Status of Dairy Milk Business in Phatthalung Province and Development Approaches to Its Sustainability

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ABSTRACT

The study aimed to investigate: 1) the management of the production of dairy milk by farmers in Phatthalung province, 2) the management of milk processing by a dairy milk cooperative, and 3) opinions on approaches to developing a sustainable dairy business. The district extension officer, 4 staff of the dairy milk cooperative—namely, the director of the cooperative, the manager, the chief of production, and the chief of finance—and 53 dairy farmers were interviewed.

The findings revealed that most farmers raised Holstein Friesian (black and white) cattle. About half of the dairy farmers had less than 20 head of dairy cattle. They fed their cows concentrates twice daily coupled with grass or roughage. They milked their cattle using milking machines. Most had their own pasture, but the grass and roughage were insufficient to feed their cattle. Their milk production was around 8–9 kilograms per head per day which was rather low. The cooperative bought the raw milk at 17–18 baht per kilogram depending on the quality of the milk. The price was fair and the farmers were satisfied with it. Mastitis, a low conception rate, and inadequate grass and roughage were mentioned as the main problems they faced. Daily, the cooperative processed 40 tonnes of dairy milk and processed 20,000 milk bags, which it had no problem in marketing. Many approaches were suggested as means of developing the sustainability of the dairy milk business: enlarging the pasture size, increasing the farmers' knowledge of raising cattle, offering concentrates at the lowest possible price, and encouraging farmers' children to take up the occupation of dairy farming.

The results suggest that future approaches to developing sustainability in the dairy milk business should have as their prime objective increasing the quantity of raw dairy milk. This can be achieved by various methods as mentioned above. In addition, the need to encourage young energetic people who are not currently associated with dairy farming to switch to this business to replace existing dairy farmers is apparent.

Keywords: sustainability, development approaches, dairy milk business

บทคัดย่อ

การวิจัยนี้มีวัตถุประสงค์เพื่อศึกษา 1) การจัดการผลิตนมโคของเกษตรกร 2) การจัดการแปรรูปนมโคของสหกรณ์ และ 3) ความคิดเห็นที่มีต่อการพัฒนาความยั่งยืนของธุรกิจโคนม ปศุสัตว์อำเภอเมือง เจ้าหน้าที่สหกรณ์จำนวน 4 คน ได้แก่ ประธานคณะกรรมการดำเนินงานสหกรณ์ ผู้จัดการสหกรณ์

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หัวหน้าฝ่ายการผลิต และหัวหน้าฝ่ายการเงิน และเกษตรกรผู้เลี้ยงโคนม จำนวน 53 คน ได้รับการสัมภาษณ์

ผลการวิจัยพบว่า ส่วนใหญ่ของเกษตรเลี้ยงโคนมสายพันธุ์โฮลสไตล์ ฟรีเชียน (พันธุ์ขาว-ดำ) ประมาณครึ่งหนึ่งของเกษตรกรมีโคนม 20 ตัว หรือน้อยกว่า เกษตรกรให้อาหารข้นวันละ 2 ครั้ง พร้อมกับหญ้าและพืชอาหารสัตว์อื่นๆ ส่วนใหญ่ของเกษตรกรรีดนมโคโดยใช้เครื่องรีดนม และมีแปลงหญ้าเป็นของตนเอง แต่หญ้าและพืชอาการสัตว์อื่นๆ ไม่เพียงพอต่อการเลี้ยง นมโคที่รีดได้ต่อตัวต่อวันประมาณ 8–9 กิโลกรัม ซึ่งเป็นปริมาณที่ค่อนข้างต่ำ สหกรณ์รับซื้อนมโคระหว่าง 17–18 บาทต่อกิโลกรัมขึ้นอยู่กับคุณภาพของนมโคเป็นสำคัญ เกษตรเห็นว่าราคาค่อนข้างมีความยุติธรรมและพึงพอใจต่อราคาที่สหกรณ์รับซื้อ โรคเต้านมอักเสบ การผสมเทียมติดในอัตราต่ำ และความไม่เพียงพอของหญ้าและพืชอาหารสัตว์ เป็นปัญหาสำคัญสำหรับเกษตรกร สหกรณ์แปรรูปนมโค 40 ตันต่อวัน โดยเป็นนมถุงจำนวน 20,000 ถุง และไม่มีปัญหาเกี่ยวกับการตลาด วิธีการในการพัฒนาความยั่งยืนของธุรกิจโคนมที่ถูกระบุโดยกลุ่มตัวอย่าง ได้แก่ การทำให้แปลงหญ้ามีขนาดใหญ่ขึ้น การเพิ่มความรู้ในการเลี้ยงโคนมให้กับเกษตรกร การจัดหาอาหารข้นที่มีราคาต่ำจำหน่ายให้กับเกษตรกร และการสนับสนุนให้บุตรของเกษตรกรประกอบอาชีพในการเลี้ยงโคนมต่อไป

ผลที่ได้ชี้ให้เห็นว่า วิธีการในอนาคตเพื่อการพัฒนาความยั่งยืน ควรเน้นที่การเพิ่มปริมาณนมโคเป็นสำคัญ ซึ่งสามารถที่จะทำได้ด้วยวิธีการดังกล่าวข้างต้น นอกจากนี้ มีความจำเป็นอย่างยิ่งที่ควรสนับสนุนให้คนหนุ่มสาวที่มีอาชีพที่ไม่ได้เกี่ยวข้องกับการเลี้ยงโคนม เปลี่ยนมาเลี้ยงโคนมเพิ่มขึ้น ซึ่งจะเป็นการทดแทนเกษตรกรที่มีอายุมาก

คำสำคัญ: ความยั่งยืน วิธีการพัฒนา ธุรกิจโคนม

INTRODUCTION

About 50 percent of Thailand's population are engaged in agriculture. Thus, agriculture plays a very important role in the economy of the country. Agricultural extension activities have been undertaken in order to increase primary production throughout the whole country in cropping, livestock management and fisheries. Rural people can have produce more than they need for their own consumption, and the rest of their farm produce can be sold for income.

The raising of dairy cattle for milk production in Thailand commenced in 1961 with the assistance of the Danish government. At that time, the contributions were in the form of technical support and the provision of good cattle breeding stock. In addition, those involved were trained in the various disciplines of dairy cattle raising.

In southern Thailand, most of the land is hilly and mountainous. It is largely covered with terrestrial forests, with mangrove forests along the seashore on both sides of the peninsula. In higher areas, rubber is the main crop and in lower areas, rice is grown as the staple food. Large-scale animal production is relatively new to the area; currently, dairy cattle production is undertaken mainly in three provinces: Chumporn, Phatthalung and Songkhla.

Previously, farmers in Phatthalung province raised native beef cattle for local consumption, supplied nearby provinces, and exported some to Malaysia. Dairy cattle raising began in Phatthalung province in 1973 with one farmer. Seven years later, a second farmer commenced. Over the following years, the number of farmers who raised dairy cattle grew slowly but steadily. The main reason why there has been such relatively slow growth in the initial stage was that farmers who wanted to raise dairy cattle must collect their funding over many years, or be able to access a loan. Until 1982, the development of dairy cattle projects was overseen by the Thai government (Department of Livestock Development, 1987). In 1985, a milk processing

plant was established which paved the way for the important development of a dairy milk cooperative. The most rapid increase in the number of dairy farmers took place from 1993 to 1994, largely as a result of the 1991 Thailand Revival Plan for Agriculture which allowed poor farmers to obtain low-interest loans. There were problems, however, as some farmers quit dairy farming due to inadequate skills, a lower level of knowledge in dairy raising, and a lack of finance.

The 8th National and Economic Development Plan (1997–2001) stressed an increase in milk production in the country and a reduction in imported milk. This led to an increase in the number of dairy farmers. However, associated problems still remained from past practices, particularly the uneasiness of farmers, intermittent aid from the government, and poor management of the dairy cooperative. This led to a decline in the number of dairy farmers and low milk production; for example, in 1992, the total number of dairy farmers was 298 (Chantalakhana, 1995) while in 1996 the number was 158 (Thongpan, 1997).

In 1997, there were 130 active dairy farmers in Phatthalung province and 252 dairy farmers who had quit raising dairy cattle (Aramlar, Chantalakhana, Saithanoo, & Pattamarakha, 2000). In 2010, the number of farmers was 115 and raw milk production was about 7,400 kg per day while the daily milk processing capacity of the cooperative required 40 tonnes of raw milk (Phatthalung Provincial Office of Livestock Development, 2010).

The decline in the number of dairy farmers had an effect on the amount of milk production which finally affected the overall dairy milk business. Questions which the study addressed with regard to this issue were:

1. Is there potential to increase the milk quantity by farmers?
2. Is there potential for the cooperative to continue milk processing in the long run?
3. How can farmers, the cooperative, and the extension officer identify sustainable approaches for the dairy milk business?

The study aimed to investigate: 1) the management of milk production by farmers, 2) the management of milk processing, and 3) sustainable approaches to the dairy milk business as perceived by farmers, the cooperative director, and the district husbandry officer.

LITERATURE REVIEW

Relevant to this study, is the adoption theory, which proposes that the behavioral changes of an individual can be observed by the adoption of recommendations; thus, the adoption of innovations is a function of, and varies according to individual characteristics of : education, income, farm size, etc. Those who score highly in such characteristics will adopt recommendations faster than others. Thus, the adoption of recommended practices can be seen as a function of the socioeconomic status of the individual (Rogers, 1983).

With reference to farmers' adoption of recommendations, Srinoy, Chantalakhana, Saithanoo, and Pattamarakha (1999) found that the amount of concentrates fed was related to cow's body condition and milk yield. Para grass and *Paspalum plicatulum* Michx. were the major forage species used as roughage. Most farmers used vaccinations to prevent foot-and-mouth disease and hemorrhagic septicemia. Babiosis, pneumonia, and mastitis were the most common diseases. The selection of replacement heifers and use of artificial insemination had been adopted by most famers. The low conception rate from artificial insemination, the high price of feeds, and a shortage of roughage in summer were mentioned as the major problems in dairy raising. From correlation analysis, age, education, knowledge in dairy raising, size of pasture, and personal contact with the district livestock office were found to be positively correlated with the adoption of recommended dairy practices.

Aramlar et al. (2000) found that most farmers raised Holstein Friesian (black and white)

cattle in an open, free-stall, barn situation. Ruzi grass and para grass were grown for use as roughage feed. Concentrates were provided to each animal according to the amount of milk produced. Breeding animals were artificially inseminated by veterinary technicians. Milking was mostly done by hand and about a quarter of milking cows showed teat infection. Associated problems mentioned by farmers were: flooding in forage plots, low conception rates, and a lack of skills in daily raising. In a comparison of the characteristics of the two groups (those still dairy farming and those who had quit), it was found that those who were still in dairy farming had higher numbers of dairy cattle, larger pasture area, better knowledge of cattle raising, more positive attitudes toward dairy cattle raising, more personal contact with livestock officers, more attendance in short-training courses, and more adoption of recommended practices than those who had quit raising dairy cattle.

Chantalakhana and Skunmun (2002) focused on the four classes of factors associated with the success of raising dairy cattle. These were firstly the technical aspects, which included: the selection of breed, farm management, quality of feed, and animal health protection. The second factors were: support undertaken by organizations concerned-credit provision, center of milk collection, marketing, and extension and research. Thirdly, state policy should be associated with the development of the milk business. Fourthly, the social and economic situation of farmers affected the success of the dairy milk business, including income investment and the milk price and had an effect on farmers' decision-making in development and improvement of sustainability.

With reference to the cost-benefit analysis of dairy farming, Thanundee (2009) found that investment in dairy farming with a small herd size (6 or less) was very difficult to run at a profit, as this required a high level of finance and took much more time (at least 5 years) to gain income. It was not recommended to support this type of investment unless agricultural credit was supported.

Kongchawan (2002) defined sustainability as development for adequacy. The economic returns would support the communities and thus, communities would persist. The environment should be well conserved. Thus, sustainability could be viewed as: 1) supporting the economy, 2) maintaining vital communities, 3) conserving a good environment, and 4) supporting the sound body and mind of the people in the communities.

Nuntapanich (2008) pinpointed that development approaches to dairy farming would depend on many factors such as support from the public sector. Adjustment to the daily life of farmers was needed and this would result in self reliance for sustainability.

Sukasem (2008) considered sustainability in dairy farming was important and this could be undertaken by the technology transfer of recommended practices in dairy farming to communities, while protection of natural resources and the environment had to be encouraged in the long run such as the use of manure in plantations and avoidance of chemical fertilizers.

Technical Advisory Committee (1988) proposed that sustainable agriculture could be undertaken to respond to human needs by paying greater attention to environmental protection and restoration.

From the review of the literature, a conceptual model was developed as shown in Figure 1.

From Figure 1, sustainability can be seen as the integrated approaches associated with the people concerned—the husbandry officer, farmers, and the cooperative director. The husbandry officer would contact farmers regularly in order to advise farmers to follow the recommendations. The officer might have contact with the cooperative irregularly to see whether the supply of raw milk is being met by the demand or not. If farmers followed the recommendations, the amount of milk would increase and could be sufficient to support the milk processing undertaken by the cooperative. If enough milk was supplied, the cost of the pasteurized milk

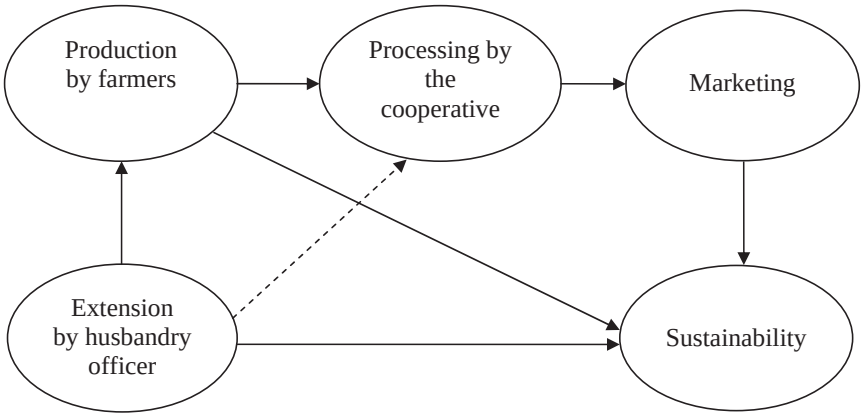

Figure 1 Conceptual framework of the study

would be low and it would be easy to present to the market. It was expected that differences in the roles of the people concerned (farmers, the cooperative director, and the husbandry officer) would result in different perceptions of the best approach to achieve sustainability in the dairy milk business.

RESEARCH METHODOLOGY

Study area

Phatthalung province consists of nine districts covering an area of 3,424.5 km^2. About 80 percent of the total population is engaged in agriculture. Rice growing, rubber plantations, orchards, and fishing are the major commercial activities. About 40 percent of the cultivated area has access to irrigation.

The dairy milk cooperative in Phatthalung province was selected for this study as it is the only dairy milk cooperative in southern Thailand. The districts of Muang, Paphayom, Kuankanoon and Kaochaison were selected for the study area as these contained most of the dairy farmers

Data collection and analysis

Personal interviews were employed for data collection. The questionnaires were then designed and tested to be a precise and accurate tool. The interviews were held between 13 and 25 January 2012. The district extension officer, the cooperative director, the manager, the chief of production, the chief of finance, and 53 dairy farmers were intensively interviewed. While the sample number of farmers required was determined to be 89 from the total population of 115, due to heavy rainfall and severe flooding in Phatthalung province, it was impossible to contact all farmers and consequently, only 53 farmers were interviewed. This represented 60 percent of the required sample. After finishing the field survey, questionnaires were checked and found to be completed correctly. Coding and a code book were prepared. Descriptive statistics were used for data analysis.

RESULTS AND DISCUSSION

Management of dairy milk production

General management and associated problems

Most of the respondents were male and married. About one half had attained formal education to Grade 4. Ages ranged from 25 to 60 years. Most farmers raised Holstein Friesian (black and white) cattle. They had less than 10 year's experience in dairy cattle raising. Raising dairy cattle was regarded as their major occupation

(considered as time spent rather than income received). Most farmers had 1–20 milking cows. Most farmers bought the feed concentrates from the cooperative where the price was low as the cooperative processed the feed formula itself. They fed their cows concentrate twice a day according to milk production coupled with grass. When grass was not available, roughage of rice straw or hay might be added. Most used milking machines. About one–third of the farmers produced raw milk at a rate of 10 kg or more per head per day. The average amount of milk produced was about 8–9 kg per head per day, which was rather low. Most had a plot of pasture of their own; however, the size of the pasture was too small at 1–10 rai (1 ha = 6.25 rai). This resulted in some farmers having an inadequate amount of roughage to feed cattle during summer. Most practiced waste management daily by collecting waste and setting it aside. Water injection of waste to the pasture plot, collecting waste and spreading it, and water injection of waste into canals were also undertaken by some farmers.

Associated problems in production mentioned by the farmers included: hemorrhagic septicemia, a low conception rate, and inadequate grass and roughage. Mastitis and a low conception rate were quite common. The solution to mastitis was increased awareness and the immediate use of health care protection to prevent the outbreak of animal diseases. Artificial insemination could solve the low conception rate. Rapid weather changes and heavy rainfall contributed to the outbreak of animal diseases. Many cows suffered from illness which made them unavailable for milking. The long rainy season made it more difficult to collect roughage such as hay or rice straw for extended use (Table 1).

Dairy production expenses

Business costs entailed payments mainly for cattle housing, breeding and concentrate. The expenses varied according to the herd size. Additional payments were made for roughage, drugs and equipment, electricity, and labor but this required less expense than those mentioned (Table 2).

Sources of investment and revenue

About one-third of the farmers used three different finance methods to run their dairy cattle business their own finance, borrowing from someone, and both using their own finance and borrowing from someone. About one half received revenue from dairy milk in excess of 700,000 baht per year. In addition, they could get extra revenue from selling manure, carcasses, and calves, especially male calves (Table 3). With this revenue, farmers were able to make ends meet.

Dairy milk processing

Milking was undertaken twice daily. After finishing milking, farmers located near the dairy factory would deliver their own milk for checking the amount and quality. Those who lived far from the factory would bring their own milk to a convenient collection point. A large amount of raw milk was carried by truck to the factory. Farmers paid nothing for the transportation.

The dairy milk cooperative raw milk processing capacity was 40 tonnes per day. Approximately 10 tonnes of raw milk was derived from Phatthalung province and the remaining 30 tonnes came from Prachuap Khiri Khan province located far from Phatthalung province. The cooperative processed the raw milk into pasteurized milk bags with a processing capacity of 20,000 bags per day. Bags were sold for 6.21 baht per bag. About 99 percent of the milk bags were sold directly to primary schools located near the cooperative and the remaining 1 percent to general stores. The purchase cost for the raw milk was about 28 million baht per month. The cooperative received 37 million baht of income monthly from the processed product resulting in a monthly surplus to the The cooperative (without subtracting operation costs) of about 9 million baht. In addition to processing the dairy milk, the cooperative also provided credit and purchasing functions to its members. The purchasing function included the development of the feed formula for the dairy cattle at the lowest possible price to reduce the production cost for members. The cooperative had

Table 1 Dairy milk production and associated problems

(n = 53)

Attribute	n	%
Herd size (head)		
20 or less	23	43.4
21–30	14	26.4
31–40	10	18.9
More than 40	6	11.3
Number of milking cows		
10 or less	23	43.4
11–20	24	45.3
More than 20	6	11.3
Milking methods		
Machine	48	90.6
Hand	1	1.9
Both	4	7.5
Quantity of raw milk per head per day		
10 kg or less	34	64.2
More than 10 kg	19	35.8
Own pasture		
Yes	52	98.1
No	1	1.9
Size of pasture (rai)		
1–10	31	58.5
11–20	19	35.8
More than 20	3	5.7
Sufficiency of pasture		
Sufficient	21	39.6
Not Sufficient	32	60.4
Time management of waste		
Daily	37	69.8
Often	12	22.7
Sometimes	4	7.5
Methods of waste management		
Collect waste and set aside	26	49.1
Water injection of waste to pasture plot	15	28.3
Collect waste and spread	8	15.1
Water injection of waste to canal	4	7.5
Associated problems*		
Mastitis	33	62.3
Low conception rate	26	49.1
Inadequate grass and roughage	14	26.4
Climate variation	5	9.4

* More than one response could be provided by respondents

no problems in marketing. The only problem was that a large amount of the raw milk (nearly 75% of the total amount) was from Prachuap Khiri Khan province which was located far from Phatthalung province. This incurred a high cost of transportation compared with the raw milk sourced from Phatthalung province. The cooperative had installed a system to solve the problem of waste so the environment around the cooperative plant was well protected.

Development approaches for sustainability in dairy milk business

Viewpoint of dairy farmers

Dairy farmers perceived that sustainability in the dairy milk business was a function of integrated approaches, which consisted of: 1) increasing knowledge of cattle raising in feed and feeding and

Table 2 Dairy production expenses

(n = 53)

Attribute	n	%
Cattle housing		
50,000 baht or less	13	24.5
50,001–100,000 baht	21	39.6
100,001–150,000 baht	10	18.9
150,001–200,000 baht	4	7.5
More than 200,000 baht	5	9.4
Cattle breeding		
35,000 baht or less	3	5.7
35,001–80,000 baht	17	39.8
80,001–250,000 baht	26	49.2
More than 250,000 baht	7	13.3
Concentrate per month		
25,000 baht or less	20	37.7
25,001–50,000 baht	25	47.2
More than 50,000 baht	8	15.1
Roughage per month		
3,000 baht or less	25	47.1
3,001–6,000 baht	16	36.2
More than 6,000 baht	12	22.7
Drugs and equipment per month		
1,000 baht or less	14	26.5
1,001–2,000 baht	31	58.4
More than 2,000 baht	8	15.1
Electricity per month		
400 baht or less	13	24.5
401-800 baht	23	43.4
More than 800 baht	17	32.1
Labor cost per month		
Do not hire	46	86.8
5,000–6,000 baht	4	7.5
More than 6,000 baht	3	5.7

health care practices, 2) increasing the size of pasture plot, 3) support from the cooperative in terms of low price of concentrates, 4) milk price intervention by the public when it was in crisis, and, 5) inducing farmers' children to enter the occupation of their parents. When asked about occupation replacement, about half of farmers responded that their children would not run this kind of business and about one quarter mentioned that their children were uncertain about how to raise dairy cattle (Table 4). A decrease in the number of dairy farmers was seen as unavoidable as farmers' children who received a higher education tended to get jobs in industry or services in towns or cities rather than choosing to work in rural areas. This had been the tendency and there was a continuing decline in the number of dairy farmers. The need was recognized to create a new generation to replace the existing farmers, but it was not certain whether this could be achieved. One solution to this might be to enlarge the herd size even though there was a decline in the number of dairy farmers. This might require credit support from the public sector or by the cooperative.

Viewpoint of cooperative director

The cooperative director considered sustainability could be viewed in three dimensions. First, intensive training for farmers should be undertaken, especially in terms of feed, feeding, and animal health care. This would contribute to an increase in the quantity of milk. Second, lower possible prices of farm inputs, especially the concentrates would reduce the cost of production. Most farmers accessed concentrates. Third, encouragement of the children of farmers to learn more about dairy cattle raising. These views of the cooperative director were similar to those of the dairy farmers except for the points regarding enlarging the size of pasture area and milk price intervention.

Table 3 Sources of investment and revenue

(n = 53)

Attribute	n	%
Source of finance		
Own	17	32.1
Borrow	17	32.1
Both	19	35.8
Raw milk		
500,000 baht or less	11	20.8
500,001–700,000 baht	14	26.4
More than 700,000 baht	28	52.8
Manure		
15,000 baht or less	35	66.0
15,001–30,000 baht	16	30.2
More than 30,000 baht	2	3.8
Carcasses		
10,000 baht or less	42	793.0
10,001–20,000 baht	9	16.9
More than 20,000 baht	2	3.8
Calves		
1,000 baht or less	50	94.3
1,001–3,000 baht	2	3.8
More than 3,000 baht	1	1.9

Viewpoint of district husbandry extension officer

The officer pinpointed firstly that adequate roughage should be provided to increase the milk production. This point was similar to that made by the dairy farmers, though the farmers paid less attention to this. Secondly, good health of the dairy cattle would result in good dairy milk production. Farmers should pay more attention to and be aware of animal diseases such as hemorrhagic septicemia or mastitis. Whenever dairy cattle were observed to not be in good condition, farmers should act immediately to address the problem. Thirdly, the children of dairy farmers should assume this role when their parents were getting old. This was in accordance with the viewpoints of the dairy farmers and the cooperative director.

Most viewpoints on development perceived by the farmers, the cooperative dissector, and the husbandry officer, were similar. One distinct viewpoint was that of milk price intervention mentioned by dairy farmers. They found that sometimes the milk price dropped and also they had to pay more for the increasing price of farm inputs. They had tried to bargain on the milk price with the cooperative but this was unsuccessful. Therefore, they needed price intervention by the public which was similar to what occurred with rice or rubber.

CONCLUSION AND RECOMMENDATIONS

From this study, the following conclusions can be drawn:

1. Dairy milk production per head per day averaged 8–9 kg which was rather low. This could be increased by the proper use of feed and feeding practices. In addition, farmers should try to provide enough grass and roughage to dairy cattle coupled with use of health care practices.

2. Milk processing by the cooperative produced 20,000 milk bags daily with 99 percent of this milk sold directly through primary schools and the remaining 1 percent was sold to general stores. The cooperative had no problem with marketing. The only problem was that a large quantity of the raw milk was sourced from a province which was remote from Phatthalung province and the processing site. This resulted in a high cost of transportation.

3. Many approaches were mentioned to sustain the dairy business, such as: enlarging the pasture size, price intervention, lowest possible price of farm inputs, organization of training courses for farmers, and inducing young people or farmers' children to switch to this occupation.

From the overall investigation, the recommendations of this study are:

Table 4 Perception of sustainable approaches and occupation replacement

(n = 53)

Attribute	n	%
Opinions on sustainability		
Increase farmers' knowledge of cattle raising	15	28.3
Milk price intervention by the public when it was in crisis	13	24.5
Low possible price of farm inputs	11	20.8
Induce farmers' children to enter their parents' occupation	9	17.0
Enlarge size of pasture plot	5	9.4
Replacement of occupation by farmers' children		
No	26	49.1
Yes	14	26.4
Uncertain	13	24.5

1. Farmers should try to develop and enlarge the pasture area if possible so they are able to feed their dairy cattle all year round. If this is not practical, the development of a silage system to preserve feed for animals is an alternative and farmers would have to join together to support this.

2. Short training courses in feed and feeding and health care practices should be undertaken by the husbandry officer to train farmers as they felt that they had little knowledge on this topic.

3. To help support the development of the dairy milk business, the husbandry extension officer should try to participate in the implementation of and encourage dairy farmers to use the recommendations made regarding dairy cattle health and herd management.

4. Farmers should be aware of mastitis and the importance of using correct preparation practices such as antiseptic cleaning of material and equipment prior to milking, stall cleaning, and cattle bathing.

5. With regard to the low conception rate, farmers should observe their cows more closely, so that when a cow is in heat, the veterinarian should be informed as soon as possible. The conception rate could be improved. Repeating procedures might help.

6. In the long run, young and energetic persons including farmers' children should be induced to work in dairy milk production. They would then be able to replace the older dairy farmers and maintained the industry on a sustainable footing.

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