensive

The small ruminant production is easier to handle and less labourious to the larger animals. The farm size of small ruminants is small hence; the rest of the family members can handle and take care animals smoothly. Mostly small ruminants have good behavior and have fewer chances of children and women getting hurt from them. Thus, investment in this farming system can create more employment opportunities and engagements for the other family members.

1.5.9 Prolific Nature of Small Ruminant

The goats are mostly regular breeds, a doe (mature female goat) and ewe (nature female sheep) can be produced successfully 3 times every two year. Furthermore, small ruminant has more reproductive rotations than the other large animals within the same time. In two years, it is likely for a female small ruminant produce up to six kids due of its high pairing rate, while a cow can give hardly two calves for the same time. The fast turnover rate of the small ruminant is a benefit to generate high income (Kendrick, 2011).

1.6 Issues and Challenges in Malaysian Small Ruminant Industry

There are many issues and challenges in Malaysian small ruminant industry for ranchers that must be emphasized to achieve production targets set at a global or national level. Small ruminant industry has the potential to be developed to ensure food security in the country and reduce meat imports. However, this industry remains small scale. The small ruminant industry has more problems and challenges to handle as compare to large ruminant industry like cows and buffalos. Among the issues and challenges faced in the development of this industry are demand, labour, land, farm management, breeding stock, feed industries, government role, low expertise and information along with the limited financial support. In addition, the ratio of research and development in terms of animal disease control and efficiency of livestock systems will be emphasized. Moreover, industry needs to move forward towards the trade liberalization where markets become more open by reducing trade barriers. It also has some more issues and problems for the implementation and intensifies farming that should be addressed.

1.6.1 Demand for small ruminant

Small ruminant's meat especially goat's meat is slightly disliked amongst the other ruminants population and it's per capital utilization has persisted, while utilization of other animal nutrition have been growing fast in line with improving and urbanization. The small ruminant meat utilization was very low, undergoing a lot of upside potential need to be highlighted and recorded (Bisant, 2010). Though, in terms of growth limitations and the need on imported small ruminant meat to fulfill national supplies,

and a great requirement to encourage and increase consumption which may lead to higher imports. The government is keeping in the 35% self-sufficient level (SSL) is targeted for the 2015. This means 22,549 metric ton mutton to be produced (in 2009 local production was 2,162 metric ton). The industry requires at least 1,500,000 breed females and 50,000 good males by 2015 in order to achieve the target 35% SSL (DVS, 2008).

1.6.2 Labour

Manpower is one of the prominent issues in agriculture and forestry sector particularly small ruminant industry. This sector is dependent on foreign labours. More than 750, 000 registered foreign labours were employed in 2012. Most of foreign labours in agriculture and forestry sectors exchange to another sector that gives them more income. Currently, labour productivity in agriculture is only about 60% of the labour productivity in the manufacturing sector. This necessitates measures to reduce labour requirement in agriculture and increase labour productivity. Selection of suitable agriculture land can be helpful to reduce the number of labours (Rozhan, 2015).

1.6.3 Land, Farm Zoning and Locations

Agricultural growth is continuously increasing through more intensive use of land despite the expansion of land used. Malaysia covers an area of about 330,803 square kilometers. However, there was a reduction occured in rubber, rice, coconut and cocoa with 494,000, 302.600, 73,400 and 30,700 hectares respectively (Rashid *et al*., 2013). Generally, the land used for livestock is small as compared to plantation crops. The total land use in Peninsular Malaysia for livestock was 36.9 thousand hectares in 2006 and 39.7 in 2008. However, the area occupied by this industry is only 0.7 % of the total agricultural land use in Peninsular Malaysia. Most of this area will be replanted with forestry, palm oil, fruits, vegetables and having a very small arable land for the livestock purpose to produce feed (Sithambaram and Hassan, 2014).

Several ranchers may subsequently abandon their farming operations due to the public non-acceptance of such farms and the associated smell-like problems. The authorities advised that all the farms should be located in certain places that are safe and away from the highly populated places.

1.6.4 Farm management

Presently, in Malaysia no particular technical criteria have been established for livestock except for pigs. The small ruminant industry needs technical effluent standards which may be applied to the small ruminant industry as part of efforts to improve its quality.

1.6.5 Globalization and Liberalization

The majority of the small ruminants are imported from various countries especially Australia and New Zealand. There is a need to focus on countries nearer such as those in the Association of Southeast Asian Nations' (ASEAN) to better improve logistical supply. Additionally, there is a need for the industry to register for the Asian Free Trade Area (AFTA). The government is targeting some improvements in the poultry industry in this regard and initially they only focused on livestock products such as chicken, entire eggs, day-old-chicks and swine. According to the 3rd NAP, globalization and liberalization policy openings the new prospects for the growth of this sector through export the livestock production and simplify competitive finding with various types of raw materials. The livestock producers have the proficiency to specify and to be viable in the development of many livestock goods, exclusively the poultry sub sector. Furthermore, there is a need of the small ruminant farming to include in the farming area for strategic sources and to encourage overseas investors for the various livestock products (Chiew, 2001).

1.6.6 Feed Industry

The feeding of animals is one of the factors that determine the quantity and quality of livestock and fisheries products. According to the OECD-FAO217 projections, from 2009 to 2018, the demand for feed such as wheat, coarse grain and oilseed meal, mainly from developing countries, will be increasing. Demand for these resources for livestock feed has to compete with at least two other factors: (1) increasing human consumption; and (2) production of bio products such as biofuel, bioethanol, biodiesel and biogas, which have been encouraged due to their environmental friendly and energy saving features. This competition would inevitably mean high costs for the inputs. In this regard, the OECD-FAO projected (for instance) an increase of 3% for wheat prices by 2019 from the average price in 2007-2009 (during the world food-price crisis) and also an increase for coarse grain rice. In order to meet the increasing local demand for animal feed, efforts have been continuously undertaken by the Malaysian Government to improve the supply and quality of foodstuffs for ruminant and non-ruminant animals. Locally available feed ingredients such as tapioca waste and rice bran are encouraged to be utilized either as compound feed for feeding livestock together with ground maize and soybean meal, or as a single feed.

Feed creates a big part of the production rate in the livestock sub sector, particularly for the small ruminant industry. The cost of feed for small ruminants is much higher than the other components. Therefore, the success of the ruminant industry depends primarily on the locally available feedstuffs. The fodder grass materials and related agro industrial by-product such as bran, copra cake, palm kernel cake, oil palm frond, sago, tapioca and broken rice are the main components for the local ruminant feeds. Another possible way to produce local feed components rather than imported ones is the utilization of palm kernel cake which is obtained from oil palm as a by-product. Palm kernel cake is a solid residue left behind after the extraction of oil kernels of the palm oil fruits. Oil palm has been Malaysia's major export commodity for years. This constitutes the 15-17 % protein (crude) and 16 % crude fiber. Additionally, it has

shortages for many amino acids and has less lysine availability. The use of this cake is frequently noticed by depending on the price related to the protein supplements and the cost of the total amino acids contents. Small ruminant farming using palm kernel cake has been already introduced as famous nourishment for ruminant rather than as a feed for animals and there is such type of other products that should be introduced locally.

1.6.7 Government Role

Malaysian government has to develop small ruminant industry in increasing self-sufficiency level. At present this sector is highly ignored by the government due to the dominancy of other industries such as poultry, oil palm, rubber, pineapple etc. Hence, it has to be more intensive mainly the shortages and to acquire good quality of breed affected yields and operation maintenance costs. Moreover, one of the significant issues for this industry should be highlighted that is the land of ruminants breeding center that is still pending and the refusal by the government state. Therefore, government must take initiative to tackle these types of issues regarding small ruminant industries.

1.6.8 Disease Infections

Small ruminant diseases have caused not only in Malaysia but it global concerns for at least two main reasons: 1) implications for food security and the economy; and 2) implications for human health. The infestations of internal parasites (like nematodes) and its control is going to be one of the most serious problems and become a challenge for the small ruminant industry. The infections of these diseases may cause a great business loss for the producers due to the treatment cost, loss of production and expiry of heavily infected animals. The appropriate time for organization of this parasite is greatly important that may help for the survival of this industry. Moreover, the skills are required to detect the clinical signs of main infestations, to correctly dress up the disease affected animals, and to reduce excellently the crowd's experience from these parasitic diseases which are very important and dangerous. Hence, the immediate prevention is needed from these types of parasitic infestations would bring an enormous improvement for the development of the small ruminant industry.

1.6.9 Limited Knowledge and Information

The lack of accessible knowledge or skills regarding small ruminant development is a key factor of unsuccessful small ruminant industy. There are inadequate and inaccurate statistics available on the productivity of small ruminants. Nevertheless, scientists are conducting research in certain focused areas so as to develop standard production protocols and policies for small ruminants in the future. Experts in animal nutrition are less involved in this industry. Ranchers have lack of understanding and expertise in farm management technologies, especially in food and nutrition. Productivity is particularly low with less profit on a small investment (economic issues of scale and efficiency).

1.6.10 Limited Access to Financial Support

Small ruminant production is still lacking behind compared to other livestock sectors. Investors are pessimistic for this industry since there is little information regarding this to determine its profitability. Many big farms including government farms fail due to the financial crises. This also creates a critical situation for the financial institutions to provide loans for the small ruminant farm.

1.6.11 Breed

The small ruminants in Malaysia have the shortage of productive breeding stock which has been identified as a major problem (ETP, 2014b). Lack of breeding stock will put the industry in a challenging situation especially when the existing stock is facing increasing demand from consumers and also due to the risk of livestock diseases. Slow progress in generating indigenous breeds and breeding stocks has resulted in the Malaysian Government importing high quality small ruminant for breeding purposes and applying artificial insemination procedures to generate increased production. Many quality breeds have been brought into the country for commercial purposes, namely Anglo Nubian (from England), Boer (South Africa) and Jamnapari (India and Pakistan) (Sithambaram and Hassan, 2014).

1.7 Problem Statement

The small ruminants are economically important particularly in the developing countries including Malaysia. Currently Malaysia is still insufficient small ruminant and fulfills consumption with import for both live small ruminants and meat where the government aims to substantially increase small ruminant production with a view to achieving 35% self-sufficiency in 2015 (DVS, 2008). However, self-sufficiency for local mutton presently is only able to accommodate 13.45% of the market and the remaining 86.55% is imported mutton from countries such as Australia, Indonesia and Vietnam (DVS, 2014c). This statistic shows that our small ruminant industry is very critical and remain unsuccessful. The rapid growth in human population, urbanization and high income, coupled with the changing consumer concerns are increasing the demand for these animals and their by-products make a crisis.

In Malaysia, government does not give proper attention to the small ruminant industry. The government is giving more emphasis on the commercial agriculture sector such as the plantation crops like rubber, oil palm and coconut, which has contribute immensely to the national economy. However, not only government is solely responsible for this, but other factors also contribute to the failure of the small ruminant farming. The major problem in small ruminant farming is the issue of limited attention given to the farming and low level of awareness by the people toward production costs. According to Rozhan (2015), agricultural production cost is increasing due to price of agricultural input and capital cost that ultimately attribute to low productivity and quality. In small ruminant farming, feed is the biggest cost which is associated with production,

typically account for more than 60% of total production cost. The continuously increasing feed cost directly influenced the production and price. The rising of price might be one of the effective parameters that directly influence the small ruminant industry that may lead to production decline in Malaysia.

Labours is one of the prominent issues in agriculture and forestry sector particularly small ruminant industry. Most of immigrant workers in the agriculture and forestry sectors tend to move to another sector that gives them more income. Currently, labour productivity in agriculture is only about 60 % of the labour productivity in the manufacturing sector. This necessitates measures to reduce labour requirement in agriculture and increase labour productivity. Moreover, local breeds are less suitable for commercial or large-scale production to give a quick return. Although there is a suitable technology for breeding, adoption of the technology to improve the productivity of local breeds remain low. At the same time, lack of quality feed from local food ingredients and processing technology have not been known to support growth of import breeds.

The farm land is one of the substantial issues for the small ruminant farming industry. Larger portion of the land area is replanted with forestry, palm oil, fruits, and vegetables, thus leaving a small land size for livestock use. Moreover, farm land has more importance for utilizing it with feed growing by easier and with lower cost of inputs (Sithambaram and Hassan, 2014). In addition, small ruminant farming is also facing other problems such as diseases and parasites, which require management skills by ranchers who mostly encounter limited access to financial support. The combined struggles create the tasks for stake holders, and government to increase the involvement of the small ruminant's ranchers in the future. The above factors are among other issues that directly influence small rumiannt farming and this contribute to marginal profits, hence some ranchers are successful, while other ranchers with similar circumstances remained unsuccessful. However, in Malaysia there is insufficient information about the real factors and problems mentioned above, especially for the growth of this industry. Hence, this study has been undertaken to evaluate and highlight the following research questions that are directly related with the small ruminant farming industry to help mitigate and solve the obstacles that affect the successful performance of ranchers in this industry:

1) What are the the respondent' perception level toward successful factors on small ruminants farming?
2) What are the relationships between socio-economic characteristics and respondents' perception level towards successful factors on small ruminants farming?
3) What are the critical success factors of small ruminant farming?

Keeping in mind these questions, the following objectives have been set up for this study.

1.8 Objectives of the Study

1.8.1 General Objective

The main objective of this study was to identify the critical success factors of small ruminants farming in Peninsular Malaysia.

1.8.2 Specific Objectives

Specifically, the objectives of this study are:

1) To determine the respondent' perception and perception level toward successful factors on small ruminants farming.
2) To clarify the relationship between socio-economic characteristics and the respondents' perception level towards successful factors on small ruminants farming.
3) To identify the relationship between selected farm profile and successful factor on small ruminants farming.
4) To examine which are the Critical Success Factors on Small Ruminant farming.

1.9 Significance of the Study

Malaysia has a lately industrialized market economy which is comparatively open and state oriented. In the Malaysian economy, livestock industry performs a vital role in terms of value-added and employment. The small ruminant industry of Malaysia's agriculture output growth is more important. Hence, it is important to identify the status and characteristics of respondent socio-economic and the Critical Success Factors on Small Ruminant Farming in Malaysia.

The study will identify the factors that influence the small ruminant farming in Malaysia so as to provide an overview of the opportunities and sectors that could be pursued by individuals that are involved in farming based on critical success factors related to rearing of small ruminants. It is expected that thirteen factors namely family support, government support and policies, labour, production system, business planning, veterinary extension services, disease and prevention management, technical skill, farm operation, marketing and price, neighbourhood relationship, feeding strategies and feed sources were recognized as the critical success factors of small ruminant farming. Moreover, the study focused on the relationship between socio-economic characteristic and respondent perception level towards success factors that influence the small ruminant farming. This study give a better understanding and knowledge to the livestock extension agents, policy makers, researchers about the current practice of goat farming among ranchers in Malaysia.

The finding of the study helps DVS and MOA in planning new strategic policies and programs that will help the ranchers and improve the livestock industry. The finding can be used by DVS to develop new technology to maximize production of small ruminant among ranchers. Hence, this study encouraged the ranchers to shift their farming into commercial farming. Therefore, they can boost up their farming production.

1.10 Thesis Outline

This section covers the organization of this study. This study consists of five chapters covering different areas of the study. The importance of Agricultural sector in Malaysia, overview of livestock industry, the ruminant and small ruminant industry in Malaysia, the problem statement, objectives, significance of the study and this thesis outline are included in Chapter 1.

Chapter 2 summarizes previous literatures and finding related to the definition, concept and theory on critical success factor. Moreover, related literatures with small ruminant farming and the success factor on small ruminant farming are reviewed in this chapter. In addition, reviews on reserch methodology in CSF related with this study are discussed.

The methodology adopted in this study is presented in Chapter 3. This chapter discusses about the research design including questionnaire as the instrument of study, details about the location of study, population and sample method, data collection technique and analysis conducted for the study.

Chapter 4 presents the results and analysis of this study. The last part of the research is Chapter 5 that concludes the research findings and provides recommendations for future study in this field. The questionnaire used is attached as Appendix.

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