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Farmers' economic status and acceptability of goat farm management technology: A case study in the lower central and upper southern regions of Thailand

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Abstract The results showed that the most farmers were male (67.12%), age between 31 to 40 years old (72.03 %) and 51.81% had high school education status, and 57.63 %of farmers had an experience of about 5 to 10 years in raising goat. Most of the farmers had an average 76 goats/family; 89.37% of them raised semi-caged goat. About 63.45 % of the farmers did not receive consulting opportunity for farm management form experts.The total averaged income was 226,401 THB/year. About 86.77% of goat sales were made with dealers. The goat farm management transfer was accepted in level in terms of breed and breeding management (3.68); good level on farm management, feeding, housing, and sanitation (2.98, 3.25, 3.07, and 2.51), and medium level for marketing (2.46). In the SWOT analysis of goat farming, it was found that the sheep farming career was consistent with the way of life as well as religion and traditions of the Muslim community in the selected area as strengths; marketing problems due to lack of slaughterhouses, no clear market system, and only few marketing resources available were the weaknesses; creation of policy by the government agencies to develop a network of sheep and goat farmers as an opportunity; and lastly, smuggling from neighboring countries making the goat products vulnerable to disease control was an obstacle.

Keywords: Economic status, Acceptability of farm management Technology and Goat

Introduction

The concept of improving Thailand as a developing country has given importance to the economic development, the society, and the environment at

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the same time. The very important principle in developing the mainstream economy at the macro level, along with the secondary economy at the micro or household level, is to achieve a sustainable balance. Currently, Thailand is facing problems on the economic and social development due to the impact of the Covid-19 epidemic that affects the entire population of the country, there is an urgent need to stimulate the economy to return societal activities to normal as soon as possible. Goat production fulfills important social and economic functions. in arid and semi-arid areas of the lower central and upper southern regions of Thailand. According to Raksasiri *et al.* (2020b), small ruminants are one of the main souces of income in Thailand. Goats are one of the most exciting new economic animals from farm production to market for fresh meat and meat products. There are many stakeholders involved; from small farmers, large farmers, private companies, government agencies, and consumers. Goat production, goat meat marketing, and goat's milk production are the starting point and there is a good connection. At present, there are more people interested in consuming goat. Therefore, it is necessary to develop the goat farming by including an introduction of farm management technology to produce quality goats in Thailand in order to meet the market demand. The data gathered is expected to be a guideline for the development of a modern goat farming system. This study responds to the market demand for good quality goat meat goats are small ruminants that eat a variety of feeds, very resistant to various environments, fast-growing, and propagate quickly. Goats are therefore an easy animal to raise and groe. Each group of ruminants has been developed to suit the farm area as well as to suit the needs of each community (Pangkham, 2012). Goats are ideal for raising in rural areas in developing countries like Thailand because of their rapid reproduction. They require short time to reach maturity; simultaneously able to have short gestation period (approximately 150 days) wherein a doe can produce 1–5 litters at a time and 2 litters per year, using only a small space to raise kids (NRC, 2007). In particular, goat can tolerate heat from sunlight better than other livestock. At present, the consumption of goat meat is so large that the amount of production in the area is insufficient. Small ruminants like goats are classified to have good quality meat, nutritious and delicious, and has higher protein than cattles. In terms of milk yield, although smaller ruminants produce less milk than cows, their feed intake is relatively small. In addition, the cost of milk produced by goats are higher than cow's milk, its milk has more nutritional value similar to human’s milk. In rural areas, milk of small ruminants is preferred to feed infants (Pralomkan, 1995; NRC, 2007). Consequently, this research aimed to study the adoption of farm management technology. of independent goat farmers in the lower central and the upper

southern regions of Thailand to bring research data to integrate into teaching and learning through knowledge transfer to the community.

Matereial and methods

The research population were the farmers who own a goat farm from the lower central and the upper southern regions in the year 2021-2022, There were 941 farms collected by answering questionnaires through the Academic Service Training Program. A set of questionnaires with open-ended questions were created to collect various information. The questions were divided into three parts. Part 1 consisted of information about personal, economic, and social characteristics of goat farmers. Part 2 related to the adoption of farm management technology that passed the academic experts or 3 experts among goat farmers with closed-ended questions [a total of 6 topics with 5 questions each;4 answer, and the question has 4 options which correspcnds to the 4 levels of acceptance as follows very good (4), good (3), moderate (2) and low (1). The acceptance scores on Part 2 were itemized, averaged, and converted as follows:3.26-4.00 means the farmers have accepted the technology at a very good level; 2.51-3.25 means that farmers have accepted the technology at a good level;1.76-2.50 means farmers have accepted the technology at a moderate level; 1.00-1.75 means that farmers have accepted the technology at a low level. Part 3 problems and suggestions in farm management. The inquiry on farmers was conducted under Scientific Experimental Animal License Number: U1-05112-848 2559 and Human Research Ethics No. COE 65.0208-027, Thailand. All responses from the goat farmers were then analyzed. This research performed data analysis using a program using Microsoft Office Excel 2003 program. The data were analyzed consisting of statistics as follows: the frequency, percentage and mean to describe for description.

Results

A study on the characteristics of people and the economic conditions of farmers. found that there were more male goat farmers in the area than female (67.12%). Farmers aged between 31-40 years (72.03%), obtained high school education (58.11%), with goat farming experience of 5-10 years (57.63%), farmers owning an average of 76 goats every farm. The opportunity to get advice from a farm management academic is very important in a goat farming career and yet possibly be limited among farmers. There were 89.37% of farmers who had not received any advice from academics. The goat farmers reported an average income of 226,401 THB/year, excluding expense deduction, during 2021-2022. Most goat farmers who participated in the

research had limited available space for raising goats and had only few goats/ farms, resulting in low gain from the goat production. There were 86.77% of farmers raised their goats in semi-contained structre, goats were kept in cages at night with supplemental thickening food, and were allowed out door grazing during the day

Table 1. Level of acceptability of farm management technology among goat farmers in the lower central and the upper southern regions of Thailand

Items	Mean	Acceptability level	Items	Mean	Acceptability level
Management system			Feed		
1. Ear tag	2.32	Medium	16. Feed management	3.37	Very good
2. Hooves trimming	3.01	Good	17. Concentrate and mineral supplementation	2.33	Good
3. Cleaning	3.24	Good	18. Concentrate mixing	3.07	Good
4.Vaccine	3.45	Very good	19. Forage management	3.23	Good
5. Budget pulse	2.88	Good	20. Checking feed price	3.37	Very good
Total	2.98	Good	Total	3.25	Good
Breeding			Sanitation		
6. Selection	3.68	Very good	21. knowledge Source	2.64	Good
7. Buying	3.64	Very good	22. Deworming	3.11	Good
8. Bargain	3.57	Very good	23. Using antibiotic	2.52	Medium
9. Checking source	3.82	Very good	24.Sick animals management	3.52	Very good
10. Objective	3.71	Very good	25. Disinfection	2.58	Good
Total	3.68	Very good	Total	3.07	Good
Housing			Marketing		
11. Housing type	2.46	Medium	26. Source of purchase	2.41	Medium
12. Housing tools	3.01	Good	27. Checking price before sale	2.55	Good
13. Roof	2.64	Good	28. selecting size for sale	2.49	Medium
14. Cleaning tools	2.02	Medium	29. Month for sale	2.58	Good
15. Water tank	2.41	Medium	30. Sale period	2.28	Medium
Total	2.51	Good	Total	2.46	Medium

Environment and potential analysis (SWOT Analysis) of independent goat farms in the lower central region and the upper southern region of Thailand were done during a community traning held on January 28-30, 2022 and February 9-10, 2022.

Strengths

Sheep and goats were easy to raise. Farmers can keep farming in their households despite the limited space available. Sheep and goat farming may be an additional occupation. Raising sheep and goats requires lower investment compared to raising cattles. There was a low investment risk and high return because sheep and goats are animals that reproduce quickly and reach marketable size in a short time. The sheep and goat farming profession corresponds to the way of life religion and traditions of the Muslim community, which had a very high population in the area. Farmers in the selected areas have been ready to raise sheep and goats. Although most of them are small-scale farmers, they would like to raise more sheep and goats if possible. The production of sheep and goats was not enough for consumption in the area, goats and sheep were being imported from the upper region of the country, selling price is higher than in other regions. The price of sheep, goat, and their products has continued to rise over the past 4-5 years (2017-2021).

Weaknesses

An important production posed problem was the limited sources of breeder's sheep and goat farmerscannot collect enough lambs and kids for commercial husbandry.The climate in the area was not suitable for goats and sheep due to high humidity causing health problems such as colds, pneumonia, internal parasites, etc. Farmers in the area were still raising sheep and goats according to the old way of life; they are resistant to the technology, and they do not like to grow supplemental grass for sheep and goat grazing, resulting in insufficient and low-quality feed. Farmers lacked forage varieties and did not realize the importance of providing quality forage crops.There were marketing problems such as no slaughterhouse and no clear market system. Market resources were scarce, the quantity and quality of goat carcasses and mutton were uncertain, making the market reluctant to invest or buy. Processing of food products from goats and sheep lacks government support and marketing development. This included mutton meat still not being widely consumed, due to the musty smell, and mostly being patronized only by Muslim consumers and some Chinese. The farming system was not up to standard. The lack of

slaughterhouses and chopping boards for the hygienic distribution of mutton and goat meat had led to a lack of confidence among consumers. The movement of the sheep network was not comprehensive and strong, lack of integration between government agencies.Lack of research to develop sheep and goat farming in commercial and industrial systems. Lack of support for product development or product processing that can be extended to regional or national commercial agriculture.

Opportunities

The related sectors of government agencies such as the Ministry of Agriculture and Cooperatives, the Department of Livestock Development, and the local government units from lower central and upper southern provinces must be involved in creating, important policies, such as policy on specifying sheep as a commodity in strategy. Sheep and goat development policy and government policies to promote halal products, this is an important opportunity to support sheep and goat farming for local farmer. Government agencies must have the policy to create and develop a strong network of sheep and goat farmers. Sheep and goat products could create a wide variety of products stimultaneously can meeting the consumer demand for health products.

In addition to inadequate production of sheep and goats to meet the demand in the local area, other Muslim countries also have a demand for goats and sheep products for consumption. Sheep and goat raising could support policies in reducing global warming, in accordance with the guidelines for promoting the use of organic fertilizers (goat manure) instead of chemical fertilizers. Farmers could gather groups of shepherds in the form of clubs, or associations; to brgin with the Goat-Sheep Shepherd Association of Thailand (with members spread all over the country), could be an important database to drive production and marketing.

Threats

There has been smuggling activities from neighboring countries, making the goat product vulnerable to disease control. There has also been smuggling of animals between local districts. Consumers' misconception about consuming goats, sheep, and other related products. Most of the consumption of sheep and goats remained only in some groups.

The number of slaughterhouses was small; they only existed in certain areas and were not accredited.

Problems and suggestions on management of goat farmers

Most farmers faced the problem of expensive prices of concentrated feeds making it impossible to maximise weight gain in goats. The price of selling live goats was also a problem. Moreover, some groups of farmers were interested in developing their skills in meat and goat milk processing but lack the knowledge particularly in processing skills, product development, packaging, as well as inadequate marketing channels. It was therefore suggested that the government must take charge of the price control; they must as well as assist the farmers in providing farming extension regarding the related concerns.

Discussion

The study to some economic background of goat farmers in the lower central and the upper southern regions of Thailand and the acceptability of farm management technology transfer were recorded. Data were collected from 941 farmers who owned goat farms in the year of 2021-2022 found that there were more male goat farmers in the area than female, farmers aged between 31-40 years, obtained high school education, with goat farming experience of 5-10 years, farmers owning an average of 76 goats every farm. The opportunity was to advice from a farm management academic which is very important in a goat farming career and yet possibly be limited among farmers and there are many farmers who are not guided by academics. Most goat farmers who participated in the research had limited available space for raising goats and had only few goats/ farms, resulting in low gain from the goat production, goat farming styles are semi-enclosed, goats were kept in cages at night with supplemental thickening food, and were allowed out door grazing during the day. Which from the study of Matthing and Thungwa (2013) studied the type of goat farming and economic structure of goat-raising households in Satun Province, it was found that farmers had a small number of goats, earned little profits from goat husbandry and incurred personal debt. As a result, farmers had a moderate economic status, they had no income security. due to factors of production and falling goat prices, and the no opportunity to receive academic advice. Meanwhile, Raksasiri *et al.* (2020b) who reported on the study of economic conditions and adoption of farm management technology among goat farmers in Phetchaburi provinces and Prachuap Khiri Khan provinces in Thailand, cited that most of the goat herders were smallholder farmers, and their crops and animal husbandry were mixed in the farm sites. Farms, in which goats are raised along with other agriculture, can

be categorized into 6 categories according to the differences in the structure of agricultural production and the economic consequences of farming. Most farmers in Phetchaburi and Prachuap Khiri Khan provinces are raising the goat as a supplementary activity. Goats are generally used for religious ceremonies in these provinces. Small farmers raise goats as a source of savings, they are sold when there is financialy needed. However, it is possible that some types of farms can raise goats for commercial purposes if they are managed. appropriate to the context of the farm, especially the management of goat food crops. However, goats can be reared in various perennial plantations, such as in rubber plantations. The rubber tree actually uses only 25% of the space. Therefore, the remaining 75% of the vacant land can be used to raise goats. Goats could be kept in cages during the night and then be released in rubber plantation during day-time feeding, although, a tether or fence might be installed to avoid the damaging the rubber trees. In other words, goats get their food from unwanted weed within the perennial plantation while goat manure increases crop yields. In the plantation with matured perennial plants, some other smaller forage crop that do not require much light can be planted as a food source for the goats. From the previous studies of Somchun (2014) and Thungwa *et al.* (2018), it was found that 6,400 m^2 of rubber plantations were able to raise up to 7-10 goats. Sajwakit (2008) mentioned that people with expertise in their careers can drastically increase their income, while, people who have less experience and skills in their occupations will earn less. While, Raksasiri *et al.* (2014) studied the adoption of farm management technology among goat farmers in Nakhon Ratchasima province in Thailand, it was found that breed management farmers accepted the technology at a very good level (4.11), in terms of system management, food, and sanitation, they accepted the technology at a good level. with an average of 2.88, 3.28, and 2.87, while in the housing and equipment and marketing, they moderately accepted the technology (2.44 and 2.47). Nahed Toral *et al*. (2021) in the study of compliance of goat farming under extensive grazing with the organic standards and its contribution to sustainability in Puebla, Mexico, found that these goat farms principally consist of creole goats that graze in extensive communal rangelands and grasslands in non-arable lands with xerophytic vegetation, their principal product is the meat of adult goats. The goat farms had a moderate level of OLCI (48.0–53.6%) as well as a moderate level of sustainability (46.0–58.0%). The greater the OLCI value, the greater the sustainability of the goat farms. Social, economic, and environmental aspects of the farms need to be improved in order to increase the sustainability of the farms. This process requires co-operation from various performers, including farmers, researchers, technical advisors, and policymakers. Only when the

sustainability of the farms was obtained, the level of technology acceptance among farmers of the lower Mixteca region of Puebla can be increased (Raksasiri, 2020b). While, Mundre (2020) conducted a study on the economic enhancement of the rural community of Pusa Block through goat rearing, he found that livestock plays an important role in the Indian economy. About 20.5 million people depend upon livestock for their livelihood. In India, livestock production is largely in the hands of women. Animal livestock husbandry is becoming feminized. Being the 5th largest goat population state, Bihar contributes about 7.63% of India's total goat population. The state is also a habitat of 42.6% of people below the poverty line, and hence there is a tremendous scope of goat farming to meet up the large gap between demand and supply of meat. Around 574,000 goats are slaughtered annually in recognized slaughterhouses contributing 31.17% of the total meat production of the state (175,000 tons of meat in 2003). However, in developing a goat farming system in Thailand farmers have a strong need to have the knowledge and understanding of farm management and marketing systems as it is considered essential, especially in feed management. Farmers need appropriate education for precise knowledge and practices. Safe sanitation is also important as it serves a positive effect on goat management, for example the impact of inulin supplementation is beneficial to hematological attributes of goat kids, resulting in increased production performance and fecal score. Inulin contributes to the establishment of a health related microbiota where *Bifidobacteria* or *lactobacilli* become predominant and exert possible health-promoting effects at the expense of more deleterious species (Raksasiri *et al*., 2020a). Similarly, house management is also as important because, when considering a residence as simple or complex, it must meet the requirements of the animal. Some other factors must also be considered when designing goat housing. Goats should not be too crowded when they are in captivity. They, must be protected from sunlight, wind, and rain, if possible. Environmental factors such as heat, humidity, rain, and wind can put pressure on goats, particularly on the immune system thar may lead to parasitic or respiratory problems, which could be fatal. Goats can tolerate cold and heat as long as they live in a dry environment good ventilation and no drafts as the cold and wet conditions can cause respiratory problems, while heat combined with moisture or humidity causes parasites. It is therefore necessary to create a practical shelterfor the goats. Previous studies and research on goat farming cited that most of the goats in Thailand are raised half-released and semi-contained (Solaiman, 2010; Pencheva *et al.*, 2012; Raksasiri *et al*., 2014; Raksasiri *et al*., 2020a).

The Bureau of Livestock Product Standards Development and Certification (n.d) suggested that good animal husbandry requires standardization to ensure that consumers would be confident in livestock products in order to achieve acceptance in the product as well as for the marketing and goat farming to continue flourishing. It was found that most farmers select goats for sale according to customer's satisfaction. and price checks from middlemen. Most of the destination markets are in Malaysia, Laos, and Vietnam. Most of the goats are sold at good prices during the winter months and usally sold to those with personal relationship with the farmers (alive goat selling price as of May 2020 – June 2021 is approxmately 110-130 THB/kg). Most farmers raise goats that are semi-contained and semi-released. However, developing a market network for live goats and their products is important. The important elements of such network are the members and the member' quality, including the ability to solve problems and the interest in helping each other. It was found that sacrifice, honesty, fairness, responsibility, intention, listening to opinions, and participation encourages the exchange and share learning experiences of the members at the highest level. The problem of aggregating and building networks at all stages was found to be at a low to very low level. which grouping will have a positive effect in terms of strengthening the community both in terms of production capacity Marketing Negotiation and welfare related to the occupation of the farmers themselves as well as to create sustainability for the economy as well. (Raksasiri, 2010; Taweewong, 2018, Poungsuk, 2017). The goat population in Thailand is relatively small. In the past, there were a few numbers of research publications concerning goats in Thailand, especially dairy goats, compared with those in other economic livestock such as swine, cattle, and poultry. The numbers of the published research articles have gradually increased, owning to the promotion of goat production by the government. There has been a marked increase in goat production in the past ten years due to an increased demand for goat meat and milk. Major research areas have been focused on breeding and genetic improvement, feed and feeding, husbandry, health, diseases, and socio-economics. Pralomkarn *et al.* (2011), found that farmers still lacked knowledge on the development of processed products, and marketing access, which is highly important to generate sustainability of goat production.

This study concluded that farmers were less likely to advise from academics. There were also few goats that reared in each farm, resulting in small amount of earnings for the farmers. As a result, farmers had a moderate economic status. Markets for goats and their products are limited. These farmers had no income security from goat production. In spite of this, farmers accepted the farm management technology for breed selection and system

management at a 'very good' level, while food management and marketing was at a 'good' level. Housing equipment, and sanitation were 'moderately' accepted. This shows potentials of goat farmers to learn, recognize and apply that knowledge to benefit to their goat farming. Therefore, there should be a promotion and knowledge transfer from academics to the farmers both in farm management technology and other related fields such as product processing potential, packaging design, and marketing of processed products.

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