Examining the Relationship between Ranchers' Demographic Profile and Success of Small Ruminant Farming

Melissa Alina Yusoff[1]*, Norsida Mana[1,2] and Nolila Mohd Nawi[1]

[1]*Department of Agribusiness and Bioresource Economics, Faculty of Agriculture,
Universiti Putra Malaysia (UPM), 43400 Serdang, Selangor, Malaysia*
[2]*Department of Agriculture Technology, Faculty of Agriculture, Universiti Putra Malaysia (UPM),
43400 Serdang, Selangor, Malaysia*

ABSTRACT

Small ruminant (goat and sheep) farming is one of the emerging farming sectors that has a lot of potential that waits to be developed. It is constantly supported by various Malaysian government agencies in order to increase the self-sufficiency level of ruminant food. Several factors directly influence ranch farming and could contribute to the marginal profits. Hence, some ranchers are successful, while other ranchers facing similar circumstances are not. Therefore, the aim of this study is to determine the relationship between ranchers' demographic profile and the factors that contribute to success in small ruminant farming. The primary data was collected via face-to-face interviews using a well-structured questionnaire. The collected data were analysed using both descriptive and chi-square analysis. The results showed that age, marital status, educational attainment and level of experience have a significant relationship with the factors of success in this type of farming. The Department of Veterinary Services as the agency responsible for this type of farming needs to take action and make the necessary improvements, taking into consideration the ranchers' demographic profile, especially their age, marital status, educational attainment and level of experience in order to design training and innovative farm visits, among other initiatives. This will enable ranchers to reach higher levels of success in small ruminant farming. This in turn will enhance and boost the livelihood activities of the ranchers and subsequently develop the small ruminant industry in Malaysia.

Keywords: Critical success factor, demographic profile, farming, goat, sheep

INTRODUCTION

Small ruminant farming is an important sector of the livestock industry in Malaysia. In terms of self-sufficiency level (SSL) comparison, the chicken industry (121.39%) leads, followed by the egg industry (113.79%) and the cattle industry (24.88%). However, self-sufficiency of small ruminant production in 2016 was only at 10.77% (Department of Veterinary Services [DVS], 2017a). The development of ruminants, especially small ruminants, was quite slow compared with that of non-ruminants such as pigs and poultry. The development of pig farming and poultry has been ongoing since the 1960s (DVS, 2017b; Hashim, 2015). However, the Malaysian small ruminant industry is becoming more important and significant in encouraging the economic growth of the country. In the third National Agriculture Policy (NAP), the government gave more importance to fresh beef, mutton and milk production for the domestic market (Ministry of Agriculture, n. d.). The small ruminant has a very strong market among the Malay population during festivals i.e. *Aqiqah* and *Qurban*. The Indian population is also a sizeable market for small ruminant products (Melissa, Norsida, & Nolila, 2016). Nevertheless, the live population of small ruminants in Malaysia was only at 592,853 heads in 2016 and unable to meet market demand (DVS, 2017c). Therefore, Malaysia depends on the import of small ruminants from countries like Australia, New Zealand, Indonesia, South Africa and Thailand. Malaysia needs to increase the production and total population of small ruminants in order to increase their self-sufficiency level and meet local market demand. Ranchers face several problems in producing small ruminants, namely lack of high quality breeds that can adapt to our climate, high cost of feed, lack of knowledge and a skill gap among the ranchers (Sithambaram & Hassan, 2014). Traditionally, small ruminant husbandry was considered a complementary livelihood activity of smallholder farmers (Devendra, 2006). Hence, this study encourages ranchers to step up their farming activities and to move into commercial farming to boost their production (Ministry of Agriculture and Agro-Based Industry [MOA], 2011).

Factors that impact small ruminant farming include business planning, management and prevention of diseases, neighbourhood relations, support from family members and friends, labour, feed sources, facilities, infrastructure and livestock area, stock and breed, veterinary services, price and market, government support and policy and production system (Abdolmaleky, 2012; Benoit & Laignel, 2010; Devendra, 2006; De Vries, 2008; Huirne, Harsh, & Dijkhuizen, 1997; Kosgey, Baker, Udo, & Van Arendonk, 2006). These factors are among other issues that directly influence ranch farming and contribute to marginal profits. Hence, some ranchers are successful, while others facing similar circumstances are not (Rozhan, 2015). However, in Malaysia, there is insufficient information about the real factors and problems, especially those related to growth and development of this industry. Therefore,

the objective of this study was to determine the relationship between the ranchers' demographic profile and the factors of success in small ruminant farming. This study was expected to provide better understanding and knowledge to livestock extension agents (EAs), policy-makers and researchers of the current practices used by small ruminant ranchers in Malaysia. The study also aimed to encourage ranchers to shift from their present status of farming to commercial farming and to step up their farming production with an increase in the self-sufficiency level of small ruminants in Malaysia.

Literature Review

Small ruminant production is mainly affected by internal and external factors. Both sets of factors are interrelated and must be in optimal conditions to facilitate favourable and optimal impact on the efficiency and performance of livestock. Internal factors affect the ability of genetic influences and usually have certain limitations. External factors include a non-genetic preservation system, which includes management, nutrition, housing and health (Kosgey, 2006). In addition, the preservation of a place is also closely linked with environmental climate, natural vegetation and the socioeconomic area. Therefore, livestock with high genetic ability will not show the actual ability of a poor environment (De Vries, 2008). The important factors that impact small ruminant farming are business planning in projects, labour, feed sources, breeding, location

and infrastructure, technical skill and knowledge, veterinary services extension, marketing and prices, government support and policies, production system, disease management and prevention, neighbourhood relationships and support from friends and family (Abdolmaleky, 2012; Benoit & Laignel, 2010; Devendra, 2006; Huirne et al., 1997).

Business planning is an important part of owning and managing a farm (Nelson, 2003), while a proper business plan serves as a map (Crow & Goldstein, 2003; Kime, 2004). A good business plan is an important tool that has a sound strategy before proceeding to adopt and implement the plan (Honig & Karlsson, 2004). Furthermore, the development of a strategic direction is one of the crucial steps for business planning that directly influences the knowledge and capability of the management team, staff and advisors and enhances improvements in the right direction for the organisation to lead a better chance for success (Honig & Karlsson, 2004).

The importance of labour for this type of farming cannot be overemphasised. It depends largely on the agricultural systems of an area. The division of labour between gender and age in rural systems differs from agro-rural systems and mixed crop-livestock farming systems (Tangka, Jabbar, & Shapiro, 2000). Gurung, Tulachan and Gauchan (2005) in their study on variation in livestock farming management found that women spent more time on various livestock raising activities by participating in tasks such as collecting of folders, milking,

feeding and cleaning of animal sheds with occasional and limited support from men, depending on the crop production season, which takes away the women's time.

Feed provided to small ruminants can be categorised into two different groups: roughage and concentrates. Roughage is high in fibre (18% crude fibre or more). Fibre adds bulk to goats' diet and keeps their digestive tract working well. Fibre has a laxative effect. It can also influence the butterfat content of a doe's milk. Diets that are high in fibre tend to increase butterfat content, resulting in creamy milk, while low fibre diets decrease butterfat content. Most roughage is forage, that is, it comes from the green vegetative parts of the plant. An example is the blade of grasses. Forage tends to be low in energy. In contrast, concentrates are low in fibre and high in either energy or protein. They often come from the seeds of a plant. Examples of concentrates include corn, oats, brewers' grains and soybeans. Chandrawathani et al. (2006) stated that daily feeding of neem leaves can control worm infestation in small ruminants. Home remnants and grasses (grazing) are used by ranchers to feed their animals. Most of the farms practise semi-intensive management and need to avoid morning grazing, which is one of the causes for high nematode infestation in the animals. Therefore, grazing management is imperative in monitoring nematode and worm infestation in small ruminants (Khadijah et al., 2014; Mursyidah, Khadijah, & Rita, 2017; Sani & Rajamanickam, 1990). Adesehinwa, Okunola and Adewumi

(2004) reported that feed affects livestock production significantly. Feed cost, which has a large influence on the performance of the enterprise, results in either a loss or small profit. Natural pastures and agricultural by-products are the main feed resources for goat production.

Building is an important component of infrastructure that is needed for small ruminant farms, especially in tropical areas where the animals spend most of their time grazing or live all the time in confinement. Building infrastructure is very important for the wellbeing of ruminants, particularly young ruminants, and thus, for overall flock performance and productivity.

There are two main aspects regarding the breeding of small ruminants i.e. the breeds themselves and the breeding system. Being very popular domestic animals everywhere and having been domesticated for thousands of years now (>12,000 years), there are hundreds of breeds of sheep and goats in the world, mainly in Europe and Asia (Iñiguez, 2005; Iñiguez & Mueller, 2008). However, in the tropical areas of the Caribbean and Latin America, there are only a few breeds of each species (Devendra & Burns, 1983; Fitzhugh & Bradford, 1983).

Veterinary services are considered the most important factor in the husbandry of small ruminants. These services provide practical extension activities among ranchers (De Vries, 2008). According to Adesehinwa et al. (2004), the availability of extension activities of veterinary services significantly impact on goat and sheep husbandry through visits of extension agents

as such visits enhance their productivity. They also disseminate information and provide advisory services among the farmers on the sources of input and credit facilities required to optimise their production (Adesehinwa et al., 2004). In Malaysia, the Department of Veterinary Services under the Ministry of Agriculture and Agro-Based Industry is one of the government agencies responsible for providing veterinary services that support the development and growth of the small ruminant industry (Mohd Nor, Mustapa, Abu Hassan, & Chang, 2003). A good relationship between small ruminant ranchers and the Department of Veterinary Services is an important factor for ensuring the successful development of the small ruminant industry.

Technical skills and knowledge required by ranchers are essential for farm management and its operations. Training and farmer education are mostly related to common practices, farm management, feed sources, marketing and utilisation of the animals' manure for composting and other purposes. Some farmers have basic information and knowledge of animal husbandry, but what they possess is not sufficient or proficient enough for successful farming. There are several related practices that require higher proficiency, and farmers need to acquire these proficiencies. Such practices include maintaining animal health and treating diseases, advance breeding and increasing the productivity of the animals. All these ought to be taught and strengthened until farmers become proficient in these skills. However, the best and proper way

to train ranchers is through information sharing among the farmers themselves, where the farmers 'teach' one another in a kind of mentor-mentee programme. The ranchers can visit nearby model farms that are doing well to see first-hand what practices and activities they can adopt for use on their own farms. In addition, these regular meetings between the members in associations or groups are also possible opportunities for sharing best practices and addressing potential challenges.

The demand for small ruminant meat in the market is still a great issue and it needs to be improved upon through a proper supply mechanism. The demand for meat in the market and its price are unstable, largely unpredictable and not well organised. The meat market for small ruminants has no established standards that can be helpful for the adequate supply of this meat.

Government policies directly focus on national herd population rather than on growth (Agyemang, 1997). The government needs to consider support for the development of small ruminant farming including giving subsidies for building farm houses, production of feed, veterinary services, extension services and introduction of more breeding centres. In addition, the government supports this industry by preparing proposals that can be directly addressed and that are responsible for facilitating the growth of the small ruminant industry. There is a need for ideas and concepts from the ranchers that could be included in decision-making at the national management level. Research into

small ruminants has progressed vibrantly in recent years, providing dependable solutions to the numerous problems that have been highlighted at the level of production and in the different subdivisions. Many countries have several associations looking into enhancement of their research and development sectors.

The major production systems of small ruminant farming can be categorised into three types of farming based on the feeding and management methods i.e. the extensive, intensive and semi-intensive systems. Each system has its own strengths and weaknesses (Devendra, 2006; Devendra, Thomas, Jabbar, & Zerbini, 2000; Umunna, Olafadehan, & Arowona, 2014). A successful breeding production programme must have an expected output, including set goals and aims geared at facilitating the growth of the market towards rationalisation of the producer's investment, while successful implementation of technology depends on its compatibility with the demands of the farmer for a production system that is comparatively simple and cheap and accommodates fewer risks. An important aspect is the thorough assessment of the production system, which comprises the producer at different stages in the planning and operation of the breeding programme while assimilating traditional attitude and values. Moreover, it should be kept in mind that with breeding programmes, like any other programme that comes with high risk, there may be a chance of failure or success. However, we should expect some failure along the way as being natural instead of setting unrealistic achievements for success

that in the long run may be detrimental to the development of the industry (Kosgey et al., 2006).

The relationship with neighbours is an important factor for the success of this type of farming. Relationships should be in such a way that neighbours will not be disturbed. The small ruminant project would be successful if the farm is able to contain the odour that comes from such farming so that neighbours living close by will not be faced with a problem. The farm also has to ensure that these animals will not intrude into the neighborhood. The importance of this farm should be explained to the neighbours while ensuring their understanding of the needs. There should be enforcement of social responsibility, which ought to be highlighted to communities where livestock is maintained in the neighbourhood. The high cooperation and support of the neighbourhood enhances and facilitates the success of the ranch. In addition, small ruminant farms should be sheltered from rain, wind and excessive heat and cold (Adams & Ohene-Yankyera, 2014).

Livestock disease management is one of the biggest issues globally along with huge amounts of agricultural product trade, human travel and the realisation that many diseases pose a threat to livestock, wildlife and humans (Wolf, 2005). Disease and insufficient nutrition in terms of quality or quantity constitute serious constraints to small ruminant production (Tadesse, 2012). However, disease can be reduced or decreased using modern and traditional methods (Mursyidah et al., 2017; Chandrawathani et al., 2006). Public policy

involvement in livestock disease planning can directly influence producers' decisions. In Malaysia, the Department of Veterinary Services is the responsible agency for preventing, controlling and eradicating animal and zoonotic diseases (Mohd Nor et al., 2003).

Several research studies have been conducted on small ruminant farming such as Huirne et al. (1997) and Kosgey et al. (2008). Huirne et al. (1997) in their research used a well-structured questionnaire. The study was analysed using descriptive statistical analysis, chi-square ($\chi2$), t-tests and factor analysis. Similarly, Kosgey et al. (2008) used the well-structured questionnaire approach to gather the required data. Data were analysed using descriptive analysis, chi-square ($\chi2$), t-tests and the logit regression model. They reported that over 98% of the farmers surveyed had found incidence of disease, while over 95% of the farmers fed supplements in both dry and wet seasons.

METHODS

The data for this study were collected using a survey of 600 ranchers in Peninsular Malaysia. Three districts ranked as having the highest number of ranchers in Kelantan, Terengganu, Pahang, Johor, Negeri Sembilan, Melaka, Selangor, Perak and Pulau Pinang were selected for this study. However, in Kedah two districts and in Perlis one district ranked as having the highest number of ranchers were selected. These districts were chosen for the survey

because of their positive economic growth through the development of small ruminant farming (Table 1).

Table 1
List of study areas and the number of respondents

State	District	Number of Respondents
Kelantan	Kota Bharu	20
	Pasir Mas	20
	Bachok	20
Terengganu	Kuala Terengganu	20
	Marang	20
	Setiu	20
Pahang	Kuantan	20
	Bera	20
	Maran	20
Johor	Kluang	20
	Segamat	20
	Batu Pahat	20
Melaka	Melaka Tengah	20
	Jasin	20
	Alor Gajah	20
Negeri Sembilan	Seremban	20
	Jempol	20
	Kuala Pilah	20
Selangor	Kuala Selangor	20
	Kuala Langat	20
	Hulu Langat	20
Perak	Kinta	20
	Hilir Perak	20
	Larut,Matang, Selama	20
Pulau Pinang	Prai Utara	20
	Prai Tengah	20
	Prai Selatan	20
Kedah	Alor Star	20
	Kubang Pasu	20
Perlis	Kangar	20
Total		600

The study also identified the categories of ranchers. The main reason for categorisation was to capture all categories of ranchers who were available and operating in Malaysia. A total of 20 ranchers were selected from each of the districts (Table 1). The random sampling technique was employed for this study. The survey method was used to gather the data through face-to-face interviews using a well-structured questionnaire that was divided in the following way:

Part A: Demographic profile

Part B: Farm profile

Part C: Factor influence, and

Part D: Other factors of influence.

For this article, Part A and Part B were included. Descriptive statistical analysis and the chi-square analytical technique were employed to analyse and describe the data to arrive at dependable conclusions about the phenomenon represented by the information.

Chi-square analysis is one of the simplest methods for describing relationships by means of cross-tabulation. It is an inferential set of statistics that is typically used to analyse the association between two variables (Field, 2009). The main target of the research was the association among the variables that directly impacted the factors for the ranchers' success. The subsequent hypotheses were developed based on the review of literature to determine the affiliation between the demographic factors and the perception of the factors of success

for the various individual characteristics. The study tested the following hypotheses:

The null hypothesis

$$H_0 : \quad \beta_0 = \beta_1 = \beta_2 = \ldots\ldots = \beta_p = 0$$

The alternative hypothesis

$$H_A: \quad \beta_1 \neq 0 \text{ for at least one i}$$
$$i = 1, 2, \ldots\ldots, p$$

The null hypothesis (H_0) showed that there was no significant influence between the dependent mutable (perception of factors of success) and the independent mutable (age, race, experience, education level, farm size and income), while the alternative hypothesis (H_A) showed that there was a significant influence or relationship between the dependent variable and the independent variables.

Hypothesis:

H_o: There is no significant relationship between ranchers' perception of factors of success and demographic factors.

H_A: There is a significant relationship between ranchers' perception of factors of success and demographic factors.

However, there were a few limitations to the chi-square test where it was sensitive to the sample size. In this case, the results of the study may be argued in terms of its significant level due to the large sample size. Besides that, chi-square only indicates that two variables are related to one another and

does not necessarily imply that one variable has any causal effect on the other.

RESULTS AND DISCUSSION

Descriptive statistical analysis was carried out, where frequency counts, percentages of data and interpretation of the demographic profile of respondents were easy to comprehend. It was used to describe the sample population of the study. Normally, each category in the demographic and socio-economic profile was assumed to have impacted the factors of success in small ruminant farming.

Demographic Profile of Respondents

In this section, outcomes on the ranchers' socio-economic status are presented. The socio-economic profile of the ranchers included age, gender, religion, marital status, educational level, family involvement in farming, levels of farming experience and year started. Table 2 shows the distribution of respondents using frequency counts and percentages. The majority of the respondents, numbering 368 (61.3%), involved in small ruminant farming were above the age of 40 years, while 129 (21.5%) were between 31 and 40 years old and 103 (17.2%) were 30 years and below, making the average age of the respondents 45.32 years old. The majority of the respondents involved in small ruminant farming were males 557 (92.8%), while females numbered only 43 (7.2%). Due to the drudgery of small ruminant husbandry, this type of farming seems more popular among males. This

is supported by the findings of Chah, Obi and Ndofor-Foleng (2013), who reported that the majority of their respondents, who were engaged in small ruminant husbandry, were males. The majority of the respondents were Muslims, numbering 549 (91.5%), followed by Hindus, numbering 33 (5.5%), Buddhists, numbering 13 (2.2%) and Christians, numbering 5 (0.8%). The majority of consumers of small ruminant products in Malaysia are Muslims, who use small ruminants for religious ritual during festivals such as *Qurban* and *Aqiqah*. The majority of the respondents were married, numbering 502 (86.7%), while 89 (14.8%) were single and only nine (1.5%) were widows/widowers. It has been suggested that business is mostly driven by married people because of the family support they enjoy. This finding was supported by Chah et al. (2013), who stated that many of the ranchers in their study were married and involved in traditional farming i.e. raising food production along with tree crop production, while the women were involved in food processing and marketing.

The majority of the respondents in this study had secondary education, numbering 353 (58.8%), followed by 133 (22.2%) who had tertiary education, 107 (17.8%) who had primary education and only seven (1.2%) who were illiterate. Table 2 shows that the majority of the respondents had received some form of education, suggesting that communication of knowledge and innovations in small ruminant farming could be done effectively.

Table 2
Demographic profiles of respondents involved in small ruminant farming

Variables	Parameter	Frequency	(%)
Age	≥30 years	103	17.2
	31-40 years	129	21.5
	41-50 years	141	23.5
	51-60 years	135	22.5
	≥61 years	92	15.3
	Means	45.32	
Gender	Male	557	92.8
	Female	43	7.2
Religion	Muslim	549	91.5
	Christian	5	0.8
	Buddhist	13	2.2
	Hindus	33	5.5
Marital status	Married	502	86.7
	Single	89	14.8
	Widow/Widower	9	1.5
Education qualification	Illiterate	7	1.2
	Primary	107	17.8
	Secondary	353	58.8
	Tertiary	133	22.2
	0	77	12.9
Number of family members involved	1-2 members	407	67.8
	3-4 members	93	15.5
	5-6 members	18	3.0
	7-8 members	3	0.5
	≥9 members	2	0.3
	4-5 years	216	36.0
	6-10 years	226	37.7
	11-15 years	73	12.2
Experience	16-20 years	54	9.0
	21-25 years	7	1.2
	≥26 years	24	4.0
	Means	9.60	

It was believed that those involved in small ruminant farming would likely have minimal or no education (Table 2), but Chah et al. (2013) and Harris (2011) stated the most of small ruminant ranchers were able to understand the requirements of this type of farming and could handle the problems such as disease and other related issues.

The majority of the respondents, numbering 407 (67.8%), had one to two family members involved in the work. Another 93 (15.5%) had three to four members involved in the work, while 18 (3.0%) respondents had five to six family members involved in the work. Three (0.5%) of the respondents had seven to eight family members involved in the work and two (0.3%) had nine or more family members involved in the work. On the other hand, 77 (12.9%) respondents stated that they did not have family members engaged in small ruminant husbandry. This finding was supported by Chah et al. (2013), who found a high number of respondents with family members involved in small ruminant farming. This encouraging fact may have been due to support from the family for income generation.

The majority of the respondents, numbering 442 (73.6%), had between four and 10 years of experience in small ruminant farming, while about 134 (22.3%) had more than 10 years of experience. According to the Department of Veterinary Services, researchers need to collect data from respondents who have more than four years of experience to show the factors of success of small ruminant farming. Seven respondents (1.2%) had between 21 and 25 years of experience in the industry. Indeed, small ruminant farming is a potential industry for boosting the income of the poor and the low-income group.

Table 3 shows the small ruminant farm profile. The majority of the respondents, numbering 312 (52.0%), had a farm size ranging from 1 to 50 heads, followed by 129 (21.5%) respondents who had a farm size of between 51 and 100 heads. About 85 (14.17%) respondents had a farm size of between 101 and 150 heads, while 74 (12.33%) had above 150 heads of small ruminants. This study documented that the majority of small ruminant ranchers in Malaysia fell in the category of small-scale farming (1-50 heads). This suggested that the small ruminant farming industry in Malaysia is based on the small-scale model. The study also highlighted that small-scale farming made it easier to control and take care of the animals.

A total of 542 (90.3%) respondents were farm owners, a vital position for ensuring the success of small ruminant farming. This was followed by the position of supervisor, which was held by 54 respondents (9%) and four other positions (0.7%) such as labourer or worker. Most of the ranchers managed their farms by themselves as they were small. In addition, they received support from their family members in managing their farm, thus bring down operational costs.

Table 3
Small ruminant farm profile

Variables	Parameter	Frequency	(%)
Scale farming	Small scale (1-50 heads)	312	52.0
	Medium scale (51-100 heads)	129	21.5
	Large scale (101-150 heads)	85	14.17
	≥151 heads	74	12.33
Farm Personnel	Owner	542	90.3
	Supervisor	54	9.0
	Other	4	0.7
Farm category	Breeder	151	25.2
	Cross breeder	431	71.8
	Trader	155	25.9
Production system	Other	113	18.8
	Intensive	282	47.0
	Semi-intensive	253	42.2
	Traditional system	65	9.8

The majority of the respondents were classified as cross breeders, numbering 431 (71.8%). This was followed by the category of breeder, with 151 respondents (25.2%) and trader, with 155 respondents (25.9%), as recorded in Table 3. The category "other" in Table 3 refers to ranchers who reared small ruminants for milk and who were also involved in more than two farm categories. Most of the ranchers preferred to adopt cross breeds instead of pure breeds due to the price and selectivity of the breed. A similar finding were reported by Ebegbulem, Ibe, Ozung and Ubua (2011). In terms of the production system, 282 (47%) of the respondents practised intensive farming, while 253 (42.2%) practised semi-intensive farming. About 65 (9.8%) of the respondents practised the traditional system of production (Table 3). The majority of the ranchers practised intensive farming probably because of the shortage of land for agricultural purposes. It may also have been their decision to help reduce possible outbreaks of disease. In this system, ranchers just need to keep small ruminant in houses similar to those in the feedlot system. In their study, Chah et al. (2013) reported that about 96.7% of the respondents practised the intensive system.

Factors of Success in Small Ruminant Farming

Table 4 shows the summary of the average mean scores and the ranking (average position) for each factor of success in small ruminant farming. The 13 factors were arranged in sequence based on their average mean score from the highest to the lowest (4.255 to 2.353). The highest average mean score was for technical skill (4.255), followed by feed sources (4.246) and

disease and prevention management (4.221). The fourth most influential factor was marketing and price (4.197), the fifth was breeding (4.167), the sixth was building, infrastructure and farm area (4.139) and

the seventh was government support and policies (4.055). The least influential factor of success was neighbourhood relationships (2.353).

Table 4

Mean score and rank of factors of success in small ruminant farming

Factors	Average Mean Score	Ranking
Technical skill	4.255	1
Feed sources	4.246	2
Management and prevention of disease	4.221	3
Marketing and price	4.197	4
Breeding	4.167	5
Building, infrastructure and area	4.139	6
Goverment support and policies	4.055	7
Veterinary services extention	4.048	8
Production system	4.025	9
Support of family and friends	3.920	10
Labour/Worker	3.857	11
Business planning (Project)	3.840	12
Neighbourhood relationship	2.353	13
Overall Mean Score	3.977	

Note: (n=600)

The importance of the factors of success on the basis of the respondents' response suggested that technical skills, feed sources and disease and prevention management were the components impacting the small ruminant industry. In addition, all these factors are important and play a main role in the development of this industry. Similar findings were reported by Yang, Shen, Ho, Drew and Chan (2009) and Li, Akintoye, Edwards and Hardcastle (2005). They have categorised the factors in small ruminant

farming on the basis of their average mean scores.

Chi-Square Analysis Result

Chi-square analysis was the primary tool used for computing the statistical significance of the cross-tabulation table. Chi-square is used to test for statistical independence (Field, 2009). The hypotheses formulated earlier were tested in order to determine the statistical relationship of some demographic factors with respondents'

perception of the factors of success in small ruminant farming. If the variables had no relationship, the result of the statistical test would be non-significant and the null hypothesis would have failed, meaning that there was no statistical relationship between the ranchers' demographic profile and the factors of success. If the variables were related, the results of the statistical test would be significant and the null hypothesis would be rejected, meaning that there was a statistical relationship between the dependent and independent variables (Zikmund, 2003).

Testing Relationship between Ranchers' Demographic Profile and Factors of Success in Small Ruminant Farming

Table 5 shows the summary of the chi-square test results for relationship between ranchers' demographic profile and factors of success in small ruminant farming. The result of the chi-square analysis indicated that some of the ranchers' demographic profile showed a significant relationship with the factors of success in small ruminant farming.

Table 5
Testing relationship between ranchers' demographic profiles and factors of success in small ruminant farming

Variables	χ^2	p-value	Decision
Age	69.425	0.001**	Reject H_0
Religion	2.337	0.506	Failed to reject H_0
Marital status	22.663	0.001**	Reject H_0
Education level	10.805	0.005**	Reject H_0
Experience	6.344	0.042**	Reject H_0
Number of family members	5.285	0.382	Failed to reject H_0
Farming category	7.637	0.106	Failed to reject H_0
Farming system	3.775	0.289	Failed to reject H_0
Income	4.548	0.337	Failed to reject H_0
Scale of farming	5.519	0.138	Failed to reject H_0

Note: **Significant at 5% level of significance

The results shown in Table 5 indicate that four out of the 10 variables have a statistically significant relationship with the success factors for small ruminant farming at a 5% significant level (α=0.05). The four variables were age (p=0.001), marital status (p=0.001), educational level (p=0.005) and level of experience (p=0.042). This indicated that there was significant interaction between age and success factors, status and success factors, educational level and success factors and level of experience and success factors. Thus implies that the factors of success in small ruminant farming were significantly

dependent on age, status, educational level and level of experience of the respondents or ranchers. For age, the results suggested that ranchers of different ages have a different view and perspective of the success factors in small ruminant farming. The finding also suggested that ranchers with different marital status have a different perspective and view of the factors of success in small ruminant farming. For level of education, the results suggested that respondents with a different level of education had a different perspective regarding the factors of success in small ruminant farming. Finally, ranchers with different levels of experience had a different perspective regarding the success factors in small ruminant farming.

CONCLUSION

Small ruminant farming is currently an important type of farming based on the high demand for small ruminant meat in Malaysia. It is an important source of income for small ruminant ranchers across the country. These ranchers have a close relationship with the small ruminants. In general, the findings of the current study suggested that the majority of the respondents (ranchers), numbering 368 (61.3%), who were involved in small ruminant farming were above the age of 40 years old, while the majority of the ranchers were males, numbering 557 (92.8%). Due to the drudgery of small ruminant husbandry, this type of farming is more suitable for males. The majority of these ranchers, numbering 442 (73.6%), had between four and 10 years of experience. In this study,

an attempt was made to explore the present socio-economic level of the ranchers, their farm profile and the factors of success in small ruminant farming.

Ranchers of small ruminant farming in Malaysia were found to use semi-intensive farming as their production system. This requires Research and Development (R&D) of feeding issues, improvement in veterinary services, financial assistance from agencies and extension services to encourage and enhance the production of small ruminants. Additionally, government departments, especially the Department of Veterinary Services, need to take action in terms of ranchers' demographic profile, especially their age, marital status, education level and experience to study how their ranchers' productivity can be enhanced to increase their success in small ruminant farming. It is clear that small ruminant farming can enhance and boost the livelihood of small ruminant ranchers and subsequently, facilitate development of the industry.

ACKNOWLEDGEMENT

REFERENCES

Abdolmaleky, M. (2012). Predictions of small-farmers' empowerment to success in farm operations in Lorestan province, Iran. *World Applied Sciences Journal, 20*(10), 1416–1422.

Adams, F., & Ohene-Yankyera, K. (2014). Determinants of factors that influence small ruminant livestock production decisions in Northern Ghana: Application of discrete regression model. *Journal of Biology, Agriculture and Healthcare, 4*(27), 310–321.

Adesehinwa, A. O., Okunola, J. O., & Adewumi, M. K. (2004). Socio-economic characteristics of ruminant livestock farmers and their production constraints in some parts of South-western Nigeria. *Livestock Research for Rural Development, 16*(8), 5–10.

Agyemang, K., Dwinger, R. H., Little, D. A., & Rowlands, G. J. (1997). *Village N'Dama cattle production in West Africa. Six years of research in the Gambia.* Nairobi, Kenya: International Livestock Research Institute.

Benoit, M., & Laignel, G. (2010). Energy consumption in mixed crop-sheep farming systems: What factors of variation and how to decrease? *Animal, 4*(09), 1597–1605.

Chah, J. M., Obi, U. P., & Ndofor-Foleng, H. M. (2013). Management practices and perceived training needs of small ruminant farmers in Anambra State, Nigeria. *African Journal of Agricultural Research, 8*(22), 2713–2721.

Chandrawathani P., Chang K. W., Nurulaini R., Waller P. J., Adnan M., Zaini C. M., …, & Vincent N. (2006). Daily feeding of fresh neem leaves (Azadirachta indica) for worm control in sheep. *Tropical Biomedicine, 23*(1), 23–30.

Crow, R., & Goldstein, H. (2003). *Guide to business planning for launching a new open access journal* (2nd ed.). Retrieved from www.soros.org/openaccess/oajguides/ business_ planning.pdf

Department of Veterinary Services (DSV). (2017a). *Livestock statistics. Malaysia: Self-Sufficiency in livestock products (%), 2007-2016.* Retrieved from http://www.dvs.gov.my/dvs/reso-urces / user_1/DVS%20pdf/Perangkaan%202015%20 2016/page_12.pdf

Department of Veterinary Services (DSV). (2017b). *Livestock statistics. Malaysia: Output of livestock products (%), 2007-2016.* Retrieved from http://www.dvs.gov.my/dvs/-resources/ user_1DVS%20pdf/Perangkaan%202015%20 2016/page_6.pdf

Department of Veterinary Services. (2017c). *Livestock statistics. Malaysia: Livestock population, 2015-2016.* Retrieved from http://www.dvs. gov.my/dvs/resources/user_1/-DVS%20pdf/ Perangkaan%202015%202016/page_1.pdf

Devendra, C. (2006). *Small ruminants in Asia; contribution to food security, poverty alleviation and opportunities for productivity enhancement.* Retrieved from http://www. mekarn.org/procsr/ Devendra.pdf.

Devendra, C., & Burns, M. (1983). *Goat production in the tropics* (Revised ed.). *Technical communication bureaux of animal breeding and genetics.* England: Commonwealth Agriculture Bureau.

Devendra, C., Thomas, D., Jabbar, M. A., & Zerbini, E. (2000). *Improvement of livestock production in crop–animal systems in rainfed agro-ecological zones of South Asia.* Nairobi, Kenia: International Livestock Research Institute.

De Vries, J. (2008). Goats for the poor: Some keys to successful promotion of goat production among the poor. *Small Ruminant Research, 77*(2), 221–224.

Ebegbulem, V. N., Ibe, S. N., Ozung P. O., & Ubua, J. A. (2011). Morphometric trait characteristics of West African dwarf goats in Abia State South East Nigeria. *Continental Journal of Agricultural Science, 5*, 1–6.

Field, A. P. (2009). *Discovering statistics using SPSS* (2nd ed.). London: Sage Publication.

Fitzhugh, H. A., & Bradford, G. E. (1983). *Hair sheep of Western Africa and the Americas: A genetic resource for the tropics.* Boulder, CO: Westview Press.

Gurung, K., Tulachan, P. M., & Gauchan, D. (2005). *Gender and social dynamics in livestock management: A case study from three ecological zones in Nepal.* Retrieved June 1, 2013, from http://r4d.-dfid.gov.uk/PDF/Outputs/Livestock/ZC0286-Case-Study-Nepal.pdf

Harris, E. (2011). *Project definition is critical for success – 5 key elements you ignore at your own peril. Practical business process and performance improvement information, for today's business operating environment.* Retrieved from http://blog. ssqi.com/2011/08/12/project-definition-project-charters.

Hashim, F. A. H. (2015). *Strategies to strengthen livestock industry in Malaysia.* Retrieved from http://ap.fftc.agnet.org/ap_db.php?id=477&print=1

Honig, B., & Karlsson, T. (2004). Institutional forces and the written business plan. *Journal of Management, 30*(1), 29–48.

Huirne, R., Harsh, S., & Dijkhuizen, A. (1997). Critical success factors and information needs on dairy farms: The farmer's opinion. *Livestock Production Science, 48*, 229–238.

Iñiguez, L., & Mueller, J. (Eds.). (2008). *Characterization of small ruminant breeds in Central Asia and the Caucasus.* Aleppo, Syria, MA: ICARDA Publishing.

Iñiguez, L. (2005). *Characterization of small ruminant breeds in West Asia and North Africa.* Aleppo, Syria. MA: ICARDA Publishing.

Khadijah, S., Andy, T. F. H., Khadijah, S. S. A. K., Mursyidah Khairi A. A. K, Nur Aida., H., & Wahab, A. R. (2014). Parasite infection in two goat farms located in Kuala Terengganu, Peninsular Malaysia. *Asian Journal of Agriculture and Food Sciences, 2*(6), 463–468.

Kime, L. F. (2004). *Developing a business plan.* Retrieved from http://extension.psu.edu/-business/ag-alternatives/farm-management/devel oping-a-business-plan/extension_-publication_file

Kosgey, I. S., Baker, R. L., Udo, H. M. J., & Van Arendonk, J. A. M. (2006). Successes and failures of small ruminant breeding programmes in the tropics: A review. *Small Ruminant Research, 61*(1), 13–28.

Li, B., Akintoye, A., Edwards, P. J., & Hardcastle, C. (2005). Critical success factors for PPP/PFI projects in the UK construction industry. *Construction Management and Economics, 23*(5), 459–471.

Melissa, A. Y., Norsida, M., & Nolila, M. N. (2016). Exploring critical success factors for stakeholder management in small ruminant farming. *Journal of Advanced Agricultural Technologies, 3*(4), 239–246.

Ministry of Agriculture. (n. d.). *Third national agriculture policy 1998-2010 – Executive summary.* Retrieved from (http://www.pmo.gov.my/dokumenattached/Dasar/29THIRD_NATIONAL_AGRICULTURAL_POLICY_(1998_-_2010)_-_EXECUTIVE_SUMMARY.pdf

Ministry of Agriculture and Agro-Based Industry. (2011). *Agrofood statistics 2010.* Retrieved from http://www.moa.gov.my/c/document_library/get_file?uuid= 1cb6c 87 7-bada-410a-9dbd-12da85cbc8e0&groupId=43204

Mohd Nor, M. N., Mustapa, A. J., Abu Hassan, M. A., & Chang, K. W. (2003). The organization of the Department of Veterinary Services Malaysia. *Veterinary Services: Organization, Quality Assurance and Evaluation Scientific and Technical Review, 22*(2), 485–497.

Mursyidah, A. K., Khadijah, S., & Rita, N. (2017). Nematode infection in small ruminants and the management of the farms in Terengganu, Peninsular Malaysia. *Tropical Biomedicine, 34*(1), 59–65.

Nelson, L. (2003). A case study in organisational change: Implications for theory. *The Learning Organization, 10*(1), 18–30.

Rozhan, A. D. (2015). *Transformation of agriculture sector in Malaysia through agriculture policy. FFTC Agriculture Policy Platform (FFTC-AP).* Retrieved from http://ap.fftc. agnet.org/ap_db.php?id =386

Rural Research and Development Council. (2011). *Draft of National Strategic Rural Research and Development Investment Plan.* Canberra: Rural Research and Development Council.

Sani, R. A., & Rajamanickam, C. (1990). Gastrointestinal parasitism in small ruminants in Malaysia. *Proceedings of Integrated Tree Cropping and Small Ruminant Production Systems Workshop* (pp. 197–201). Medan, Indonesia.

Sithambaram, S., & Hassan, Q. N. (2014). Country report – Malaysia. *Asian-Australasian Dairy Goat Network, 57.* Retrieved from http://cdn. aphca.org/ dmdocuments/PAP_14 _ AADGN_ Country_ Report_2013_14.pdf#page=61

Tadesse, Y. (2012). *Success and failure of small ruminant breeding programmes: Impact of indigenous knowledge, genotype and local environment* (Review). Retrieved from http://www.articlesbase.com/ science-articles/success-and-failure-ofsmall-ruminant-br-eeding-programmes-impact-of-indigenousknowledge-genotype-and-local-environment-review-6164993.html.

Tangka, F. K., Jabbar, M. A., & Shapiro, B. I. (2000). *Gender roles and child nutrition in livestock production systems in developing countries: A critical review. Socio-economics Policy Research* (International Livestock Research Institute No. 27). Nairobi, Kenya: International Livestock Research Institute.

Umunna, M. O., Olafadehan, O. A., & Arowona, A. (2014). Small ruminant production and management systems in urban area of Southern Guinea Savanna of Nigeria. *Asian Journal of Agriculture and Food Sciences, 2*(2), 1–8.

Wolf, C. (2005). Producer livestock disease management incentives and decisions. *International Food and Agribusiness Management Review, 8*(1), 46–61.

Yang, J., Shen, G. Q., Ho, M., Drew, D. S., & Chan, A. P. C. (2009). Exploring critical success factors for stakeholder management in construction projects. *Journal of Civil Engineering and Management, 15*(4), 337–348.

Yong, Y. C., & Mustaffa, N. E. (2013). Critical success factors for Malaysian construction projects: An empirical assessment. *Construction Management and Economics, 31*(9), 959–978.

Zikmund, W. G. (2003). *Business research methods* (7th ed.). Toronto: Thomson.