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Farmers' Social, Communication and Psychological Factors Towards Adoption of Husbandry Practices and Innovations in Small Ruminant Farming

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Abstract

Malaysia aims to achieve full self-sufficiency in beef and mutton, which currently below 50%. This will be achieved by promoting innovative husbandry practices among small ruminant farmers to enhance production and productivity. Despite government initiatives, small ruminant farmers in Selangor, Malaysia, continue to rely on conventional husbandry practices, resulting in low dairy production and productivity due to lack of knowledge and skills to adopt advanced husbandry practices and innovations. Therefore, this study aims to determine the social, communication and physiological factors influencing the adoption of both husbandry practices and innovations. A total of 250 small ruminant farmers were selected as respondents through simple random sampling. Data was gathered through interviews guided by a structured questionnaire and personal observations. The findings indicate that most ranchers have a high level of perception towards social, communication, and psychological factors influencing the adoption of husbandry practices and innovations. The study recommends that the effort of government support through extension services is crucial to strengthen the small ruminant industry, enabling local production to achieve a self-sufficiency level of 50%, ensuring sufficient domestic supply and reducing dependence on fluctuating imports, thereby meeting the increasing demand for ruminant-based products. Future research could investigate the effectiveness of government-supported strategies and policies in achieving targeted self-sufficiency and their impact on small ruminant industry stability.

Keywords: Adoption, Innovation, Good Husbandry Practices, Small Ruminant, Farmers

Introduction

Small Ruminant Industry in Malaysia

In the Malaysian agriculture sector, one of the many essential components is livestock, providing employment opportunities and an important source of animal proteins to the population. The livestock industry produces animal products for human consumption, including cattle-beef, dairy cattle, buffalo, mutton, poultry meat, eggs, pork, and milk. Ruminants are characterized by their four-compartment stomachs comprising the rumen, reticulum, omasum, and abomasum. They possess a unique ability to chew a cud, regurgitating partially digested meal for further processing. Malaysia's ruminants are categorized into large ruminants (cattle and buffalo) and small ruminants (sheep and goats).

The ruminant farm operations primarily operate on a smaller scale, yet their potential for development is promising in bolstering food security and reducing import reliance. While Malaysia can produce its domestic supplies of pork, poultry meat and eggs, it is still reliant on imports from other countries for milk, beef, and mutton. In 2022, the import dependency ratio (IDR) for selected livestock of milk (63.6%), beef (85.6%) and mutton (91.5%) exceeded 50 per cent (DOSM, 2022). Generally, meat is an essential product of farm animals that provides nutrients for human well-being, productivity, and overall well-being. In 2022, the per capita consumption (PCC) of chicken meat was the highest, with 48.0 kilograms per year, followed by chicken/duck egg with 22.6 kilograms per year (DOSM, 2022). For beef, the PCC was 6.9 kilograms per year, mutton was 1.4 kilograms per year and fresh milk was 2.1 litres per year (DOSM, 2022).

Sheep (*Ovis aries*) and goats (*Capra aegagrus hircus*) are small ruminants belonging to the family of Bovidae and the subfamily of Caprinidae. Other exotic relatives are in the genus of *Ovis* and *Capra*. Meat goat is the domestic reference for domesticated goats raised for their meat, known as *Chevon,* when the goat is between 5 and 18 months old, while a young goat is called *Cabrito*. The common breeds of small ruminants in Malaysia include Boer, Dopper, Jamnapari, Katjang, Saenan, and Anglo Nubian. There are hybrids as well, but they are produced through improper breeding programmes because ranchers are not well-educated with small ruminant breeding. Common breeds reared for meat consumption include Boer, Dopper, and Katjang. In contrast, Anglo Nubian, Jamnapari, and Saenan are primarily raised for milk production. Both Boer and Dopper produce superior quality meat and, therefore, have a high demand in the market (Sithambaram & Hassan, 2014). The overall ruminant population in Malaysia experienced a slight decline of 0.03% from 2021 to 2022. This decrease was attributed to a decline in buffalo (2.76%) and sheep (0.88%), while cattle (0.55%) and goat (1.76%) numbers increased (DVS, 2022).

The livestock industry is critical to Malaysia's economic growth, contributing significantly to employment opportunities through value-added production. Small ruminant contribution to livestock ranks fourth after swine, chicken, and cattle; therefore, it is considered substantial to Malaysia's agricultural output growth. The Malaysian government agencies have relentlessly promoted the small ruminant industry to bolster food self-sufficiency. Specifically, the expansive presence of oil palm and rubber plantations provides opportunities for large-scale small ruminant farming to capitalise on the synergies between these operations. The implementation of integrated farming proves advantageous across various aspects, including management efficiency and improved production output and enhanced feed systems of the

farms (Devendra, 2006). Farming systems can be classified into three (3) categories: intensive, semi-intensive, and traditional. Traditional methods combined with extensive and integrated cropping systems are commonly used by small farmers to supplement their income. Small ruminant farming is most prevalent in rural villages, while others are integrated in rubber and palm oil plantations, fruit orchards, rice fields, as well as fallow land. Many small farmers are driven by the desire to produce meat, milk and utilise the manure as organic fertilizers. Ranchers believe that small ruminant farming is important not just economically, but also in terms of socio-agriculture (Devendra, 1982). The four (4) categories of ranchers in Malaysia are breeder, cross-breeder, trader, and importer. Small ruminant farming, as the name indicates, is done on a smaller scale with only a few ventured into commercial operations.

Problem Statement

Small ruminants are integral to agricultural systems in developing countries, including Malaysia, with significant contributions to economic and ecological well-being. The country faces a shortage of small ruminants, forcing it to rely on imports of both live animals and meat. In response, the government aims to ramp up the production of small ruminant production to achieve self-sufficiency. The burgeoning human population, coupled with urbanization and rising incomes, along with evolving consumer preferences, is driving up demand for animal-based and their derived products. Indeed, the nation's dairy industry has grappled with numerous challenges spanning several decades that persist to this day (Faghiri et al., 2019). Although the government's implementation of various plans to advance the ruminant industry, farmers' reliance on conventional husbandry practices persists, which may lead to the poor output and productivity of dairy animals. In addition, a lack of competency in knowledge and skills on advanced husbandry practices prevents them from implementing better practices. Studies have shown that farmers who lack the knowledge and skills to adopt improved husbandry practices are less inclined to embrace new technologies (Mugisha et al., 2012). Therefore, this study aims to examine the farmers' perception of social, communication and physiological factors towards the adoption of husbandry practices and innovations in small ruminant farming in Selangor, Malaysia.

Literature Review

Definition and Concept of Adoption

The concepts of adoption have evolved over time with Rogers (1962) pioneered the concept by framing it as a cognitive journey individuals embark on upon the initial exposure to an innovation to ultimately adopt it. This definition was later expanded by Rogers and Shoemaker (1971), who defined it as a choice to utilise new ideas in one's practice, recognizing them as the most favourable and optimal course of action. Deliberating the choice to embrace or reject a new technology is influenced by several factors associated with technical, economic, and social considerations. Feder et al (1985) then proposed a categorization of adoption based on its scope, distinguishing between individual and aggregate adoption. Individual adoption refers to a farmer's choice to implement new technology into their production methods, whereas aggregate adoption describes the wider diffusion of that technology within a specific region or population. Dasgupta (1989) broadened the term by including a time frame, specifically the long-term application of a proposed thought or activity by individuals or organisations. Most recently, Rogers (2003) differentiated between adoption and diffusion, defining adoption as the choice to fully utilise

innovation as the appropriate course of action possible, whereas diffusion is the gradual dissemination of that innovation through specific channels within a social system.

Adopting new technologies is the culmination of a continuous innovation process, where concepts evolve into novel or improved services or procedures. Technological attributes are pivotal in the adoption process. Rogers, in his framework of diffusion theory, identifies five key attributes: relative advantage, compatibility, intricacy, trialability, and observability. The first attribute, which is relative advantage, pertains to the perceived superiority of an innovation over its predecessor. Compatibility measures how well the innovation aligns with existing social and cultural values, established concepts, or prior customer innovation requests. Intricacy refers to the complexity of the innovation, both in terms of comprehension and application. Trialability pertains to the potential for implementing an innovation in stages before committing to full-scale, while observability refers to the degree to which the outcomes of the innovation are readily apparent to potential adopters.

Two crucial characteristics that define the dynamism of the adoption process are trialability and observability. Pannel et al (2006) outlined a four-stage model of technological adoption: awareness of the opportunity or issue at hand, followed by evaluation through non-trial and trial assessments, leading to the actual adoption, and culminating in the potential for non-adoption or dis-adoption. In the agricultural context, these stages are particularly relevant as farmers constantly educate themselves with the latest technological information. Chatzimichael et al (2014), on the other hand, identified two strategies for farmers to obtain new information. The first is learning through the adoption process, and the second is learning through information exchange among fellow farmers, research scholars and extension personnel. Pannel et al (2006) further noted the considerable challenges associated with uncertainties around new technology, particularly in the early phases of adoption. As a result, farmers are forced to depend on their communication networks. As the adoption processes advance to the trialling stage, farmers gain a distinctive firsthand experience of the technology, which subsequently influences their future actions.

Adoption involves a multi-stage mental process, starting from the initial awareness of an innovation and culminating in full integration, following a series of changes in awareness, curiosity, evaluation, experimenting, and adoption (Diro et al., 2016). Two ways to measure the adoption of any agricultural innovation – the number of farmers embracing the innovation and the total area under its implementation. Both measures are equally valid, and the decision depends on the specific matter being considered. For instance, determining the proportion of farmers embracing the innovation is crucial when assessing the number of people affected by an innovation. On the contrary, focusing on the total land area under implementation is more relevant when evaluating the economic advantages of implementing the adoption.

Fita et al (2012) demonstrated positive and statistically significant relationships between media coverage, dairy farming training programmes and dairy farmers' understanding of husbandry practices with the acceptance of enhanced practices of dairy husbandry. The acceptance of improved dairy husbandry practices is also positively and significantly associated with the educational background of dairy farmers, their expertise in dairy farming, and their active involvement in various dairy farming organizations. According to Gezie et al

(2014), both household age and activities outside of farming have a negative but significant impact on the acceptance of enhanced dairy technologies. Technological acceptance is also positively and significantly affected by family size, farming expertise, the presence of extension services, access to training, credit and saving institutions.

Technological impact in agriculture is often assessed through four key indicators: agricultural productivity, farmers' revenue, nutritional quality, and gender equality. When it comes to enhancing agricultural productivity, adopting technology tends to amplify the output of dairy cow, thereby boosting revenue, particularly among rural communities, when resources are diversified for other activities (FAO, 2017). For instance, one can simply inquire about the impact of adopting new and enhanced dairy technologies on their milk output. Second, measuring farmers' revenue in terms of income gain is often used as an indicator of welfare since it is significantly correlated with the ability to acquire several commodities associated with a higher standard of living, such as meals, clothes, accommodation, access to healthcare and education, and leisure (Mishra et al., 2002). It is also a strong indicator of impacts because it reflects productivity gains attributable to the implementation of improved technologies. For instance, enhanced maize technology as livestock feed can lead directly or indirectly to boosted sales of cows, milk, and associated by-products, or it can lead to reduced expenses related to those commodities.

The three predominant models utilised in examining the adoption of agricultural technology are the Innovation Diffusion Model (Feder et al., 1985), the economic constraint model Smale et al (1994); Shampine (1998) and the adopter perception paradigm (Norris & Batie, 1987). The innovation diffusion model highlights the importance of access to information for efficient acceptance and diffusion of the technology. This includes active engagement and consultation with extension services, conducting farm trials, and utilising diverse channels for exchanging information. The economic constraint model, as the name implies, economic factors that could hinder the adoption, though in the short run, because the decision to adopt becomes more viable in the long run. The third model highlights the difference in how farmers and scientists evaluate technologies, suggesting the need for periodic research on technology adoption to overcome the disparities. Businesses or firms often evaluate the potential profitability of new technologies before adopting them. If the anticipated benefits of a new technology outweigh its costs, the firm is more likely to adopt it. However, other factors besides the cost of technology itself can also influence the decision to adopt new technology.

Social, Communication and Psychological Factors Influencing the Adoption of Husbandry Practices and Innovations

Social Determinants

Numerous factors influence the adoption of new practices, but technical and economic aspects often receive the most attention. However, this research explores the social nature of change and farming as key factors in adoption, particularly when considering natural resource management. Vanclay (2004) outlines several social processes that impact adoption in agricultural extension. The underlying social concept influencing adoption is the idea that farming is a socio-cultural practise. This indicates that practices, customs, and beliefs are equally influential on the adoption of husbandry practices as technical factors (soil type, climate, farm size, etc.). It is important to recognize the role of social processes and not

underestimate their influence. Furthermore, social principles highlight the diversity within the small ruminant farmer population. Even though the farmers are seen as a homogenous group, individual farmers differ in age, wealth, and farming goals. This diversity needs to be considered when designing and implementing adoption strategies.

There is a need to recognise the different priorities, perspectives, values, and practices that exist among small ruminant farmers. This is because all these factors exert influence on innovation adoption. Since adoption is also a social process, farmers often engage in discussions with their close-knit social circles to evaluate and enhance the techniques, sometimes resulting in more effective solutions than those proposed by researchers or extension agents. This aligns with the findings of Asghari and Hadi (2009), who demonstrated a significant correlation between farmers' adoption of biological control and their involvement in social activities, rural associations, extension programmes, and consultations with extension experts. According to Erbaugh et al (2010), farmers' participation in farmer field schools (FFS) programmes had an impact on their ability to learn more about the new knowledge. Meanwhile, Noorhosseini Niyaki et al (2010) identified farmers' educational backgrounds, family sizes, farming experience, and engagement in extension activities as critical social factors influencing the adoption of new knowledge, practices, or technologies. Vanclay (2004) further emphasised the divergence in farmers' views on environmental management methods, particularly in implementation and concerns regarding sustainability and profitability. The difficulty usually stems from opposing views on what constitutes effective husbandry practices and management. Therefore, the most effective approach to extension involves using multiple channels to reach a diverse group of farmers and reinforce the message in various ways. Ultimately, a crucial social determinant lies in ensuring that small ruminant farmers feel valued. Years of battling the elements and facing various challenges in farming necessitate a sense of validation. When they feel valued, even small changes can easily happen that will influence the adoption of improved husbandry practices and innovations. Moreover, the social context within which farmers operate plays a pivotal role in shaping their receptivity to innovations (Majharul, 2012). This influence stems from the normative ideas about the acceptability of adopting innovation (Ajzen & Fishbein, 1980). Farmers may adopt an innovation not because they perceive its inherent benefits but rather due to perceived social pressure to conform (Talukder et al., 2011). This pressure can arise from individuals with influential ideas and attitudes, such as peers and social network members (Igbarial et al., 1996).

Communication Determinants

Communication and the exchange of knowledge are fundamental for successfully implementing and maintaining any technological innovation in agriculture (Babu et al., 2012; Ashraf et al., 2015). Clear and effective communication is essential, particularly when it comes to articulating the advantages of embracing husbandry practices and innovations. Upscaling the use of adopting husbandry practices and innovations relies on the efficacy of communication and the methods used to disseminate research findings (Maureen et al., 2021). According to Martey et al (2014); Wiredu et al (2014), effective promotion of innovation in husbandry practice demands knowledge of communication elements that can either accelerate or slow the adoption process. Adoption has been described as the decision by an individual, household, or group of people to use a new technology or practice (Serote et al., 2020). However, producers can only benefit from the introduction of new agricultural

technologies if they adopt them (Guner et al., 2020). Consequently, raising awareness of new agricultural technologies, especially those with limited recognition, is the first critical step in the adoption process (Gwambene et al., 2015). Effective dissemination of information on any technology is contingent on the variety of communication available to the target audience (Kelil et al., 2020; Elia et al., 2017). Suboptimal agricultural productivity can be attributed to ineffective technology distribution, poorly packaged information, inadequate communication networks, and the utilisation of inefficient communication approaches (Mapfumo et al., 2013; Spurk et al., 2020). Therefore, this study seeks to explore the communication-related factors influencing the adoption of husbandry practices and innovations among small ruminant farmers in Selangor, Malaysia.

Physiological Determinant

The human state is affected by physiological aspects since these elements are the fundamental processes that affect thought and other psychological factors. All choices to adopt an innovation are driven by a complex interplay of mental and physical factors, including motivation, perception, and emotional states. Empirical research has shown that psychological factors impact various crucial aspects of innovation research and application, such as creative problem-solving skills, the choice to embrace new technology, and decision-making across diverse management situations (Abraham et al., 2016; Griskevicius et al., 2013; Saad, 2017; Timming, 2019). However, there remains a significant limitation in exploring the human dimension and psychological influences on the choices regarding adoption and innovation. The five-stage model of the innovation-decision process by Rogers (1983), comprising knowledge, persuasion, decision, implementation, and confirmation, provided the foundational framework for understanding how psychological factors, including personality traits, attitudes, uncertainty, and social norms, impact the adoption process. This model has proven instrumental in guiding further research on innovations. Studies have also identified the influence of other psychological factors such as incentives Simpson & Clifton (2017) and leadership (Keengwe et al., 2009), on the adoption process. Psychological factors significantly influence farmers' decision-making processes and preference formation. Such factors have been shown to be reliable indicators of consumer behaviour, including their purchasing, or adopting intentions (Levin et al., 1997; Galdamas et al., 2011; Hunecke et al., 2010). Psychological needs such as self-enhancement and self-verification can be the underlying motivators for adopting husbandry practices and innovation. Thus, this study proposes a relationship between small ruminant farmers' psychological needs and the outcomes associated with adopting such practices and innovation.

Methodology

This study, a collaborative effort between the Department of Veterinary Services (DVS) and UPM, was fully funded by the DVS. The DVS provided crucial information, including the study location, current issues, historical background, and various details about goat and sheep farming in Malaysia. A total of 250 respondents were surveyed in the field through interviews conducted by DVS district office officials. However, due to unforeseen circumstances, not all ranchers attended the session. The DVS provided lists for each state in Peninsular Malaysia, with ranchers categorized based on herd size: small-scale (below 50), medium-scale (51-100), large-scale (100-150) and extra large-scale (over 150). To ensure a comprehensive representation of small ruminant farming, the study targeted areas known for their significant number of ranchers. Areas within these states were chosen at random using a sampling

framework sourced from the DVS offices. This type of sampling method was also adopted by (Katiku et al., 2013). Data collection involved personal interviews guided by a structured questionnaire, as advised by the DVS district offices. The questionnaire included 30 statements exploring ranchers' views on the social, communication, and physiological factors influencing their husbandry practices and openness to innovation. Each statement was rated by a five-point Likert scale, with 1 indicating strongly disagree and 5 indicating strongly agree. Mean ranking analysis was then used to rank the statements based on the responses, revealing the order of agreement from “strongly agreed” to “faintly agreed”.

Results and Discussion

Mean Ranking Analysis on Respondents’ Factor of Social, Communication and Physiological Towards Adoption of Husbandry Practices and Innovation

Mean ranking analysis was used in this study to evaluate the relative importance of 30 statements presented to respondents. These statements were categorized into three (3) main factors: Social (12 statements), Communication (8 statements), and Physiological (10 statements). The analysis yielded optimal rankings for each factor, revealing the relative importance of each statement within its respective category. The statements were arranged according to the mean score from the highest to the lowest in each factor.

Average Mean of Respondents’ Social Factor Towards Adoption of Husbandry Practices and Innovation of Small Ruminant Farming

Table 1 shows the average mean of respondents’ social factors concerning the adoption of husbandry practices and innovation in small ruminant farming. Most of the respondents agreed with the statement that using appropriate technology and having an interest in goat farming helped them practice good farming (mean score of 4.79 on a scale of agreement). This shows the important role of adopters in ensuring the success of rearing small ruminants through their implementation of improved technologies, management practices, and production systems. This aligns with Melissa et al (2016), who argued that the development of this industry requires strong governmental support and the creation of appropriate policies. Interestingly, the analysis revealed the lowest mean score of 3.25 for the statement concerning the influence of relationships with neighbours on adoption behaviour. This could be because of the age factor, with older farmers being less likely to adopt new practices due to a more conservative mindset and aversion to risk. The reluctance to adopt innovation may be attributed to their lack of trust or fear of making a mistake during the implementation of the innovation, which could result in financial losses, or worse one that costs their source of income. These outcomes contradicted Hossain et al (2005), which indicate a positive and significant correlation between farmers’ age and the adoption of advanced poultry management practices in India. The total average mean of 4.11 for respondents’ social factors towards adopting husbandry practices and innovation in their farming indicates a high perceived value placed on this factor.

Table 1

Average Mean Respondents' Social Factor Towards Adoption of Husbandry Practices and Innovation in Small Ruminant Farming

No.	Statements	Score					Mean	S.D.
		1	2	3	4	5		
Social								
1.	Meetings with other breeders have influenced me to adopt new farming practices.	0 (0)	0 (0)	0 (0)	142 (66.0)	73 (34.0)	4.34	0.47
2.	Visiting other farms and state projects has influenced my farming practices.	0 (0)	0 (0)	47 (21.9)	95 (44.2)	73 (34.0)	4.12	0.74
3.	My involvement in development agencies has influenced my farming practices.	0 (0)	0 (0)	47 (21.9)	91 (42.3)	77 (35.8)	4.14	0.75
4.	My neighbours have helped support my farming practices.	0 (0)	47 (21.9)	95 (44.2)	46 (21.4)	27 (12.6)	3.25	0.94
5.	Good cooperation from neighbours has contributed to my success as a goat farmer.	0 (0)	0 (0)	45 (20.9)	143 (66.5)	27 (12.6)	3.92	0.57
6.	My interest in goat farming has motivated me to implement good farming practices.	0 (0)	0 (0)	0 (0)	45 (20.9)	170 (79.1)	4.79	0.41
7.	Local training from the Department of Veterinary Services helps me regularly adopt new practices and innovations in livestock farming.	0 (0)	0 (0)	72 (33.5)	0 (0)	143 (66.5)	4.33	0.95
8.	Handbooks supplied to breeders provide information that helps me implement animal husbandry practices.	0 (0)	0 (0)	118 (54.9)	0 (0)	97 (45.1)	3.90	1.00
9.	Using appropriate technology helps me increase my livestock production capacity.	0 (0)	0 (0)	0 (0)	45 (20.9)	170 (79.1)	4.79	0.41
10.	Participating in meetings with other agencies and breeders has helped me adopt new farming practices.	0 (0)	0 (0)	0 (0)	138 (64.2)	77 (35.8)	4.36	0.48
11.	Being involved in animal husbandry research projects has influenced me to adopt good farming practices and innovations.	0 (0)	0 (0)	91 (42.3)	47 (21.9)	77 (35.8)	3.94	0.88
12.	Participating in farm demonstration programmes, exhibitions, and visits has helped me improve my livestock husbandry practices.	47 (21.9)	27 (12.6)	0 (0)	45 (20.9)	96 (44.7)	3.54	1.65
Total Average Mean							**4.11**	

Average Mean of Respondents' Communication Factor Towards Adoption Husbandry Practices and Innovation in Small Ruminant Farming

Table 2 shows the average mean score regarding respondents' perception of communication factors in adopting innovative husbandry practices in small ruminant farming. Most respondents agreed that ranchers need frequent contact with livestock breeders, with a mean score of 4.57. This shows the importance of communication between ranchers and breeders, which positively and significantly impacts the adoption of improved dairy husbandry practices. Frequent contact indicates a continuous exchange of information, leading to knowledge improvement and the adoption of scientific practices. This finding is supported by Chandrakala and Eswarappa (2001), who identified a positive association between the adoption of improved dairy management practices among women farmers and their social-personal characteristics, such as experience and contacts with extension agents. Contrary, respondents expressed the least agreement with the statement related to participation in extension contact activities, with the lowest mean score of 2.40. According to Ahuya et al (2005), the absence of extension personnel has hampered technology dissemination and service delivery. Muhammad (2004) further emphasise the importance of research, education, and extension for successful small ruminant farming. The total average mean for the communication factor is 3.89. This value indicates a strong perceived importance of communication as a facilitator of successful farming practices.

Table 2
Average Mean of Respondents' Communication Factor Towards Adoption of Husbandry Practices and Innovation in Small Ruminant Farming

No.	Statements	Score					Mean	S.D.
		1	2	3	4	5		
Communication								
1.	Extension/veterinary officers often visit the farm to help me with farm management.	97 (45.1)	27 (12.6)	0 (0)	91 (42.3)	0 (0)	2.40	1.41
2.	Information available from social media (internet use) encourages me to practice animal husbandry practices.	0 (0)	0 (0)	0 (0)	143 (66.5)	72 (33.5)	4.33	0.47
3.	News or information from newspapers, magazines, and so on helps me learn about good farming practices.	0 (0)	0 (0)	74 (34.4)	141 (65.6)	0 (0)	3.66	0.48
4.	Sharing of information and farming developments between breeders influences my acceptance of adopting farming practices.	0 (0)	0 (0)	47 (21.9)	45 (20.9)	123 (57.2)	4.34	0.82
5.	Livestock programme broadcast on television and radio encourage me to practice good farming practices.	0 (0)	47 (21.9)	91 (42.3)	77 (35.8)	0 (0)	3.14	0.75

6.	Frequent contact with livestock breeders and learning from each other make me more likely to accept new farming practices.	0 (0)	0 (0)	0 (0)	92 (42.8)	123 (57.2)	4.57	0.50
7.	Exposure to breeding development programmes influences my decision to adopt farming practices	0 (0)	0 (0)	47 (21.9)	45 (20.9)	123 (57.2)	4.35	0.82
8.	Information provided through livestock development programmes influences my decision to adopt farming practices.	0 (0)	0 (0)	0 (0)	138 (64.2)	77 (35.8)	4.36	0.48
Total Average Mean							**3.89**	

Average Mean of Respondents' Physiological Factor Towards Adoption of Husbandry Practices and Innovation of Small Ruminant Farming

Table 3 shows the average mean of respondents who perceived physiological factors towards adoption of husbandry practices and innovations in small ruminant farming. Environmental management, particularly farm waste, received the highest average mean score of 4.97. This highlights the importance of ensuring farmyard cleanliness and livestock health because poor management negatively affects animal welfare, rendering them vulnerable to parasites and disease infection. Interestingly, the use of technology from private companies and other countries received the lowest mean score of 3.05. This suggests that extension training programmes disregarding farmers' perceived needs for technological training may be inefficient and wasteful. Some of the factors hindering innovation adoption include the absence of deliberate meetings with extension agents, inadequate awareness of available innovations, and potential conflicts between innovation and cultural aspects. The total average mean for respondents' perception of physiological factors towards adoption of husbandry practices and farming innovation is 4.04. This value indicates a high level of perceived importance of physiological factors.

Table 3

Average Mean of Respondents' Physiological Factor Towards Adoption of Husbandry Practices and Innovation in Small Ruminant Farming

No.	Statements	Score					Mean	S.D.
		1	2	3	4	5		
Physiological								
1.	I am familiar with both conventional and organic food practices for ruminants.	0 (0)	0 (0)	92 (42.8)	0 (0)	123 (57.2)	4.14	1.00
2.	I followed a suitable goat breeding system based on local recommendations.	0 (0)	0 (0)	45 (20.9)	46 (21.4)	124 (57.7)	4.37	0.81
3.	I gained knowledge about pasture management for the purpose of ensuring adequate pasture and fodder availability.	0 (0)	0 (0)	72 (33.5)	46 (21.4)	97 (45.1)	4.11	0.88
4.	I maintain regular communication with the development officer for farming-related information.	27 (12.6)	0 (0)	48 (22.3)	60 (27.9)	80 (37.2)	3.75	1.30
5.	I seek guidance from the agricultural agency.	0 (0)	27 (12.6)	92 (42.8)	96 (44.7)	0 (0)	3.32	0.69
6.	I use technology from private companies or other countries.	47 (21.9)	0 (0)	91 (42.3)	50 (23.3)	27 (12.6)	3.05	1.27
7.	I conduct regular checks to prevent infectious diseases like mouth and nails.	0 (0)	0 (0)	0 (0)	138 (64.8)	77 (35.8)	4.36	0.48
8.	I prioritise environmental management, ensuring daily cleaning of farm waste to maintain a clean farmyard environment and promote livestock health.	0 (0)	0 (0)	0 (0)	45 (20.9)	170 (79.1)	4.97	0.41
9.	I convert livestock faeces into fertilizer and generate additional income from its sale.	0 (0)	0 (0)	92 (42.8)	46 (21.4)	77 (35.8)	3.93	0.89
10.	Implementing improved nutrition practices can improve the efficiency of livestock production.	0 (0)	0 (0)	45 (20.9)	47 (21.9)	123 (57.2)	4.36	0.81
Total Average Mean							**4.04**	

Constraints Faced by the Small Ruminant Farmers in Adopting Husbandry Practices and Innovation in Small Ruminant Farming

Constraints in this study were measured by taking into consideration of all possible difficulties faced during animal rearing. Four main categories of constraints emerged: economic, input supplies, marketing, and administrative constraints. Mean weighted scores were used to rank the constraints, as summarized in Table 4. The economic constraints that limit farmers' adoption of dairy innovations are ranked in descending order: high rates of interest on loans, followed by high cost of milch animals, short loan durations, expensive construction of goat and sheep sheds, and lack of loan facilities. The lack of supply of crossbred goats posed the biggest constraint in terms of input supplies, followed by the lack of subsidized goat feed, the non-availability of balanced goat feed locally, the lack of purebred goats, and the absence of readily available medical aids and skilled labour. In terms of marketing constraints, the high cost of preparing milk products was the top major constraint, followed by the non-availability of remunerative prices for milk and irregular milk collection.

Table 4
Constraints Faced by Small Ruminant Farmers in Adopting Innovative Husbandry Practices (n=215)

No.	Constraints	Mean Weighted Score	Rank Order
Economic Constraints			
1.	Lack of loan facilities	2.52	5
2.	High cost of milch animals	2.79	2
3.	High interest rates on loans	2.85	1
4.	Short duration of loans	2.70	3
5.	Expensive construction of goat and sheep sheds	2.66	4
Input-Supplies Constraints			
1.	Lack of supply of crossbred goats and sheep	2.18	1
2.	Lack of subsidized goat feed	1.85	2
3.	Non-availability of medical aids	1.45	5
4.	Lack of purebred goat supply	1.50	4
5.	Unavailability of balanced goat	1.70	3
6.	Lack of skilled labour	1.40	6
Marketing Constraints			
1.	Unfavourable remunerative milk price	2.51	2
2.	Irregular collection of milk	1.50	3
3.	High cost of milk product preparation	2.60	1
Administrative Constraints			
1.	Lack of knowledge about silage preparation	3.25	1
2.	Lack of proper training in dairy management	2.41	3
3.	Lack of technical know-how on feed, fodder, and health management aspects	3.20	2
4.	Lack of artificial insemination facility in the village	1.54	4

The lack of knowledge about silage preparation was the primary administrative constraint faced, followed by deficiencies in technical know-how about feed, fodder, and management

aspects. Training in small ruminant management and the absence of an artificial insemination facility within the village emerged as the third and fourth impactful constraints, respectively.

Summary, Conclusion and Recommendation

The study aimed to identify the perception of social, communication, and physiological factors influencing the adoption of husbandry practices and innovation in small ruminant farming among respondents in Selangor. The findings highlight the significant impact of social processes on technology adoption. This indicates that practices, customs, and beliefs play an equally important role as technical factors in influencing farmers' decisions. Effective communication emerged as a critical factor, particularly in conveying the benefits of adopting husbandry practices and innovations. Farmers' choices are also influenced by cognitive processes and physiological factors, such as motivation, perception, and emotional states. These psychological factors can shape their decision-making regarding the adoption of husbandry practices and innovations in their small ruminant farming. To enhance productivity, farmers require motivation, training, and periodic monitoring of their farming practices by livestock extension officers. Through these efforts, Malaysia can work towards achieving self-sufficiency in the ruminant sector. Nevertheless, the effectiveness of government-supported strategies and policies in achieving targeted self-sufficiency and their impact on the stability of the small ruminant industry could be investigated in future research.

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Conflicts of Interest

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Ethical Standards

Not Applicable.

Disclosure Statement

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