

Adoption of Recommendations Concerning Dairy Raising Practices in Southern Thailand: Comparison Between Those Who Are Currently Raising and Those Who Have Quit Raising Dairy Cattle

Key words : dairy raising, farmers, recommended practices, adoption, differential characteristics, southern Thailand

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Abstract

There has been a large decline in the number of dairy farmers in recent years in Phatthalung Province, southern Thailand. This study aimed to assess farmers' use of dairy cattle management practices and compare some characteristics between farmers who are still in dairy farming and those who have quit dairy farming in Phatthalung Province. Simple random sampling was employed for sample selection and personal interviews were undertaken for data collection. Sixty five farmers who are still raising dairy cattle and ninety-seven who have quit their farming operation were interviewed.

The findings revealed 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. About one-fourth of milking cows showed teat infection. For associated problems, farmers mentioned flooding in forage plots, low conception rates, and a lack of skills in dairy raising. In comparison characteristics of the two groups, it was found that those who are 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 have quit raising dairy cattle.

This study indicates that the promotion of dairy cattle raising in Phattalung Province has been successful to a certain degree. Farmers' participation in decision-making, for example in selection and purchasing of dairy cows, in the project should be more encouraged. The government should provide veterinary supplies and seeds for pasture production. The debt and loan situation of those who retired from dairy raising should be reviewed in order to help them return to dairy farming in the future if they wish. In addition, extension officers should initiate more contact with farmers in order to develop more favourable attitudes of farmers toward their work for better promotion of dairy cattle raising.

บทคัดย่อ

เกษตรกรผู้เลี้ยงโคนมในจังหวัดพัทลุง ภาคใต้ของประเทศไทย ได้ลดจำนวนลงอย่างรวดเร็วในช่วง 2-3 ปีที่ผ่านมา การวิจัยนี้มีวัตถุประสงค์เพื่อประเมินถึงการใช้วิธีการจัดการในการเลี้ยงโคนมและเปรียบเทียบลักษณะที่แตกต่างระหว่างเกษตรกรผู้ที่ยังคงเลี้ยงอยู่ กับเกษตรกรผู้ที่เลิกเลี้ยงแล้วในจังหวัดพัทลุง ใช้การสุ่มตัวอย่างแบบธรรมดาก่อนเป็นวิธีการคัดเลือกตัวอย่าง และใช้การสัมภาษณ์เป็นวิธีการรวบรวมข้อมูล ได้ทำการสัมภาษณ์เกษตรกรผู้เลี้ยงโคนมที่ยังคงเลี้ยงอยู่จำนวน 65 คน และเกษตรกรผู้ที่เลิกเลี้ยงแล้วจำนวน 97 คน

จากการวิจัยพบว่า เกษตรกรส่วนใหญ่เลี้ยงโคนมพันธุ์โฮลสไตน์ ฟรีเซียน (ขาว-ดำ) ในรูปแบบของการผูกขึ้นโรง เกษตรกรให้หญ้าและหยาขุ่นเป็นอาหารหยาบ ส่วนอาหารข้นให้ในปริมาณที่เป็นสัดส่วนกับปริมาณน้ำนม ส่วนใหญ่ยังใช้การผสมเทียม ซึ่งดำเนินการโดยเจ้าหน้าที่ผสมเทียม และใช้มือในการรีดนม ประมาณหนึ่งในสี่ของโคนมมีการติดเชื้อจากโรคเต้านมอักเสบ เกี่ยวกับปัญหาในการเลี้ยงโคนมพบว่า การมีน้ำท่วมแปลงหญ้า การผสมเทียมผิดมีอัตราต่ำ และการขาดทักษะในการเลี้ยงโคนมเป็นปัญหาที่สำคัญ เกี่ยวกับการเปรียบเทียบลักษณะที่แตกต่างระหว่างเกษตรกรสองกลุ่ม พบว่าเกษตรกรผู้ที่ยังคงเลี้ยงโคนมอยู่มีจำนวนโคนมมากกว่า มีขนาดแปลงหญ้าที่ใหญ่กว่า มีความรู้เกี่ยวกับการเลี้ยงโคนมดีกว่า มีทัศนคติต่อการเลี้ยงโคนมดีกว่า มีการติดต่อสื่อสารกับเจ้าหน้าที่ปศุสัตว์ที่มากกว่า เข้าร่วมการฝึกอบรมเกี่ยวกับการเลี้ยงโคนมมากกว่า และยอมรับวิธีปฏิบัติต่างๆ ในการเลี้ยงโคนมมากกว่าเกษตรกรผู้ที่ยังคงเลี้ยง

ผลการวิจัยแสดงให้เห็นว่า การส่งเสริมการเลี้ยงโคนมในจังหวัดพัทลุงได้ประสบความสำเร็จในระดับหนึ่ง เกษตรกรควรได้รับการเปิดโอกาสในการตัดสินใจเกี่ยวกับการคัดเลือกและจัดซื้อโคนม รัฐควรช่วยสนับสนุนในการจัดหาเวชภัณฑ์และเมล็ดพันธุ์หญ้า เกษตรกรผู้ที่ยังคงเลี้ยงและยังคงมีหนี้สินอยู่ หากประสงค์จะกลับมาเลี้ยงใหม่ควรได้รับการพิจารณาทบทวน นอกจากนี้ เจ้าหน้าที่ปศุสัตว์ควรเพิ่มการติดต่อสื่อสารกับผู้เลี้ยงโคนมให้มากยิ่งขึ้น จะทำให้ผู้เลี้ยงมีทัศนคติที่ดีต่อการเลี้ยงโคนม อันจะเป็นผลดีต่อการส่งเสริมการเลี้ยงโคนมในอนาคตต่อไป

INTRODUCTION

Previously farmers in Phatthalung Province raised native beef cattle for local consumption, supply to nearby provinces and some export to Malaysia. In the early 1960s a demand for fresh milk began to arise, and some dairy cattle farming was started in 1965. 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 significant development of dairy cattle farming. There were problems, however, as some farmers quit dairy farming, primarily as a result of a lack of skill and knowledge in dairy raising and finance.

The 8th National Social and Economic Development Plan (1997-2001) stressed an increase of milk production in the country and a reduction of imported milk. This led to an increase in the number of farmers raising dairy cattle. However, associated problems still remained from past practices, particularly the unreadiness 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 - i.e. in 1992 the total number of dairy farmers was 298 (Chantalakhana, 1995) and in 1996 the number was 158 (Thongpan, 1997).

The decline in the number of dairy farmers reflected the social and economic constraints which farmers faced and their difficulty in adjusting to a new situation, leading to their closing their dairy farms and finding new work. This study aimed to investigate farmers' observance of dairy cattle raising practices as recommended by the appropriate government departments, anticipated results

from the raising, and associated problems, and compare some characteristics of those who are still raising with those who have quit the raising of dairy cattle.

LITERATURE REVIEW

First, the theoretical framework will be provided and summaries of several related studies on farmers' adoption of recommended husbandry practices will be reviewed. A conceptual model will be developed for a clearer picture of the study, and the hypotheses will be postulated.

Theoretical framework

In this study, two theories were employed as the framework: diffusion of innovations and attitude theory. The theory of diffusion of innovations was defined by Rogers (1962) and refers to the spread over time of a new idea through a social system via communication channels. This process consists of (1) the innovation being diffused, (2) the person or source of information about the innovation, (3) the person who receives information and adopts the innovation, (4) the media, channel or structure through which information is transmitted, (5) the situations in which information is transmitted and adoption occurs and (6) the time span during which the diffusion of information and its adoption occur. Characteristics of the person who receives information is one factor which has an influence on the adoption of innovations. A person who is high in socio-economic status (i.e. high education, more income, large farm) will adopt the innovation earlier than one who is lower in such characteristics.

An attitude is, in general, a predisposition of an individual to respond in a given way under a particular set of circumstances. Generally, a person's behavior towards another person or object will be determined to some extent by his/her attitude towards that person or object. According to Greenwald et al. (1968), the attitude theory in a way combines three other theories - instrumental learning theory, cognitive learning theory and classical learning theory. People develop positive attitudes toward people and objects that facilitate their achievement of desired goals, and will develop negative attitudes toward people and objects that frustrate the achievement of those goals.

As little research about dairy cattle production has been undertaken in southern Thailand, the relevance of the above studies in the sphere of the adoption of recommended dairy practices is not known. One purpose of the present study was to determine if works such as the above could be usefully applied to the analysis of dairy farmers' attitudes to cattle raising in southern Thailand. The results of related research undertaken in the past are as follows:

Saleegaset et al. (1994) found that many problems in the adoption of artificial insemination (AI) in beef cattle were a function of low enthusiasm and misconceptions. Some farmers believed that calves resulting from artificial insemination would have a big size and consume more grass so they would have to walk a long distance to look for more grass. Others believed that beef from crossbred cattle was not as tasty as beef from native cattle thus more difficult to sell at markets. Some farmers believed that a calf

conceived through artificial insemination could not be used for religious rituals. His study also found that those willing to use AI had more education, better literacy, more use of farm mechanization and more favourable attitudes in general towards artificial insemination; as a result, they had more crossbred calves than the non-adopters.

Pattamarakha et al. (1997) found that few farmers used government recommendations for goat husbandry practices. Constraints in the adoption was mainly a function of wrong perception. Regarding recommendations for improved health practices, most farmers believed that their goats were in good health already and did not have parasites. For use of feeding practice recommendations, they believed that it was not necessary, coupled with a lack of interest. For use of selection and breeding methods, some 50 percent did not select goats for breeding as they felt that natural mating was less complicated. The study also found that income, living standards, number of goats, leadership status, social participation, knowledge of goat husbandry, awareness of community leaders, urban contact and degree of modernization of goat farmers were positively correlated with the adoption of goat husbandry practices.

Thongpan (1997) found that most farmers had a lack of skill and knowledge in dairy cattle raising. They needed, and were willing to participate in, training courses. Constraints in the adoption of recommended dairy practices were a function of low conception rates from AI, smaller size of pasture plots and a lack of finance for investment.

Bhorisuthsawat et al. (1998) found that about two-thirds of the dairy farmers of the Nong-Po Dairy Cooperative in Ratchaburi Province had a medium level of knowledge about dairy production. Also, most of the farmers (82 percent) used a medium level of technological applications. In a correlation analysis, family expenses, dairy expenses, farm income, dairy income, farm size, size of pasture plots and knowledge of dairy production were found to be correlated with the application of dairy technology.

Ekpanithanpong et al. (1998) found that most beef farmers (more than 50 percent) adopted a low level of feeding and mineral supplements and a medium level of animal health and breeding recommendations. Education, social participation, personal contact with a livestock officer, urban

contact, farm size, family income, use of family labour, loan access, attitudes towards crossbred beef cattle raising and motivation in cattle raising were found to be correlated with the adoption of recommended crossbred beef practices.

Conceptual model

Based on the theoretical framework and empirical research reviewed, the conceptual model was developed. The model postulated a linkage of three areas of concern: farmers' personal characteristics, adoption of dairy practices, and anticipated results. Individual characteristics would have an influence on the adoption of recommended dairy practices and thus on the anticipated results (Figure 1).

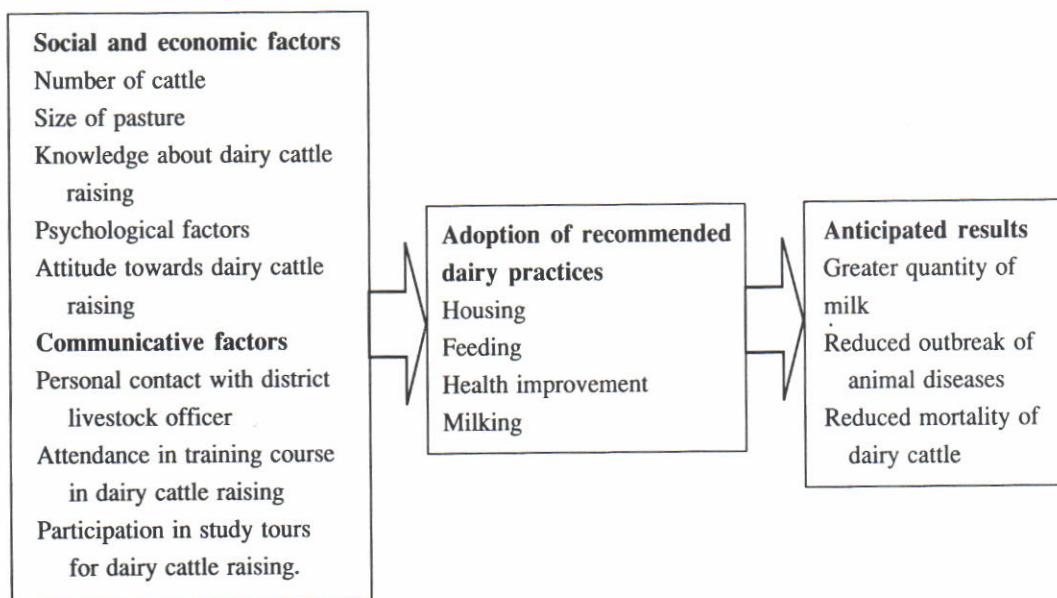


Figure 1 Conceptual model of factors affecting farmers' adoption of recommended practices and anticipated results.

The following general propositions are made:

1. The adoption of innovations was a function and varied according to personal characteristics.

2. Those who adopted continuously will have a higher level in social, economic, communicative and psychological characteristics than those who adopted discontinuously.

Thus, from the propositions, the following hypotheses have been postulated:

Hypothesis 1 - Those who are currently raising will have more cattle than those who have quit raising.

Hypothesis 2 - Those who are currently raising will have a larger size of pasture than those who have quit raising.

Hypothesis 3 - Those who are currently raising will have better knowledge of dairy cattle raising than those who have quit raising.

Hypothesis 4 - Those who are currently raising will have more favourable attitudes toward dairy cattle raising than those who have quit raising.

Hypothesis 5 - Those who are currently raising will contact the district livestock officer more than those who have quit raising.

Hypothesis 6 - Those who are currently raising will attend training courses more than those who have quit raising.

Hypothesis 7 - Those who are currently raising will participate in study tours more than those who have quit raising.

Hypothesis 8 - Those who are currently raising will adopt more recommended practices than those who have quit raising.

Hypothesis 9 - Those who are currently raising will receive a higher quantity of milk per cow per day than those who have quit raising.

Hypothesis 10 - Those who are currently raising will have less outbreaks of animal diseases than those who have quit raising.

Hypothesis 11 - Those who are currently raising will have less mortality in their cattle than those who have quit raising.

RESEARCH METHODOLOGY

Selection of the study area

In southern Thailand, Chumporn and Phatthalung Provinces are the main dairy raising areas. Of these two, the number of dairy farmers in Phatthalung is much greater than in Chumporn, and most dairy farmers joined the dairy raising projects promoted by the government. With this higher number to begin with, a greater decline has also been noted over the years.

Background of the study area

Phatthalung Province consists of 9 districts covering an area of 3,424.5 square kilometers. From the 1997 census, the total population was 485,250: 239,914 males and 245,336 females. About 80 percent of the total population works in agriculture. Rice growing, rubber plantations, orchards and fishing were regarded as the major occupations. About 40 percent of the cultivated area (1,513,269, 1 ha = 6.25 rai) had access to irrigation, and forest land was about 28.4 percent of the total area in the province.

Population and sampling procedure

The study was undertaken as a field survey. The total population of active dairy farmers was 130 and the number of those who had quit raising was 252. Simple random sampling was employed for sample selection. Fifty percent of those who are currently raising (65 farmers) and 40 percent of those who have quit raising (100 farmers) were required for samples. The total number of samples was 165, representing 43.1 percent of the total population.

Data collection and analysis

Personal interviews were chosen as the method of data collection, as most of the sample was farmers with a low level of formal education. The questionnaires were prepared and tested in August 1997 and modified before employment in the survey. The interviews were started at the beginning of September 1997 and lasted approximately six weeks. Sixty-five farmers who are raising dairy cattle and ninety-seven farmers who had quit raising were interviewed in total.

When the field survey was finished, all the questionnaires were checked and found to be completed correctly. Coding and a code book were prepared. The analysis of data was undertaken at the Computer Center at Prince of Songkla University. The Statistical Package for the Social Sciences (SPSS) was employed as the tool for data analysis. Inferential statistics were used as a means for the analysis.

Reliability tests

After the final survey, two types of reliability tests were employed. Cronbach's alpha was conducted to test the degree of attitudes toward dairy cattle raising. It was found that the coefficient of reliability was fairly high and yielded 0.56. The Kuder-Richardson method was assigned to test the knowledge of dairy cattle raising. The coefficient was found to be 0.58 which is fairly high.

RESULTS AND DISCUSSION

Production systems and number of cattle raised

Raising methods of both farmer groups were split into three types: stall feeding, pasture-feeding and free ranging. The best raising method was stall feeding. This method was suitable for the prevention of epidemics, pests and problems associated with heavy rainfall, but required a higher initial investment for building the barn, which some farmers tried to avoid. Most farmers (more than 50 percent) raised Holstein Friesian (Table 1). This breed gave more milk and was found to be more suitable to the local topography. Most farmers who are currently raising had between 6-10 head while of those who had quit averaged 5 or less. For daily milk production, about one-half of those who are raising had 11-15 kilogrammes while about one-half those who quit had 10 kilogrammes or less.

Table 1 Production systems and number of cattle by farmer types.

Attribute	Types of farmers			
	Currently raising ($n_1=65$)		Quit raising ($n_2=97$)	
	Number	Percentage	Number	Percentage
Raising methods				
Stall feeding	31	47.7	47.7	26.8
Grazing on improved pasture	20	30.8	30.8	39.2
Free to roam natural pasture	14	21.5	21.5	34.0
Dairy cattle breed				
Holstein Friesian (HF)	49	58.3	58.3	58.5
Sahiwal	9	10.7	10.7	20.7
Crossbred HF X Native	21	25.0	25.0	10.9
Crossbred HF X Other breeds	5	6.0	6.0	9.9
Total number of cattle				
5 or less	5	7.7	7.7	62.9
6-10	46	70.8	70.8	26.8
More than 10	14	21.5	21.5	10.3
(Average = 10.1)				
Number of cows				
5 or less	11	17.0	17.0	69.0
6-10	29	44.6	44.6	25.8
More than 10	25	38.4	38.4	5.2
(Average = 7.3)				
Number of milking cows				
3 or less	8	12.3	12.3	55.7
4-6	33	50.8	50.8	37.1
7-9	20	30.8	30.8	6.2
More than 9	4	6.1	6.1	1.0
(Average = 4.9)				
Daily milk production (kg./cow/day)				
10 or less	25	38.5	38.5	53.6
11-15	31	47.7	47.7	32.0
More than 15	9	13.8	13.8	14.4
(Average = 7.5)				

Exposure to information and knowledge about dairy cattle raising

With regard to communicative characteristics of farmers, most farmers (more than 80 percent) said that during the preceding year they visited the livestock officers at the office and received a visit initiated by the livestock officers. This showed a close contact between farmers and the officers. In addition, most also participated in a short-training course as well as about one-half attended a study tour operated by the government agency.

For sources of farm information about dairy cattle raising, the district livestock officer and dairy cooperative were mentioned as main personal sources for farmers to seek information about dairy cattle raising. For mass media, television was the important source. As most farmers have access to information through personal and mass media sources, an increase in knowledge and understanding of dairy cattle raising can be expected.

From Table 2, most farmers (more than 50 percent) answered most questions correctly. They answered that the body shape of good dairy cattle should be triangular (question no. 1), a newborn calf should receive colostrum 4 hours (question no. 2), milking should be completed within 5-8 minutes (question no. 4) and the milking machine should be turned off as soon as possible after milk stops flowing (question no. 5). Those who are still raising cattle answered more questions correctly than those who have quit raising, except question no. 3, that the amount of concentrate fed to dairy cows depends on body weight. This might be due to the fact that those who are raising have had a longer period of time in dairy

cattle raising, and thus have acquired a better knowledge than those who quit raising. In addition, those who are still raising had more personal contacts with district livestock officers and had more participation in short training courses than those who have quit raising.

Number of farmers who have quit raising dairy cattle

A shift from dairy cattle raising to other occupations began in 1970 with a small number. From 1971 to 1983, the number was unchanged as no further farmers closed their dairy operations. A reduction in the number of practicing farmers began again in 1984, lasting until 1992 except for 1987. A greater number leaving began in 1992 to 1996 (Figure 2).

The reasons most farmers gave for quitting were uncertainty of farm yield and income, insufficient pasture, and insufficient labour. Uncertainty of farm produce and income was a problem because they had a few cows and fed their cattle according to their socio-economic status. The amount of concentrates and roughage fed to the cattle were uncertain supply leading to the uncertainty of the quantity of milk. Given the small pasture size and poor pasture management, a shortage of roughage was unavoidable.

For those who quit raising, some 41.2 percent noted that the cattle barns were still in good condition and ready for use; however, only 30.9 percent would raise dairy cattle again. Most of those who planned to raise dairy cattle once again needed financial support including low interest rate loans coupled with intensive training in marketing and production.

Table 2 Knowledge about dairy cattle production by farmer types.

Question	Types of farmers			
	Currently raising ($n_1=65$)		Quit raising ($n_2=97$)	
	Number	Percentage	Number	Percentage
1. Body shape of good dairy cattle should be....				
(A) Rectangle	5	7.7	16	16.5
(B) Triangle ⁽¹⁾	57	87.7	53	54.6
(C) Trapezoid	3	4.6	28	28.9
2. How many hours should a newborn calf receive colostrum?				
(A) 4 hours ⁽¹⁾	47	72.3	54	55.6
(B) 5 hours	7	10.7	18	18.6
(C) 6 hours	11	17.0	25	25.8
3. The amount of concentrate fed to dairy cows depends on....				
(A) Body weight ⁽¹⁾	61	93.8	91	93.8
(B) Height	1	1.5	4	4.1
(C) Girth	3	4.7	2	2.1
4. Milking should be completed within....				
(A) 5-8 minutes ⁽¹⁾	46	70.8	54	55.7
(B) 9-11 minutes	14	21.5	27	27.8
(C) 12-14 minutes	5	7.7	16	16.5
5. When should the milking machine be turned off?				
(A) Upon reaching a set time	12	18.5	27	27.9
(B) When blood comes out from the udder	4	6.1	8	8.2
(C) As soon as possible after milk stops flowing ⁽¹⁾	49	75.4	62	63.9

⁽¹⁾Correct answer.

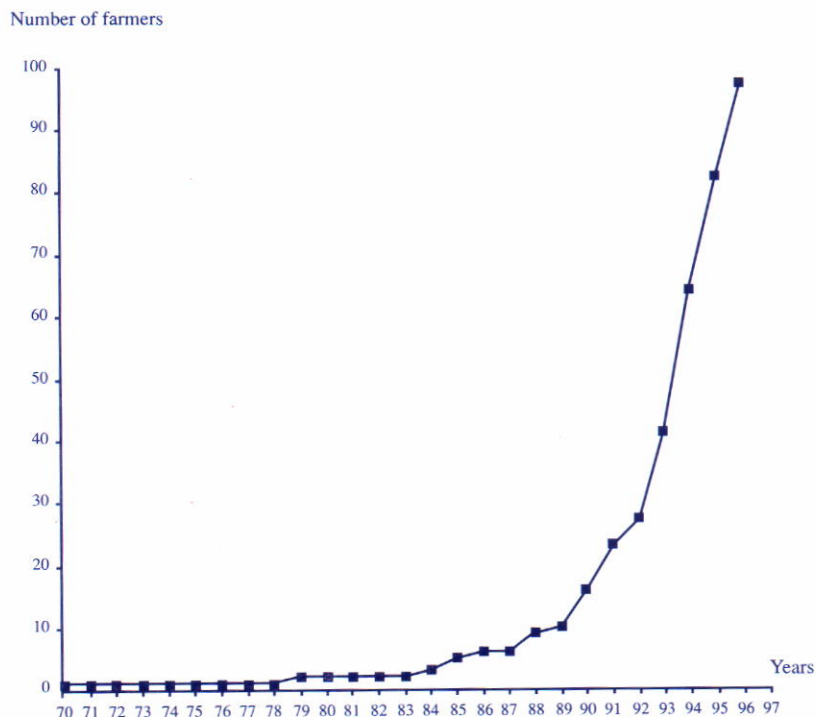


Figure 2 Diffusion curve showing the cumulative number of dairy farmers who quit.

Farmers' adoption of the recommended practices

With reference to adoption of cattle housing, most farmers had a cattle barn with a floor of coarse concrete and the barn flooring was sloped towards the rear for better barn cleaning. Drainage of waste was available at most farms although a waste holding pond was not available. Most farmers did not have waste holding ponds because they would have to spend some money for digging the pond and they were unwilling to do. To solve this they collected the manure each day and usually just piled it near the cattle barn. This is a dangerous practice as it represents a possible source of disease; it also presents a potential environmental problem as people who live near the farms might object to the smell of a large manure pile.

For adoption of recommended feeding practices, most farmers provided concentrates to dairy cattle according to milk production - more milk, more concentrates given (Table 3). About one-half of those who are currently raising and of those who have quit raising gave concentrates to dairy cattle at 3-4 kilogrammes per cow per day. For feeding grass, most farmers cut and carried grass to the barn. In addition, about one-half let their cattle graze on pasture. Para and ruzi grass were the major species used for roughage, and hamata legume and sweet corn leaves and stems were also given to dairy cattle where available. However, about one-half of farmers said that generally there was inadequate roughage for healthy dairy cattle. Some of them switched to rice straw and hay as a roughage supplement.

Table 3 Feeding practices by farmer types.

Attribute	Types of farmers			
	Currently raising ($n_1=65$)		Quit raising ($n_2=97$)	
	Number	Percentage	Number	Percentage
Criteria for concentrate given				
Milk production	60	92.3	82	84.6
Cow condition	4	6.2	8	8.2
Farmer's feeling	1	1.5	7	7.2
Amount of concentrate given (kg./cow)				
Less than 3	18	27.6	45	46.4
3-4	29	44.7	47	48.4
5-6	8	12.3	5	5.5
More than 6	10	15.4	-	-
(Average=3.0)				
Methods of providing grasses ⁽¹⁾				
Cut and carry	65	100.0	93	95.9
Graze on pasture	26	40.0	55	56.7
Tether in the rice field	18	27.7	18	18.6
Tether in rubber plantation	7	10.8	6	6.2
Tether in public areas	1	1.5	5	5.2
Grass/roughage source ⁽¹⁾				
Para grass	56	86.2	66	68.0
Ruzi grass	33	50.8	57	58.8
Plicatum grass	23	35.4	12	12.5
Napier grass	7	10.8	6	6.2
Hamata legume	4	6.2	2	2.1
Sweet corn leaves and stems	1	1.5	-	-
Sufficiency of pasture				
Sufficient	34	52.3	44	45.4
Not Sufficient	31	47.7	53	54.6
Types of supplemental roughages ⁽¹⁾				
(n1=31, n2=53)				
Rice straw	31	47.7	53	54.6
Hay	24	36.9	35	36.1
Fresh forage	7	10.8	14	14.4

⁽¹⁾Quoted from more than one source.

For adoption of health practices, most farmers of both groups (more than 60 percent) observed the recommended practices-regular health checks, internal and external parasite control, vaccinations and artificial insemination. In each area the number of those who are currently raising was greater than that of those who have quit raising, except concerning the use of external parasite controls where the number of those who have quit was greater. Whenever their dairy cattle were sick most would go and inform a veterinary officer. Quite a few would treat the cattle themselves or with the help of a neighbor if they could manage it.

For adoption of milking practices, most farmers (more than 70 percent) milked their cows by hand (Table 4), primarily because of financial

considerations; also, since they had few cows, milking without using a machine was practical. There was a tendency that those who are currently raising were more likely to use a milking machine than those who have quit raising, generally also indicating they had more cows. Before milking, about one-third of both groups tested for mastitis. The remaining two-thirds rejected the mastitis test as they perceived it was wasting time and they were confident that their cows were not receptive to mastitis. About one-fourth of both observed antiseptic cleaning routines for material and equipment for milking, barn cleaning and cattle bathing before milking. Most farmers felt that this was not a necessary requirement. On the whole, it could be concluded that farmers observed a low level of recommended milking practices.

Table 4 Milking practices by farmer types.

Attribute	Types of farmers			
	Currently raising ($n_1=65$)		Quit raising ($n_2=97$)	
	Number	Percentage	Number	Percentage
Milking methods				
Hand	50	76.9	94	96.9
Machine	10	15.4	2	2.1
Both	5	7.7	-	-
Test for mastitis				
Test	18	27.7	31	32.0
Do not test	47	72.3	66	68.0
Management before milking ⁽¹⁾				
Preparation of antiseptic	16	24.6	22	22.7
Cleaning of material and equipment for milking	14	21.5	28	28.9
Stall cleaning	14	21.5	26	26.8
Cattle bathing	14	21.5	26	26.8

⁽¹⁾Quoted from more than one source.

Diseases and mortality

Farmers were asked to mention the names of diseases they were faced with. About one-half of both groups claimed that their cattle had diseases. Mastitis was mentioned as most common for them (Table 5). About 20 percent could not identify the real cause as they were not familiar with the symptoms. Although most farmers observed a high level of health improvement practices, outbreaks of animal diseases still occurred. This might be due to the fact that some farmers were not well aware of the situation as they felt

that their cattle were in good health so there was no need to do anything.

With reference to dairy cattle mortality, it was found that about one-half of both groups had experienced mortality problems, with the number of dead cattle ranging from one to four. A high mortality rate was associated with poor management in relation to the adoption of recommended health practices, indicating a serious need for education of how to protect against the outbreak of animal diseases.

Table 5 Diseases and mortality of dairy cattle by farmer types.

Attribute	Types of farmers			
	Currently raising ($n_1=65$)		Quit raising ($n_2=97$)	
	Number	Percentage	Number	Percentage
Outbreak of animal diseases				
None	37	56.9	50	51.5
Mastitis	17	26.1	25	25.8
Haemorrhagic septicaemia	3	4.6	5	5.2
Foot and mouth	1	1.6	5	5.2
Anthrax	1	1.6	-	-
Tuberculosis	-	-	4	4.1
Unknown	6	9.2	8	8.2
Cattle mortality				
None	56	86.2	86	88.7
1-2	6	9.2	7	7.2
3-4	2	3.1	4	4.1
More than 4	1	1.5	-	-

Associated problems

For associated problems in present production, most of those who are currently raising mentioned pasture flooding, a low conception rate from artificial insemination, and a lack of production skills as three major problems. As the land in the survey area is generally low, flooding is widespread. One solution to this was to search for grass species that can withstand flooding. For the low conception rate from AI, it was felt that repeating the procedures might help. More training and study tours were recommended for those with a lack of the necessary dairy-raising skills. As average farm size was felt to be too small (only 10 rai), and expansion of land was impossible, a search for alternatives was recommended. One solution might involve the use of hay or rice straw when there is a shortage of feed, or possibly develop a silage system to preserve feed for animals. It was noted that farmers would have to join together to initiate such practices.

A comparison between some characteristics of those who are currently raising and those who have quit raising

In testing the hypotheses, it was found that those who are currently raising had more dairy

cattle, a larger size of pasture, better knowledge about dairy cattle raising, more favourable attitudes towards dairy cattle raising, more personal contact with district livestock officers, participation in training courses, and more adoption of recommended practices than those who had quit raising (Table 6). However, differences in adoption of recommended practices and anticipated results between those farmers' groups were not found. This supported hypotheses 1-6 and 8 and rejected hypotheses 7 and 9-11. This showed that those farmers who are currently raising adopted those practices at a higher level than those who have quit raising. Although a difference in the adoption of government recommended practices was observed, anticipated results showed no differences. This might be due to the variation in the estimation of the quantity of milk by farmers. If the recorded data at the milk processing plant had been used, a greater accuracy in the data might have shown a difference in that respect. For outbreak of animal diseases, those who are currently raising observed a very similar pattern as those who quit raising. This also had effect on the mortality of dairy cattle of both groups similarly.

Table 6 A comparison of some factors between those who are currently raising and those who have quit raising.

Factors	Average score		Statistical Value
	Currently raising (n ₁ =65)	Quit raising (n ₂ =97)	
Social and economic characteristics			
Number of cattle	10.7	5.2	t = 7.26 **
Size of pasture (rai)	11.4	4.9	t = 5.54 **
Knowledge about dairy cattle raising	6.2	5.0	t = 3.19 **
Psychological characteristics			
Attitudes towards dairy cattle raising	13.2	12.4	t = 2.19 *
Communicative characteristics			
Personal contacts with district livestock officer	3.7	3.2	t = 4.26 **
Attendance in training course	-	-	X ² = 6.40 *
Participation in study tours	-	-	X ² = 0.01
Use of recommended practices	7.1	5.9	t = 5.02 **
Anticipated results			
Quantity of milk (kg./cow/day)	7.8	6.7	t = 1.71
Outbreak of animal diseases	-	-	X ² = 4.71
Mortality of dairy cattle	-	-	X ² = 0.64

* Significant at 0.05% level.

** Significant at 0.01% level.

CONCLUSIONS AND RECOMMENDATIONS

Most farmers kept cattle in a form of open free-stall barn, and drainage of waste was available at most farms although most farms did not have a waste holding pond. For feeding practices, most farmers provided concentrates to dairy cattle according to the level of milk production. Para grass and ruzi grass were the major species used as rough-

age; hamata legume and sweet corn where available were also given. For health practices, most farmers observed the recommended practices of health checking, internal and external parasite control, vaccinations and artificial insemination. For milking practices, about one-third tested for mastitis before milking and most did milking by hand. With regard to diseases and mortality, about one-half of farmers claimed that their cattle had dis-

eases and mastitis was mentioned as a common disease. About one-half of farmers recorded dead cattle, generally 1-2 head.

With reference to associated problems, pasture flooding, low conception rate of AI and a lack of production skills were mentioned as most common.

For a comparison, those who are currently in dairy raising had higher number of dairy cattle, larger pasture area, better knowledge of cattle raising, more positive attitudes toward dairy cattle raising, more personal contact with veterinary service personal, more attendance at short-training courses, and more adoption recommended practices than those who have quit raising.

Based on this study, the following are recommended:

1. As most farmers who were still raising dairy cattle had more personal contact with the livestock officers than those farmers who had quit, and in return, most of the livestock officers also initiated more contact with farmers, this contact should be encouraged at the same or higher level. This close contact will develop more positive attitudes between farmers and officers, which will lead to higher use of proper practices.

2. As many farmers who participated in the study tours indicated they were useful, an obvious path to increase farmers' knowledge in dairy raising is through participation in study tours. If possible, this should be undertaken once a year with full support of the government, allowing more farmers the opportunity for this learning.

3. An alternative for flooded areas is to search for grass species that can withstand regular flooding. Research in this area should be undertaken at the earliest opportunity to support dairy production.

4. Development of a silage system to preserve feed for animals is obvious and farmers would have to join together to support this.

5. A low conception rate was mentioned by two-thirds of farmers as a serious problem. This is common with AI, but the conception rate can be improved by improved communications between farmers and veterinarians, who should be informed as soon as the farmer observes the cow is in heat.

6. For those who have quit dairy raising, some of them may return once again if a chance is offered and the situation for raising looks better.

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REFERENCES

- Bhorisuthsawat, K., D. Rerkrai, P. Chit-anan, and C. Chantalakhana. 1998. **A Research Report on Factors Affecting Adoption of Technology by Dairy Producers at Nongpho Dairy Cooperative.** Bangkok : Office of Extension and Training, Kasetsart University.

- Chantalakhana, C. 1995. **The Development of Dairy Cattle Production and Milk Products in Thailand: Strategies for Research and Development in the Future.** Bangkok : Office of Foundations for Research Support.
- Department of Livestock Development, 1987. **Development of Dairy Cattle Production in Thailand.** Bangkok.
- Ekpanithanpong, P., Y. Siriwithananukul, K. Pattamarakha, and Y. Siriwithananukul. 1998. "Factors Affecting Farmers' Adoption of Crossbred Beef Cattle in Ampho Muang, Changwat Songkhla." **Songklanakarin J. of Soc & Hum.** 4(1) : 115-129.
- Greenwald, A.G., T.C. Brock, and T.M. Ostrom. 1968. **Psychological Foundation of Attitudes.** New York: Academic Press.
- Office of Agricultural Economics, 1996. **Agricultural Statistics of Thailand Crop Year 1995-96.** Bangkok.
- Pattamarakha, K., J. Tanapanyarachwong, and S. Saithanoo. 1997. "The Use of Recommended Goat Husbandry Practices by Farmers in Southern Thailand." **Asian-Australasian J. Anim. Sci.** 10(6) : 587-592.
- Phatthalung Provincial Office of Livestock Development. 1995. **Information about Dairy Cattle Production in the 9th Regional Livestock Zone.** Phatthalung.
- Rogers. E.M. 1962. **Diffusion of Innovations.** New York: The Free Press.
- Saleegaset, P., S. Saithanoo, and K. Pattamarakha. 1994. "Effects of an Innovation on Rural Communities: A Study on the Adoption of Cattle Artificial Insemination." **Songklanakarin J. of Soc & Hum.** 1(1) : 39-65.
- Samnakhon, A. 1992. **Communication Exposure and Adoption of Innovation Affecting the Accomplishment of Farmers' Dairy Production in Changwat Petchaburi Between Members of Dairy Cooperative and Non-Members.** Bangkok: Master's Thesis, Graduate School, Kasetsart University. (Unpublished)
- Thongpan, P. 1997. **Dairy Cattle Raising in Southern Thailand with Emphasis on Gender Analysis.** Songkhla: Master's Thesis, Graduate School, Prince of Songkla University. (Unpublished)