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Review Article

The Necessity of a Herd Health Management Programme for Dairy Goat Farms in Malaysia

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ABSTRACT

In Malaysia, an increasing number of new dairy goat farms are being opened by smallholders due to increasing demand for dairy goat products. However, most of the dairy goat farms are not managed well due to poor knowledge and information about the standard management of dairy goat. Indeed, low performance of dairy goats with respect to growth performance, feed utilisation, disease resistance and milk production has been associated with improper rearing protocol, specifically, herd health protocol. For this reason, implementation of a herd health management programme is important as a standard rearing management and disease control programme for dairy goat farms. A herd health management programme is a preventive programme intended to keep the herd healthy and free of disease through comprehensive husbandry management that includes nutrition management, breeding, parasite control, vaccination, biosecurity and environmental management with the goal of improving the herd's performance and productivity. However, the level of acceptance from farmers for implementing herd health management programmes varies, especially among smallholder farmers. Thus, veterinarians play an important role as advisor in transferring knowledge of the importance of herd health management to the farmers.

Keywords: Breeder, farm management, goat, herd health

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INTRODUCTION

Rising human population has resulted in a corresponding increase in demand for food, especially food made from animal products (Sarma & Yeung, 1985). This has triggered an increase in goat farms to meet the demand for goat products such as meat and milk (Derks, 2013). In the last two decades, expanding market demand for goat milk has resulted in the establishment of commercial dairy goat farms in several Southeast Asian countries (Liang, 2014). In Malaysia, dairy goat farms opened by smallholders contribute to the increasing dairy production for the local market. However, these smallholder farmers lack knowledge and information about standard management of dairy goats, resulting in poor farm production practice and methods (Young, 2010).

To cope with the problem, a herd health management programme was developed for use as the standard in rearing management and disease control. The programme, for implementation in dairy goat farms, intended to monitor, treat and prevent health problems as well as ensure the welfare of animals while being cost effective (Sibley, 2000, 2006). The main purpose of the programme is to prevent disease and improve animal health and production by introducing long-term strategies focussing on the whole herd (Hall & Wapenaar, 2012).

Regardless of the fact that research activities have developed comprehensive herd health management programmes, there are still problems in implementation at the farm level, especially among smallholders. Major concerns regarding animal nutrition, disease control, breeding and husbandry that directly affect production and profitability do not seem to have been properly understood by farmers and entrepreneurs (Aziz, 2007). Therefore, there is a need for a multidisciplinary approach involving veterinarians, animal nutritionists and theriogenologists in the work of transferring this knowledge actively to farmers. As the dairy industry has evolved tremendously, the scope of veterinary work also has grown; where in the past veterinarians were called by farmers to diagnose and treat sick animals, they now need to take the lead in approaching farmers to share suitable and relevant advice (Derks, 2013).

The objectives of this review were:

1. To provide a brief profile of the dairy goat industry in Malaysia,
2. To highlight the common practice of goat rearing in Malaysia and aspects of a proper herd health management programme that can be practised in dairy goat farms, and
3. To outline the challenges and problems in implementing a herd health management programme among smallholder goat farmers.

DAIRY GOAT INDUSTRY IN MALAYSIA

The population of goats in Malaysia is small compared to that in other developing countries such as India, China, Thailand and Indonesia. In 2005, the population of goats in Malaysia was 428,263 heads,

with approximately 200,000 heads reared mainly by smallholders (Aziz, 2007). In 2015, the population of goats in Malaysia had increased to 439,667 heads. Although there was an increment of 2.7% in the population of goats, the increment was small and it could not meet local demand. Therefore, the government had encouraged the import of live goats from other countries, and 102,445 heads of imported live goats were brought into Malaysia in 2007 (Department of Veterinary Statistics, DVS, 2012). Nevertheless, in 2013, the number of imported live goats had decreased to 82,821 heads (Table 1). This was due to the government policy of increasing participation of smallholders in goat farming in order to lower dependence on imports to meet the shortfall in domestic production (Jamaluddin, 2012). Compared with the commercialised pig and poultry sector, the ruminant industry, particularly the goat industry, was stagnant and lagging. While the former had achieved domestic self-sufficiency, mainly with the active participation of the private sector, the goat industry is kept going mainly by smallholders, who generally start out on low capital. Although there has been enthusiastic participation by government land development agencies aiming to increase production in goat and sheep rearing integrated with plantation crops, the goat industry continues to lag in meeting local demand (Devendra, 2007).

Table 1
Information of goats in Malaysia from 2011-2015

Item	2011	2012	2013	2014	2015
Goat population (Number)	479,444	462,510	434,202	429,398	439,667
Recorded slaughter of goats (Number)	37,121	37,653	64,368	67,858	66,466
Imports of live goats (Number)	102,445	110,117	82,821	80,065	50,634
Imports of mutton (Tonne)	17,805	18,007	18,400	22,116	18,143
Local production of mutton (Tonne)	3,091.5	4,806.2	4,688.8	4,546.1	4,367.3

The dairy goat industry is part of the world dairy industry and has to confront competition with cow, sheep and even buffalo milk products (Dubeuf, Morand-Fehr, & Rubino, 2004). This is because the organisation of the goat milk sector appears to be reliant on existing competition from the cow milk sector, as goat milk is generally still not widely sold although consumed locally. However, goat milk production could meet its potential role as a significant milk alternative especially in developing tropical countries. This is because in 2000, FAO projected that demand for milk in the developing tropical world would reach an estimated 242 million tonnes, whereas the projected supply was estimated to be only 177.6 million tonnes. This increase in demand for milk production could be met by goat milk as 90% of the total world goat population comes from developing countries in the tropics (Knights & Garcia,

1997). In addition, according to Lai (2012), goats are generally more efficient than other domesticated ruminants in digesting low-quality roughage in both tropical and arid environments and are more efficient than sheep in temperate zones. This shows that goats are well adapted and their abundance of population in the tropics can be used as an important source in milk production.

Dairy goat farming in Malaysia began in 1950 when imported breeds were used such as the Saanen, Anglo Nubian, British Alpine and Jamnapari. While the most common breed used was the Saanen, dual purpose breeds such as Anglo Nubian, Boer and Jamnapari as well as Shami goats have been used in Malaysia since 2009. In 2009, a total of 115 dairy goats were imported to Sarawak by the Agriculture Department; they consisted of the Saanen, Anglo Nubian, Toggenburg, Australian Brown and British Alpine breeds and were meant to meet demand from local dairy goat producers. Table 1 shows information on goats in Malaysia from 2011-2015 (DVS, 2017). Up until now, there is no official recorded data of goat milk production and its consumption in Malaysia. This is because the majority of milk production in Malaysia is still dominated by cow's milk and statistical data often categorised goat milk together with cow and buffalo milk (Table 2). Nevertheless, in 2013, there were 8,195 heads of dairy goats in Peninsular Malaysia, with about 50% of the dairy population located in Johor (Shanmugavelu & Nizamuddin, 2013). The biggest share of dairy goat products in the local market is fresh goat's milk. Also available are fermented goat's milk and pharmaceutical products made from goat's milk such as soap and shampoo. Although there is a lack of official data on goat's milk in Malaysia, it does seem clear that there is a significant increase in demand for goat's milk since claims of its benefit to health rose among the public. Indeed, various studies have been done to compare the nutritional advantage of goat's milk compared to milk from other animals. According to Chadan et al. (1992),

Table 2
Production quantity, ex-farm value and vonsumption of major livestock products in Malaysia for 2012 and 2015

Product	Production (000MT)		Ex-Farm Value (RM million)		Consumption (000MT)	
	2012	2015	2012	2015	2012	2015
Beef	51.28	50.50	1,031.78	1,411.72	181.48	214.87
Chevon/Mutton	4.81	4.37	146.12	143.18	24.38	38.10
Poultry (Live)	1,374.50	1,613.92	6,867.81	9,421.27	1,301.48	1,544.78
Pigs	218.47	215.76	1,988.88	2,459.41	225.82	228.03
Eggs (Mil. units)	643.00	775.05	3,274.03	4,641.24	545.00	683.00
Milk (Mil. L)	72.41	76.04	144.82	152.08	1,046.28	1,087.83

Adapted from DVS (2017)

the average of fat globule size in goat milk is significantly smaller compared to that of cow's milk. It also has a greater amount of selenium, which is an important nutrient requirement for infant milk formulae, and thus, it has been used widely as replacement milk for infants (Haenlein, 1992). In the case of infants who have cow's milk protein intolerance, goat's milk also can act as a viable dairy option in meeting nutritional requirements.

One of the issues and challenges facing dairy goat smallholders in Malaysia is the dependency on imported breeding stock to meet local demand (Jamaluddin, 2012). To overcome the problem, in the 1980s, the development of a breeding programme was started to produce a synthetic goat breed called Jermasia, which is a combination of the German Fawn breed and the Katjang breed. This is a dual-purpose breed developed by University of Malaya and the Department of Veterinary Services (DVS). Nevertheless, the number of goat produced under this programme is small and still not able to meet local demand. Thus, to further encourage development of dairy goat production and its sustainability, Malaysia developed the Malaysian Livestock Breeding Policy in 2013. The objective was to enable breeding of quality livestock through sound genetic principles and practices that satisfy the need for an economical and sustainable livestock industry and to fulfil market requirements (DVS, 2013). Since then, many programmes have been initiated by the DVS to boost the development of dairy goat production. In 2013, the DVS set up a National Boer Breeding Centre (NBBC) in Pondok Tanjung, Perak to harness the superior qualities of the Boer breed, which has undergone systemic genetic selection in South Africa. Besides developing a systematic breeding programme through application of breeding technology, this centre also provides training and incubator programmes to ensure that the technology and knowledge can be transferred to commercial goat farmers and thus, production quality will be consistent.

COMMON PRACTICE OF GOAT REARING IN MALAYSIA AND ASPECTS OF A PROPER HERD HEALTH MANAGEMENT PROGRAMME IN DAIRY GOAT FARMS

Malaysia has a long history of goat rearing, with most of the production being carried out by farmers and lower-income farming families (Devendra, 2013). In the past, the traditional farming system was observed; farms were usually a family-orientated business and the goats were inherited from previous generations of the family. Most of the goat products were used only for family consumption, providing the family with food security as its principal means of survival. The productivity of the goats during this time was low due to the fact that the goats were reared using an extensive system, which allowed them to graze in small plots of land or wander freely while scavenging natural vegetation that had low nutrient content (Gatenby, 1986). However, commercial goat farms in Malaysia began to increase in the last 20 years. There has been some improvement in rearing practices

in this time, as these smallholders have started to use the intensive farming system to increase the production of goat products. However, information on standard rearing management for goats is limited and most farmers still rely on traditional knowledge to rear their goats.

The herd health programme is a preventive programme intended to keep the herd healthy and free from disease (Salisi et al., 2012). The programme is a comprehensive husbandry management programme, which includes nutrition management, breeding, parasite control, vaccination, biosecurity and environmental management aimed at improving herd performance and productivity. Developing an effective herd health programme is very crucial as it can determine the success of a dairy goat farm. A farm management programme that integrated herd health, animal welfare, public health and farm production was developed in the 1990s (Noordhuizen & Wentink, 2001) and it has resulted in improvement of animal on farms (Sol & Renkema, 1984; Hogeveen & Dykhuizen, 1992). Relying solely on feeding and breeding will not result in maximum production if goats are exposed to disease and not kept in good health (Salisi, 2012). Diseases have a major effect on reproduction, growth, survival rate and performance of the goats. When disease occurs and treatment is required, in the event of ineffective treatment, production losses may occur.

Feeding Programme

Common feeding practice by smallholders in Malaysia relies on locally available forage and commercial concentrated feed. Common forage includes Guinea grass, Napier grass and *Bracharia* spp., while goats are usually fed legume species like *Lucaena* spp., *Gliricidia* spp. or *Mulberry* spp. (Shanmugavelu & Nizamuddin, 2013). One of the major constraints in developing dairy goat production is the difficulty of maintaining a balanced diet throughout the year for the animals (Islam, 2000). This is due to shortage of available grazing pasture, the hot and humid climate, which limits the ability to grow quality grass for ruminants (Rahman, 2015). The farmers have been using concentrates (goat pellets) and low-quality forage extensively to overcome the problem. In recent years, various agro-industrial by-products such as oil palm fronds, rice straw and soy bean waste have been utilised as animal feed. Malaysia produces 2 mil tons of agro-industrial by-products every year. Indeed, the use of agricultural by-products as source of feed for animals has been accepted and is widely practised by smallholder farmers in Malaysia.

Most of the farmers have limited knowledge of a systematic feeding management that takes into account all nutritional requirements needed based on the goat's stage (Devendra, 2013). According to a study by Abdullah (2015), only 59% of smallholder goat farmers in

Malaysia understand the importance of good feeding management for herds. They do not comprehend the usage of proper rations and minimal amount of nutrients such as protein, carbohydrate and fat required in the different stages of goat growth. Balanced nutrition is essential for the health and productivity of all animals and is the basis of successful production systems. A well-planned preventive health programme without a proper feeding programme cannot overcome problems that are created by poor nutrition (Hart, 2008). Besides that, nutrition is a production factor that reflects the total production and profit of a farm as it is the easiest aspect of management for farmers (Morand-Fehr, 2005). Therefore, goat nutrition is of paramount importance for successful goat production (Abubakr, 2015).

Like other ruminants, goats have four compartments in their stomach, three of which contain microbes that will break down feed. To promote proper fermentation in the stomach, the microbes need to be provided with an optimum amount of energy, protein, fibre, minerals and vitamins. Each nutrient should be given in correct proportion to meet the minimum daily requirements. The nutritional requirements are expressed on the basis of either percentage or grams per kilogram of the total ration, which comprises the minimum daily requirement for each nutrient group. Indeed, energy and protein are the most crucial nutrients needed by goats to build new tissue for growth or tissue replacement (Mowlem, 1992).

With respect to nutritional management, adequate nutrients should be given to animals according to their sex, age and body size as well as the production system, climate and physiological stages (Rashid, 2008). Planning nutrient requirements for each stage of animal growth should address the requirements for maintenance, growth, pregnancy and lactation, during which energy is needed to maintain a steady live weight as well as special needs related to the stage.

Health Monitoring and Vaccination Programme

Poor animal health due to disease infection may result in low milk production and indirectly lead to low profit margin. Goats in herds, especially in an intensive farming system, are more prone to infection with a higher mortality rate. This is because diseases in a high stocking density environment are more easily transmittable between animals through the air, faeces and urine. Since past times, smallholders have been using traditional medication to treat their goats; for example, goats with respiratory problems are given mulberry leaf, while goats infested with helminth parasites are given areca nut palm in their drink as a means of deworming and goats suffering from bloating have coconut oil rubbed on the affected area and are fed water mixed with tamarind fruit and ginger. However, the growing number of goats imported from other countries has led to the emergence of zoonotic and infectious diseases such as foot

and mouth disease (FMD) and brucellosis; these together with the increasing number of common diseases such as mannheimiosis, caprine arthritis encephalitis (CAE) and enterotoxaemia (pulpy kidney) highlight the importance of proper health monitoring and a vaccination programme to ensure that the production and health of the goats are not affected (Salisi, 2012). A study by Abdullah (2015) showed that only 35% of goat smallholders in Malaysia have complied with good health management. This includes participation in vaccination programmes, deworming programmes, disease monitoring and data recording for disease incidence and mortality. This shows that herd health management is very important as it determines the productivity of the farm and thus, smallholders need to implement herd health programmes on their farms.

A vaccination programme is one of the important components in herd health programmes. It can ensure that goats are protected from various types of disease. Vaccination helps the animal to develop its immune system at an earlier stage of life (Smith & Sherman, 2009). There are two types of vaccine that are commonly given to goats: killed vaccine and modified live vaccine. In Malaysia, the vaccination programme is aimed at treating various infectious diseases such as pneumonia, foot and mouth disease and caseous lymphadenitis (CLA), among others. Pneumonia is a respiratory problem that commonly occurs in goats, especially young goats. The main causative agent of respiratory problems in Malaysia is *Mannheimia haemolytica* serotypes A2, A7 and A9 (Salisi, 2011). Under stressful conditions such as transportation, overcrowding, malnutrition and weaning following concurrent viral infection and other diseases, disease can compromise the animal's immune system, exposing them to infection and disease (Davies et al., 1982; Zamri-Saad et al., 1989). During the rainy season, the number of pneumonia cases increases, especially among young goats (Jasni et al., 1991). Vaccination against *Mannheimia haemolytica* is normally given at six-month intervals, in March and September, prior to the rainy season. Vaccination can also be given to newly introduced goats on a farm to ensure the goats are healthy and protected from disease.

Besides pneumonial infection, vaccination in Malaysia currently also combats foot and mouth disease (FMD) (Abdullah, 2015), which is caused by *Apthovirus* under genus *Picornaviridae* and is highly contagious among cloven-footed animals and can affect livestock production (Abdul-Hamid, 2011). It is characterised by fever, loss of appetite, hypersalivation and vesicular eruptions on the feet, mouth, udder and teats (Wongsathapornchai, 2008). According to Edwards (2004), the disease is endemic in Peninsular Malaysia with mainly serotype O and occasionally A and Asia 1. Nevertheless, Sabah and Sarawak have been declared as FMD-free zones, which means there is no need of an FMD vaccination programme for animals in those states. Besides strict management of

animal movement, vaccination is one of the important measures to control the disease. Vaccination against FMD is normally given twice a year to all goats, especially those in high-risk zones and bordering Thailand (Gleeson, 2002).

Under Malaysian Veterinary Protocol, Mannheimiosis and foot and mouth disease have been categorised as a notifiable disease which should be reported to the Department of Veterinary Diseases (DVS, 2011). Under the protocol, there is a standard operating procedure (SOP) to control and eradicate the disease; the SOP includes treatment to infected goats and a vaccination programme carried out by the authorities. The vaccine for the disease is controlled by the Control and Eradication Section under the DVS and is distributed to each state DVS for farm vaccination programmes.

Parasitism Management and Deworming Programme

Parasitism is one of the biggest problems occurring on farms and needs to be tackled effectively. In Malaysia, infectious diseases such as parasitism, together with mismanagement and nutritional deficiencies, are the main reason for high losses on goat farms (Dorny, 1994, 1995; Fatimah, 1992; Syed, 1976; Symoens, 1992; Zamri-Saad, 1987). Parasites can vary from ectoprasites, endoparasite and blood protozoa. Parasitism results in weakness, low body condition, lowered resistance to disease, mortality and, ultimately, loss of productivity and income from the affected stock. One of the common parasitic gastroenteritis diseases among goats in Malaysia is caused by *Haemoncus contortus* (Symoens, 1992). It is considered to be the most prevalent and pathogenic nematode species to infect small ruminants in Malaysia (Dorny, 1995). Favourable conditions such as a hot and humid climate throughout the year and free grazing usually practised by smallholders encourage the development of these nematodes in the goats' gastrointestinal system, causing haemonchosis ((Dorny, 1994; Ikeme, 1987). Besides haemonchosis, coccidiosis is also typically occurring among goats in Malaysia (Dorny et al., 1995). Coccidiosis, which is caused by *Eimeria* sp., commonly occurs among young goats. It is known as one of the main factors of mortality among kids; the mortality rate among kids in their first year of age can reach up to 63% (Symoens et al., 1993).

A good herd health programme must include a plan to manage the common parasites that are a threat to goats. A good parasite control programme should be focused on preventive rather than therapeutic action. Indeed, treating goats after heavy parasite loads has less impact on reducing future contamination of the environment. Besides that, goats tend to shed worm eggs back into the environment even after treatment.

Whether or not goats are in an intensive system of free grazing, it is best to practise deworming every two or three months for adult goats. Kids should be dewormed at weaning and this should be repeated after 21 days. Antihelminthic drugs such as albendazole or fenbendazole should

also be given orally. These drugs are effective against gastro-intestinal nematodes such as *Haemonchus contortus*, *Oestergia circumcinta*, *Trichostrongylus axel*, lung nematodes such as *Dictyocaulus viviparous*, cestodes such as *Moniezia expansa* and hepatic nematodes such as *Fasciola hepatica*. A good parasite control programme also should include a scheduled screening programme; faecal samples from goats in the herd should be collected once every three months and the most common parasite diagnostic tests, faecal floatation, should be carried out.

Breeding Management Programme

Under the smallholder goat farming system in Malaysia, goats are often kept under a wide range of minimal husbandry conditions (Holst, 1999). Whether they practise intensive or extensive farming, farmers lack understanding and proper implementation of breeding programmes for their farm. Indeed, there is no recorded data on goat breeding by smallholder farmers in Malaysia. Only 48% of smallholders comply with proper breeding management (Abdullah, 2015). Most of them use native local breeds such as the Katjang for milk and meat production. Even though the breed is known to be adaptive to the local environment and is able to breed all year round, it is not an efficient milk producer due to the female's small udder size and low effective reproductive or maternal ability. Furthermore, most smallholders do not keep proper breeding records. Record keeping in breeding management is important as it can help the farmer to select high quality traits from their goats to be used for future breeding. It also can help them to reduce production cost by culling unproductive goats (Doye, 2004).

A good breeding programme should start with a clear objective of farm production and what traits are important for the particular environment of the farm (Carles, 1983; Sölkner et al., 1998). Indeed, different farms have different aims of production i.e. either for meat, milk or both. Thus, breeds suitable for a particular production can be selected to improve production and profit in the long run. Selection and replacement of goats to be used for breeding should be based on the important traits for the purpose of breeding. For instance, the selection of the buck should be based on structural and breeding soundness. The buck should be healthy and free from any reproductive disease and should have good male characteristics such as masculinity, adequate muscling, conformation of head and neck and standard buck vocalisation. The doe or female goat should have a proper oestrous cycle, be free from any reproductive disease, have good conformation and a healthy udder for milk production. Selection of suitable traits for breeding is important because these traits will contribute to the genetic makeup of every kid born and will determine the performance of the herd on the farm.

Biosecurity Programme

Another important aspect of a herd health programme is biosecurity control. Biosecurity can be defined as a prevention

plan to control disease on the farm or spreading around the farm by implementing certain practices or procedures on the farm (Delabbio, 2006). Biosecurity control includes daily cleaning of the animal pens, buying animals and other products from approved sources, control of traffic on the farm, disposal of dead animals, quarantine and isolation of new and sick animals, hygiene control by personnel, foot dips at the entrance of the farm and animal house and many other practices (Delabbio et. al., 2006). The type and frequency of biosecurity controls implemented on a farm varies based on the level of awareness of the importance of biosecurity by the farmer (Gillespie, 2000; Sanderson, 2000; Lee & O'Bryen, 2003) as well as the characteristics of the farm itself such as species grown, number of staff and adequate source of water on the farm (Delabbio et. al., 2003, 2004, 2005). A study done by Nooraisyah (2014) to measure the biosecurity status of small ruminant farms in Peninsular Malaysia found that only 40% of the total farms surveyed adopted proper bio security practices. The remaining 60% of farms practised poor biosecurity by not implementing proper isolation, traffic control or sanitation. The main causes of poor practice of biosecurity controls, especially among goat farmers in Malaysia, is the lack of time to maintain a biosecurity programme, the cost of running such a programme and the lack of technical knowledge about biosecurity programmes (Abdullah, 2015).

Implementation of biosecurity has been said to be able to reduce disease risk on a farm (Ganter, 2008), improve production efficiency and thus, increase farm revenue (Stott, 2003; Gunn, 2004). However, implementation of biosecurity controls on a farm should be seen as simple, practical and not burdensome or expensive (Ganter et al., 2008). Indeed, the effectiveness of biosecurity plans on a farm depends on the ability of the farmer to continuously adhere to the plan for the farm. As implementation of a biosecurity programme is very low among smallholder dairy goat farms, particularly in Malaysia, it is important for farmers to understand the essence of such a programme in preventing disease occurrence and to implement it efficiently on the farm.

Depending on the level of biosecurity planning to be implemented on the farm, the planning should start from proper selection of new animals on the farm. This includes purchasing animals from a known source that is free from any diseases, keeping proper health records for the animals and performing health screening in a quarantine pen once new a new herd arrives on the farm. This is important for ensuring the newly introduced animals are healthy and free from any transmittable disease. Besides that, proper farm planning is also a biosecurity measure that needs to be addressed, such as one-way entry to the farm, a vehicle dip with disinfectant at the entry of the farm and proper fencing surrounding the farm to ensure that the farm is restricted from outsiders who might harbour disease and affect animals on the farm.

Challenges and Problems Facing the Implementation of a Herd Health Programme Among Smallholder Farms

Despite the tremendous growth of dairy goat farming in Malaysia with the participation of many smallholders in this profitable venture, implementation of a herd health programme as the standard in goat rearing management of a farm in Malaysia is still low (Abdullah, 2015). One of the reasons is that this programme is seen among smallholders as being too ideal even though some are aware of the benefits of implementing the programme in terms of farm production and profit (Kristensen, 2008). A herd health programme is a new thing in dairy goat production in Malaysia as most dairy goat production depends on smallholders. Most smallholders perceive a herd health programme as being too ideal because their farm operation is small-scale, whereas implementation of such a programme will need a huge overhead in terms of medication, feed cost and restructuring of the farm for the addition of biosecurity controls, among other reasons. According to Esslemont (1992), farmers in the United Kingdom are not implementing a herd health programme on their farms due to the extra cost it will require. This is affirmed by Lievaatt and Noordhuizen (1999), who reported that high cost was the main reason that Dutch farmers did not implement a herd health programme and instead, stuck with the traditional farming system. Thus, it is important that the veterinarian be able to plan an effective herd health programme that is able to reduce disease incidence and mortality of goats on the farm; hence, it could successfully improve the productivity and profitability of the farm. Besides that, the veterinarian also needs to have vast knowledge of calculating costs and benefits of running a herd health programme.

Most smallholders think that a veterinarian's role is only to treat sick animals, control disease, support animal health and make welfare decisions (Hall et al., 2012). They seem unaware that veterinarians can also play an important role as advisor in optimising production and decreasing the overall cost of running their farms. Thus, the role of veterinarians on farms should be emphasised to farmers; they should be made aware that veterinarians can help by giving advice and guidance in every aspect of farm management.

A herd health programme is also difficult to implement in a family-orientated farm (Hall et al., 2012). This type of farm is passed down the generations of farming families, and farming skills are gained from the experience and knowledge passed from one generation to the next. It is indeed difficult to change the attitudes and ideas passed down in families; only an experienced veterinarian would be able to come against such entrenched thinking and habits (Jansen, 2010).

Good communication skills play a crucial role in developing a good relationship between farmers and veterinarians and enable effective delivery of knowledge (Derks, 2012). A strong relationship between

both parties indeed determines the success of a farm's herd health programme (Maister, 2000).

CONCLUSION

It is important for goat farmers, especially smallholders, to know the standard management practices needed to run a goat farm effectively and successfully, through implementation of a herd health programme. Such a programme can control the disease incidence and mortality rate on the farm, thus improving production and profitability of the farm. Veterinarians play a vital role in bringing new knowledge and technology to dairy goat farmers, especially smallholder farmers. It is hoped that the formulation of a standard herd health programme can guide dairy goat producers to proper herd management, increasing the productivity of their farms.

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