

CHAPTER I

SOME INTRODUCTORY ASPECTS

It should be noted at the Outset that Thai dairy industry can be called at best **an emerging experience** represented by a collection of firms producing a **milk-base** product. It has not been the **subject** of scientific economic analysis and the little **research** which has been **undertaken** is mostly of a descriptive **nature**. There has **been no analysis** of the industry in economic terms. **What literature exists** on the **industry's economic** implications **for** Thailand **is** again of little importance **as** a significant contribution to economic analysis. The industry itself has **encountered some** critical **problems** up to the present time and it needs today a workable solution of the problems for its **possible** development.

As regards Danish Co-operative Dairy **System**, it has been highly developed over a period of many years. But no studies on implications **of** the System for the solution of **Thai** dairy industry problems are available today. **No** attempt has been made to show how the System might be applied for use in Thailand today.

The need for such literature is thus apparent-an economic analysis of the System **and its relevance** for the country. This is the subject of this **research**.

1.1 Specification of the problem

To meet the need mentioned **above**, the present study is divided into two parts:

1) Analysis of the **Thai dairy industry**, which constitutes the larger part of this **study**: (a) an agricultural and dairy **development** background; (b) a logical and systematic

interpretation of some economic essentials in respect of dairy **consumption, milk** production and **utilization, and** marketing; (c) **a consideration** of the industry's needs primarily for **the** purpose of **considering** ways and **means** to develop the industry today; and (d) **a** consideration of how **some** of its problems can be solved by application of certain dairy co-operative techniques successfully developed in Denmark.

2) Analysis of the Danish Co-operative Dairy System (a lesser part of **this** study **other** than its **implications** for **Thai** application): (a) **consideration** of historical background in so far as this is both relevant and conformable to **necessary** research methodology; (b) a logical and systematic interpretation of economic essentials in respect of **characteristics, production, marketing** and other problematic aspects of the 'system'; and (c) an examination of the extent to **which** such knowledge may be applied to a solution of **the** Thai dairy **'s** problems.

1.2 Method of Study

This study has been conducted along the lines of accepted research **techniques, and investigative** approach by which a body of **reliable** and corroborative knowledge of the **System** and the Thai dairy industry have been examined. **Statistical methods** are used in evaluation of accuracy of **data** so obtained. And **other** analytical methods **are** also used in elucidation of the **System's** economic nature.

1.5 Agricultural Development and Dairy Industry Background of Thailand

1.3.1 Agricultural Development¹⁾

¹⁾ According to the Thai **concept, Thai** agricultural development means the increase of agricultural **products, the-** innovation of production **techniques, and** the organization of **farmers' institutions** to increase the **efficiency** of production and sales.

1) Thailand, a small tropical country located in Southeast Asia on the Indo-China peninsula between longitudes 60 and 20 North and latitudes 97 and 106 East, has a total land area of 514,000 sq.km. (almost 200,000 square miles with a population of 40,000,000; approximately 60 persons per sq.km.). The country has four major physiographic regions: Northeastern, Northern, Central, and Southern. Each of the regions is subdivided into administrative units called Changwads (Provinces). The regions form 72 Provinces today (see Figure 1).

2) Today the country has two main economic resources, agricultural and industrial, with the latter¹⁾ being the lesser of the two. The national economy of Thailand relies primarily upon its production of rice, rubber, teak, maize, jute, kenaf, and other agricultural products. Of these, rice looms above the rest in importance to the national economy. This is indicated by the substantially large percentage of income derived from rice. Both domestic and foreign trade in these agricultural products are actually significant economic activities of this small nation. The foreign trade in the products makes up about 70 percent of total exports.

3) In 1965, the total area was divided according to its utilization, into sub-areas of forest, farm holdings, and swamp, with some lands unclassified. The forest sub-area ranked first and farm holdings second in size importance. The farm holdings land area in 1965 amounted to 78,715,509 rai²⁾, or 23.53 per cent of the total land area. Approximately 321,250,000 rai of the country was utilized for rice, upland crops, and vegetables, tree crops, wood, and others. This area forms a vitally important national property as the main source of

¹⁾ Industrial production of tin, lead, wolfram, lignite, iron-ore, and electric power.

²⁾ One rai equals approximately one-sixth of one hectare.

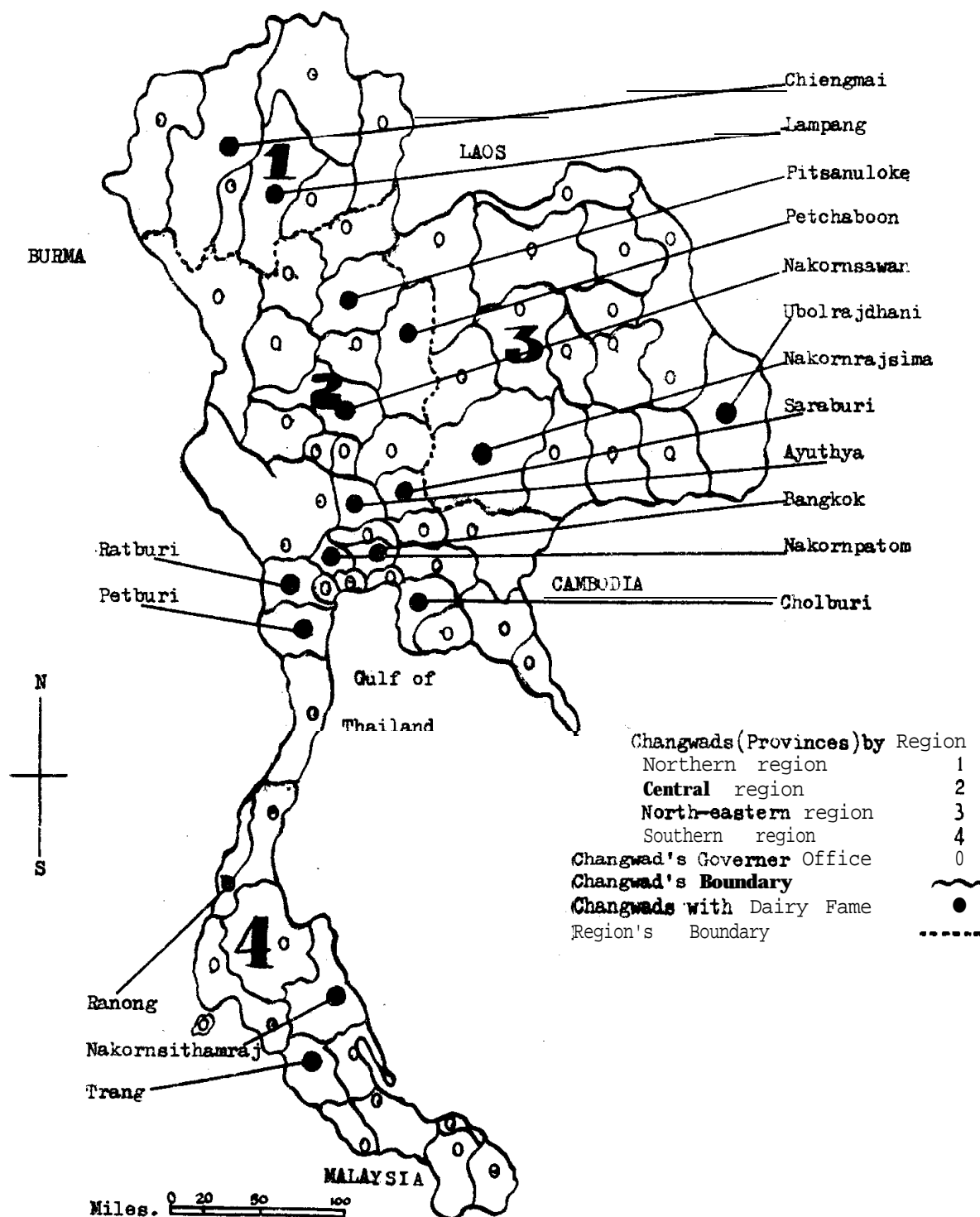


Figure 1
Locations of Dairy Farms in Thailand, 1972

Thailand's wealth. About 3,400,000 farms of **various sizes**, with an average **size** of 26 rei (9.334 acres), are worked by Thai farmers at present. ¹⁾ The farms, rice, dairy and other types, scattered throughout the said regions, are characterized by their number and small size. Many farms produce but one crop, while many others are diversified by producing both crops and livestock simultaneously. In 1970/71 13,270,000 tons of rice valued at 13,174.8 million Baht (3 Baht=1 D.Kr.) were produced by the said agricultural economic units; and in 1970, these units had 5,734,500 buffaloes, 4,666,969 Cattle and 5,132,214 swine ²⁾ both for home consumption and for regional and international markets. These figures are fairly large for Thailand today. (Cattle includes meat, draft, and dairy animals.)

4) Our next task is to consider agricultural problems as affecting Thailand and then their solutions and development. Some sticky economic phenomena have been recognized by the farmers. They are, for example, traditionally inadequate methods practiced by the farmers, low rates of agricultural investment, and low productivity. The greater proportion of the agricultural population is undereducated and poor by any standards. Additionally, a high rate of increase in population, 3.4 per cent per annum, has added more complication to the already confusing situation. ³⁾ Yet of the farmers themselves are unable to cope with their problems and need governmental aid in this and other respects. The government must therefore guide and assist the farmers both technically and economically, for their own well-being.

¹⁾ This information was collected from the Division Of Agricultural Economics, Ministry of Agriculture and Cooperatives, Thailand.

²⁾ Division of Agricultural Economics, Agricultural Statistics of Thailand 1970 (Bangkok: the Division, 1972), pp. 44-73.

³⁾ Division of Supervision and Extension, Land Co-operatives in Thailand (Bangkok: the Division, 1966), p. 1.

The Royal Thailand Government, concerned with the economic and social conditions of the farmers, has tried to overcome these problems by various measures, one of which is a co-operative method used as an economic lever. That is, co-operative societies of various forms were organized among the farmers to solve their agricultural economic problems, commencing with a co-operative credit society in 1916. However, the problems as such could not be entirely overcome by the co-operative method.

Although its efforts produced few good results, the government did not lessen its assistance services. Greater efforts to assist the farmers were made. Since the Second World War its policy has emphasised the importance of agriculture for the country. It has put a good deal of money and effort into solving the problems and developing the agricultural infrastructure to a great extent, even in research and extension activities. But since such activities were performed without planning as a guiding way, it is difficult to know the results achieved.¹⁾

(1) However, the first Economic Development Plan (1961-1966) of Thailand prepared by the government was launched in 1960 as guides which the government agencies concerned were required to follow. The Plan consisted of the following: main components: economic structure of Thailand, objectives, economic development policy, development factors, development projects, and evaluation of the Plan.²⁾ As to the development projects, one of them was the agricultural projects including irrigation,³⁾ research and extension, promotion of

¹⁾ Dr. Thalerng Thanrongnavasawasdi, "Economic Planning of Thailand", Co-operator (vol. 1, 1966), p. 59.

²⁾ Ibid., pp. 59-66.

³⁾ It consisted of state irrigation, people's irrigation, water storage, and water conservation,

fishery and livestock (breeding, disease control, and dairy farming), and co-operatives.¹⁾ The Ministry of Agriculture and Co-operatives assumed responsibility for agricultural projects during the Plan period.

The proper economic objective of the Plan was to increase Thailand's national income—"the net value of all final goods and services produced in some period, measured at factor cost"—at the rate of 6 per cent per annum. The proper agricultural objective was to increase the overall national productivity from 2 to 3 per cent per annum. To achieve these objectives, about 22,000 million Baht was allocated for economic development. Of this sum, 1,551 million Baht was spent for the development proper.

As a result of operations according to the Plan, the growth rate of agricultural production proper averaged 5 per cent per annum.²⁾ The growth rate of industrial production averaged 10 per cent per annum. During the 1961-1963 period the national income increased at an annual rate of 6.1 per cent (or from 59 million Baht in 1961 to 65.8 million Baht in 1963). During the same period, the per capita income increased at an annual rate of 3.1 per cent (or from 1,850 Baht in 1961 to 1964 Baht in 1963). By these figures, the country's economic development satisfactorily achieved the objectives set during the Plan period.

(2) However, the accomplishment of such achievements did not mean a lessening effort on the part of the Government towards further development. On the contrary, the Government continued every effort to achieve even better results than

1) 62-64 J., pp.

2) The National Economic Development Board, The Second National Economic and Social Development Plan 1967-1-m: the Board, 1965, pp. 12-21.

in the past. In 1966 it launched the **Second National Economic and Social Development Plan(1967-1971)** for the improvement of Thai living standards through the utilization of national, financial, and human resources. It was a five-year plan and broader than the First Plan in scope and emphasis. The Second Plan covered the following main areas: financing of the Government for a development review of past trends and significant structural changes; "emphasis on social development to assure harmony of social and economic transitions; discussion on manpower development planning with the view to relating education and training to the nation's manpower requirements; great emphasis on the role of the private sector, particularly the development of industry, trade, and services; important consideration of regional development to accelerate development in the rural and remote areas"; development objectives and policies; and economic structure of Thailand.¹⁾ TO achieve the above-mentioned objectives, 55,375 million Baht was allotted by the Government for development expenditures during the Second Plan.

In the agricultural sector mentioned in the Second Plan, the main objectives were to accelerate and diversify agricultural production, to improve the quality of agricultural products, and to increase the farmers' real income to upgrade living standards. 11,350 million Baht allotted by the Government for the agricultural sectors program proper, representing about 20.23 per cent of the total outlay as compared to 14.15 per cent under the First Plan.²⁾ Agricultural production was expected to grow at 4.3 per cent annually over the Second Plan period. A favourable outlook was anticipated for paddy production, which would increase to 13.7 million tons by 1971. Also, the production of maize would increase by 50 per cent to 1.5 million tons by 1971.

¹⁾ The National Economic Development Board, Summary of the Second Five-Year Plan(1967-1971) (Bangkok: the Board, 1966), pp.1-4.

²⁾ Ibid., pp.1-4.

The agricultural development projects carried out under to the Second Plan included those related to irrigation and flood control, land development, rubber replanting schemes, agricultural research and experiments, agricultural extension services, forestry, fisheries, farmers' institutions (agricultural co-operatives and farmers' organizations), and livestock development. ¹⁾

The last, dealt with the acceleration of work on veterinary and animal husbandry and experimentation, animal disease control, and livestock promotion. The promotion programs for each type of livestock entailed cattle and buffalo raising, the promotion of swine production, experiments on dairy cattle production, research into the development of better breeds of chicken, and extension activities. ²⁾ All these activities were together undertaken by the dairy farmers, the Officials of Livestock Department, and the experts concerned.

At the Thai-German Dairy Farm dairy cattle promotion, dairy breeds improvements, and experiments on fodder and vaccination methods used on the cattle were carried out at some length. The study on a kind of disease from a blood-sucking insect was also conducted at the experimental station,

Besides these, an agricultural economic project, which included methods for collecting data, land utilization, crop and animal production and consumption, farm management, prices and markets, study of farmers' economic status, was carried out by the Division of Agricultural Economics during the Second Plan period.

Some results showed that the per capita income had increased at an average rate of 7.2 per cent as compared to the 8.5 per cent estimated by the Second Plan. ³⁾ This stemmed mainly from the fact that some agricultural development pro-

¹⁾ The National Economic Development Board, The Second National Economic and Social Development Plan (1967-1971) (Bangkok: the Board, 1968), pp. 89-93.

²⁾ Ibid., p. 92.

³⁾ The National Economic Development Board, The Third National Economic and Social Development Plan (Bangkok: the Board, 1972), p. 12

jects, as well as transportation projects, did not achieve their objectives to the full extent. One reason for this failure was drought occurring during the Second Plan period.

With respect to the livestock production proper, twenty-six artificial insemination stations were established in the country's regions. Experiments on dairy cattle production continue at the Dairy Farming Promotion Organization of Thailand and the L'hait-German Dairy Farm at Chiangmai. Technical assistance is also rendered by these institutions to Thai farmers in dairy cattle production. During the Second Plan period it became apparent that successful dairy farming is actually possible in Thailand.

Concerning the farmers' income proper, according to the survey conducted by the Division of Agricultural Economics, the average agricultural cash income amounted to 3,876.87 Baht per agricultural household in 1970. The income increased from 7,165 Baht in 1953, the year before the First Plan period, to 3,876.87 Baht in 1970. The increase rate of income was 3.8 per cent.¹⁾

(j) However, the agricultural development which is a part of the national economic and social development must be continued under a plan for upgrading Thai farmers' living standards. Thus the Third National Economic and Social Development Plan 1972-1976 was launched in 1971 by the Royal Thai Government. The proper objectives of the Third Plan are (1) increasing present economic and social conditions; which reflect upon Thailand; (2) presenting projects which will introduce economic and social progress into Thailand; and (3) presenting ways and means to cope with the problems of balance of international trade. The Third Plan is a five-year plan which is broader in scope and emphasis than the Second Plan. It covers not only economic development but also social development and deals with

¹⁾ Report on Results of the 1970 Farm Income and Expense Survey (Bangkok: Division of Agricultural Economics, 1970), p.25.

education, public health, and social welfare. More specifically, the Third Plan's components are agriculture and irrigation, industry and mining, commerce and services, communication and transportation, energy, social development, urban and rural development, public health, and education. Of these components, agriculture and education are very important.

Agriculture ranks first in importance. This branch of production is strongly emphasized for the effecting of sufficient quantity and better quality of agricultural products, not only for consumption at home but also for export trade. It is anticipated that agricultural production shall grow at 5.1 per cent annually over the Third Plan period. Two of the agricultural development projects mentioned in the Third Plan deal with dairy farming promotion. The projects' purposes are: (1) promoting dairy cattle raising, (2) improving dairy breeds, and (3) experimenting grasses for feeding dairy cattle. These purposes are implemented in Thailand today.

To achieve the Third Plan's objectives, about 150,275 million Baht is provided for development expenditures. Of this sum, 13,695 million Baht, or 14.3 per cent of the total number, is being spent for the agricultural development.²⁾ The outcome will be evaluated at the end of the Third Plan period.

In sum, the agricultural development, which has been undertaken by the plan of the Royal Thai Government and the farmers in the areas of crops, livestock, forestry, land development, farmers' institutions, and other sections, has achieved some of its objectives to the full extent.

1.3.2 Economic Background of the Thai Dairy Industry

To give readers some insight into the dairy industry in Thailand, its economic background should first be presented:

1) Ibid., pp. 241-243.

2) Ibid., pp. 114-116.

1) On the consumption side, Thais did not ingest cow milk and milk products under a subsistence economy. This fact might be attributed to traditional consumption of rice and other foods as staples and very limited acquaintance with the products on the part of the people. But Thais began to consume milk products during a period of commercialized economy when international trade was introduced into Thailand. For example, the people have fed their children with condensed and dried milk, mixed it with coffee, tea, and dessert or sweets.¹⁾ This phenomenon indicates that a germ of consumer demand for the products has originated in the country since the early period of commercialized economy, beginning about the reign of King Chulalongkorn (Rama V, 1868-1910). Still, the consumption of dairy products was not so great at that time because the products were considered foreign by the people. Today they consume the products on a larger scale. This increase may be attributed to various reasons, one being greater familiarity of the products on part of the people, who have learned that consumption of such products contributes to their health.

2) On the milk production side, up to the present time dairy farms received less attention by farmers nationally. Such farms as there are were very much under-developed because of lack of knowledge of dairy science. The farmers could produce milk in very small quantities, not sufficient to meet the growing demand. Moreover, the milk's quality was poor and unhygienic²⁾ because of lack of the above-mentioned science and previous experience on part of the producers. Owing to such unfavourable conditions at the domestic dairies as such, many traders have had to import milk products of various types in large quantities at the high price of millions of Baht³⁾ to supply consumer demand.

¹⁾ Sawasdi Viradacha, Handbook of Animal Husbandry (ed. in Thai, Bangkok: New Odeon Store, 1962), pp. 639-645.

²⁾ Division of Agricultural Economics, Economic Survey On Indiv. Urban Dairy Farming In Bangkok (Bangkok: the Division, 1964), pp. 11-13.

³⁾ Division of Agricultural Economics, Agricultural Statistics of Thailand 1970 (Bangkok: the Division, 1972), p. 122.

Accordingly, the Thai Government has initiated a policy of dairy farming promotion. The prime reasons for this are that (1) the country has favourable physical and natural resources and the advantages of economic and technical innovation for dairy farming; (2) the farmers can begin to operate dairy farms, thus enabling the domestic dairy products to compete with imported dairy products; (3) the Government is trying to promote the popular consumption of local dairy products for nutritive purposes; (C) the dairy farms can bring about an increase in farmers' annual income.¹⁾ Studies have shown that the first two points have contributed satisfactorily to dairy farming success in Thailand today.

Since dairy farming promotion, especially the establishment of Thai-Danish Dairy Farm and Training Centre, has been implemented by the Ministry of Agriculture and Co-operatives, the dairy farmers have organized and managed their farms according to advices of the Ministry. They thus produce raw milk of better quality. Today many dairy farms are established in Thailand because promotion work has been effective.

3) On the milk-product production side, seven firms with modern dairy plants, privately owned by foreign traders, were organized some years ago. They were occupied mainly with producing reconstituted milk, condensed milk, and ice cream through utilization of milk powder imported from abroad. The firms' clandestine objective is to buy milk powder from dairy countries, in which the firms' owners live, to be utilized in the processing of the products to be sold on the Thai market at higher prices than at home. (However, from time to time, some of the firms do buy raw milk in small quantities from Thai dairy farms for processing purposes at uncertain prices.) Thus, it seems to the investigator that the firms are aimed at extending dairy business in foreign countries, not at extending the dairy business in Thailand.

¹⁾ Dr. Somnuk Sriplung and Koses Manovalailow, Agricultural Economics Development Planning (ed. in Thai, Bangkok: the Division, 1970), p. 7.

Besides • hese dairy firms, four dairy farms which have their own local plants, process pasteurized fresh milk to be sold on the home market. One of the dairy farms produces both pasteurized Fresh milk and dried milk.

4) Concerning the marketing of milk by farmers, they find performing this economic task difficult in many respects. For example, they cannot find a permanently favourable market; and they sell their milk at unfairly low price as well. As to the farmers' business organization, a prolonged discussion of a dairy co-operative to be introduced into Thailand to assist milk producers in marketing of their milk was entered into by the Department of Land Co-operatives under the Ministry of National Development¹⁾ and some milk producers.

At last, the first dairy marketing co-operative society was organized by the Department at Ayudhya in 1970, and two more societies were organized in 1971 at Nakornpatom and Ratburi. Besides, two centres with some dairy machines for collecting and storing milk from dairy farms were established by the societies at Ayudhya and Nakornpatom, according to agreements made by the Royal Thai Government and the Royal Danish Government in 1970. After the completion of their establishment, the centers will belong to the co-operative societies.²⁾ In 1972 one co-operative society of the flame type was organized by the Department at Saraburi³⁾ (see Figure 1). The specific purpose of organizing the four co-operative societies is to enable them to cope with their farmer members' problems which the latter cannot solve individually; these problems are (1) lack of capital for dairy cattle raising development and for scientific milk production; (2) inability to transform

¹⁾ The Ministry was merged in 1972 and the Departments of Co-operatives under it were transferred to under the Ministry of Agriculture and Co-operatives (formerly: Ministry of Agriculture).

²⁾ Royal Gazette of Thailand, vol. 88, sec. 20, January 10, 1970.

³⁾ The Department of Co-operative Promotion.

raw milk into the pasteurized fresh milk demanded by the market; and (3) inability to wait for an optimum time to sell raw milk at a better price, owing to the product's perishable nature.¹⁾ This third is the most serious marketing problem of milk which the milk producers have encountered so far.

The Thai co-operatives, by the Danish standard, are not true co-operative organizations. They have the dairy machines as mentioned, but they have no dairy plants for processing purposes. The co-operatives encountered many difficulties in their business operations because of lack of capital and dairy co-operative knowledge. Today they can sell only raw milk to other dairy firms, but they have no bargaining power in this respect. At the end of 1971 the co-operative societies at Ayudhya, Nakhonpathom and Ratburi had 548 farmer members and their working capital amounted to 239,610.34 baht. The fourth society is the newest one and its account has not been audited yet. Thus, its information is not provided for. The four societies can handle 14 tons of raw milk daily.²⁾

1.3.3 Significance in Thai Economy

Owing to the great nutritive value of milk and milk products, they constitute an important part of well-to-do families' diets in Thailand today. This means that they consume the commodities daily. And such consumption makes for greater health, a fact that in itself has important economic implications. These commodities are annually consumed in great quantities at considerable cost to the people. In 1969 166,393 tons of dairy products worth 692,338,000 Baht were imported for consumption in the country,³⁾ of which condensed and dried

1) Division of Agricultural Co-operatives, Policy of Organization and Promotion of Dairy Cattle Co-operatives (pamphlet in Thai, Bangkok, 1973), pp. 3-4.

2) Ibid., p. 1.

3) Division of Agricultural Economics, Agricultural Statistics Thailand 1970 (Bangkok: the Division, 1972), p. 122.

milk constituted the greater portion. (Milk produced locally is not included in the 166,393 tons mentioned above.) The amount signifies the great demand for the products, which provides direction for the dairy production at home.

Even if the domestic dairy farms, which are small in number, can supply the raw milk only in limited quantities to meet the growing demand, they can play a significant role in Thai agriculture. They are integrated, as a branch, into a unified farm system of the country. Therefore, the system becomes automatically a diversified one. It thereupon produces more wealth, in the form of dairy products and others, not only for itself but also the nation as a whole.

Therefore, the dairy farming integration as such will introduce dairy science into the country. The farmers who lacked it before can now have the knowledge. The producers can thus increase their agricultural output, resulting in a two-fold increase in their income.

Last, but not least, both dairy farms and dairy firms can provide employment for many people scattered throughout the kingdom. They can pay wages and salaries to their employees regularly. They will thus provide a permanent and reliable source of income for their employees.

1.3.4 Potentials for Dairy Development in Thailand

As studied, Thailand today has many substantiated factors for dairy development, e.g., a growing demand for dairy products, a growing supply of milk, a considerable supply of stable varieties of grasses for dairy cattle,¹⁾ a favourable man-land ratio, and favourable physical resources. These factors are the central preconditions by which dairy development is possible and expansible in the country. Particularly, demand and supply are the most significant factors for development: without them development cannot begin. Our next task is to analyse each factor mentioned above.

1) This information was given by the Director of the Dairy Farming Promotion Organization of Thailand.

1) Growing Demand for Dairy Products: The people of Thailand have consumed milk-based products up to the present time for various reasons, such as realization of their nutritive value. They consume the products to promote sound health. The mere existence of a market means that the people possess the purchasing power and desire for the products. And in fact, the purchasing power is increasing to some extent. This implies that the apparent increased shifts in general income levels of the country are perceived as real,¹⁾ a result of Thailand's economic development, which has been growing for nearly one decade. The increasing purchasing certainly influences a demand for the quality goods, not inferior goods, to increase to some extent; and it is increasing steadily from year to year. This statement can be proved by one of various factors, i.e., the considerably increased imports of dairy products of various types.

One other significant factor that contributes directly to the growing demand for the products is the growth in population. In particular, Thai babies born yearly at remarkably increasing rate demand the condensed and dried milk more and more. This fact is generally seen throughout the country, which is quite different from the situation in Denmark. More Thai adults also demand condensed milk to be mixed with tea and coffee which they drink daily. This is generally quite true because they do not mix fresh cream with tea and coffee due to economic reasons, except for some rich urban families.

There are other factors contributing to the growing demand for dairy products, such as a change in taste and preference for particular products, but they do not seem important enough to be treated in this study.

All these factors affect the quantities of dairy products marketed daily.

¹⁾ The National Economic Development Board, The Second Rational Economic and Social Development Plan (Bangkok: the Board, 1968),
a. 11.

It is **today** estimated that about **24,237** kgs. of milk **are daily consumed by consumers in Thailand.**¹⁾ This figure, detailed in Chapter III, is very much greater than the corresponding figure in the past. It shall certainly increase to some extent in the future because of **growing** demand. Now it is rational to say that this **growing** demand is a very significant precondition for the development of **both** dairy farming and **the co-operative** dairy carrying on business in **the country.**

2) **Growing Supply of Milk and Considerable Grasses for Dairy Cattle:** We will consider these factors in the order given.

(1) As mentioned in Chapter III, commercial milk production on farms does exist in Thailand, but it is very underdeveloped because of **lack of knowledge of** dairy science. Yet owing to the growing demand for the products mentioned above, milk production has been rather **accelerated by dairy farmers** today, and is assisted, guided, and promoted by the Government to some extent. Among other things, the Project of Dairy Farming Promotion has been created by the Ministry of Agriculture and Co-operatives for **the** introduction of management by modern dairy farming techniques to the dairy farmers. Dairy cattle are improved by **the** importation of **better** breeding stock, cross breeding, artificial insemination, and the control of disease.²⁾ As a result, dairy farming has been expanded. Milk is produced in larger quantities not only for consumption but also for **the** marketing purposes. It is estimated that the milk production **per** day has increased from an unknown figure in the past to **about** twenty tons in 1973.

This increase in **milk** production is causing an increase in the supply of milk for the **home market.** It is forecasted that the supply of milk will increase from year to

1) The figure estimated and mentioned in Chapter III.

2) Division of Agricultural Economics, Economic Survey on Indian Urban Dairy Farming in Bangkok (2nd. ed., Bangkok: the Division, 1964), p. 45.

year, if the marketing problems mentioned later are solved successfully and dairy promotion is undertaken **continuously**.

The above-mentioned figure **is** a very significant precondition for the development of both dairy farming and the co-operative dairy at full strength. It indicates a sufficient quantity of milk to justify the scientific **organization** and management of one large co-operative dairy along the **Danish** model.

(2) Judging from the **dairy** farming experiment **carried** on under the agreements between the Royal Danish **Government** and the Royal Thai **Government**, which was signed on **October 20, 1961**, the dairy farming is really possible in the country. Dairy cattle **can** stand against the tropical climate well. Grasses suitable for dairy cattle can be grown in large quantities in the **country**, **providing** a year-round supply. These favourable **aspects**, which can result directly in an increasing supply of **milk**, form the vital potential for dairy industry **development** in Thailand.

3) Favourable **Man-land Ratio**: Possibilities for dairy farming in the country are increased by favourable physical **resources**, e.g., **better man-land ratio** and the advantages of economic and technical innovations.¹⁾ As to the first aspect, Thailand, as well as **Burma, Malaya, the Philippines, Laos, and Cambodia**, is in an area of low population **density**, while **India, Pakistan, Ceylon, Korea, Taiwan, and Japan** are in areas of very high population density.²⁾ The man-land ratio in Thailand is **higher** than that in other countries in the first group while lower than those in the second **group**, thus comparing favourably with the latter. A low population-to-land ratio

1) D.W., "Land Reform". Encyclopaedia Britannica (th. ed.), 13, 658-695.

2) Dr. Sawaeng Kulthongkham and Dr. Shao-er Ong, Rice Economy of Thailand (Bangkok: Division of Agricultural Economics, 1964), p. 105.

and a comfortable farm size still remain in Thailand today. It is not difficult to have an economically sized dairy farm in this tropical country. In comparison, the average size of rice farms in Thailand is bigger than one-fifth that of Japan. Yet Japan has successfully combined dairy with rice farming. Also, "Taiwan has begun to follow the Japanese way."

In Thailand, besides single dairy farms, it might also be appropriate to combine dairying with rice farming in the North because of that region's milder climate and free availability of water during the greater part of the year. It might also be appropriate to combine rice and dairying in the Central area of the country because of its adequate conditions for dairying development, e.g., adequate fodder crops.

One important thing that should not be overlooked is that the development of dairy farms is entirely new in this Kingdom. It is therefore necessary to educate both producers and consumers in the hygiene and nutritional value of producing and consuming fresh milk to the benefit of all.