

**PREFERENCES ON BREEDING PRACTICES AND BREEDS OF CATTLE
AND GOAT IN SANDAKAN SABAH**

LAM LAI YAN

**DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF BACHELOR OF
AGRICULTURE SCIENCE WITH HONOURS**

**PERPUSTAKAAN
UNIVERSITI MALAYSIA SABAH**

**LIVESTOCK PRODUCTION PROGRAMME
FACULTY OF SUSTAINABLE AGRICULTURE
UNIVERSITI MALAYSIA SABAH
2017**



UMS
UNIVERSITI MALAYSIA SABAH

UNIVERSITI MALAYSIA SABAH

BORANG PENGESAHAN TESIS

JUDUL: PREFERENCES ON BREEDING PRACTICES AND BREEDS OF CATTLE AND GOAT IN SANDAKAN SABAH

IJAZAH: DEGREE OF BACHELOR OF AGRICULTURE SCIENCE WITH HONOURS (LIVESTOCK PRODUCTION)

SAYA: LAM LAI YAN SESI PENGAJIAN: 2013-2017
(HURUF BESAR)

Mengaku membenarkan tesis *(LPSM/Sarjana/Doktor Falsafah) ini disimpan di Perpustakaan Universiti Malaysia Sabah dengan syarat-syarat kegunaan seperti berikut:-

1. Tesis adalah hak milik Universiti Malaysia Sabah.
2. Perpustakaan Universiti Malaysia Sabah dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan tesis ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. Sila tandakan (/)

SULIT

(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di AKTA RAHSIA RASMI 1972)

TERHAD

(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

TIDAK TERHAD

**PERPUSTAKAAN
UNIVERSITI MALAYSIA SABAH**

Disahkan oleh:

NURULAIN BINTI ISMAIL

PUSTAKAWAN KANAN

UNIVERSITI MALAYSIA SABAH

(TANDATANGAN PUSTAKAWAN)



(TANDATANGAN PENULIS)

Alamat Tetap: 86, JLN MERBAU,
TAN KALUMPANG, 4100,
HULU SELANGOR.

PROF. DR. M. A. MY KHANDOKER

(NAMA PENYELIA)

TARIKH: 13/1/2017

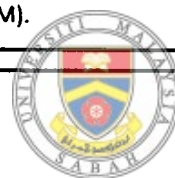
TARIKH: 13/1/2017

Catatan:

*Potong yang tidak berkenaan.

*Jika tesis ini SULIT dan TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh tesis ini perlu dikelaskan sebagai SULIT dan TERHAD.

*Tesis dimaksudkan sebagai tesis bagi Ijazah Doktor Falsafah dan Sarjana Secara Penyelidikan atau disertai bagi pengajian secara kerja kursus dan Laporan Projek Sarjana Muda (LPSM).



UMS
UNIVERSITI MALAYSIA SABAH

DECLARATION

I hereby declare that this dissertation is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that no part of this dissertation has been previously or concurrently submitted for a degree at this or any other university.



LAM LAI YAN
BR13110075
13 January 2016



UMS
UNIVERSITI MALAYSIA SABAH

VERIFIED BY

1. Prof.Dr.M.A.M.Y.Khandoker
SUPERVISOR



PROF. DR. M.A.M. YAHIA KHANDOKER
PENSYARAH
FAKULTI PERTANIAN LESTARI
UMS KAMPUS SANDAKAN

2. Prof.Dr.Abdul Rahman Milan
CO-SUPERVISOR



PROF. DR. ABD RAHMAN MILAN
PENSYARAH
FAKULTI PERTANIAN LESTARI
UMS KAMPUS SANDAKAN



ACKNOWLEDGEMENT

The process of writing a dissertation is long and arduous and it is certainly not done singlehandedly. First and foremost, I would like to thank my supervisor, Prof.Dr. M.A.M.Y. Khandoker. Without his help, advice, expertise, and encouragement, this research and dissertation would not have happened. His guidance helped me in all the time of research and writing of this dissertation.

Besides my advisor, I would like to thank Prof.Dr.Abdul Rahman Milan for the continuous support of my Degree study and related research, for his patience, motivation, and immense knowledge.

I would certainly be remiss to not mention and sincerely thank to Dr.Jamaun, Head of Department of Veterinary Services in Sandakan by providing me the list of farmer's information.

Last but not the least, I would like to thank to Dean of Faculty of Sustainable Agriculture, UMS Campus Sandakan by providing me this opportunity to carry out this study and arrange transportation service for me.



ABSTRACT

Malaysia has reached in self-sufficiency in non-ruminant products such as pork, poultry and eggs. However, the self-sufficiency level in the production of ruminant products is still below 30% and this might due to the limitation of existing breeding policies in beef and goat production in Malaysia. So it is important to evaluate the farmer's opinion on breeding practices and choice of breeds of cattle and goat. Moreover, existing breeding practices should be investigated for sustainable development of beef and goat production in Malaysia. Therefore, to investigate the farmer's opinion on breeding practices and choice of breeds, data was collected from 18 beef and goat farmers in Sandakan. The data collected and evaluated revealed that all farmers in Sandakan practice only the natural mating and they are facing the problem of shortage of quality breeding males. On the other hand, farmers in Sandakan have very limited option in choosing the breeds of beef cattle and goat. Finally it can be concluded that the farmer's perceptions should be taken in consideration for choice of beef and goat breeds and by regular replacing of quality breeding males or by introducing artificial insemination (AI). Inbreeding should be prevented for sustainable development of cattle and goat production in Malaysia.



PILIHAN PENTERNAK LEMBU DAN KAMBING TERHADAP KAEDAH PEMBIAKAN DAN PILIHAN BAKA DI SANDAKAN SABAH

ABSTRAK

Malaysia telah mencapai tahap sara diri dalam produk bukan ruminan seperti daging babi, ayam dan telur. Walau bagaimanapun, tahap sara diri dalam pengeluaran produk ruminan masih di bawah 30% dan ini mungkin disebabkan oleh had dalam polisi pembiakan daging lembu dan kambing di Malaysia. Jadi, penyiasatan terhadap pendapat penternak dalam kaedah pembiakan dan pilihan baka lembu dan kambing adalah penting. Selain itu, amalan pembiakan haiwan yang sedia ada perlu disiasat untuk meningkat pengeluaran daging lembu dan kambing di Malaysia. Oleh itu, 18 orang penternak di Sandakan telah dipilih dan data telah dikumpulkan untuk menilai pendapat mereka dalam amalan pembiakan dan pilihan baka. Bukan itu sahaja, data mengenai ketersediaan haiwan pejantan untuk tujuan pembiakan telah dikumpulkan. Data yang dikumpul dan dinilai menunjukkan bahawa semua penternak di Sandakan mengamalkan cara mengawan secara semula jadi kepada penternakan mereka dan mereka menghadapi masalah kekurangan haiwan pejantan yang berkualiti. Di samping itu, penternak di Sandakan mempunyai pilihan yang sangat terhad dalam memilih baka lembu daging dan kambing. Kesimpulannya, persepsi penternak lembu dan kambing terhadap cara pembiakan dan pilihan baka perlu diambil dalam pertimbangan semasa merangka dasar dan selalu menggantikan haiwan pejantan yang kualiti atau dengan memperkenalkan peranakan beradas (AI). Perkahwinan sekerabat perlu dielakkan untuk meningkatkan pengeluaran daging lembu dan kambing di Malaysia.



TABLE OF CONTENTS

Content	Page
DECLARATION	ii
VERIFICATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
<i>ABSTRAK</i>	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF SYMBOLS, UNITS AND ABBREVIATIONS	xi

CHAPTER 1 INTRODUCTION

1.1	Background	1
1.2	Justification	4
1.3	Objective	5
1.4	Hypothesis	5

CHAPTER 2 LITERATURE REVIEW

2.1	Importance of Livestock	6
2.2	Current Trend of Livestock Population	7
2.3	Livestock Meat Production	8
2.4	Self-sufficiency Level	8
2.5	Livestock Consumption	9
2.6	Livestock Trade	10
2.7	Breeding Policy Development	11
2.8	Breeding Policy	11
	2.8.1 Dairy Cattle	11
	2.8.2 Beef Cattle	13
	2.8.3 Buffalo	14
	2.8.4 Goats	14
	2.8.5 Sheep	15
	2.8.6 Deer	15
2.9	Natural Mating	16
2.10	Artificial Insemination	16
2.11	Inbreeding	18
2.12	Current Breeding Practices	18
	2.12.1 Beef Cattle	19
	2.12.2 Dairy Cattle	19
	2.12.3 Buffaloes	20
	2.12.4 Meat Goats	20
	2.12.5 Dairy Goats	21
	2.12.6 Sheep	21
2.13	Available Livestock Breeds	21
2.14	Breed Preferences	22
2.15	Summary	23



CHAPTER 3 METHODOLOGY		
3.1	Location	25
3.2	Duration of the Study	25
3.3	Materials and Methods	25
3.4	Measurement of Independent Variable	27
3.5	Measurement of Dependent Variable	28
3.6	Statistical Analysis	29
CHAPTER 4 RESULT		
4.1	Socio-economic Status of Farmers	30
4.2	Involvement in Animal Rearing	32
	4.2.1 Cattle and Goat Herd Size	32
4.3	Breeding Practices of Cattle and Goat	33
	4.3.1 Male and Female Pooled Ratio	33
	4.3.2 Types of Breeding Practice	33
	4.3.3 Service Availability	34
	4.3.4 How Long Farmers Used Their Breeding Bulls and Bucks	34
	4.3.5 Constraints Associated with Breeding	36
4.4	Choice of Breeds	37
	4.4.1 Level of Knowledge of Farmers on Cattle and Goat Breeds	37
	4.4.2 Popularity of Choice of Cattle and Goat Breeds	37
	4.4.3 Constraints Associated with Choosing Breeds	38
CHAPTER 5 DISCUSSION		
5.1	Farmer's Background	40
5.2	Breeding Practices	40
5.3	Choice of Breeds	43
CHAPTER 6 CONCLUSION AND RECOMMENDATION		45
REFERENCES		46
APPENDICES		49



LIST OF TABLES

Table	Page
2.1 Statistics GDP Malaysia, 2009-2012	6
2.2 Malaysia: Ex-Farm Value of Livestock Products (RM Million), 2010-2014	7
2.3 Population of Major Classes of Livestock under Ninth Malaysia Plan 2006-2010	7
2.4 Livestock Meat Production (Tonnes) in Malaysia, 2008-2012	8
2.5 Self-sufficiency Level (%) in Livestock Products, 2000-2010	8
2.6 Consumption of Beef, Mutton, Pork and Poultry in Peninsular Malaysia, 1960-2014	9
2.7 The Per Capita Consumption of Meat in Peninsular Malaysia (kg), 1993-2013	10
2.8 Export of Livestock Products in Peninsular Malaysia (Metric Tonnes), 2003-2007	10
2.9 Import of Livestock Products in Peninsular Malaysia (Metric Tonnes), 2003-2007	11
2.10 Available Breeds and Major Crossbreeds of Livestock in Malaysia, 2009	22
3.1 Measurement of Independent Variable	27
3.2 Measurement of Dependent Variable	28
4.1 Characteristics of Respondent Farmers with Categories and Basic Statistical Values	31
4.2 Farmers' Groups Based on Cattle Herd Size	32
4.3 Farmers' Groups Based on Goat Herd Size	32
4.4 Number and Pooled Ratio of Cattle and Goat	33
4.5 Breeding Practice in Cattle and Goat	33
4.6 Service Availability in Cattle and Goat	34
4.7 How Long Farmers Used Their Breeding Bulls	34
4.8 How Long Farmers Used Their Breeding Bucks	35
4.9 Constraints Associated with Breeding	35
4.10 Knowledge Level of Farmers on Cattle and Goat Breeds	37
4.11 Popularity of Choice of Cattle and Goat Breeds in Sandakan	38
4.12 Constraints Associated with Choosing Breeds	38



LIST OF FIGURES

Figure		Page
4.1	Constraints Associated with Breeding	36
4.2	Constraints Associated with Choosing Breeds	39



LIST OF SYMBOLS, UNITS AND ABBREVIATIONS

%	Percentage
*	Breeds at risk
>	More than
<	Less than
AFS	Australian Friesian Sahiwal
AI	Artificial Insemination
AMZ	Australian Milking Zebu
ART	Assistant Reproductive Technology
BBB	Barbados Blackbelly
BUT	British United Turkey
DVS	Department of Veterinary Services
E	Estimate
ECER	East-Coast Economic Region
FELDA	Federal Land and Development Authority
FMD	Foot and Mouth Disease
F1	First Filial Generation
FSA	Faculty of Sustainable Agriculture
GDP	Gross Domestic Products
HF	Holstein Friesian
IC	Identity Card
IVM	Institute Veterinar Malaysia
Kg	Kilogram
KK	Kedah-Kelantan
KPD	Rural Development Corporation
LID	Local Indian Dairy
MAJUTERNAK	National Livestock Development Authority
MARDI	Malaysian Agricultural Research and Development Institute
MFW	Mafriwal
MoA	Ministry of Agriculture and Agro-based Industries
MOET	Multiple Ovulation and Embryo Transfer
MT	Metric Tonnes
NIVB	National Institute for Veterinary Biodiversity
P	Provisional
PINTAR	Ruminant/Tree Crop Integration Project
RM	Ringgit Malaysia
SSL	Self-sufficiency Level
STPM	Malaysian Higher School Certificate
TNAU	Tamil Nadu Agricultural University
UMS	University Malaysia Sabah
X	Crossbred



CHAPTER 1

INTRODUCTION

1.1 Background

Livestock is one of the very important sector in Malaysia as it supplies the largest sources of animal protein for Malaysian population and generates income for the growth of the country (Irani *et al.*, 2001). The total Gross Domestic Products (GDP) for agricultural production which comprising of agricultural, forestry and fisheries, is RM 709.3 billion in the year 2011. It is estimated that RM 11724.86 million (based on ex-farm values) was contributed by the livestock sector, of which 51% were contributed by poultry meat (Irani *et al.*, 2001). In the case of Malaysia, the livestock production is still inadequate to meet the local demand, following the increasing trend of population and consumption. Malaysia has become self-sufficient in the production of poultry and pork and produced 85% of its beef requirements (Irani *et al.*, 2001). However, there are 95% of its milk and milk product requirements still depending on other countries. Production of poultry meat, eggs and pork were self-sufficient and there was a surplus. Thus, Malaysia can export these products, especially to its traditional market, Singapore (Irani *et al.*, 2001).

Despite Malaysia is able to produce pork, poultry meat and eggs, nevertheless the country still needs to import milk, beef and mutton (Loh, 2002). Imports of beef and mutton rising every year, which causes an increment in the trade balance of food products. According to statistics from Ministry of Agriculture and Agro-based Industry (MoA), data regarding the deficit of demand compare with production of livestock in Malaysia in 2010 amounted to 3,568,000 metric tonnes. The deficit is expected to increase in 2020, as it is forecasted that production will only reach 11,175,000 metric tonnes compare with demand of livestock that will reach up to 14,790,000 metric tonnes. The forecast deficit in 2020 will be amounted to 2,615,000 metric tonnes (MoA, 2012). This apparently shows that Malaysia will be highly dependent on import of



livestock products, especially beef and mutton, from various countries, such as New Zealand, Australia, India and Thailand to make sure the supply of meat meets the demand of the Malaysian population (Sahar and Chamhuri, 2016).

Policies in Malaysia depend heavily from the political panning and views. Large scale government intervention is done through national planning to reach its objectives to fulfil ethnic demands, and maintain political stability has been the essential component to development of Malaysia policy since 1957 (Sahar and Chamhuri, 2016). In order to improve livestock industry, the government has formulated various policies and strategies such as National Agricultural Policy and the National Agro Food Policy. However, the self-sufficiency level (SSL) of ruminant products still has not been reached. Since the 1960s to 2010, the development of ruminant products was much slower compared to non-ruminant products. Malaysia is still highly dependent on the import of ruminant products from other countries such as India, Australia, New Zealand and Thailand. Moreover, imports of beef, milk and mutton are rising every year (Hashim, 2013).

Livestock breeds are the result of both natural mating and human intervention by using artificial insemination (AI). In Malaysia, both natural mating and AI are practiced by the farmers (DVS, 2013a). Typically, type of breeding practice used by the farmer depends on the production system and objective of the farm. For example, most of the farmers are using natural mating of purebred local KK cattle under a traditional farming whereas both natural mating and AI are practicing under a feedlot system (DVS, 2013b). Application of livestock AI in Malaysia still lagging behind due to several factors such as limited coverage of extend services to the rural areas, problem associated with the administration of the AI service, lack of well-trained and experienced AI technicians and lack of logistical support related to production and distribution of semen and liquid nitrogen supply (Azage *et al.*, 1995).

Livestock in Malaysia has wide varieties of breeds and strains. There are more than 14 species of livestock that contribute to human population directly in the forms of meat, milk, egg, hide, skin, fiber and also indirectly in forms of manure, transport and investment. Of the 14 species of livestock, the most common types of livestock are chickens, pigs, cattle, goats, buffalo, sheep, horses and deer and there are 101 breeds have been identified among them. Among the 101 breeds, 36 breeds are locally

adapted and another 65 breeds are recently introduced or continually imported (Johari, 2007).

Beef cattle (*Bos taurus/Bos indicus*) breeds available in Malaysia are Kedah-Kelantan (KK), Brahman and crosses, Brakmas, Charoke, Charolais X, Chianina X, Giriando, Droughtmaster, Limousin X, Hereford X, Boran X and Nelore and crosses. Dairy breeds are Australian Milking Zebu (AMZ), Australian Friesian Sahiwal (AFS), Holstein Friesian and crosses, Local Indian Dairy (LID), Mafriwal (MFW), Jersey and crosses, Sahiwal Friesian, Red Friesian X and Sabah Sahiwal-Friesian. The Seladang and the Bali cattle classified as *Bos tarus* sub-species. The LID cattle and KK cattle are considered as indigenous breeds, whereas the Bali cattle were imported from Indonesia. The Selembu is the hybrid produced by crosses the cattle and the Seladang (Johari, 2007).

Breeds of buffalo (*Bubalus bubalis*) available in Malaysia are the River Buffalo (Murrah) and the Swamp buffalo (Kerbau Sawah). Breeds of sheep (*Ovis aries*) available are indigenous Malin and exotic breeds and their crosses such as Dorset X, Long Tail, Barbados Blackbelly, Dorsimal, Malin, Santa Inês, Morada Nova X, Suffolk X, Sussex X, Segurena X, Sufrimal and Southdown X. Breeds of goat (*Capra hircus*) available are the local Katjang, Boer, Saanen, Jamnapari, Alpine, Anglo Nubian, Australian Feral Goat, Kambing Gurun, Jermasia, German Fawn and Toggenburg (Johari, 2007).

The most common poultry in Malaysia is chicken, duck, geese, quail and turkey. The indigenous strains of chicken (*Gallus gallus*) are the Ayam Kampong, Ayam Hutan, Ayam Serama, Ayam Sabong and Ayam Sutera (Silky). Breeds of duck (*Anas platyrhyncha*) are Itik Jawa, Belibis, Khaki Campbell, Itik Kampong, Pekin, Muscovy, and Serati. An Indigenous geese in Malaysia is the Angsa Kampong. Breeds of quail are Bob White, Japanese Quail and Puyuh IKTA. Breeds of ostrich available in this country are Blue Neck and Black Neck. Breeds of turkey available are British United Turkey (BUT) and Bronze Turkey. Breeds of pig available are Duroc, Large White, Yorkshire, Landrace, Sarawakian Bearded Pig and South China Pig. Breeds of the horse are Kuda Padi, Arabs, Bimo Siam, Polo Horses, Miniature Horses, Saddlebred, Shetland Ponies, Quarter Horses and Thoroughbred. Breeds of deer available in Malaysia are Sambar, Axis, Timorensis, Red Deer and Sika (Johari, 2007).



The choice of livestock breeds is actually depends on the farmer's perspectives. Factors affecting farmer's choice on breeds such as economic consideration, profitability, environment and animal performance. Generally, there are two categories of livestock rearing operations which are purebred and commercial. The purebred operation needs more time, record keeping and initial input whereas commercial is normally a low input, lower risk type venture (Carole and Dyer, 2003).

1.2 Justification

This research was conducted to determine the farmers' perceptions on breeding practices and choice of breeds in Sandakan Sabah. The target of this study was not non-ruminant but ruminant only because the non-ruminant livestock such as poultry and pig had already reached their self-sufficiency level. The self-sufficiency level in the ruminant industry has not yet been reached and remains below 30% (MoA, 2005). This indicates that the policies might not ideal for the farmers. Although it may not be possible to formulate an ideal and perfect policy within a short period due to a shortage of infrastructure and institutions to implement it. However, we should, at least, have some common understanding on which breeds should be advocated and why, which type of breeding strategy should be followed in the country, to know the advantages and disadvantages of different breeding strategies, so that the government may give farmers some kind of services or incentives with some knowledge of the result of any breeding practice for long-term stable breed development in the country. Typically, the policy was formulated on the basis of recommendations of an advisory committee under consultations with experts and might not consider the opinion of the farmers. Hence, this study was to collect opinions from the bottom level, the farmers, so that the policy makers can reconsider some of the decisions on the basis of more specific information. In order to achieve the objectives, a data collection sheet was designed to investigate the 18 farmer's preferences on cattle and goat breeding practices and choice of breeds around Faculty of Sustainable Agriculture (FSA) UMS Sandakan Campus.



1.3 Objective

The objectives of this study were:

- i. To investigate the existing cattle and goat breeding practices in Sandakan, Sabah
- ii. To investigate the choice of cattle and goat breeds in Sandakan, Sabah.

1.4 Hypothesis

i) Null hypothesis : All farmers practising the same breeding practices.

Alternative hypothesis : All farmers not practising same breeding practices.

ii) Null hypothesis : All farmers reared same breeds of livestock.

Alternative hypothesis : All farmers not reared same breeds of livestock.

CHAPTER 2

LITERATURE REVIEW

This chapter reviewed the current status of livestock production, consumption, trade, breeding policy development, current types of breeding practices and available livestock breeds in Malaysia.

2.1 Importance of Livestock

The Malaysian livestock industry is a vital and integral component of the agricultural sector. It provides gainful employment and producing important animal protein food for the population in Malaysia (Irani *et al.*, 2001). Of the total GDP for agricultural production which comprising of agricultural, forestry and fisheries, of RM709.3 billion in the year 2011. It is estimated that RM11724.86 million (based on ex-farm values) was contributed by the livestock sector (Table 2.1 and 2.2).

Table 2.1 Statistics GDP Malaysia 2009-2012

Gross Domestic Product (at constant 2005 prices)	2009		2010		2011		2012 ^E	
	RM bil	%p.a	RM bil	%p.a	RM bil	%p.a	RM bil	%p.a.
	629.9	-1.5	674.9	7.2	709.3	5.2	743.5	4.5~5.0
Agriculture, forestry and fishing	50.1	0.1	51.3	2.4	54.3	5.9	54.6	0.6
Mining	66.4	-6.5	66.1	-0.4	62.3	-5.7	63.3	1.5
Manufacturing	152.2	-9.0	170.3	11.9	178.3	4.7	185.8	4.2
Construction	19.3	6.2	20.4	6.0	21.4	4.6	24.7	15.5
Services	335.0	2.9	359.2	7.2	384.3	7.0	405.5	5.5

E=Estimate

Source: Economic Planning Unit, Ministry of Finance and Bank Negara Malaysia, (2013)



Commodity	Year				
	2010	2011	2012	2013 ^P	2014 ^E
Beef	847.11	889.47	1031.76	1141.02	1246.70
Mutton	67.66	77.8	146.12	139.64	149.93
Pork	2073.62	2047.04	1968.86	2048.89	2110.94
Poultry Meat	5776.21	5949.50	6867.61	7413.53	7603.77
Eggs	2358.62	2614.35	3274.63	3872.77	4063.53
Milk	127.29	134.68	144.82	147.98	150.54
Raw Hides & Skins	11.45	12.02	12.26	12.36	12.39
Total	11261.96	11724.86	13446.06	14776.19	15337.80

P=Provisional E=Estimate

Source: Department of Veterinary Services (DVS) Livestock Statistics 2013/2014

2.2 Current Trend of Livestock Population

According to the report prepared by DVS (2011), the number of livestock has increased dramatically over the decades. The population of major livestock classes in Malaysia under the Ninth Malaysia Plan (2006 – 2010) is shown in Table 2.3.

Table 2.3 Population of Major Classes of Livestock under Ninth Malaysia Plan

Class of Livestock	Year				
	2006	2007	2008	2009	2010
Cattle	786,201	842,186	851,227	860,491	837,543
Buffalo	128,938	130,775	131,229	127,152	125,175
Goats	349,427	428,263	477,480	514,233	494,499
Sheep	116,387	125,988	131,278	136,285	123,349
Deer	16,033	12,659	14,894	14,612	13,862
Swine	2,029,119	2,020,117	1,988,889	1,831,308	1,880,309
Chicken	179,226,276	188,383,841	192,693,703	208,332,522	225,789,624
Duck	8,640,628	8,261,647	7,120,994	7,521,819	7,927,857

Source: Annual Livestock Statistics, Department of Veterinary Services Malaysia, 2011

2.3 Livestock Meat Production

The report prepared by the MoA (2014) had shown that the production of livestock meat was increasing each year except beef and buffalo meat production from the year 2008 to 2012. For example, the beef production was decreasing from 19,097 tonnes in 2008 to 10,593 tonnes in 2012 (Table 2.4).

Table 2.4 Livestock Meat Production (Tonnes) in Malaysia, 2008-2012

Meat Indigenous (tonnes)	2008	2009	2010	2011	2012
Chicken	996,870	1,001,659	1,083,030	1,231,908	1,249,836
Pork	200,107	195,072	206,032	235,609	231,242
Duck	123,492	124,485	123,191	125,195	128,136
Beef	19,097	14,914	9,141	6,823	10,593
Buffalo	4,074	4,082	3,991	3,991	3,991

Source: FAOSTAT Agricultural Production, February 2014

2.4 Self-sufficiency Level

In the previous study by Fatimah Mohamed Arshad *et al.* (2007), the livestock industry in Malaysia is divided into two main sectors which are the ruminant and non-ruminant sectors. The non-ruminant sector consists of poultry and swine which are well developed and heavy commercialized with modern technology and involvement of the private sector. However, the ruminant sector which composed of beef cattle, dairy cattle, beef buffaloes, dairy buffaloes, sheep, and goats are less developed as compared to the non-ruminant sector in term of technology and production. In spite of the encouraging progress made by the government in the recent years, it is still unable to produce adequate for domestic consumption. Table 2.5 shows the self-sufficiency levels (%) in livestock products (2000-2010).

Table 2.5 Self-sufficiency Levels (%) in Livestock Products, 2000-2010

Commodity	2000	2005	2010
Beef	15	23	28
Mutton	6	8	10
Poultry	113	121	122
Eggs	6	113	115
Pork	100	107	132
Milk	3	5	5

Source: Ministry of Agriculture (MoA), 2005

2.5 Livestock Consumption

Kaur (2010) had reported that livestock meat consumption in Malaysia has shown an increasing trend, and it is predicted to be increased at the rate of 2.4% annually (Table 2.6). In the year of 2014, the consumption of mutton has the most significant changes compared to the other meats which have increased 22.3%. This trend can also be observed in the per capita consumption (Table 2.7). The per capita consumption of mutton remained low at below one kg per annum before 2010. According to the study by Kaur in 2010, this situation is due to the misconception of that mutton is high in cholesterol and saturated fats.

Nor Amna Aliah and Mohamad Hifzan (2016) were found that the per capita consumption has increased to more than one kilogram per person in 2014. This phenomenon has shown that the Malaysian has begun to change their perception and started to consume mutton as part of their daily diet.

Table 2.6 Consumption of Beef, Mutton, Pork and Poultry in Peninsular Malaysia, 1960-2014

Year	Beef		Mutton		Pork		Poultry	
	MT	% changes	MT	% changes	MT	% changes	MT	% changes
1960	14,030	-	3,380	-	30,170	-	23,636	-
1970	14,935	6.45	4,147	22.69	59,760	98.08	61,080	158.42
1980	20,479	37.12	6,607	59.32	122,808	105.50	119,200	95.15
1990	50,874	148.42	7,283	10.32	150,093	22.22	296,327	148.60
2000	99,611	95.80	16,700	129.30	144,200	-3.93	948,500	220.09
2010	145,412	45.98	19,054	14.10	202,681	40.56	1,104,570	16.45
2011	158,111	8.73	19,042	-0.06	180,037	-11.17	1,102,210	-0.21
2012	168,192	6.38	23,239	22.04	178,824	-0.67	1,182,990	7.33
2013	184,202	9.52	27,299	17.47	178,444	-0.21	1,254,240	6.02
2014	190,201	3.26	33,390	22.31	181,880	1.93	1,286,260	2.55

Source: Department of Veterinary Services, Malaysia, 2015

Fatimah Mohamed Arshad *et al.* (2007) were found that the Malaysian has higher purchasing power as the country continues to develop and thus stimulate the consumption of beef, mutton and poultry meat. For instance, the per capita consumption of beef has increased from 3.65 kg in 1993 to 7.73 kg in 2013. 0.48 kg to 1.38 kg for mutton and 28.06 kg to 53.35 kg for poultry. However, the consumption of pork has declined from 10.19 kg in 1993 to 7.54 kg in 2014 (Table 2.7). The increase is due to the lower price of imported beef affiliated with the higher per capita income which has affected the household demand for beef.



Table 2.7 The Per Capita Consumption of Meat in Peninsular Malaysia (kg), 1993-2013

Product	1993	2003	2010	2011	2012	2013	2014
Beef	3.65	5.06	6.42	6.83	7.15	7.73	7.89
Mutton	0.48	0.75	0.82	0.82	0.99	1.15	1.38
Pork	10.19	7.83	8.87	8.63	7.6	7.49	7.54
Poultry	28.06	37.8	48.75	49.36	44.4	52.63	53.35
All meats	42.38	51.34	64.86	65.64	60.14	69	70.16

Source: Department of Veterinary Services, Malaysia, 2015

2.6 Livestock Trade

In the previous study by Fatimah Mohamed Arshad *et al.* (2007), the import of livestock is still high if compared to the total exports in Malaysia. In, 2007, import of beef was around 1,395.2 metric tons, swine was 307.7 metric tons and poultry was 6,438.2 metric tons (Table 2.8). In term of self-sufficiency level, Malaysia has reached its self-sufficiency level in poultry meat production and is able to export to other countries such as Singapore. However, Malaysia is still importing poultry from another country in the form of day-old chicks or parent stocks for breeding purposes.

Nor Amna Aliah and Mohamad Hifzan (2016) had claimed that Malaysia depends heavily on the importation of beef and mutton in order to meet the local demand in term of the ruminant sector (Table 2.9). In 2003, Malaysia imported 85,277.0 MT of beef and increased to 102,304.0 MT in 2007. The most imported meat is beef if compared to other meats. This is because the price of imported beef is cheaper than the local beef and there is a high demand from the Malaysian consumers. In 2003, the number of imported mutton has also increased from 10,707.0 MT to 16,303.4 MT in 2007.

Table 2.8 Export of Livestock Products in Peninsular Malaysia (Metric Tonnes), 2003-2007

Livestock products	2003	2004	2005	2006	2007
Beef	1,302.0	1,594.0	1,496.6	1,568.1	1,395.2
Mutton	-	11.1	33.6	18.1	-
Pork	56.6	170.7	212.1	2,091.7	307.7
Poultry Meat (Processed)	14,135.4	10,264.0	4,321.6	5,122.1	6,438.2

Source: Department of Veterinary Services, Malaysia, 2007



Table 2.9 Import of Livestock Products in Peninsular Malaysia (Metric Tonnes), 2003-2007

Livestock Products	2003	2004	2005	2006	2007
Beef	85,277.0	116,944.0	113,797.0	105,786.3	102,304.0
Mutton	10,707.0	13,365.0	13,922.7	15,094.5	16,303.4
Pork	1,368.9	1,819.2	2,359.7	3,087.9	3,139.3
Poultry Meat (Processed)	20,654.5	2,163.0	3,583.2	2,262.8	17,528.7

Source: Department of Veterinary Services, Malaysia, 2007

2.7 Breeding Policy Development

DVS (2013b) had reported that the DVS had organized the First Meeting of the Committee on Cattle Breeding Policy in Port Dickson in April 1980. This meeting was participated by experts from the University of Malaya, University Pertanian Malaysia, MARDI (Malaysian Agricultural Research and Development Institute), MAJUTERNAK and the Department of Veterinary Services. During that time, the committee had come up with recommendations on the breeding of dairy cattle, beef cattle, and buffaloes. In July 1986, there was a second meeting attended by the same committee. At that time, this committee acted as an instrumental role in addressing issues on the breeding of cattle and buffaloes. However, the solutions proposed could not be fully implemented during that time because of the limited resources which did not support a comprehensive policy.

2.8 Breeding Policy

The breeding policy is outlined for dairy cattle, beef cattle, buffalo, goats, sheep, and deer.

2.8.1 Dairy Cattle

From the report prepared by DVS (2003), it had shown that, in the early part of the twentieth century, the dairy industry in Malaysia was initiated using Local Indian Dairy (LID) animals. These animals were found to produce good quality milk in terms of solids non-fat (SNF %) and fat % but were poor in terms of milk volume. In the 1950's, Sindhi and later Sahiwal sires from India and Pakistan were used to crossbreed with the LID to increase the productivity. The lactational performance of crossbreds was a little better than the LID. In early 1970's, crossbreeding LID with European dairy

breeds was bred and this produced crossbreds show considerable hybrid vigor. The government thus wanted to organize breeding of cattle by disseminate relatively superior crossbred bulls and by giving artificial insemination service. Since 1978, the government also imported large numbers of crossbred Sahiwal x *Bos taurus* cattle from Australia and New Zealand with the aim of providing farmers with dairy-type animals in the shortest possible time and increasing the crossbred breeding population. The recommended way to increase the performance of dairy animals was to crossbreed Zebu with *Bos taurus*, the way ahead was still not clear especially in terms of:

- Breed or breeds of *Bos taurus* to use in the crossbreeding.
- Mating program to follow to maximize dairy animal performance

The first meeting of the committee for the development of policy and systems of breeding for cattle was held at Port Dickson in April 1980. The committee made the following resolutions:

- At least 70% of available animals for crossbreeding should be bred to Friesian.
- *Inter se* mating of F1 animals to be undertaken at the smallholder level to maintain 50% temperate blood level and criss-cross breeding in government farms and selected smallholder areas where breeding can be controlled to have animals at 62.5% temperate blood level.
- A parallel breeding plan for LID's - a pure LID line to be kept by governmental institutions or agencies for long-term selection and as a future base for crossbreeding where necessary.

DVS (2003) also stated that there have been some refinements to these 1980 breeding proposals. Firstly, the aim of the breeding program for dairy animals was documented at the second meeting of the National Cattle Breeding Committee in 1986. The aim is to develop animals which produce milk and meat economically in a hot and humid tropical environment. Secondly, the reduction in lactation performance, 39.0% drop in milk yield from the F1 to the F2 animals (Sivarajasingam and Kumar, 1989) and the failure of 60-70% of F2 animals to milk on the machine, led policy makers to recommend a higher proportion of Friesian inheritance in dairy crossbreds. The recommended proportion of Friesian inheritance in dairy crossbreds is 60-75%. Imported semen used only in the early part of the breeding program included Holstein, Red Holstein, AFS (Australian Friesian Sahiwal), AMZ (Australian Milking Zebu), Kenyan

REFERENCES

- Abdinasir, I. B. 2000. *Smallholder Dairy Production and Dairy Technology Adoption in the Mixed Farming System in Arsi Highland, Ethiopia*. PhD Thesis. Humboldt University of Berlin, Department of Animal Breeding in the Tropics and Subtropics. Germany
- Alexandre, G., Leimbacher, F., Maurice, O., Domarin, D., Naves, M. and Mandonnet, N. 2009. Goat Farming Systems in Martinique: Management and Breeding Strategies. *Tropical Animal Health and Production* **41(4)**: 635–644
- Ariff, O.M., Hifzan, R.M., Zuki, A.B.M., Jiken, A.J. and Lehan, S.M. 2010. Maturing Pattern for Body Weight, Body Length and Height at Withers of Jamnapari and Boer Goats. *J. Trop. Agric. Sci.* **33(2)**: 269–276
- Azage, T., Lahlou-Kassi, A. and Mukassa Mugrwa, E. 1995. Biotechnology in Animal Production. Development Opportunities in Livestock Agriculture. *Proceedings of the Second Annual Conference of the Ethiopian Society of Animal Production*, 26–27 May, 1993, Addis Ababa, Ethiopia. 49–80
- Bebe, B. O., Udo, H. M. J., Rowlands, G. J. and Thorpe, W. 2003. Smallholder Dairy Systems in the Kenya Highlands: Breed Preferences and Breeding Practices. *Livestock Production Science* **82(2-3)**, 117–127
- Carole, H.K. and Dyer, T.G. 2003. Selecting a Beef Breed. <http://extension.uga.edu/publications/detail.cfm?number=C859>. Access on 20 November 2016. Verified on 23 November 2016
- DVS. 2003. First Report on the State of the World 's Animal Genetic Resources Animal Genetic Resources in Malaysia. Department of Veterinary Services Malaysia
- DVS. 2007. Livestock Statistics 2007. Department of Veterinary Services Malaysia
- DVS. 2011. Annual Livestock Statistics, Department of Veterinary Services Malaysia
- DVS. 2013a. Livestock Statistics 2013/2014. Department of Veterinary Services Malaysia
- DVS. 2013b. Malaysian Livestock Breeding Policy. Department of Veterinary Services Malaysia, 1-42
- DVS. 2015. Livestock Statistics 2014. Department of Veterinary Services Malaysia
- EPU, 2013. *The Malaysian Economy in Figures*. Economic Planning Unit, Prime Minister Department. Retrieved from <http://www.epu.gov.my>
- Eli, N., Khong, K.W. and Oming, M. 2002. Regulation of Livestock Farming in Sabah: Issues and Challenges. <http://ww2.sabah.gov.my/jpas/news/SITE/SITEppr12.pdf>. Access on 19 November 2016. Verified on 23 November 2016
- ESGPIP. 2010. Chapter six: Genetic Improvement of Sheep and Goats. <http://www.esgpip.org/handbook/Chapter6.html>. Access on 15 November 2016. Verified on 23 November 2016
- FAO. 1990. Strategies for Effective Extension Services to Guide the Advancement of Animal Agriculture in Developing Countries. FAO
- FAO. 1999. Chapter 7: Preventing Inbreeding Depression and Loss of Genetic Variance in Hatchery Populations. FAO
- FAOSTAT. 2014. Agricultural Production – Malaysia. FAOSTAT
- Fatimah Mohamed Arshad, Nik Mustapha Raja Abdullah, Bisant Kaur and Amin Mahir Abdullah. 2007. 50 Years of Malaysian Agriculture: Transformational Issues, Challenges and Direction. Universiti Putra Malaysia Press. 553-584
- Field, J. and Anderson, N. 1997. Beef Breeding Season Management. [http://www.omafra.gov.on.ca/english/livestock/beef/facts/85-054.htm#Bull to Cow Ratio](http://www.omafra.gov.on.ca/english/livestock/beef/facts/85-054.htm#Bull%20to%20Cow%20Ratio). Access on 3 November 2016. Verified on 23 November 2016



- Flanders, F.B. and Gillespie, J.R. 2015. 9th Edition: Modern Livestock and Poultry Production. Published by Cengage Learning
- Frommen, J.G., Luz, C., Mazzi, D. and Bakker, T.C.M. 2007. Inbreeding Depression Affects Fertilization Success and Survival But Not Breeding Coloration in Threespine Sticklebacks. Published by Koninklijke Brill NV, Leiden. *Behaviour* 145, 425-441
- Georgoudis, A., Rosati, A. and Mosooni, C. 2005. Animal Production and Natural Resources Utilisation in the Mediterranean Mountain Areas. Wageningen Academic Publishers The Netherlands
- Gimenez, D. and Rodning, S. 2007. Reproductive Management of Sheep and Goats. Alabama A&M and Auburn Universities. <http://www.aces.edu/pubs/docs/A/ANR-1316/ANR-1316.pdf>. Access on 4 November 2016. Verified on 23 November 2016
- Hailemariam, M. and Kassamersha, H. 1994. Genetic and Environmental Effects on Age at First Calving and Calving Interval of Naturally Bred Boran (Zebu) Cows in Ethiopia. *Animal Production* 58: 329-334
- Hashim, F. A. H. 2013. Strategies to Strengthen Livestock Industry in Malaysia, *Journal of Economic and Social Science Research Centre* 512: 1-4
- IAEA. 2003. Artificial Insemination (AI) of Cattle. <http://www-naweb.iaea.org/nafa/aph/resources/technology-ai.html>. Access on 3 April 2016. Verified on 23 November 2016
- Irani, T., Siwar, C., Hossain, M. A. and Vijian, P. 2001. Situation of Agriculture in Malaysia - A Cause for Concern. *September 2001 Edition*. Education and Research Association for Consumers, Malaysia
- Johari, J. A. 2007. Conservation and Utilization of Animal Genetic Resources in Malaysia, Strategic Livestock Research Center, May 2007, 67-72
- Kaur, B. 2010. Consumer Preference for Goat Meat in Malaysia: Market Opportunities and Potential. *Journal of Agribusiness Marketing* 3(20): 40-55
- Loh, T. C. 2002. Livestock Production and the Feed Industry in Malaysia. Food and Agriculture Organization of the United Nations Rome. *Protein Sources For The Animal Feed Industry- Expert Consultation and Workshop Bangkok*, 29 April - 3 May 2002
- Kebede, T., Haile, A. and Dadi, H. 2012. Smallholder Goat Breeding and Flock Management Practices in the Central Rift Valley of Ethiopia. *Journal of Animal Health and Production* 44(5)
- Khandoker, M.A.M.Y, Apu, A.S, Husain, S.S. and Notter, D.R. 2011. A Baseline Survey on the Availability of Black Bengal Breeding Bucks in Different Districts of Bangladesh. *Journal of J. Bangladesh Agril. Univ* 9(1): 91-96
- Khatun, M., Kaur, S., Kanchan and Mukhopadhyay, C.S. 2013. Subfertility Problems Leading to Disposal of Breeding Bulls. *Journal of Asian-Australas J Animal Science*. 26(3): 303-308
- KPD. 2005. Boer Breeding Project. <http://ww2.sabah.gov.my/kpd/eng/1boergoatbreedingproject.html>. Access on 17 November 2016. Verified on 23 November 2016
- Leo, T.K., Leslie, S.S., Ebrahimi, M., Aghwan, Z.A., Panandam, J.M., Alimon, A.R., Karsani, S.A. and Sazili, A.Q. 2012. An Evaluation on Growth Performance and Carcass Characteristics of Integration (Oil Palm Plantation) and Feedlot Finished Bali Cattle. *Journal of Animal and Veterinary Advances* 11(18): 3427-3430
- Lindell, I.C. 2013. *Phenotyping of Bali Cattle and Interviewing Farmers in Indonesia - A Minor Field Study*. Bachelor of Animal Science. Swedish University of Agricultural Sciences
- MoA. 2005. Livestock Statistics. DVS, Kuala Lumpur. MoA
- MoA. 2012. National Agrofood Policy 2011 -2020. Strategic Planning and International



- Division, Ministry of Agriculture and Agro-based Industry Malaysia. MoA
 MoA. 2014. Market overview: Malaysia. Her Majesty the Queen in Right of Canada.
 MoA
- Naidoo, G., Hulman, B. and Preston, R. T. 1981. Effect of Artificial Insemination or Natural Mating on Calving Interval in Dual Purpose Herd. *Tropical Animal Production and Health* **6**: 2
- Najim, A., Amin, M. R., Karimand, S. M. R. and Mei, S. J. 2015. Smallholder Cattle Farming in East Coast Economic Region (ECER), Malaysia : Farmers ' Perception on Type , Breed and Crosses, *Journal of Dynamics in Agricultural Reseach Vol. 2(4)* 40–45
- Nor Amna Aliah Mohammad Nor and Mohamad Hifzan Rosali. 2016. The Development and Future Direction of Malaysia ' s Livestock Industry, 1–7. http://ap.ffa.org/ap_db.php?id=529&print=1. Access on 10 June 2016. Verified on 23 November 2016
- Sahar, N. and Chamhuri, N. 2016. Agricultural Policies Effect on Livestock Industry - Perspectives from Malaysia and New Zealand. *International Journal of Agriculture, Forestry and Plantation Vol. 2*: 77–83
- Sivarajasingam S. and Kumar R.A. 1989. Distribution and Production Characteristics of Friesian Crossbred Cattle in Malaysia. *MARDI Res. J.* **17(1)**:91-106
- Tamil Nadu Agricultural University. 2012. Breeding Management of Sheep and Goat. http://agritech.tnau.ac.in/expert_system/sheepgoat/Breeding%20Management%20of%20Sheep%20and%20Goat.html. Access on 15 November 2016. Verified on 23 November 2016
- Wattiaux, M. A. 1998. Heat Detection, Natural Service and Artificial Insemination. *Reproduction and Genetic Selection*. Babcock Institute for International Dairy Research and Development
- Winder, J. 1999. Get Bull Management Problems Under Control. <http://www.noble.org/ag/livestock/bullmgt/>. Access on 16 November 2016. Verified on 23 November 2016

