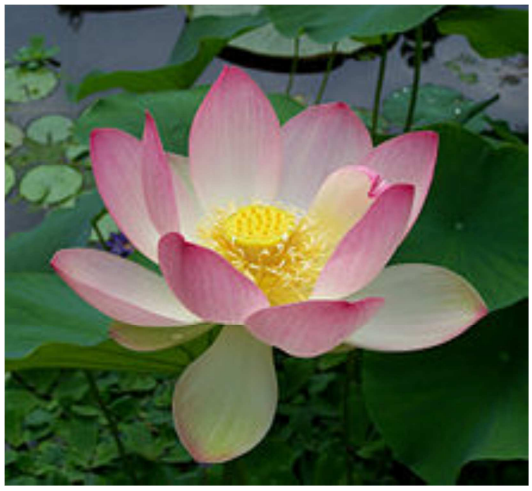
GRAESE : Groupe de Recherches Asie de l'Est et du Sud Est



ETUDES ET DOCUMENTS DU GRAESE

An analysis the value chain of fresh milk in the northern area Vietnam: a case study in son la province

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ABSTRACT

In Vietnam, the consumption of dairy products has increased dramatically in recent years due to rising incomes. To meet this growing demand, and reduce imports, the Vietnamese Government has encouraged milk production. In this context, our research is primarily interested in the distribution of value added among the actors within the fresh milk chain observed in the province of Son La.

Our study demonstrates that value added within the fresh milk chain was unequally distributed among actors in the chain in the bias orientation to the non-farmers (non-producer). The key feature in the chain was the dairy farmers, but they were also the most vulnerable actors of the chain. Given the balance of power among the actors, the most appropriate method to promote the added value for dairy producers is to help a better control on their production costs by improving the management at the dairy farm.

ABBREVIATIONS AND ACRONYMS

AgriBank	Bank for Agriculture and Rural Development of Vietnam
AI	Artificial insemination
ASODIA	Association Sud-Ouest pour le Développement International Agricole
BTC	Belgian Development Agency
CAGR	Compound annual growth rate
CCA	Commodity chain analysis
DARD	Department of Agriculture and Rural Development of Vietnam
GDP	Gross Domestic Product
GSO	General Statistics Office of Vietnam
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)
HF	Holstein Friesian
JICA	Japan International Cooperation Agency
MARD	Ministry of Agriculture and Rural Development of Vietnam
MCM	Moc Chau Dairy cow joint stock company (Vietnam)
MPI	Ministry of Planning and Investment of Vietnam
NIAH	National Institutes of Animal Husbandry of Vietnam
SME	Small- and Medium-sized Enterprises
USD	United States Dollar
VA	Value added
VND	Vietnamese Dong

1. INTRODUCTION

By the end of 2012, Vietnam's population numbered 88.78 million, of which 59.97 million live in rural areas, accounting for 67.48% of the total; 44.86 million were women. Of the country's workforce, 70.3% live and work in rural areas.[1] Creating jobs, generating income, and improving the living standard for people in rural areas are of considerable concern in Vietnam. Agricultural growth is central to poverty reduction in rural areas.[2] Therefore, it plays a significant role in the sustainable development of the country.

In recent years, agricultural production in Vietnam has changed. It is no longer a rice-producing monoculture. Types of businesses and production have been diversified, as have crops and livestock raising. In particular, dairy farming and milk production have become relatively effective components of an expanding agro-industry. It is also an important branch within the policy of restructuring the agricultural economy.

A large market for milk exists in Vietnam. And milk consumption in Vietnam is increasing rapidly.[3] However, the dairy industry in Vietnam currently meets only 22 percent of the domestic demand (in 2012); the shortfall in demand for dairy products has been met by imports from overseas suppliers and producers.[4] This situation makes Vietnam dependent on the foreign market. In addition, there is some distortion in the milk market in Vietnam which, in turn, leads to fluctuations in the price of milk. In such a context, farmers are easily vulnerable. It also leads to reduced production effectiveness throughout the chain. Promotion of the milk value chain is a move that would contribute to rural development within the country.

Numerous earlier studies have concentrated on this value chain. In Vietnam, an economic and technical cooperation program funded by the German government (GTZ-SME) helped Vietnam to establish and improve a value chain of ornamental trees in Nam Dinh province, tourism in

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1 GSO, 2013

2 Humphrey, 2006

3 Nancy, 2008

4 MARD, 2013

Danang, rattan handicraft production in Quang Nam, coffee in Dak Lak, safe vegetable growing in An Giang, avocadoes in Dak Lak, pangasius fish farming in An Giang and longan fruit in Hung Yen.

These programs have proven that promoting the value chain is meaningful for the development of the farmers. The action creates employment for them, increases their income, enhances their knowledge, and improves their living standard.[5] However, in a comprehensive value chain in general and that of milk in particular, farmers who produce and distribute products are forced to bear the largest share of the cost but their corresponding earnings are the lowest and their growth rate lower, especially when it comes to value added.

A case study to estimate the cost of a value chain of rice in Vietnam and Cambodia showed that farmers bore 56.1% of the total cost, with a profitability margin of only about 20%.[6] Intangibles such as the distribution and marketing phases, often account for a larger share of the final price of a good than do its manufacturing costs.[7]

One research project analyzed the stakeholder costs and benefits in a tea value chain in Vietnam[8] and found similar results. The farmers had to invest the most but earned the least in terms of proportion of benefit. The highest proportion of benefit came to the retailers. Farmers who joined the export market earned the most in comparison to those who sold in the domestic market.

The Mekong Delta Development Research Institute[9] analyzed the pangasius fish value chain and reported that there was an unequal distribution of benefits. Farmers always got the lower proportion of value added in comparison to collectors, retailers, and export manufacturing companies. Statistics showed that farmers got only 19.4% of the total benefits, retailers 2.1% and export manufacturing companies 78.5%. The research recommends that in order to achieve sustainable development, farmers must be the in center of development and be given due consideration.

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5 GTZ-SME, 2008

6 WB/GDS, 2007; Lebailly et al., 2007

7 Kaplinsky, 2000; Lebailly et al., 2007

8 Ipsard, 2007; Lebailly et al., 2007

9 Can Tho University, 2007

Although there are many studies about value chains, it seems that none of them has tackled promotion the fresh milk value chain in northern Vietnam. Besides, milk is a fresh food, highly subject to spoilage and hence waste. Dairymen are affected by the harsh natural conditions of Vietnam such as high temperatures, humidity, and heavy seasonal rains. Thus, they are confronted with increased risk and vulnerability. In addition, it seems that there is an unequal distribution of earnings among actors in the dairy value chain, in which the producers seem to be losers.

Questions have been asked: Is there any way to improve the earnings of dairymen? What should be the approach? To improve the earnings of the dairymen, one way is to promote the value of the whole chain. This study fills a critical need.

OBJECTIVES OF THE STUDY

The study intends to:

- Get insight into the characteristics of the fresh milk value chain in northern Vietnam, the role and function of stakeholders in the chain, as well as explore the linkages among determinants and stakeholders.
- Define the flows of milk, the information pattern, the distribution of added value among fresh milk chain stakeholders in northern Vietnam;
- Determine the main problems and key obstacles that must be overcome to enhance dairy farmer earnings and equality throughout the chain.
- Highlight the positive implications of promoting the fresh milk value chain in northern Vietnam.

2. DAIRY PRODUCTION IN VIETNAM

2.1 Brief history of dairy development in Vietnam

Vietnam has no tradition in the breeding of dairy cattle. The first dairy cattle were brought to Vietnam in the 20th century during colonial times. Merchants from Pakistan and India were the first to bring dairy breeds into Vietnam. The races included Red Sindhi, Sahiwal, Ongole, and Thaparkar. At almost the same time, exotic dairy breeds originating from Europe also appeared in Vietnam. Dairy cattle began to be kept to provide milk for French residents, and the main consumers lived in Hanoi, Dalat, and Saigon (Ho Chi Minh City). Then a new Laisind crossbreed was generated by mating the Vietnamese yellow cow with Indian Red Sindhi bulls.

During the 1920s and 1930s, some farms were founded in the south, producing around 400 tons milk (Nancy et al., 2006). From the 1950s, State-owned farms in the north and some large private farms in the south were established to keep dairy cattle imported from Australia, the Netherlands, and China (Beijing). At first, dairy cattle were kept in the most favorable conditions for milk production, such as in Moc Chau (Son La), Ba Vi (Hanoi), Dong Giao (Ninh Binh), and Sapa (Lao Cai). In the 1970s, with the support and generosity of Cuba, 883 Holstein Friesian cows originating from Canada were put on farms in Moc Chau and the Moncada artificial Insemination Center was set up in Ba Vi.

Dairy cattle were raised mostly on large State-owned farms until the 1980s. After that, a State-owned dairy processing company was set up to start processing fresh milk into milk products, mainly sweetened condensed milk. Since *Doi Moi* (renovation), dairy farms were expanded to many other regions. Many milk processing companies, including foreign companies such as Dutch Lady and Nestlé, also appeared in the milk market at that time.

In 2000, there was a breakthrough in dairy development in Vietnam with the issuance of Resolution No. 09/2000/NQ-CP[10] and Governmental Decision No. 167. The Resolution created a new policy to expand the herd of dairy cattle up to 100,000 head of dairy cows to produce 300,000 tons

10 Promulgated on June 15, 2000

of fresh milk. The decision built a strategy for dairy cattle production and development for the 2002–2010[11] period. This decision stimulated and promoted dairy herd development in Vietnam. However, at first, this decision led to massive development in almost all provinces and resulted in inefficient milk production due to the low level of technology, lack of experience, and unfavorable conditions. Nowadays, dairy herds are concentrated in provinces of the north and south where there are favorable natural conditions.

2.2. Herd holding pattern

Dairy farmers in Vietnam are considered to be small holders as even large farms throughout the country have only a relatively small herd size. Around 76% of small dairy farms have only 1 to 5 head of dairy cattle and their holdings accounted for 37% of entire dairy herd throughout the country (Nancy et al., 2006). The northern provinces had a higher proportion of small-scale farms (88%) in comparison to the south (69%). Farms that had from 6 to 20 head of dairy cows accounted for the next 22%, making up 39% of total herd number. Larger farms that had more than 20 head of cows accounted for only 2%, nevertheless holding 24% of total number of dairy cows. Some of these farms have a large number of cows, such as in Moc Chau, Tuyen Quang, Thanh Hoa, and the outskirts of Ho Chi Minh City.[12]

In 2008, Tuyen (2008) reported that the average size of dairy farms in Vietnam was 5.3 head overall. The mean scale of the south was 6.3 head, higher than that of the north (3.7 head). This number suggested that it could be more difficult to expand the scale of dairy cow husbandry in the north than in the south.

11 This strategy defined the targeted areas for raising dairy cattle, including 10 provinces in the north, 5 provinces in the central coastal region, 4 provinces in the Central Highlands and 7 provinces in the south.

12 In Tuyen Quang, one of the 7 units of Yen Son district under provincial management, with 1,797 head; followed by LASUCO farm in Thanh Hoa with 1,100 head and the HCMC Dairy Company farm with 1,072 head

2.3. Dairy production

Number of dairy cows

The number of dairy cows in Vietnam increased steadily over time from 11,000 head of cows in 1999 to 133,000 head in 2011, a 12-fold increase. Especially, from 2000 to 2004, the number of dairy cows increased quickly at an average growth rate of nearly 30% per annum from 35,000 to 95,800 head. Reasons for the rapid increase in the number of dairy cows had to do with the quickly increasing demand for milk. Resolution 09 and Decision 167 also created conditions, stimulated, and prompted farmers to raise dairy animals. They accumulated stocks both from domestic and foreign sources. The number of imported dairy cows increased very quickly from 192 head in 2001 to 5,581 head in 2003 (USDA, 2005). In 2005 and 2006, the growth rate of dairy cow numbers was 8.7% per annum.

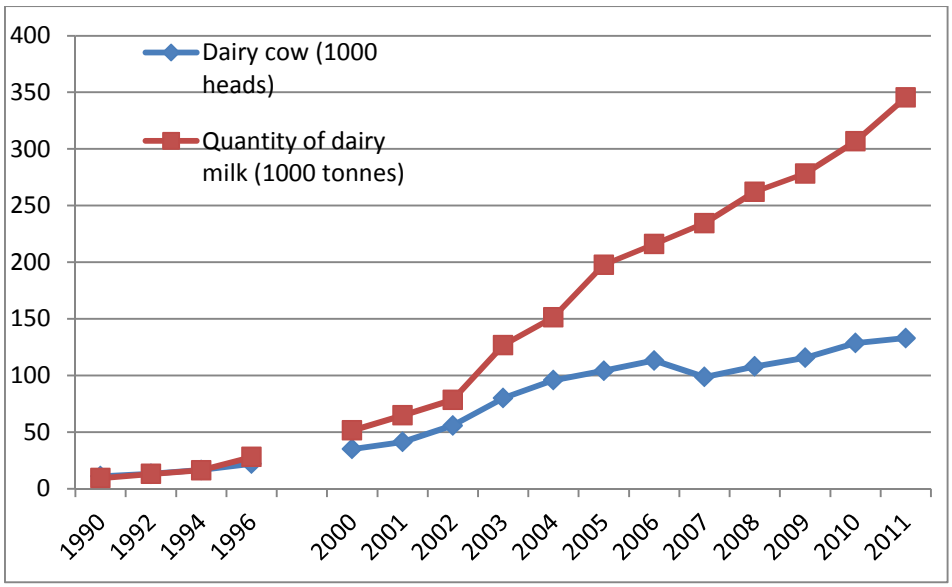

Figure 1. Dairy production in Vietnam

Source: FAOSTAT, 2011; GSO, 2012; NIAH, 2011

In 2007, many provinces experienced failure with regard to the dairy program[13] due to poor technology, lack of experience, and unfavorable conditions. As a result, the number of dairy cows dropped. Restructuring

13 Dairy program from the implementation of Resolution No. 09 and Decision No. 167

of the dairy program, accompanied with the sharp increase in the demand for milk, led to a jump in the number of dairy cows from 2008 on.

In 2011, Vietnam had 133,000 head of dairy cattle. The number in the south accounted for 67.5% of total dairy cattle over the last decade because of the good natural conditions for dairy cows. The northern and Red River Delta regions ranked the second and third in the number of head, which accounted for 9% and 8% respectively (HSSB, 2011).

Dairy production

In 1990, total dairy production in Vietnam was only 9,300 tons but by 2011, it was 37 times higher, the amount totaling 345,400 tons. Thanks to rapid herd growth, the amount of milk produced from 2000 to 2005 grew quickly at an average rate of over 30% annually. Although the number of head decreased in 2007, milk production still went up by nearly 10% due to the increased expertise in dairy animal husbandry and maximizing their productivity. On average, milk production has increased by 20.45% per annum in the last decade. Average milk yield in Vietnam increased, but is still low. In 2000, the milk yield per cow per lactation[14] was 1,470 kg. In 2010, milk yield had increased to 2,386 kg, 1.62 times higher. For a lactation of 305 days, the average milk yield per day was only 7.8 kg per cow in 2010 (NIAH, 2011). This low milk yield, of course, led to low economic efficiency on dairy farms.

2.4. Milk market

Milk consumption

The high income growth rate has stimulated milk consumption in Vietnam. Vietnam became one of the countries with the highest milk consumption growth rate in the Asia region, just after China. Milk consumption throughout country went up quickly. Within 20 years from 1990 to 2010, it increased 41 times. In 1990, the Vietnamese consumed only 31,000 tons of milk, or an average of 0.5 kg of milk per person a year. In 1995, the total milk consumption of Vietnam was 260,000 tons, and milk consumption per capita went up to 3.6 kg. In 2000, total milk consumption was 460,000 tons or 5.9 kg per capita. The amount continuously rose and reached 8 and 14.8 kg per capita in 2005 and 2010,

14 Lactation of 305 days

respectively. However, the amount of milk consumed per capita in Vietnam is still very low and, nutritionally speaking, this may have negative physical effects on the Vietnamese.[15]

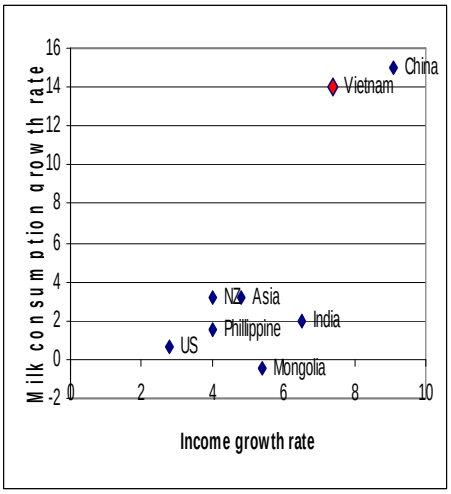

Figure 2. Milk consumption in comparison with the increase in income 1996–2006

Source: Nancy, 2008

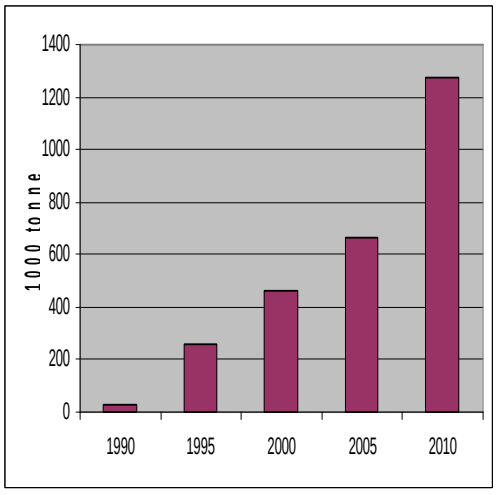

Figure 3. Milk consumption 1990–2010

Source: Nancy, 2008; GSO, 2011; FAOSTAT, 2011

15 It is a fact that the Vietnamese people are shorter in stature than people in many other countries of the world.

Quantity of imported milk

Although the quantity of milk production in Vietnam increased gradually, the milk supply cannot satisfy the very quickly growing demand for milk. It could satisfy only 28% of total consumption in 2009, 25% in 2010, and 22% in 2011 (GSO, 2011; 2012). The remaining demand was met through the imported product.

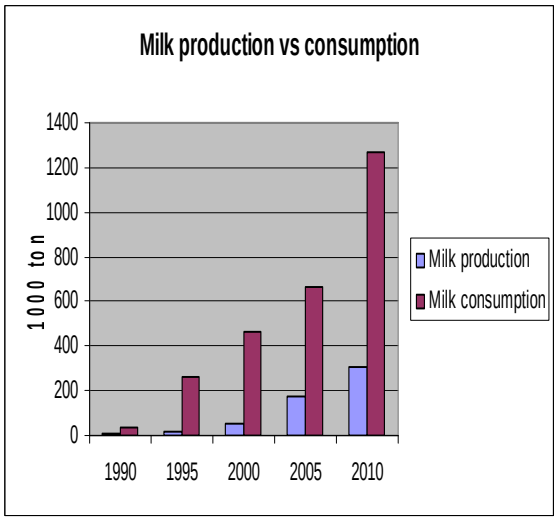

Figure 4. Milk consumption versus production per capita in Vietnam

Source: NIAH, 2011; Nancy, 2008, GSO, 2011

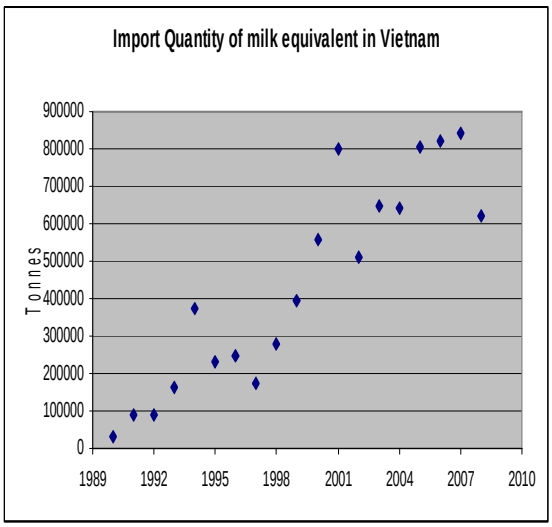

Figure 5. Imported quantity of milk in Vietnam

Source: FAOSTAT, 2011

The amount of imported milk in Vietnam increased obviously over time. It increased quickly from 34,000 tons in 1990 to 372,800 tons in 1994.[16] The quantity fluctuated between 1995 and 1997 because of the low economic development and indirectly from the impact of the Asian financial crisis. From 1997 to 2001, it went up very quickly and reached 800,500 tons in 2001. From 2002 to 2010, it also fluctuated due to the effect of the dairy strategy (Resolution 09 and Decision 167) and the melamine added to milk crisis in the Asia region in general and in Vietnam in particular.

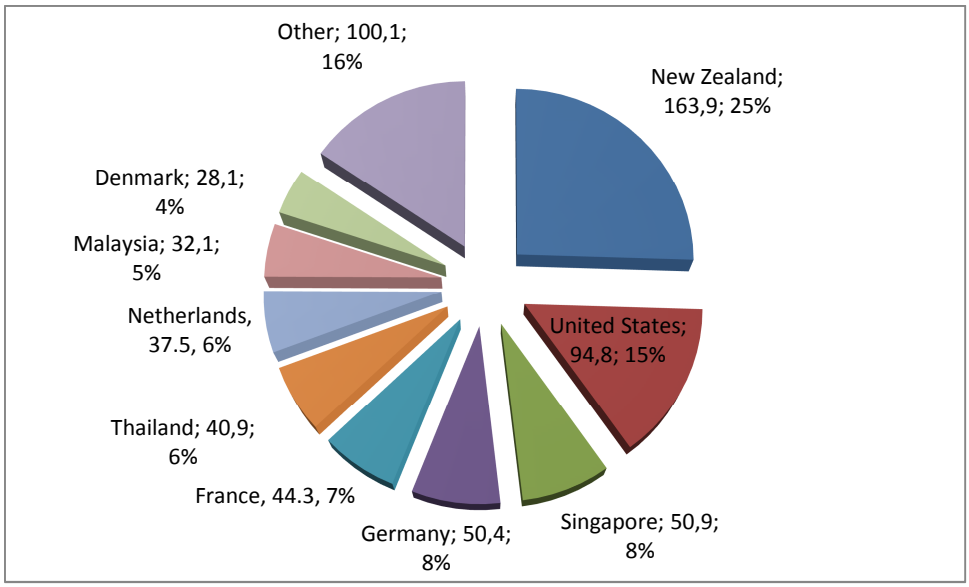

Figure 6. Major milk exporters to Vietnam in first 9 months of 2012

Source: GSO, 2012

Note: Denmark 28.1, 4%: Milk imported from Denmark was valued at 28.1 million US dollars, accounting for 4% of the total value of imported milk in 2012.

In the imported milk and dairy products market, New Zealand is the largest dairy exporter to Vietnam. In 2012, Vietnam spent 163.9 million USD, accounting for one fourth of the market share. The United States ranks second with the value of 94.8 million USD, followed by Singapore (50.9 million USD), Germany (50.4 million USD), France, Thailand, the Netherlands, Malaysia and Denmark. These nine large exporting countries account for 84.4% of the total value of imported milk in Vietnam. This sometimes led to the manipulation of the price of milk on the market.

16 Although there is not any hard evidence, this situation might be explained by the facts of normalization and reestablishment of relations between Vietnam and the United States.

Milk price

There are different points of view on the milk price in Vietnam. Some researchers state that milk price to the consumer in Vietnam is one of the highest in the world (Luan, 2008, IFCN, 2004). Others claim that there is no evidence of the highest price, and show that prices in Vietnam are within the range of that in neighboring countries (Jonathan, 2010).[17] It is a fact that the retail or consumer price in Vietnam is relatively high compared to the producer price, or compared to other agricultural goods, or compared to incomes. The farm gate price varies considerably among different processors (Nancy et al., 2006). A result from IFCN (2004) and Patrice (2008) research showed that the energy corrected milk price paid in Vietnam was constant for a decade and was lower than that in Thailand and Bangladesh and slightly lower than in India, but higher than in Pakistan.

Milk markets in Vietnam are imperfectly competitive (Jonathan, 2010). It is difficult for consumers to access to complete information about the products that they buy. The control of product quality and safety by government agencies is deficient.

Vietnam issued a regulation on price registration and control in 2010[18] in order to reduce fluctuation and stabilize prices of many products, including dairy products. The policymakers believe that dairy companies raise milk prices because of spending too much money on advertising and promotion. However, results from Jonathan's study (2010) show that the price would not be lower or even stabilized due to: (i) the unexpected immediate impact of the new policy would be a price increase because dairy companies raised prices before the implementation date of the new circular to avoid the need to re-register prices after the policy came into effect and (ii) the high administrative costs of registering inputs, outputs,

17 He compared the milk price in Ho Chi Minh City to that in Shanghai, Hong Kong, Jakarta, Kuala Lumpur, Singapore, and Bangkok. Although there was no clear evidence that the price in Vietnam is higher than that in those countries, the writer thinks that the relative price in Vietnam is higher because all of these study sites have a higher income per capita compared to Ho Chi Minh City.

18 On August 12, 2010 the Ministry of Finance issued Circular 122/2010/TT-BTC on the registration and regulation of prices. The new regulations, which came into effect on October 1, 2010, cover a range of key consumer and producer goods, including milk and milk powder; (http://vbpq.mof.gov.vn/download.aspx?Docmain_ID=31730).

wholesale, and retail prices. Thus, dairy companies would pass these additional costs onto consumers. Yet, we do hope that this regulation will be the opening point for future success in controlling the price of milk in Vietnam.

2.5. Flow of services and institutions involved in the dairy industry in Vietnam

At the central level, the strategy of the dairy program is under the control of the government. The government entrusted operational responsibility to the ministry of agriculture and rural development (MARD). MARD, in turn, assigned NIAH to implement the program.

The project steering committee at the provincial level is under the provincial people's committee and is set up under the guidance of MARD and responsible for implementing their work. The provincial animal breeding company and veterinary services support them in their specializations.

Similarly, at the district level, the project steering committee under the control of the district people's committee carries out the work with the support of veterinary services and is responsible to the department of agriculture and rural development (DARD).

At the commune level, the project helps farmers directly in a relatively close relationship with the dairy breeders' association, also linked with farmers' associations and other associations such as the war veterans, women's union and youth union.

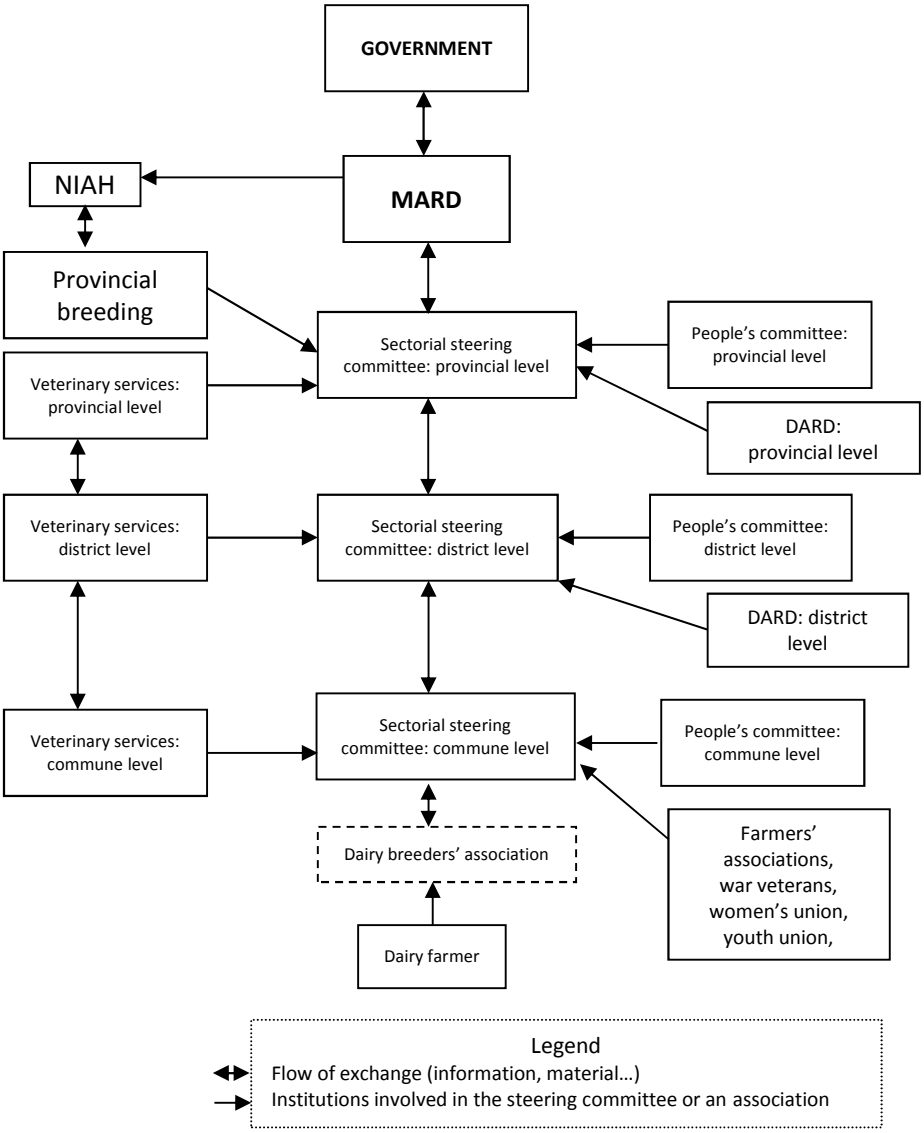

Figure 7. Flow of services/ information/inputs in the dairy industry in Vietnam

Source: Nancy et al. (2006) and review

3. STUDY SITE AND METHODOLOGY

3.1 Study site

The choice of study sites was based on the real condition of dairy production in Vietnam. Vietnam has a tropical monsoon climate with an average relative humidity of 84–100%. Vietnam also suffers from many natural disasters such as storms, flooding, drought, etc., often following an annual cyclical pattern. Natural conditions do not weigh in favor of the dairy industry. Regarding favorable geographic areas for dairy farming, Vietnam has only two main places: Son La in the north and Lam Dong in the south. Dairy cattle have been raised in these two provinces for years.[19] Son La province ranked third highest in the size of cattle herds in Vietnam.[20] Thus, this study chose Son La as a study site.

In Son La, most of the dairy cattle were kept in Moc Chau district, which accounts for about 80% of the total number of cattle and over 90% of the quantity of milk produced.[21] It is well known for dairy husbandry and milk production in Vietnam. It also has a trademark: Moc Chau milk.

19 See next part: Dairy industry in Vietnam

20 The first rank belongs to HCMC, the second to Long An. Son La ranks third, followed by Tuyen Quang, Ha Tay (now included in Hanoi), Binh Duong, Binh Dinh, Lam Dong and Thanh Hoa

21 See next part: Dairy industry in Vietnam

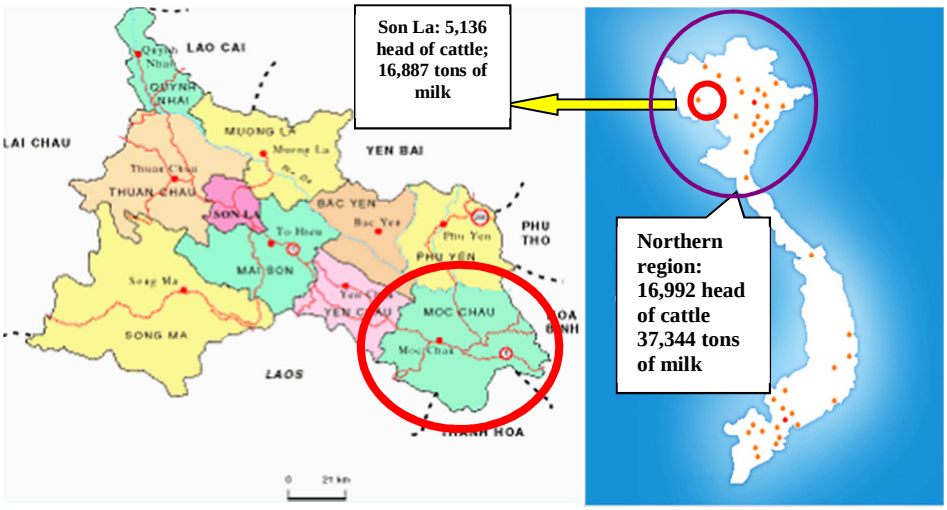

Figure 8. The study site of Moc Chau, Son la

Source: GSO, 2011; dairyvietnam.org.vn

3.2. Methodology

The probability sampling method with probability proportional to size (PPS) was chosen to select the farms for the research during period from 2009 to 2012. A sampling frame was established and estimates were reckoned so as to approximate real population values in the area.

The first step was to select a number of farms. This selection sample was based on the real status of farms and representatives for the entire dairy situation in the region. The total number of farms in the region was 491 in 2009. In order to get a suitable sample, the investigated farms should account for from 7% to 10%[22] of total dairy farms that had a similar ratio of total head of dairy cattle in the region. Thus, the researcher would choose 50 farms for the study, which accounted for 10.2% of total farms.

The second step was the selection of farms. A sample of 50 dairy households/farmers (hereinafter simply referred to as dairy farmers) were chosen and determined to represent all of the dairy farms, herds of dairy cattle, and the average herd of dairy cows for milk production in the study region.

22 According to Salvatore and Reagle (2002), a random sample size (n) is satisfied if it is at least equal to 5% of the population size (N) and the number of observations is at least equal to 30 ($n \geq 30$).

In the region, the average farm size was 12.44 head of dairy cows per farm. There were three sizes of farms:

- Small-sized farms that kept less than 10 cows, accounting for 29% of total farms in the region
- Medium-sized farms that raised from 10 to 15 cows, accounting for 45% of total farms
- Large-sized farms (more than 15 cows), which are larger and more progressive dairy farms, allowed further exploration of potentials for economies of scale in the region.[23] The large-sized farms made up 26% of total farms.

Thus, the farms selected should have been approximately these numbers. After a period of researching in consultation with the dairy plant extension officer, the researcher selected 50 farms with the following characteristic:

- The average size of the investigated farms was 13 head of cattle.
- Small-sized farms: 15 farms accounted for 30% of total farms in the region
- Medium-sized farms: 21 farms accounted for 42% of total farms
- Large-sized farm: 14 farms made up 28% of total farms.
- Investigated farms kept 10.2% total head cow in the region.

The study also investigated three of eight milk collecting centers (37.5% of the total population value) and four middlemen, three distributors in the region (10%) by using the a method similar to that of choosing the farms; and one of one dairy plant (100%).

The study is concerned with the qualitative features of the value chain for the selected households, and quantitative information about chosen value chains, in particular, technical and economic data of the dairyman's milk production. The methodology was designed to collect these data at critical stages in the value chain, beginning with input supply, through to farm production, collection, processing, and distribution.

The structured interview is the main method to collect primary data. Three structured questionnaire sets were designed to interview three sets of actors in the chain – farmers, milk collectors, and milk distributors – to collect qualitative and quantitative information about the dairy industry.

23 This farm size was based on the classification in the region

Besides, informal conversational interviews is used for exploring a broad field related to dairy farming. This interview method is used to gain insight problems in the target study villages. The conversations focused on such things as milk production and preservation methods and problems of production (e.g. diseases, biological safety) such as In-depth interviews, Key informant interviews, focused group interview, PRA/RRA (participatory rural appraisal/rapid rural appraisal), Group discussions, Ranking and Observation.

4. RESULTS

4.1. General information about milk production in the study site

4.1.1. Overview of dairy production in the region

Moc Chau started a dairy industry in 1958 with only 10 dairy cows; average daily productivity of the animals was 4 kg per day per cow the production totaled 12 tons of milk a year (Anh et al., 2009).[24] At an altitude of 1,050 m from sea level, the Moc Chau highlands area has an average temperate of around 20°C. Conditions there are considered good for dairy farming.

Although dairy cattle husbandry has been practiced in Moc Chau for over 50 years (from 1958), most dairy farmers have only around 20 years' experience at the most. Before 1991, cows were kept in a cooperative farm (a state-own company) supported by the government. The number of dairy cows and amount of milk production in Moc Chau fluctuated over time. The number of cows increased from 10 head (that produced only 12 tons milk) in 1958 to 400 head by 1966, 1,314 head in 1976, peaking at 3,000 head in 1986–1987. In 1986, Vietnam transformed from a centralized economy to a market-oriented economy. Many things changed following that change. The government privatized or reduced support for State-owned enterprises, including the Moc Chau dairy cooperative. Thus, the company faced many difficulties and losses during that period. The dairy cow herd decreased quite quickly from 3,000 head in 1987 to 1,294 head that produced only 1,285 tons of milk in 1991.

In 1989, five dairy farmers were assigned to keep cows at the farm level as a test model. In 1991, based on the success of the 1989 test model, 15 other farms were assigned to dairy cattle keeping. Since then, dairy cows have been distributed to farmers to keep at the farm level. In the period from 1991 to 2000, dairy farmers faced many difficulties because of the limited milk sales and consumption. The number of dairy cows, milk yield, and quantity of milk produced failed to develop.

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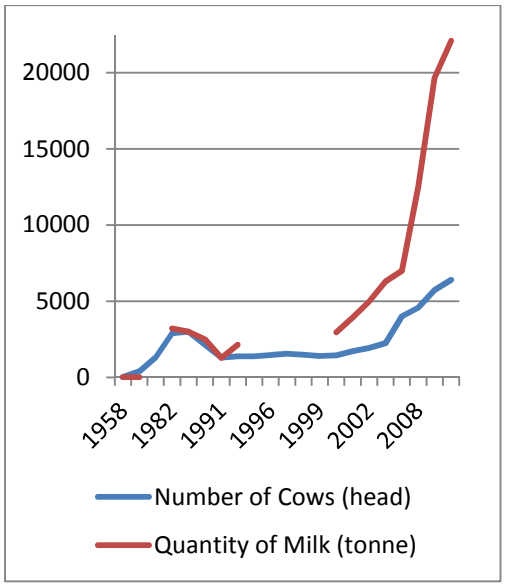


Figure 9. Milk production in the region
Source: Anh et al.2009, MCM.2009:2011

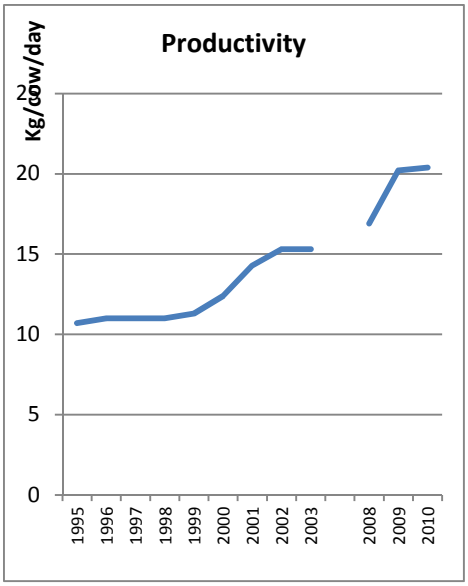


Figure 10. Milk production in the region
Source: Anh et al.2009, MCM.2009:2011

During the first decade of the 21st century, a rapid increase in the demand for milk, especially fresh milk, was observed. The increase in demand stimulated milk production. In 2001, a thousand Holstein Friesian (HF) dairy cows that had been imported from Australia were brought into Moc Chau. Thus, the number of dairy cows increased from 1,453 head in 2000 to nearly 6,000 head by 2010. In addition, the milk yield also grew during that period, nearly doubling from 12.4 kg per cow per day to nearly 20.38

kg. This led to dramatic growth of the quantity of milk produced, 7.47 times from 2,959 tons in 2000 to 22,111 tons in 2010.

At first, one hectare was assumed necessary to keep two cows. When the number of cows went up, and due to limited land available, one hectare of land was used to keep three cows, then five. At present, it is common to keep seven cows on one hectare. Some farms have a density of 10 cows or more per hectare of land. Thanks to its much longer history of dairy farming than in almost all other regions in northern Vietnam, Moc Chau is currently well-known for its fresh milk. The number of dairy cows, milk yield, and dairy production are increasing rapidly and continuously.

Table 1. Major data on dairy production in Moc Chau

Year	No. of farms	Total dairy cows (head)	Fresh milk production (1000 tons/year)	Average milk yield (kg/cow/ day)	Average farm size (head of cattle/farm)
2008	503	4,154	12,507.5	16.9	9.10
2009	491	5,237	19,675.7	20.21	11.68
2010	483	5,907	22,111.5	20.38	13.24

Source: MCM, 2009:2011

The number of dairy farmers decreased from 503 farms (in 2008) to 483 farms (in 2010). There are three main reasons for these decreases. The first is the reduction in available land area in the region. Since 2009, this region has given up a large land area for administration buildings and to implement new projects. Secondly, some farms have had to stop their production due to a lack of human resources.[25] Thirdly, because dairy farming is very labor-intensive and requires more capital incentive compared to other agricultural sectors. Some small farms merged to become larger farms in order to exploit the economy of scale.

However, the number of cows increased because dairy farmers wanted to expand their production. They kept the new-born calves for future milk production and bought imported heifers, which led to an increase in the herd size. At the same time, the milk yield went up thanks to training and technical support from the dairy plant, JICA, and other projects. The herd

25 Some farmers stopped keeping cows because of old age. They either did not have children or their children did not want to take over the hard work of their parents (PRA results and observation).

size at the farm level in this region is larger than in any other region in northern Vietnam. It is considered to be large enough to exploit the economy of scale. The growth rate of dairy production in this region seems very good.

4.1.2. Number and proportion of dairy cows by production unit

Moc Chau has 10 production units.[26] Nine out of 10 production units achieved a high growth rate in number of cows, at around 20%, except Unit 82. Vuon Dao 1 was the largest unit in terms of herd size, with 811 dairy cows, accounting for 18% of the total head of dairy cattle in the region. Unit 19/5 ranked second with 15%, followed by Unit 26/7 and Unit 8/5. The number of cows in Unit 82 was the lowest in the region, just equal to one tenth of the largest unit. It accounted for only 2%, with 86 head of dairy cattle.[27]

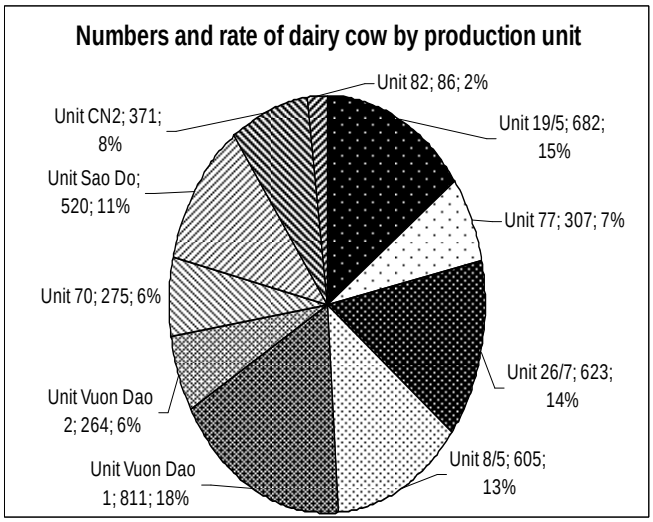


Figure 11. Numbers and proportion of dairy cattle by production unit in Moc Chau

Source: MCM, 2011

26 Vietnamese soldiers first arrived in this region 55 years ago and set up military units to protect our territory. After that, the unit was gradually expanded and changed into civilian units. The initial names of units are still being used until today.

27 At the time of surveying.

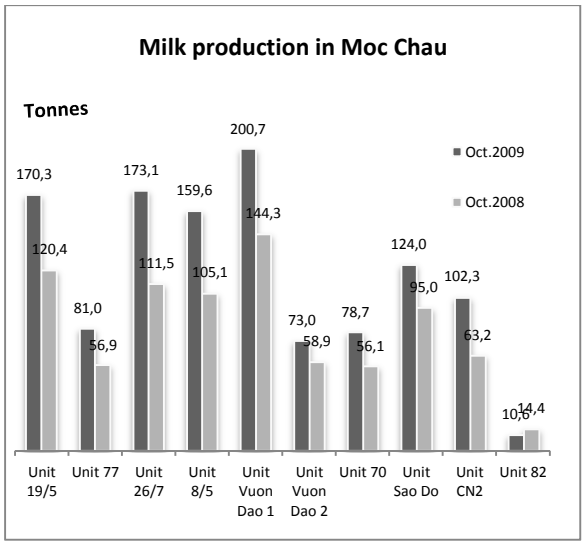


Figure 12. Milk production by unit

Source: MCM, 2009:2010

Note: Unit CN2, 371, 8%:

CN2: name of production unit

371: number dairy cows in the unit

8%: proportion of dairy cow of the unit compared to the whole number of cows.

Unit Vuon Dao 1 was also the largest unit in terms of milk yield. Its output accounted for 17% of total milk produced in the region. Unit 19/5 was the second among the largest milk production units, with 170 tons as of October 2009. The quantity of milk production increased in all units in the region at a high growth rate, except Unit 82. On the average, nine units grew at 43% per annum. Unit CN2 had the highest growth rate at 62%, followed by Unit 26/7 (55%); Unit 8/5 (51.8%) while unit 82 decreased 26.5%.

4.1.3. Herd size

The average herd size in Moc Chau was 12.42 cows, more than twice that of mean herd size throughout the country (5.3 cows per farm).[28] It was 3.35 times higher than those in the north overall.[29] Dairy households and farms[30] (henceforth referred to as "farms") in 10 production units in the region are normally classified into three types of size: large-sized,

28 Tuyen, 2008

29 Tuyen, 2008

30 Count up to data survey date (July 28, 2010)

medium-sized and small-sized farms. The largest farm in Moc Chau had 72 head of dairy cattle.[31] The capacity of this farm is around one ton of milk daily.

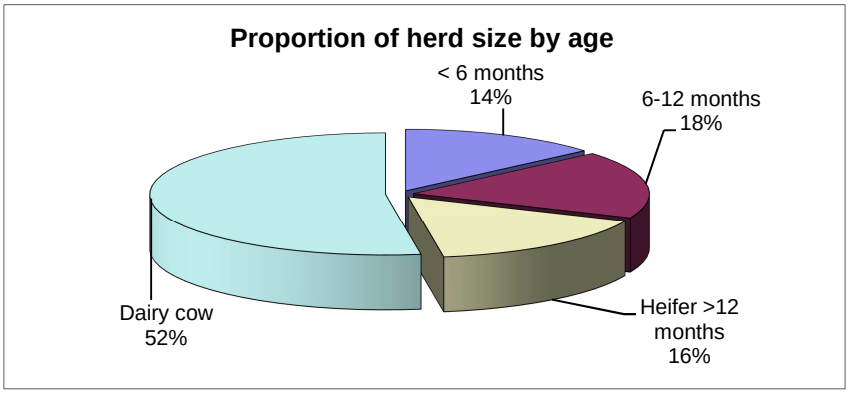


Figure 13. Proportions of the herd by age

Source: MCM, 2009–2011; Thien, 2010;

Most dairy cows in Moc Chau are Holstein Friesian (HF) but came from many sources: imported from Australia, Cuba, the United States, etc. Some others are Jersey or crossbreeds (F1, F2, and F3). Nowadays, pure HF cows occupy the largest share making up more than 95% of total head of dairy cattle in the region. By age, milking cows account for the highest proportion, at 52%. Heifers over 12 months occupy 16%, and the rest, 32%, are younger heifers.

4.1.4. Milk chain in Moc Chau

The main actors and stakeholders in the Moc Chau fresh milk chain are presented in the figure below:

31 Count up to data survey date (July 28, 2010)

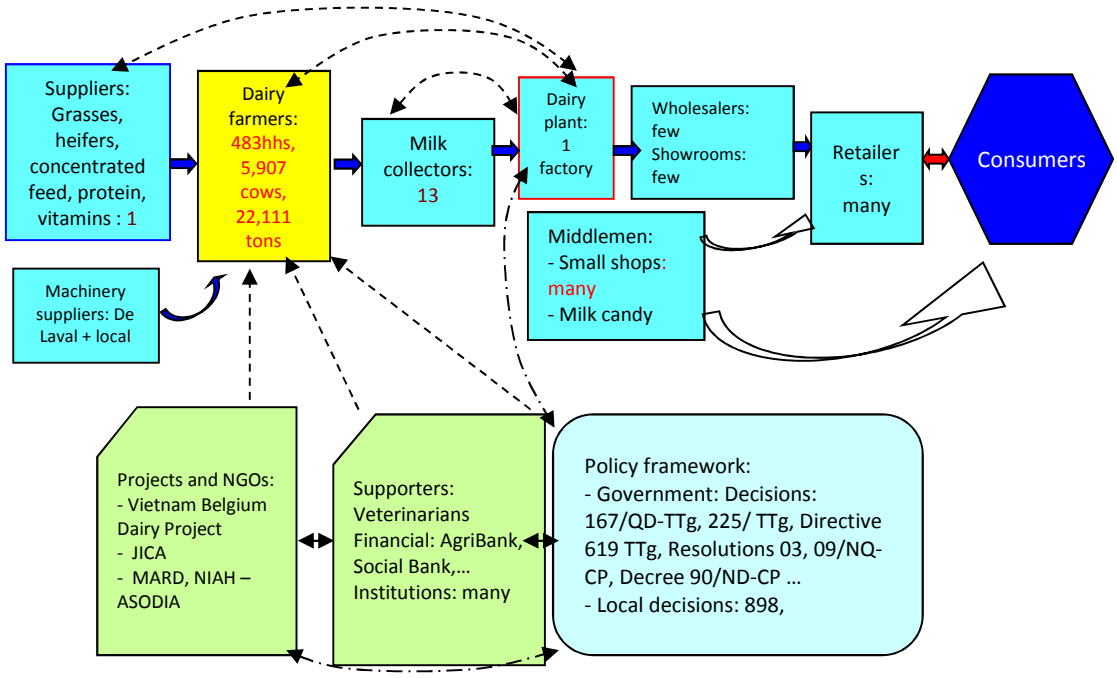


Figure 14. Basic actors and stakeholders in the Moc Chau milk chain

Source: Survey and PRA results, 2010

Note: All of these farms belong to and are located in 10 production units.

There is one dominant supplier of heifers, grasses, feed, proteins, etc., for dairy farmers in the region belonging to the Moc Chau Company and that has a very close relationship with the dairy plant. There are also some small private input suppliers. Although there are some local blacksmiths and retailers that supply some items of machinery, most of the equipment for milk production is supplied by the DeLaval Company.[32]

Overall, there are 483 dairy farmers keeping 5,907 dairy cows that produce 22,000 tons[33] of fresh milk per annum. They are the main actors in the milk chain. They play the most important role in the production chain. All other actors depend on their operation. There are 13 milk collectors (called collecting centers) in the region. Normally, they work independently. However, unofficially, almost all of them belong to the Moc Chau Company.

32 This is an international company (http://www.delaval.com/en/About-DeLaval/The-Company/) and have a collaboration with the dairy plant to provide necessary equipment for dairy farmers.

33 At the time of surveying

The most powerful actor in the milk value chain is the dairy processing company or dairy plant. Theoretically, it depends on the dairy farmers. Even so, in reality, it has become the decision-making actor for the chain. It links dairy farmers with input suppliers, milk collectors, and distributors.

In the distribution stage, there are many participants referred to as small milk shops, milk candy shops, some showrooms and supermarkets, and many agents and retailers.

There are some relevant stakeholders within the chain. Some organizations and projects from JICA, ASODIA, MARD, DARD, and NIAH support the dairy farmers.[34] The major fields of support from JICA involve the technique of breeding cows and includes a training course for feed preparation. ASODIA provides them with financial support.

The veterinarian and outreach[35] initiatives helped farmers to deal with their specialized problems such as diseases control, protecting dairy cows from harsh conditions, preventing them from suffering the effects of natural disasters, etc. Financial institutions such as the Bank for Agriculture and Rural Development (AgriBank), along with the Policy and Social Bank provided them with small loans for keeping cattle.[36] The Government and local authorities created the environment to produce milk through decisions, resolutions, directives, decrees, etc.

34 In fact, only JICA supported them in technical areas and ASODIA supported in the financial aspect

35 Mostly from the dairy plant

36 In reality, it was difficult for them to access these financial institutions. Most of them did not borrow from the banks but accumulated themselves

4.1.1 Milk distribution channel

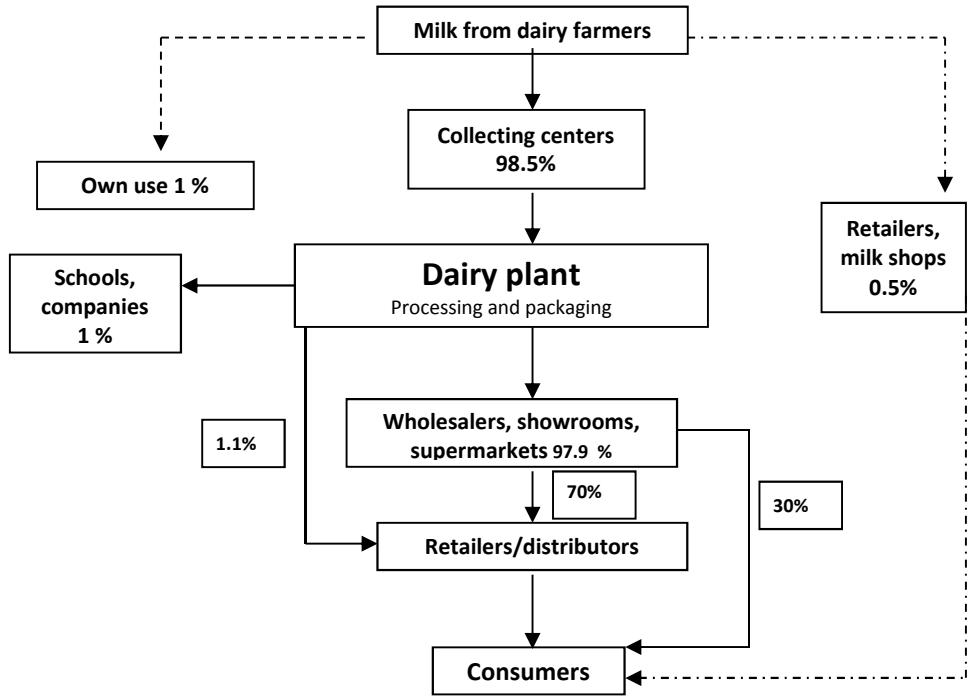


Figure 15. Milk distribution channel

Source: Surveyed results, 2010

Most of the milk produced from the dairy farms is collected by 13 collecting centers (98.5%). A small amount is used for self-consumption (1%) and collected by retailers or milk shops within the local region. All of the milk at the collecting centers is to be transferred to the dairy plant in Moc Chau. The dairy plant processes, pasteurizes, and packages mainly fresh milk, along with a small proportion for milk candy and yogurt. Except for 1.1% of fresh milk that is transferred directly to retailers or distributors, almost all milk was delivered to wholesalers, showrooms, and supermarkets. These agencies supply retailers (70%) or sell directly to consumers (30%).

The most important actor in this chain is the dairy farmer. Dairy farmers create the goods and thus create the chain. However, the dominant actor in the chain is the dairy plant. The dairy plant holds the highest level of power in the chain. It decides the most important things with regard to the chain. It sets the prices, and the dairy farmers have to abide by them. It decides how to organize the collecting centers. It also imposes impacts on both wholesalers and retailers.

4.2 VALUE ADDED BY DAIRY FARMERS

4.2.1 Basic technical and economic data of the surveyed farms

The total of investigated farms[37] was 50, on which 651 head of dairy cattle are being kept. This number accounts for 11% of total farms and 10.2 % of the number of dairy cattle in the region. The average farm size is 13 cows per farm. The farms were classified into three sizes based on the number of cows.

Table 2. Surveyed farm size *(Unit: head)*

	Total (50)		**Large-sized farms (14)**		**Medium-sized farms (21)**		**Small-sized farms (15)**	
	Heifers	*Milking cows*	*Heifers*	*Milking cows*	*Heifers*	*Milking cows*	*Heifers*	*Milking cows*
Average head/farm[(a)]	6.37 (±0.4)	6.6 (±0.6)	9.7 (±0.67)	11.6 (±1.37)	6.3 (±0.18)	5.7 (±0.3)	3.4 (±0.35)	3.3 (±0.26)
% of herd	48.95	51.05	46	54	52	48	50.7	49.34
Average farm size[(b)]	13.02 (±0.9)		21.29(±1.3)		12(±0.3)		6.73(±0.5)	
Max.	35		35		15		9	
Min.	2		16		10		2	

Source: Survey results, 2010

(*a*) *Number in brackets is Standard Error, confident level at 95%, F test=29.81, p=5.01E*(*-18*)*.*

(*b*) *Number in brackets is Standard Error, confident level at 95%, F test=82.45, p=4.26E*(*-16*)*.*

Large-sized farms included 14 farms, accounting for 28%. The average number of dairy cows in this group was 21.29 head. Medium-sized consists of 21 farms, or 42% of total surveyed farms. The average head of dairy cattle in this group was 12. There were 15 small-sized farms, occupying 30% of total farms. On the average, each farm in this group has 6.73 head of dairy cattle.

On the average, milking cows accounted for 51.05%; the remaining numbers were heifers. This high ratio of heifers seemed not good for the profitability of dairy farms because of the required time and cost of

37 This investigated farms sited within 10 production units in the region

raising them (purchase expense, feeding cost, veterinary cost, etc.) without any revenue until they become milking cows. This situation can be explained by the fact that the rapid increase in the demand for milk in the previous period (after the melamine added to milk issues in Asia and in Vietnam in 2008) encouraged dairy farmers to expand their production. They not only kept all of their newborn heifers but also bought imported heifers (through the dairy plant) to enlarge their herd. All dairy farmers tried to increase their number of cows. Therefore, the proportion of heifers in this region in particular and in Vietnam in general was quite high in comparison to the normal ratio of the world.

The proportion of milking cows was higher in the large-sized group. Nevertheless, in the medium- and small-sized groups, the proportion of heifers was higher. This situation occurred because the small- and medium-sized groups were trying to expand their herd size as much as they could while the large-sized group expanded their size more cautiously due to limited resources, especially land area.

Besides milking cows and heifers, each farm kept only one strong water buffalo or bullock as a draft animal for transporting manure, etc. Any newborn male calves are usually sold to the slaughter house shortly after birth.

Table 3. Major information of the surveyed farm

Farm	Units	Total (50 farms)	Data and information		
			Average/farm	Max./farm	Min./farm
Land owned	ha	114.5	2.289(±0.15)	5.55	0.77
Cattle	Head	651	13.02	35	2
Milk production	Ton/year	2,023	40.46(±3.65)	124	7
- per ha	*Ton/ha/year*		*17.55*(±1.1)	*38.4*	*5.4*
- production	*kg/cow/day*		*21.2*(±0.5)	*27*	*17*
Fat content[38]	%	3.11–3.36			
Protein[39]		3.14–3.26			
SNF[40]		8.31–8.41			
Labor					
Full-time employees	*Person*		*1.15*(±0.04)	*2*	*0*
Family working labor	*Person/farm*		*2.7*(±0.08)	*4*	*1*
Milking system		Milking machine+hand	Milking machine	Machine + hand	Milking by hand
Milkings per day	Times	2		3[41]	
Length of lactation	Days		305 (±3)		
Inter-calving period[42]	Days		427	518	365
Dry period	Days	60			
Breeding method		Artificial			
Feeding time per day		3		4	3
Death rate[43]	%	4.43			
Culling rate[44]	%	25.8			
- Old or low quality milking cow	*%*	*2.6*			
- from low quality heifers	*%*	*0.8*			
- from male calves	*%*	*22.4*			

Source: Survey results, 2010

38 It depends on the breed of cow. The American HF has higher fat content in comparison with others. (Thien, 2010)

39 Thien, 2010

40 Thien, 2010

41 Only 1 farm with exceptional dairy cows that can yield more than 50 kg per day

42 Thien, 2010

43 MCM, 2011

44 MCM, 2011

Total ***land area*** of the surveyed farms is 114.5 ha, used for growing forage to feed the dairy cows. On average, the area for each dairy cow is 0.176 ha. One ha is used to keep 5.7 cows. The largest farm has 5.55 ha and keeps 25 cows. The maximum sized farm has 35 cows, and the minimum 2 cows.

The ***milk yield*** of all surveyed farms was 2,023 tons per annum. On the average, each farm produced around 40.46 tons of milk per annum. The highest milk yield for one farm was 124 tons, and the lowest was seven tons. Daily milk productivity was significant statistically at 21.2 kg. However, there was a difference in ***milk productivity*** among farms. The farm with the highest productivity was 1.5 times higher than that of the lowest.

There was inconsistency in terms of ***breed*** found by the survey. Although all those taking the questionnaires responded that their breed was HF, as the surveyors observed, there were some crossbreeds on the surveyed farms.

Most of the farms had various ***machines*** for milk production. However, there was quite a substantial difference in machinery used between the large farms and small farms. Large farms had more machines than smaller farms. Some farms had only one or two simple machines and almost all work was done by hand.

All cows in the region were bred by ***artificial insemination.*** Normally, each ***inter-calving*** period was 15.5 months (427 days). Among the surveyed farms, there were two farms that had very good experience and practice and thus could shorten the inter-calving period of a few cows to the theoretical level of from 12 to 12.5 months (365–380 days).

Milk bulking times at farms were measured and presented in the following table:

Table 4. Lengths of time for milk bulking at the farms *(Unit: minute)*

	Total (50)	Large-size farms (14)	Medium-size farms (21)	Small-size farms (15)
Average bulking time at farm	37(±3)	54(±3)	35(±1)	23(±1.8)
Max.	70	70	40	40
Min.	15	40	25	15

Source: Survey results, 2010

Number in brackets is Standard Error, confident level at 95%, F test=58.74, p=1.64E(-13).

The average time of milk bulking at farms was 37 minutes. The shortest time was 5 minutes (this farm had 2 cows in which only one was a milking cow), and the longest was 70 minutes. There was a statistically significant difference between different farm sizes. Most of the large-sized farms had milking machines; some others had to milk the cows by hand.

Average age of the farm holders was 42.7 years of age. Some older people still kept the contract for their sons/daughters even though their children did not want to work on the farm.

Table 5. Ages of farm holders (*Unit: years of age)*

	Average age	Max.	Min.
Total	42.7(±2.3)	56	27
Large-sized group	45.7(±2.3)	55	27
Medium-sized group	44.2(±1.2)	56	32
Small-sized group	37.9(±2)	52	27

Source: Survey results, 2010

Number in brackets is Standard Error, confident level at 95%; F test=4.946 (>Fcrit=3.195), p=0.011.

Average number of laborers (family labor) on a farm was 2.7 (some farms included their children), of which 54.9% were female. The large-sized group had more laborers (average of 3.1 laborers) than the medium-sized

(2.8 laborers) and small-sized one (2.1 laborers). Besides family labor, they had to use hired labor. Generally, almost all farms had 4 laborers.

Time of working per day on all investigated farms was 12 hours. However, some farmers worked longer, others less. They started working from early in the morning (4:30 a.m.) until very late at night (9:00 p.m.); some farmers even worked until 11:00 p.m. In case of difficult calving, some had to work all night.

Because of working very long, hard hours, they achieved quite a high income in comparison to the average income in the agricultural sector. Their ***average income*** was 4.9 million VND per person per month.

Table 6. Monthly income of dairy farm

	Total (50)		**Large-size farms (14)**		**Medium-size farms (21)**		**Small-size farms (15)**	
	Millions VND	USD	Millions VND	USD	Millions VND	USD	Millions VND	USD
Average income	4.9 (±0.27)	**259.3**	7.18 (±0.47)	**378**	4.53 (±0.18)	**239**	3.37 (±0.27)	**178**
Max. income	12	**634.1**	12.05	**634**	5.68	**299**	4.64	**245**
Min. income	1.03	**54.4**	5.51	**290**	2.58	**136**	1.03	**54.4**

Source: Survey results, 2010

Number in brackets is Standard Error, confident level at 95%; F test=37.6, p=1.76E(-10).

There was a statistically significant difference in the incomes between the different size groups of surveyed farms. The survey data shows that the larger size farms enjoyed the highest income. The income of the large-sized group was more than twice that of small-sized ones. The highest farm income was 11 times higher than that of the minimum one. According to criteria of classification in the study site,[45] 60% farms had quite a high income; 30% were in the medium bracket, and low income farms accounted for 10%.

45 Classification based on their understanding.

All of them (100%) considered dairy cows as ***their only source of income.*** Some of them raised other animals such as poultry (chickens, ducks) or grew vegetable but only for self-consumption, not for sale.

4.2.2 Economic effectiveness of land use for dairy farming

In Vietnam, the land area used to grow forage to keep dairy cattle was limited, thus all the dairy farms applied the closed-pasture system. Within the surveyed farms, the average livestock rate was 5.24 cows per hectare; the highest stock rate was over 9 head of cattle per hectare of land. The high stock rate led to a low land area per head in the region. However, this land area was much higher than in other regions in Vietnam. According to IFCN research (Garcia et al., 2007), some dairy farms in northern Vietnam had a high livestock rate of about 14 head of cattle per hectare of land. Using a low land area for forage growing would affect the efficiency of dairy milk production, as farmers could not grow enough forage for their dairy cows. The farmers had to feed them more concentrate or had to buy forage from outside which, in turn, tended to increase the production cost and reduce farm profit.

The average land area in the large-sized group was larger than those in the medium-sized group and small-sized group. On average, a large-sized group had twice as much land as the small one. However, the average land area per head of cattle in the large-sized group was the smallest. Average land area per head in the large-sized group was only 0.16 hectare, smaller than that of the medium- and small-sized group. The small-sized group had the largest land area per dairy animal.

Table 7. Land area *(Unit: ha)*

	Total (50)	Large-sized farms (14)	Medium-sized farms (21)	Small-sized farms (15)
Average land area of farm (a)	2.289(±0.15)	3.4(±0.3)	2.1(±0.11)	1.52(±0.14)
Max area	5.55	5.55	3.23	2.63
Min area	0.77	1.79	1.25	0.77
Average land area/head (b)	0.191(±0.01)	0.16(±0.01)	0.174(±0.007)	0.242(±0.026)
Max. area/head	0.56	0.222	0.269	0.56
Min. area/head	0.11	0.11	0.124	0.137

Source: Survey results, 2010

(a) Number in brackets is Standard Error, confident level at 95%, F test=25.35, p=3.41E(-8).

(b) Number in brackets is Standard Error, confident level at 95%, F test=7.09 (>Fcrit=3.19), p=0.002.

There are three possible reasons for this situation. The first reason would be that the large-sized group had more experience and produced more efficiently than the other groups. The second reason could be that the large-sized group could exploit the economy of scale in terms of land area. When increasing their herd size, their land area per head would be reduced and the production became more efficient.

The average shed area was 167.5 m^2 per dairy farm. This area in the large-sized group was larger than those in the smaller ones because they had more head of cattle. The average shed area per head in the large-sized group was the smallest. However, there was no clear difference in shed space per head among the three sized groups.

Table 8. Milk yield per ha of land (*Unit: ton)*

	Total (50)	Large-sized farms (14)	Medium-sized farms (21)	Small-sized farms (15)
Average milk yield/ha/year	17.55(±1.1)	22.4(±2.6)	17.05(±1.2)	13.72(±1.7)
Max milk yield/ha/year	38.4	38.4	28.72	29.47
Min milk yield/ha/year	5.39	7.96	8.05	5.393

Source: Survey results, 2010

Number in brackets is Standard Error, confident level at 95%, F test=5.37 (>Fcrit=3.2), p=0.008.

The average milk yield per hectare of land per year was 17.55 tons of milk. It seemed that the larger the size of the group, the higher the efficiency of land use. The large-sized group achieved the highest efficiency rate for land using. They could produce 22.4 tons milk per annum per hectare, 1.6 times higher than those of the small-sized group. The farm with the highest productivity produced 38.4 tons of milk per hectare of land, seven times higher than the least productive farms. This situation is reflected the operation of economy of scale in dairy farming.

4.2.3 Efficiency of milk production

Milk productivity

Average milk productivity in the surveyed farms was 21.2 kg per head per day. However, in reality, as the surveyors observed, the actual milk yield was lower than this amount. Some observed cows that had a low milk yield of only 7 to 10 kg milk per day. There was a small difference between the three different sized groups. The larger sized group seemed to achieve a higher average milk yield than the smaller size group.

Table 9. Average milk productivity on farms

	Total (50)	Large-size farms (14)	Medium-size farms (21)	Small-size farms (15)
Average daily milk productivity(*) (kg/day/head)(a)	21.2(±0.5)	22.7(±1)	20.7(±0.75)	20.47(±0.9)
Average yearly milk productivity (kg/head(**)/year) (b)	3,050(±142)	3,288(±118)	2,902(±90)	3,038(±171)
Max./head/year (kg)	6,314	4,696	4,372	6,314
Min./head/year (kg)	1,360	1,488	1,360	1,372

Source: Survey results, 2010

(*) This is for milking cows only

(**) This is for dairy cows which consists of milking cows and dry cows

(a) Number in brackets is Standard Error, confident level at 95%, F test=1.86 (<Fcrit=3.2), p=0.166.

(b) Number in brackets is Standard Error, confident level at 95%, F test=0.6 (<Fcrit=3.2), p=0.54.

It is noteworthy that the highest milk production per head per annum or productivity per cow per annum belonged to the small-sized group at 6,314 tons. There could be two reasons for this. Some small-sized farms had fewer cows; they took time to better care of each of their cows, thus they achieved a higher productivity. The second reason might be that the small farms were newer dairy farmers; their cows were of a better breed and were milked in the first lactations. The productivity of a cow follows a cycle in which the first lactation is often the most productive. Thus, their productivity was higher. The medium-sized group had the lowest productivity among the three groups. However, there is a ***statistically insignificant*** difference in milk productivity among different sized farms both in regard to daily milk yield and to yearly milk yield. Thus, this issue needs to be studied further for the final conclusion.

The survey results showed that dairy cows in Moc Chau have a life expectancy of around 10 to 12 years and could produce milk through from five to eight calvings. The cow with the highest record calved 12 times during her life.

Milk yield

There was an obvious wide difference in milk yield between the different sized groups. The average amount of milk produced in the large-sized group is 3.55 times higher in comparison to the small-sized group. The farm with the highest milk production produced 124 tons milk per annum, 17.7 times higher than the farm with the lowest milk production.

Table 10. Milk yield per farm *(Unit: kg)*

	Total (50)	**Large-sized farms (14)**	**Medium-sized farms (21)**	**Small-sized farms (15)**
Average milk yield/year	40,460(±3,650)	70,370(±6960)	35,260(±2690)	19,810(±2500)
Max. milk yield/year	124,200	124,200	61,200	44,200
Min. milk yield/year	7,000	23,800	13,600	7,000

Source: Survey results, 2010

Number in brackets is Standard Error, confident level at 95%, F test=34.7, p=5.4E(-10).

Production cost

- Grass growing (from one hectare per annum)

Cows are ruminant animals. A cow has to eat an amount of grass approximately 10–12% of its weight daily.[46] Thus, all dairy farms grow grass themselves to serve their cows. In Moc Chau, with the more favorable condition of a larger area of land, enjoying a more temperate climate than many other regions in Vietnam, it is easier to grow grass for dairy cows. The calculation of cost and estimated benefit from grass growing is presented in the table below.

46 According to the guidance of the dairy plant

Table 11. Grass production per ha/year

Items	Quantity	Price (VND)	Total (VND)	Note
OUTPUT			**60,000,000**	
Estimated revenue[47]	200,000 (kg)[48]	300[49]	60,000,000	
INTERMEDIATE COST			**19,430,000**	
Seed/turf[50]			100,000	
Fertilizers[51]			19,330,000	
Urea	*2000 kg*	*5800*	*11,600,000*	
NPK	*400 kg*	*5000*	*2,000,000*	
Kali	*500 kg*	*10500*	*5,250,000*	
Phosphate	*200 kg*	*2400*	*480,000*	
Manure[52]				*630,000*[53]
Irrigation			0	
VALUE ADDED			**40,570,000**	
Labor			5,400,000	
Growing grass[54](*day*)	*5 days*	*80,000*	*400,000*	
Care: fertilizer, irrigation				*Family labor*
Cutting grass[55]	*500 hours*	*10,000*	*5,000,000*	
Land fee[56]			350,000	
GROSS PROFIT			**34,820,000**	
Depreciation			735,294	
NET PROFIT			**34,084,706**	
Cost of grass/cow/year			**3,597,142**	
Cost of 1 kg grass			**126**	
Cost of grass/1 kg of milk[57]			302	

Source: Survey results, 2010

47 One hectare of grass can serve 5–7 cows

48 Wet grass

49 Market price

50 Over three years, calculation for 1 year, 300,000 VND for seed/3 years.

51 Each year, there are three harvests, after each harvest, fertilizer has to be applied

52 Price of dry manure: 250,000 VND/m^3

53 Self-production, they do not have to buy it. Just opportunity cost

54 By hand

55 Some farms cut by hand, other farms cut by mower. Each day two people spend two hours cutting grass and transporting it to their farm

56 Land fee paid to the company is 30,000 VND/month.

57 Process questionnaire data (Excel)

The main cost for grass growing is fertilizer. In this area, there is no irrigation system and the livestock-to-land ratio was high (low land area per cow); farmers tried their best to grow forage in their fields by using many different fertilizers, especially urea. They found that urea stimulates the growth of grass. As grass grew faster, it could be harvested sooner and the numbers of cuttings per annum would increase. Thus, the amount of urea used is quite high.

Due to quite a harsh climate in northern Vietnam, normally grass cannot be grown during the period from November (sometimes October) to April, as the weather is too cold and dry. Temperatures can sometimes approach the freezing point. Even in summer, grass may not grow if affected by excessive rains or flooding. In that situation, the farmers have to replant it, which takes time and costs money. In addition, little attention has been given to the varieties of grass in Vietnam. Thus, the yield of grass growing in Vietnam is still low. This explains the low amount of grass grown per cow. The farmers had to buy hay from outside (imported hay from America through the dairy plant). This, in turn, increases the feeding cost in particular, and production cost in general.

Under normal weather conditions, farmers plant grass once and harvest it for three years. Each year, they harvest three times. After each cutting, they fertilize the mowed grass fields for future cutting. Fertilizers dominate the total costs of grass production at 76.77%. Hired laborers are commonly used to cut grass and their wages account for 92.6% of labor costs.

- Maize silage

Besides grass, from 2007–2008 to now, the dairy farmers were trained to grow maize for silage feed. Nowadays, growing maize for silage is another necessary activity on farms.

Table 12. Cost of maize silage production

Items	Quantity	Price (VND)	Total (VND)	Note
OUTPUT			**18,000,000**	
Estimated revenue	20,000 kg of silage	900[58]	18,000,000	
INTERMEDIATE COST			**2,396,500**	
Seed[59]	10 kg	46,000	460,000	
Materials[60]			300,000	
Plastic bags			300,000	
Fertilizer[61]			1,336,500	
Urea[62] *NPK* *Kali* *Manure*[63]	*30 kg* *75 kg* *75 kg*	*800* *5,000* *10,500*	*174,000* *375,000* *787,500*	*200,000*[64]
VALUE ADDED			**15,603,500**	
Labor for growing and cutting			5,760,000	
Growing maize[65] *Care: fertilizer, irrigation* *Cutting maize*[66] *Trench digging* *Silage*	*10 days* *15 days* *15 days* *2 days* *30 days*	*80,000* *80,000* *80,000* *80,000* *80,000*	*800,000* *1,200,000* *1,200,000* *160,000* *2,400,000*	*+family labor* *+family labor*
Land fee[67]			*350,000*	
Irrigation			0	
GROSS PROFIT			**9,493,500**	
Depreciation			280,000	
NET PROFIT			**9,213,500**	
Cost of silage maize/cow/year			**680,520**	
Cost of 1 kg maize silage			**425**	
Cost of maize* silage*/1 kg of milk			***318***	

Source: Survey results, 2010

58 Market price

59 Each year, two crops are grown

60 Molasses, fodder and salt are added: 8–10 kg/1 ton maize

61 Each year, there are three harvests; after harvesting, fertilizer must be applied

62 Each crop 8–10 kg urea, 25 kg NPK

63 Price of dry manure: 250,000 VND/m^3

64 Self-production (they do not have to buy it)

65 By hand

66 Some farms cut by hand, other farms cut using a mower. Each day two people spend two hours cutting it and transporting it to their farm.

67 Land fee paid to company 30,000 VND/month

Each year, farmers can grow two to three crops of maize for silage. The cost for cultivating one hectare of maize per annum was much lower, around one third the cost of grass growing in the same area. For maize silage production, the labor cost occupied the largest proportion, at 67.7% of total costs. The gross profit of maize growing seems lower than that of grass, but for milk production, maize is considered to be better.[68]

- Concentrated feed and purchased hay

In Moc Chau nowadays, besides grass and maize silage, there are two main kinds of feed that have to be bought for the dairy cow herd, mixed feed (concentrate) and imported hay.[69] The cost of these two kinds of feed is presented in the table below.

Table 13. Bought feed for one dairy cow/year in Moc Chau

Items	Quantity per cow/year	Price (VND)	Total (VND)
α – grass (alpha grass) (kg)	182	5,200[70]	946,400
α – grass per kg of milk			310
Mixed feed (concentrate) kg	1,057	5,600[71]	5,919,530
Mixed feed/1 kg of milk			2,520

Source: Survey results, 2010

In the past (as shown in figure 25), the farmers produced the concentrates themselves, a mixture of rice, maize, or soybeans. They did not feed their cows bought concentrates. The milk yield in that period was around 10 kg per milking cow per day and then rose up to 15 kg of milk per milking cow per day. When the number of cows expanded quickly, homegrown feed could not satisfy the demand for cows. Farmers started to buy concentrates to feed their cows. The milk yield from that period also grew rapidly in comparison with the previous period. From the point of view of the farmers, the more feed concentrate the cows consume, the higher the milk yield. Thus, the farmers buy and feed their cows large amounts of concentrates. In some farms, they feed their milking cows at the ratio of 0.45 kg of concentrate per kg of milk produced.

68 In the awareness of farmers

69 Imported from the USA and Australia

70 Price of company support

71 Price of company support

Concentrates provide nutrition for dairy cows, especially high milk yielding cows. However, it is necessary for dairy farmers to calculate carefully the suitable ratio of concentrates to feed the cows. Cows are ruminant animals; they need more forage than concentrates. If farmers feed their cows too much concentrates, there are some negative impacts on the health of cows and on the productivity of the farms. Research showed that feeding dairy cows too much concentrates will be unfavorable for the ecology and the health of the cows and detrimental economically (Trach, 2010). If a cow consumes too much concentrate, this could cause problems of increasing acidity and disorders of rumen microorganisms, which in turn results in loss of appetite or undigested food, abdominal bloating, congestion of the rumen, low milk fat content, reproductive disorders, milk fever, etc. (Trach, 2010).

At the time of survey, 100% of farmers were buying concentrates from outside. Some farmers produced concentrate themselves, but they did not pay attention to and follow the right proportion of components for the mixed feed and their cows did not provide a high milk yield. Feed concentrate accounted for a large proportion of feed costs and total costs.

In addition, the farmers in Moc Chau had to buy imported hay at a very high price[72] because they believed that this dry fodder could provide more and better milk.

72 Price of 1 kg of imported grass is 5,200 VND, more than twice as much as normal dried grass in Vietnam, at 2,500 VND, equal to 1 kg of maize, nearly equal to 1 kg of mixed (concentrated) feed

- Other costs

The farmers had to pay other cost listed in the following table.

Table 14. Other costs for a dairy cow/year

Items	**Total (VND)**	
Artificial insemination (AI)	426,000[73]	
Veterinary	1,085,800	
Cleaning products[74]	38,500	+Family labor
Electricity	192,300	
Water	144,000	+pump
Small tools[75]: brooms, sickles…	104,403	
Labor	840,000	
Total	**2,831,000**	
Other cost/1 kg of milk	928	

Source: Surveyed results, 2010

Among the other costs, those for veterinary services were the highest. Each year, the farmers spent more than 1 million VND per dairy cow. After veterinary casts came artificial insemination. Despite support from the dairy plant, this cost for each dairy cow amounted to 426,000 VND.

- Fixed costs for a cow per annum

Dairy farming needs machinery to do the work. In comparison to other regions, this region has more machinery, for example, milking machines. However, in Vietnam in general and in Moc Chau in particular, it is difficult for farmers to access credit/finance to purchase machinery. Most of them put money aside to buy machinery or heifers, but did not borrow from a bank or financial institution or even from relatives. Thus, they did not have to pay interest on their investment. In addition, the investment for machinery was small in comparison to the variable costs. Sometimes, they bought the equipment and paid monthly installments. And this cost was depreciated, thus it is not necessary to count the opportunity cost for it.

73 New AI: 826,000

74 Disinfectant spray used daily

75 Such as brooms, sickles, scissors, etc.

Table 15. Fixed cost and depreciation in dairy farms

Fixed costs	Purchased Price (VND)	Time of Depreciation (Year)	Depreciation yearly (VND)
Heifers (or initial cows)(*)	8,420,000	8	1,057,800
Shed	5,870,000	10	587,000
Maintenance			48,600
Milking machines	1,290,000	10	129,000
Milk storage	304,000	10	30,400
Other (**)	1,323,000	6	220,500
Total			**2,121,900**
Fixed costs/1 kg of milk			**695**

Source: Survey results, 2010

(*) *Farmers keep newborn calves for future development, but at first and over time, they also bought heifers from outside, especially imported heifers of good breeds. Cull cows have been calculated but with a very low price in comparison to the price of bought heifers. In some farms, for example, they have to buy a pregnant heifer at a price ranging from 45 to 80 million VND. In case of a problem with this heifer, and it becomes a cull cow, it can fetch only from 7 to a maximum of around 20 million VND. Thus, it is necessary to calculate the depreciation of heifers.*

(**) *Some farms have other machinery or equipment such as: trolleys, pumps, cow washing machines, grass mowers, generators*[76]

76 The calculation based on the average value of the investigated farms

- Total cost of raising a cow per annum

Table 16. Costs of raising a cow per annum *(Unit: VND)*

Item	Cost	%
Variable cost	**12,358,205**	**85.4**
Feeding cost	9,527,205	65.8
Mixed feed	*5,919,530*	*40.9*
α – grass	*946,400*	*6.5*
Cost of maize silage	*680,520*	*4.7*
Cost of home-grown grass	*1,930,047*	*13.3*
Other feed cost[77]	*50,708*	*0.4*
Other costs	2,831,000	19.6
Fixed costs	**2,121,900**	**14.7**
Total costs	**14,480,105**	**100**

Source: Survey results, 2010

In order to keep one cow per annum, farmers have to spend nearly 9.5 million VND. Feeding costs account for the largest proportion (65.8%) of total costs in dairy farming. This is really a problem with the small farmers because they often face difficulty in accessing credit/finance, both officially and unofficially.

- Cost of producing one kg of milk

There was a statistically significant difference in feeding cost between three sizes of farms. It seems that the larger the farm size, the lower the feeding costs of the farmers. This might be explained by the difference (statistically significant) in the concentrated feed and bought hay that the farmers use to feed their cows. The larger-sized farms tended to feed their cows a lower amount of concentrated feed and bought hay than the smaller ones.

77 Vitamin, substance, mineral, etc.,

Table 17. Costs of one kg of milk on the farm

Items	Large-size farms (14)	Medium-size farms (21)	Small-size farms (15)	Average Cost	%
Variable costs	**4,325**	**4,385**	**4,410**	**4,378**	**86.3**
Feeding cost (a)	3,395 (±26)	3,456 (±53)	3,485 (±47)	3,450	68.1
Mixed feed (*b*)	*2,436* (±13)	*2,521* (±69)	*2,535* (±35)	*2,520*	*49.7*
α – grass (*c*)	*308* (±15)	*312* (±7)	*323* (±16)	*310*	*6.1*
Cost of silage maize (*d*)	*324* (±18)	*301* (±11)	*313* (±9)	*302*	*6*
Cost of home-grown grass (*e*)	*327* (±21)	*322* (±12)	*314* (±8)	*318*	*6.3*
Other costs (f)	930 (±26)	929 (±21)	925 (±17)	928	18.2
Fixed costs (g)	**701** (±98)	**692** (±27)	**685** (±35)	**695**	**13.7**
Total costs	**5,026**	**5,077**	**5,095**	**5,073**	**100**

Source: Survey results, 2010

(*a*) *Number in brackets is Standard Error, confident level at 95%, F test=11.2, p=1.6 E*(*-5*)

(*b*) *Number in brackets is Standard Error, confident level at 95%, F test= 21, p= 5.2 E*(*-8*)

(*c*) *Number in brackets is Standard Error, confident level at 95%, F test=5.6* (*>Fcrit=3.2*), *p=0.008*

(*d*) *Number in brackets is Standard Error, confident level at 95%, F test=1.21* (*<Fcrit=3.2*), *p=0.146*

(*e*) *Number in brackets is Standard Error, confident level at 95%, F test=0.86* (*<Fcrit=3.2*), *p=0.32*

(*f*) *Number in brackets is Standard Error, confident level at 95%, F test=1.84* (*<Fcrit=3.2*), *p= 0.14*

(*g*) *Number in brackets is Standard Error, confident level at 95%, F test=4.26* (*>Fcrit=3.2*), *p=0.009*

Similar to the cost of keeping a cow, the feed cost (3,450 VND) accounted for largest proportion (68.1%) in the total cost of producing one kg of milk.

Revenue of dairy farms

The results of farm revenue are presented in the table below.

Table 18. Average revenue of a farm per annum (in VND)

	Revenue/ cow/year	Revenue/kg milk		Large-sized farms (14)	Medium-sized farms (21)	Small-sized farms (15)
		In VND	% of total			
Average revenue from milk	**23,445,350**	**7,687**	**89.6**	**7,745**	**7,680**	**7,683**
Milk type 1 (a)	17,965,842	5,890.4	**68.7**	5,896 (±121)	5,887 (±152)	5,885 (±134)
Milk type 2 (b)	790,121	259.06	**3.0**	241(±15)	268(±10)	260(±12)
Milk type 3	56,437	18.5	**0.2**	16	19	17
Milk bonus (c)	4,632,950	1,519	**17.7**	1,592 (±75)	1,526 (±82)	1,521 (±103)
Secondary revenue	**2,723,650**	**893**	**10.4**	**880**	**896**	**892**
Male calves (d)	387,350	**127**	**1.5**	121(±7)	131(±11)	128(±9)
Heifers (e)	1,351,150	443	**5.2**	451(±16)	439(±13)	441(±21)
Manure	106,750	35	**0.4**	32	34	37
Old cow (f)	466,650	153	**1.8**	150(±7)	155(±5)	152(±10)
Other (g)	411,750	135	**1.6**	126(±6)	137(±11)	134(±8)
Total farm revenue	**26,169,000**	**8,580**	**100.0**	**8,625**	**8,576**	**8,575**

Source: Survey results, 2010

(*a*) *Number in brackets is Standard Error, confident level at 95%, F test=25, p=2.6 E(-8)*

(*b*) *Number in brackets is Standard Error, confident level at 95%, F test=1.54,* (*<Fcrit=3.2*), *p= 0.18*

(*c*) *Number in brackets is Standard Error, confident level at 95%, F test=12, p= 5.6 E(-5)*

(*d*) *Number in brackets is Standard Error, confident level at 95%, F test=2.3,* (*<Fcrit=3.2*), *p=0.12*

(*e*) *Number in brackets is Standard Error, confident level at 95%, F test=7.1,* (*>Fcrit=3.2*), *p=0.002*

(*f*) *Number in brackets is Standard Error, confident level at 95%, F test=4.9,* (*>Fcrit=3.2*), *p=0.010*

(*g) Number in brackets is Standard Error, confident level at 95%, F test=0.8,* (*<Fcrit=3.2*), *p=0.41*

Most of the farm revenue came from the selling of milk, especially milk type 1. Revenue from milk occupied 89.6% of total farm revenue, of which milk type 1 accounted for 76.6% of milk receipts or 68.7% of the entire farm revenue. The dairy farmers delivered their milk daily and were paid once a month. There was a small difference (statistically significant) between revenue per kg milk of this type among the three farm group sizes. The larger sized farms tended to have higher revenue per kg of milk. As this type of milk dominated the total quantity of milk, there was also a difference (statistically significant) in the milk bonus between three sizes of farm.

Secondary revenue amounted to 10.4%. Heifers seemed to be significant not only for their role in secondary income, but also for farmers to keep for future milk production. Farmers did not count income from manure because they used the manure to fertilize grass fields.

4.2.4 Value added of producing fresh milk

Table 19. Value added by dairy farmers

CASH RECEIPTS	VND/kg	VND/cow	% of milk received
Milk production/cow/year			
Milk receipts	7,687.0	23,445,350	89.59
Non-milk receipts	893.0	2,723,650	10.41
Total farm receipts	**8,580.0**	26,169,000	100.00
PRODUCTION COSTS	**VND/Kg**	**VND/cow**	
Purchased feed	2,847	8,683,350	33.2
Fertilizer	940	2,868,220	11.0
Seed	17	51,850	0.2
Repairs & maintenance	16	48,800	0.2
Other feed costs	22	67,100	0.3
Feed-related costs	**3,842**	**11,719,320**	**44.8**
Margin over feed-related costs	**4,738**	14,449,680	55.2
Animal health	496	1,511,800	5.8
Herd costs	**496**	1,511,800	5.8
Dairy shed cost	110	336,300	9.5
Chemicals	13	38,500	0.1
Shed and chemical costs	**123**	374,800	1.4
Cartage, levies and other	34	104,403	0.4
Other variable costs	**34**	104,403	0.4
Intermediate costs	**4,495.2**	**13,710,323**	**52.4**
Value added milk only	**3,192**	9,735,027	37.2
Value added – whole farm	**4,085**	12,458,677	47.6

Source: Survey results, 2010

4.3. Economic calculation and value added by collecting sectors

Milk collectors in Vietnam are intermediate actors between dairy farmers and the dairy processing company. They collect milk from dairy farmers and deliver it to a dairy processing company. However, they did not set the price for collecting; they followed the price of the dairy processing company and got a commission.

The cost of milk collection for one kg of milk was very low. Although the collectors had to make quite a big investment for machinery for milk

collecting activities such as milk containers, bulking tanks, and chilling, etc., they could use these items of equipment daily for quite a long time. Thus, the unit cost per kg of milk was very low. Total cost, including labor cost, rental cost, and fixed costs, accounted for only 9% of the total receipts of collectors, in which the cost for labor was the highest, followed by electricity and water expenses.

Table 20. Value added by milk collectors

CASH RECEIPTS	VND/kg milk	% of
From milk collection	**474.4**	48.99
From other income	**494.0**	51.01
Total receipts	**968.4**	100.00
COSTS	**VND/kg**	
Milk (*)	***0***	
Other costs	***85.4***	8.82
Tanks and chilling equipment	*8*	0.83
Milk containers and bulking equipment	*4*	0.36
Electricity and water	*12*	*1.28*
Chemicals	*1*	*0.10*
Location rental	*4*	*0.45*
Labor (**)	***26***	*2.71*
Sundry variable costs (*miscellaneous*)	*5*	*0.52*
Total costs	**85.4**	8.82
Value added from milk collection	**456**	47.09
Value added of total activities in milk collectors	**950**	98.10

Source: Survey results, 2010

(*) Milk collectors did not have to pay anything for raw milk, the dairy plant pays farmers directly.

(**) Cost that labor consumed during the collecting process such as: gloves, boots, etc.

Revenue of collectors comes from two sources: income from milk collection and from other incomes. In fact, income from milk collection is the commission, based on the quantity of milk collected. Besides this income, milk collectors have other sources of income, including a milk bonus and an allowance from the dairy company. In addition, the dairy plant allows a certain loss in milk collecting. If collectors manage things well and control losses, this proportion of milk revenue would be

considered as a part of their additional income. Besides, some of them have other agricultural activities such as crop or vegetable growing, animal husbandry, a business, etc., which brings them some small supplemental income. The two sources of income seemed to be equal.

Value added from milk collectors was quite high as it accounted for 47% of receipts from milk collecting activities and 98% of total income.

4.4. Economic calculation and value added by the dairy processing company

The cost and revenue of fresh milk were presented in the table below.

Table 21. Economic calculation and value added by the dairy plant

Unit: VND

Type	C	Revenue	Value added	% of revenue
Pasteurized milk:				
1 kg bottle of pure fresh milk	13,819	20,580	6,761	32.9
1 kg bottle of fresh milk with sugar	14,859	20,580	5,721	27.8
1 kg bag of pure fresh milk	12,156	20,580	8,425	40.9
1 kg bag of sweetened fresh milk (sugar added)	13,196	20,580	7,385	35.9
Sterilized milk:				
1 kg bag of sterilized milk with sugar and cacao	16,772	21,500	4,728	23.0
1 kg bag of sterilized milk with strawberry	16,674	21,500	4,826	23.4
1 kg bag of sterilized milk with sugar	16,508	21,500	4,992	24.3
1 kg bag of unsweetened sterilized milk	15,241	21,500	6,259	30.4

Source: Survey results, 2010; and MCM, 2010

Although the intermediate costs of 1 kg of milk, bottled or bagged, pure or sweetened and/or flavoring added, were different from each other, the prices of pasteurized milk of all kinds were the same, as were the prices for sterilized milk. This was part of the dairy plant's price and product strategy. In spite of having spent much time and thus having more

experience in milk production than any other region in northern Vietnam, it is not positioned to deliver its products directly to the market but acts as an intermediate partner and provides unprocessed milk to Vinamilk (the largest dairy company in Vietnam).

From 2003, when the demand for milk increased quickly, the Moc Chau dairy company started to build a processing plant with two processing chains: one for sterilized milk and the other for pasteurized milk. In 2004–2005 they started to process milk and to provide two products (sterilized and pasteurized, in bags) directly to the market under the name of Moc Chau milk. Recently, in order to satisfy the demand from customers, the company is trying to diversify its products with a mono price to gain an increased market share. However, due to the much higher cost of the production line with materials to output sterilized products compared to pasteurized products, it still keeps the two price levels for the two different kinds of products.

Although there are eight different types of fresh milk produced by the Moc Chau dairy plant with eight distinct cost levels, the dairy plant provides the market with only two price levels: 20,580 VND/kg for the first four types (pasteurized) and 21,500 VND/kg for the other four types (sterilized).

In general, value added in producing fresh milk in the dairy plant accounts for 23% to 41% of total milk receipts, of which pure fresh milk in bags provided by them has the highest added value, while sterilized milk sweetened and with chocolate flavoring added provided the least.

4.5. Economic calculation and value added by distributors

Table 22. Economic calculation and value added by milk distributors *(Unit: VND)*

	Pasteurized milk				Sterilized milk			
Type	*1 kg bottle pure fresh milk*	*1 kg bottle fresh sweetened milk*	*1 kg bag pure fresh milk*	*1 kg bag sweetened fresh milk (with sugar)*	*1 kg bag sterilized sweetened milk with chocolate flavor*	*1 kg bag sterilized milk with strawberry flavor*	*1 kg bag sweetened sterilized milk*	*1 kg bag unsweetened sterilized milk*
Revenue	24,200	242,00	25,200	25,200	25,208	25,208	25,208	25,208
Cost	22,000	22,000	21,000	21,000	22,917	22,917	22,917	22,917
Pay for milk	*20,580*	*20,580*	*20,580*	*20,580*	*21,500*	*21,500*	*21,500*	*21,500*
IC	*1,420*	*1,420*	*420*	*420*	*1,417*	*1,417*	*1417*	*1,417*
Refrigeration	*3*	*3*	*3*	*3*	*0*	*0*	*0*	*0*
Electricity	*208*	*208*	*208*	*208*	*208*	*208*	*208*	*208*
Location rent	*642*	*642*	*0*	*0*	*642*	*642*	*642*	*642*
Tax(*)	*126*	*126*	*126*	*126*	*126*	*126*	*126*	*126*
Labor(**)	*358*	*358*	*0*	*0*	*358*	*358*	*358*	*358*
Other(***)	*83*	*83*	*83*	*83*	*83*	*83*	*83*	*83*
Value added	2,200	2,200	4,200	4,200	2,292	2,292	2,292	2,292
% of revenue	9.1	9.1	16.7	16.7	9.1	9.1	9.1	9.1

Source: Survey results, 2010

(*) Normally, they pay a fixed amount of tax regulated by the government and local authorities.

(**) Cost of labor during the sales process.

(***) Other costs such as security, environment fee, etc.

Pasteurized milk has to be refrigerated and the amount of pasteurized milk sold is small. In addition, the refrigerator is used not only to store pasteurized milk but also other products. Therefore, the cost of refrigeration for this milk is small. There was a special case of pasteurized milk in bags (both pure fresh milk and sweetened fresh milk) for which the rental cost and labor cost were supported by the dairy plant.

Although there was a distinction between the different kinds of milk, the prices of milk (relative to the revenue per kg of milk from the distributors)

were sometimes the same due to the fact that it was set by the dairy plant based on their price and product strategies.

The value added by milk distributors mainly comes from the sales commission and depends on the quantity of milk delivered. Normally, distributors delivered many kinds of products, and with different products, they get different ratios of commission. Value added to fresh milk by distributors accounted from 9.1% to 16.7% of milk receipts, of which pure fresh milk in bags gained the highest added value.

4.6. Milk value chain

From the surveyed data, detailed calculations for the additional turnover and value added by distribution along the chain is presented as follows:

Box 1 Additional turnover count on 1 kg of milk

	Dairy farmers	Milk collectors	Dairy plant	Distributors
Additional turnover (USD)	0.453–0.474	0.002	0.703–0.73	0.105–0.121
% of turnover	35.7–35.87	0.15–0.16	55–55.66	8.3-9.1

Source: Survey results, 2010

Research showed that farmers received only 35% of the total income generated in the whole chain, while they had to invest a large proportion, from 32.4 to 54.3%, in the overall costs of the chain. The dairy plant received more than a half of the total income in the whole chain.

Box 2. Cost count on 1 kg of milk

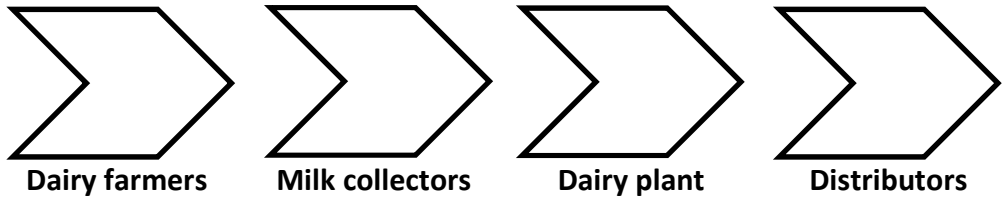
Dairy farmers	Milk collectors	Dairy plant	Distributors

Additional cost (USD)	0.237	0.0045	0.173–0.416	0.022– 0.075
Share of additional cost (%)	32.4–54.3	0.6–1.03	39.6–56.7	10.2–17.2

Source: Survey results, 2010

Value added is distributed unequally among actors in the chain. The farmers who bore the largest share of the investment received only one fifth of the total value added of the whole chain. The dairy plant received one third, a small proportion went to the milk collectors, and the rest to the distributors. In terms of value added compared to total expense, distributors got the most benefits as they spent a smaller share relative to the proportion of value added achieved.

Box 3. Value added distribution along the fresh milk chain (count on a kg of milk)



Value added (USD)	0.168–0.215	0.024–0.050	0.249–0.356	0.116–0.211
Share of value added (%)	19.22–24.6	3–6	28.5–40.7	13.3–24.1

Source: Survey results, 2010

The collectors spend only 0.6 to 1.03% but gain 3 to 6% of value added. Similar, distributors spend only 10.2 to 17.2% but achieve 13.3 to 24.1% value added.

One more thing should be noted: all the investment in the dairy plant or distributors, the financial investment, labor cost, or opportunity cost has been calculated into the cost and included in the price of their product. However, on the farms, the dairy farmers mixed income included both hard and long hours of family labor. Laborers, especially family laborers, had to work very early in the morning (from 4 a.m. or 4:30 a.m.) and until late, sometimes until 10 p.m. or later. Moreover, the capital invested in

one cow (from a small heifer to a milking cow) was around 20 to 60 million VND, depending on the breed, age, and time of buying. The cost was very high for them. If all the costs could be fully calculated in the farmer's production costs, his real income as well as actual profit and benefit would be much lower.

4.7. Actor analysis

Until now, all value chain actors in Moc Chau have not arranged together to officially establish the vision of the whole chain. However, the operators have set their own vision and objectives for the future. Each of them has a partial view of the value chain and expectations for the future. Although they have not formalized a common vision, all of them agree that they would like to have greater competiveness and capacity by reducing costs at the primary production stage. Their main objectives were: increase income, increase the volume of production and sell more (PRA, interview results, 2011).

Farmers

The dairy farmers in Moc Chau have a very important input into future milk production, and that is their good motivation. Despite many difficulties and challenges, they would really like to keep, expand, and develop their dairy herds. They are successful in milking cows. They consider this job as one of their special cultures, and they feel proud of their work. Besides, dairy cattle bring them a relatively good livelihood, which is very difficult to find in other agricultural sectors. Their income is also higher than that in other agricultural jobs.

In addition, they have longer experience in comparison to other regions of Vietnam. This advantage creates for them a good opportunity for higher income and a lower level of risk. Moreover, Vietnam is an agricultural country and there are many residual products such as straw, sugarcane, maize stover, etc. Dairy farmers use these by-products to feed their cattle and thus reduce feed costs. Updated AI technology, favorable natural conditions, self-employment, and stable output market were other opportunities for dairy farmers in Moc Chau to reach their objective of reducing costs and increasing the volume of milk they produce.

However, besides the advantages and opportunities, dairy farmers have to deal with many disadvantages and threats. The first and most important problem is that they have to spend an increasingly high amount for feed costs. Except for grass, they do not produce concentrates for cattle feed. They depend fully on purchasing from outside. The high cost, especially the feeding cost, leads to a low level of profit and competitiveness. The second problem with them is that they do not have a system for management and monitoring on their farms. Without any recording system, they do not know exactly how much they gained after doing business. They do not know how to be better off in the next period, and they could compare their results with those of other farmers.

Thirdly, they have to work extremely hard from very early morning until night. The labor market used to be large in Vietnam but is getting smaller for them because young laborers do not want to engage in this sector. The next problem is the outbreak diseases. Then, there are difficulties in expanding the scale because of the limited land area, high investment in heifers, cattle sheds, feed, lack of an irrigation system, and lack of information. Their living is also threatened by the polluted environment as a result of inefficient treatment of manure discharges.

Box 4. Actor analysis of the fresh milk chain in northern Vietnam

	Strength	Weakness	Opportunities	Threat
Dairy farmers	- Good motivation of farmers - Regular income→cover daily living cost - Higher income and profit compared to other agri sectors - Experience in milk production - Employment for farmers	- Lack of management and monitoring system; no recording system established - High and increasing feed costs - Depend on purchasing, do not produce feed themselves - Hard-working - High investment costs: heifers, feed, sheds, etc. - Limitation of land - Lack of material and equipment	- Residual products: straw, sugarcane and maize stover, etc. - Updated AI technology - Favorable conditions - Stable output market - Policy on dairy sector (Decision No. 167) - Existing technicians	- Labor is getting scarce - Outbreaks of disease - Lack of professional association - Living environment polluted due to cow manure - Lack of information - Lack of irrigation system - Increasing price of input market
Milk collectors	- Good quality control - Good relationship and communication with farmers and dairy company - High income - Easy work	- Depends highly on dairy plant	- Job creation	- Low competitiveness → no motivation to develop
Dairy plant	- Powerful - Good linkages with other actors along the chain - Monopoly in the region - Known trademark - State own equitized enterprise - High competitive capacity	- Far from central market - High transportation cost	- Milk processing technology developing - Demand for milk increasing rapidly	- Potential competitors - Lack of labor
Distributors	- Low cost investment - Employment creation	- Unprofessional - Untrained in sales skills - Limited literacy and problem solving skills	- Good potential market - High demand for milk	- High competition with imported milk and milk products - Fluctuating market, external shocks (melamine, etc.) - Competitive

Source: PRA, Group discussion, 2011

Dairy plant

The strongest point of the dairy plant is the power it holds in the chain. With this power, it is in a position to impose many regulations and rules on other actors in the chain, controlling almost the whole chain unofficially. It also creates quite good linkages with other actors in the chain. It is in close contact with the dairy farmers and collectors. It ensures benefits for the distributors.

The next strength of the dairy plant is that it is virtually a monopoly buyer in the region. There is not any other dairy processing company in this region. All milk produced in the region can only be delivered to this dairy plant and to no other. Another point is that it has a quite well-known trade mark in the fresh milk market. This helps it in marketing and selling their products. Besides, it has a good technology for its milk processing system and a highly competitive capacity.

The dairy plant will have to face high competitive pressure in the future as a number of potential competitors has been increasing since Vietnam joined and integrated in the world economy. One more problem will be a lack of highly skilled laborers in the coming time. As Moc Chau is a remote and mountainous area, its target market is quite far away from the plant. This is another constraint that leads to an increase in its transportation and transaction costs.

Milk collectors

The biggest strength of milk collectors is their good system for quality control, enabling them to ensure the quality of milk and protecting it from the risk of spoiling. Thus, milk collectors also are in a good position to communicate with and collaborate long term with dairy farmers and the dairy plant. This ensures a good job for them, with quite a high and stable income. They also find that their job is quite easy. They enjoy their work and do it effectively.

However, milk collectors in this region seem to depend too much on the dairy plant. The dependence reduces their flexibility, their voice, and power. Besides, a virtual lack of competitive factors among milk collectors easily leads to low motivation for development in the future.

Milk distributors

Milk distributors had a large and expanding potential market, as many new markets are coming on the scene. In the past, fresh milk could only be consumed in the city, or town. However, nowadays, markets have expanded considerably: delta and mountainous region, highlands and lowlands, urban and rural areas. Customers have emerged in remote areas where there had not previously been a habit of drinking milk. In parallel with the higher living standard, the demand for fresh milk is increasing in Vietnam nowadays. Thus, it is getting easier for distributors to succeed in the market. Another advantage for milk distributors is that their cost for distributing milk is very low. They do not have to invest much, but still earn a good income.

The biggest challenge to the development of fresh milk distributors is the high competitive pressure in the market. They have to compete with their current competitors and future competitors. Their products (bearing the Moc Chau milk label) have to compete with other milk products, other milk substitute products, and imported milk products. In addition, the milk market in Vietnam is subject to high fluctuation and is vulnerable to external shocks such as occurred with the melamine scandal.

5. CONCLUSIONS AND RECOMMENDATION

5.1. Conclusions

This research found that the fresh milk value chain in northern Vietnam is characterized by a *typical and formal chain* in which 98.5% of milk produced by dairy farmers is delivered to milk collectors and then to a dairy processing company (dairy plant). The dairy plant pasteurizes and sterilizes the milk and provides it to distributors. The distributors, in turn, deliver it to customers, mainly in northern Vietnam. All the milk produced in Moc Chau goes to the *domestic customers* in the form of *fresh milk.*

Although dairy farmers played the most important *role* in the chain, the dairy plant proved to be the most *powerful* actor, positioned to impose many impacts on the other actors of the chain. There were quite tight *linkages* among the actors, but not very tight linkages between the actors and stakeholders. *Value added is distributed unequally* among actors in the chain due to the bias orientation toward non-milk production (non-farmers). In term of absolute value, the dairy plant seems to achieve a higher benefit but in terms of comparative value, distributors were the actors deriving the most benefit as they spent the smaller share and gained the high proportion of value added.

The *farmers were the most vulnerable and disadvantaged actors* who bore a large share of the cost (from 32.4 to 54.3% of total costs) but received only one fifth of the total value added in the whole chain. They are also *key features* in the chain. The weakest point for the dairy farmers is high, fluctuating costs, especially for feed, in which concentrates is a chief concern. The major reasons were that they feed their cows too much concentrate and depend too much on bought feed. Their home-grown forage was limited due to shortage of land, low efficiency, poor management, and their lack of familiarity with the ruminant animal. Thus, facilitating and improving management for dairy farmers is a major *cluster* to promote farmer earnings and equality throughout the chain.

5.2. Recommendation

The key feature in the chain is the dairy farmers. They are the starting point of the whole chain. They are the condition for the existence of other

actors in the chain. Because they exist, the other actors exist. If their production was stagnant, the whole chain would be stagnant. Thus, the promotion strategy should pay attention to the dairy farmers.

The dairy farmers are the most vulnerable actors of the chain as well as being subject to the greatest difficulties. They face higher risks than other actors in the chain. Therefore, it is necessary to improve their benefits and welfare.

The biggest weakness of the dairy farmers that needs attention is their high and growing costs, especially for feed. Reducing production costs at the farm level is very significant to improve the income and value added for the farmers and for the whole chain. If their costs are high, the cost of the entire chain is high, and competitiveness suffers. Reducing their costs would generate higher profit and improve the efficiency for the whole chain.

The most suitable method to promote value added for dairy farmers is to help them to monitor and manage their farms better. If they monitor and manage their farms better, they would use their budget better, their resources would be used efficiently, costs would be reduced and profit would be higher. Moreover, if they knew how to manage their farms better, they would know how, where, and when to make the best investment of their money.

Thus, in order to promote the fresh milk chain, the most suitable area to intervene is at the primary milk production level or the dairy farmers. The main action would be to focus on monitoring and managing on the dairy farms.

In order to increase the value added and benefits, dairy farmers should concentrate on both milk yield and *quality*. They need to take care of the optimal stocking rate, invest more in herd quality. The replacement of heifers demands attention in order to upgrade the quality of herds in the future. Farmers also should increase forage feeding and decrease concentrate in the feed rations for better animal health and reduction of feeding costs. Home-grown feed should be enhanced to replace the costly bought feed. Especially, forage growing should be improved by promoting the appropriate varieties of grass, cultivating efficiently, and cutting grass at the right time. Furthermore, they should spend time to exchange experiences with other farmers in the region, especially successful

farmers. They need to develop their knowledge of milk production. They should reconsider how they operate their farm. They could compare their results with those of other farmers in the region to know what is done differently and why. In the long term, they should learn how to make better decisions regarding their farms.

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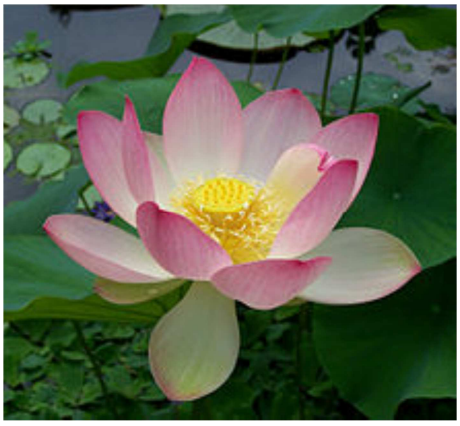
GRAESE : Groupe de Recherches Asie de l'Est et du Sud Est



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3) de réaliser des publications scientifiques de divers types concernant ces problèmes et réalisées par des chercheurs des différents centres partenaires en Europe et en Asie.
4) de fournir un lieu de rencontres entre chercheurs concernés par ces thèmes, particulièrement dans le cadre des doctorats en cours.
5) d'organiser des activités d'enseignement et d'information sur les problèmes du développement de l'Asie de l'Est et du Sud Est, notamment à travers l'organisation de conférences et séminaires donnés par des académiques et chercheurs asiatiques de passage en Belgique.

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