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Dairy Production in Vietnam: Opportunities and Challenges

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Dairy cow raising in Vietnam has been assessed as a key occupation to meet the society's demand for high nutritive food products and to improve cash income for farmers. The overall objective of the study thus is to examine the development of dairy production in the country over last years, and then to point out its opportunities and challenges to have a good strategy for next development. The research results are mostly based on secondary data collected from different sources. Descriptive statistical analysis is used as the principal methods of the study.

The research results show that the number of dairy cows and milk yield in Vietnam have trended upwards during the last decade, but they still seem to be too small compared with those in neighbor countries. Although the level of milk consumption in Vietnam is low, the national dairy production at present meets only nearly 12 percent of the total domestic consumption. There are some favorable factors which give opportunities for the development of Vietnamese dairy sub-sector, i.e. large market potential, encouraging policies of the government, abundant labor force, benefits of dairy raising and achieved progresses in crossbred activities. However, it has faced with a lot of challenges such as a lack of good cow breeds, limited level of farm management, poor status of veterinary services, high price of feeds and environmental pollution.

INTRODUCTION

Vietnam is a tropical country located in South–East Asia. It is bounded to the east by the South China Sea, to the north by the Peoples Republic of China, to the west by Laos Peoples Democratic Republic, and to the southwest by Cambodia. The nation has a land area of around 330,000 km², nearly three fourth of which is under hill and mountain. Most of the arable agricultural land is located in two large deltas: Red River Delta and Mekong River Delta (Charlotte, 1997). The population was 76.3 million in 1999, with some 76 percent of the people living in rural areas. Vietnam is classified into 7 different agro–ecological zones with widely varying climates and rainfalls (General Statistical Office, 2001).

During the past 10 years, owing to the renovation policies, Vietnam's economy has developed at a fast pace. The growth rate of gross domestic product (GDP) in 2001 improved to 6.8 percent in comparison with 4.8 percent in 1999. The agriculture accounted for almost 24 percent of GDP at current price (Statistical Department, 2002). Agricultural sector is also a source of employment and income for many of the Vietnamese

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population, as well as a source of material for industries. In 2001 over 66 percent of the main work force was engaged in agriculture. In current years, the contribution of the agricultural sector has steadily declined relative to the contribution of the industrial and service sectors. The proportion of agriculture in the total GDP decreased from 33.9 percent in 1992 to 24.5 percent in 2000 (Statistical Department, 2002).

The agriculture is based mainly on rice production (e.g., its area accounted for 60.6 percent of the total cultivated area in 2000) combined with other annual crops (e.g., maize, potatoes, groundnuts, soybeans, sugarcane, etc.), fruit trees and perennial industrial crops. Recently, the agricultural structure has become diversified, i.e. the proportion of cultivation has declined from 79.2 percent in 1999 to 77.8 percent in 2001, while the contribution of animal husbandry to agricultural GDP increased from 18.5 percent in 1999 to 19.5 percent in 2001 (Statistical Department, 2002).

Animal sub-sector in Vietnam is characterized by small herd size and predominantly managed by small households. Among animal species, poultry had the highest annual growth rate (i.e. 7.2 percent), followed by pigs with the average rate of 6.1 percent during 1991–2002. The population of buffalo trended downwards because of lower demand for draft power (Table 1). In addition to an increase in the number of animal, the improvement of its structure and quality to meet market demand has been given attention by farm households. The rapid increase in the population of cows, lean pigs and goats in the suburbs of Hanoi and Ho Chi Minh cities and in other provinces has partly met the society's demand for high quality foodstuffs. These also contribute to raise the output value of animal husbandry sector. Total output value of the sector in 2001 was about 19,200 billion VND increasing 3.9 percent compared to that in 2000 (Statistical Department, 2002).

Table 1. Population of Main Animals by Year

Year	Unit: million heads				
	Buffaloes	Cattle	Pig	Poultry	Goat and sheep (*)
1991	2.86	3.14	12.19	109.0	312.5
1992	2.89	3.20	13.89	124.5	312.3
1993	2.96	3.33	14.87	133.4	353.0
1994	2.98	3.47	15.59	137.8	427.9
1995	2.96	3.64	16.31	142.1	550.5
1996	2.95	3.80	16.92	151.4	512.8
1997	2.94	3.91	17.64	160.6	515.0
1998	2.95	3.99	18.13	166.4	514.3
1999	2.96	4.06	18.89	179.3	516.0
2000	2.90	4.13	20.19	196.1	543.9
2001	2.82	3.90	21.76	216.0	569.4
2002	2.81	4.06	23.31	233.3	–
Annual growth rate (%)	–0.16	2.36	6.07	7.16	6.18

Note: (*) Unit is thousand heads and its annual growth rate is calculated over the period of 1991–2001.

Source: Statistical Department, 2002 and Anh (2003)

DAIRY COW PRODUCTION IN VIETNAM

The kinds of dairy cow breeds in Vietnam

According to each of the ecological, economical and rearing conditions, the different kinds of cow breeds are being raised in regions of Vietnam. Almost 90 percent of the total dairy cow population was Holstein–Friesian (HF) blood crossbred cow. There are some different crossing formulas applied in Vietnam such as 37.5 percent, 50 percent, 75 percent, and 87.5 percent of the HF blood. Commonly, milk yields of 1/2 HF blood F_1 and 3/4 HF blood F_2 cows range from 3,000 to 4,000 kg in a lactation cycle of 305 days. They are mostly raised in surrounding areas of Hanoi and Ho Chi Minh cities and in other provinces as Ha Tay, Vinh Phuc, Dong Nai, Binh Duong and Long An. The regions of Moc Chau and Lam Dong where annual average temperature is much lower can rear the dairy cows of higher HF blood, even pure HF cows (Vang, 1998).

In addition, Red Sindhi crossbred cows are also fed in some provinces of the country with average milk yields of 1,200–2,700 kg in a lactation cycle. This breed is considered to be a main source of base female for dairy crossing (Vang, 1998).

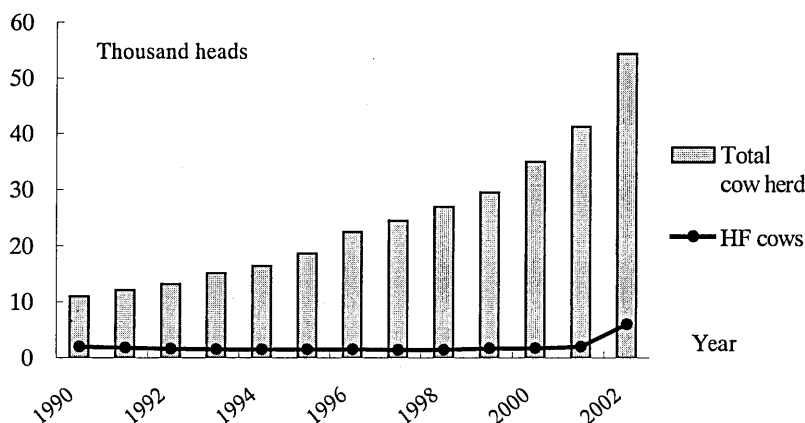
Dairy cow population

About 92 percent of the total dairy cow population is raised in farm households with the small herd size of 3–5 heads per household. There are very few large farms holding over 50 heads, which are mostly concentrated in Cu Chi and Binh Thanh districts of Ho Chi Minh City. Almost 8 percent of the total cow population is fed in state enterprises for breeding purpose (Lich and Tuyen, 2002). According to our evaluation, the dairy herd size of Vietnam at present is just like that of Japan in 1960s. During this period, most Japanese dairy farmers kept only 2–3 dairy cows as a supplement to their rice and/or dry field farming operations (Japan Dairy Council, <http://jdc.lin.go.jp/>).

Due to large demand for expanding the cow-raising occupation, the Vietnamese government currently has had a plan to import dairy breeds. The numbers of cows imported to the nation in 2001 and 2002 were 192 heads and 3,393 heads, respectively. The figure expected in 2003 will be 10,800 heads. Out of the total 3,584 heads imported in two last years, 3,498 heads were pure HF cows (Agricultural and Forestry Extension Center, 2002). This made the number of pure HF cows increase sharply in 2002 with almost 6000 heads (Figure 1). After fed in state enterprises to become familiar with Vietnam's condition, these dairy cows were sold to farm households in some provinces (i.e. Ho Chi Minh city, Tuyen Quang, Son La, Nghe An provinces, etc.).

The number of cows in Vietnam trended upwards and increased at high rate in current years. In 1995 the cow population was 18.7 thousand heads, after 5 years, the number of cows increased nearly 2 times and in 2002 that figure reached 54.3 thousand heads (Lich and Tuyen, 2002). However, the number of cows in Vietnam was not high compared to those of neighbor countries, like Thailand with 268.5 thousand heads in 1999 (Chantalakhana and Skunmun, 2001) and China with 4,265 thousand heads in 1998 (Liu *et al.*, 2001). Furthermore, the cow population of Vietnam in 2001 was only equal to 2.4 percent of the Japan's figure (According to Japan Dairy Council, the number of dairy cows in 2001 was 1,726 thousand heads).

Based on the data from 1990 to 2002, growth of the cow population in Vietnam is



Source: Vang, 2001; Lich and Tuyen, 2002; Agricultural and Forestry Extension Center, 2002

Fig. 1. Development of Dairy Cattle Population in Vietnam

illustrated by following regression equation:

$$\ln Y = 2.209 + 0.126 T$$

$$(61.2) \quad (27.7) \quad R^2 = 0.986 \text{ and } F(1, 11) = 766.4$$

where Y (thousand heads) is the dairy population, T (T=1 for the year 1990) is year and numbers in parenthesis are t values.

According to this regression result, the number of cows in the nation is predicted to be almost 130 thousand heads by 2010 holding others constant. However, the figure seems much smaller compared to the government's goal (i.e. the total dairy population in the country will be 200 thousand heads by the year of 2010). Therefore, a series of other suitable measures should be considered.

Distribution of dairy cattle population

Dairy cows are mostly raised in the southern Vietnam, especially in Ho Chi Minh city (Table 2). Less than 4 percent of the total cow population was fed in the Southern Central Coast and Highlands. In 2001, about 15 percent of the cow population was fed in the North. However, the structure significantly changed in 2002 with higher proportion of northern cow population. In general, raising cows in the nation at present is still concentrated in some big cities and their vicinities.

Milk yield and output

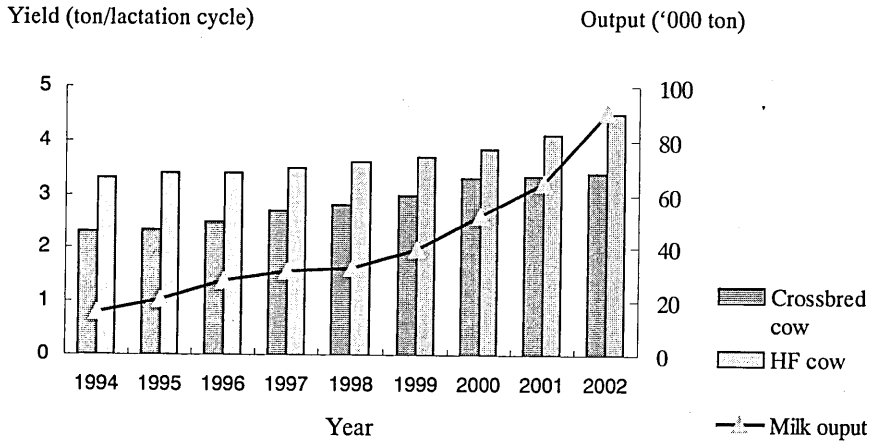
Milk productivity of dairy cattle in Vietnam is still limited when compared to that in the neighbor countries. However, the milk yield and the total milk output have been considerably improved in few current years (Figure 2).

Average milk yield of crossbred cows in a milking cycle increased from 3.0 tons in 1999 to 3.4 tons in 2002. The same tendency was found for pure HF cows, which had the

Table 2. Population of Dairy Cattle in Different Regions

Items	2001		2002	
	Quantity (head)	Percentage (%)	Quantity (head)	Percentage (%)
1. The North*	6,170	14.96	11,066	20.36
Of which: – Hanoi City	1,992	32.28	2,300	20.78
– Ha Tay province	2,035	32.98	2,988	27.00
2. Southern Central Coast	132	0.32	934	1.72
3. Highlands	804	1.95	1,224	2.25
4. The South*	34,135	82.77	41,121	75.67
Of which: – Ho Chi Minh City	27,950	81.88	32,800	79.76
– Binh Duong province	2,096	6.14	2,200	5.35
The whole country	41,241	100.00	54,345	100.00

Source: Agricultural and Forestry Extension Center, 2002 (Above figures are those in November each year)



Source: Vang, 2001; Agricultural and Forestry Extension Center, 2002

Fig. 2. Total Milk Output and Average Yields of Two Dairy Breeds

average yield of 4.5 tons per milking cycle in 2002. In comparison with milk yield in Okinawa (Japan) which has quite similar climate, the above figure seems still low. For example, in 2001 average milk yield of pure HF cows calculated for the whole Okinawa region was 6.6 tons/milking cycle (Okinawa Dairy Cooperative, 2002), compared to 4.1 tons/milking cycle in Vietnam. All those show that Vietnam should pay more attention

* Related to 7 agro-ecological regions, the North of Vietnam includes Red River Delta, Northern Mountainous and Middle Highlands and Northern Central Coast. The South includes North-east of Southland and Mekong Delta.

on breeding improvements and management to raise its milk output.

The increase in milk yield and cow population over the last years contributed to pushing up the total milk output from 39.7 thousand tons in 1999 to 64.7 thousand tons in 2001 (Figure 2). This shows a remarkable progress of dairy production in Vietnam.

MARKETING RAW MILK

Three main dairy companies, namely Vinamilk, Vietnam Foremost, Nestlé Vietnam companies absorb most of the Vietnam's raw milk materials. Vinamilk Company buys the raw milk materials in Hanoi and Ho Chi Minh cities and in some neighbor provinces such as Dong Nai and Long An. It gathers nearly 70 percent of raw milk outputs in the country. Vietnam Foremost Company collects the majority of milk materials produced in the Binh Duong province and some districts of Ho Chi Minh city. Nestlé Vietnam Company having a small milk processing factory in Hatay province mainly buys raw milk of the Hatay farmers (Ministry of Agriculture and Rural Development, 2000).

Currently, milk collection networks have been formed in some regions with supports of the Vietnamese government, Belgian government and milk processing companies. In Ho Chi Minh city, Vinamilk Company has provided breeders with loans to buy refrigerated tanks for storing raw milk. In Hanoi city, milk collection facilities were built in 5 districts under a support of Vietnam–Belgian project. Collecting and refrigerating centers funded by Nestlé Vietnam Company were also set up in Hatay province. In addition, some individuals also do their business in milk collection. At these points, after checked by quality criteria, milk materials is stored in refrigerated tanks and then transported by tanker trucks/or pickups to milk processing factories. Most raw milk produced in the country is used to process drinking milk.

Based on our survey, the highest purchase price set by Vinamilk Company is 3,550 VND/kg (around 0.22 US\$/kg) for the raw milk meeting all quality criteria. If not satisfying some quality indicators of the factory (i.e. levels of fat, total solid, etc), raw milk will be refused to purchase or have lower price. Levels of discounted price will depend on the satisfied levels of each criterion. The above price level is assessed to be lower than that of other countries, like Thailand (about 0.3 US \$/liter), Holland (around 0.45 US \$/liter) (Phuong and Tinh, 2002). Especially, the price of raw milk used to process drinking milk in Okinawa (Japan) reaches some 0.9 US \$/liter (Survey, 2003). The above facts indicate that milk products of Vietnam may have advantage on price competition in the process of trade liberalization.

MILK CONSUMPTION IN VIETNAM

Milk consumption

After the introduction of renovation policies in Vietnam, the living standards of population have remarkably improved. Demand for milk and milk products thus has increased with high tempo. However, the domestic milk production seems too low to meet the requirement of huge Vietnamese population. The total amount of milk produced by the country in 1999 was 39.7 thousand tons, while the population amounted to 76.6 million persons (General Statistical Office, 2001). This leads to a low level of per

Table 3. The Level of Milk Consumption in Vietnam

Items	Unit	1999	2000	2001
1. Population	thous. persons	76,596	77,635	78,685
2. Level of domestic production/capita	kg	0.518	0.672	0.822
3. Average consumption/person/year	kg	5.7	6.5	7.0
4. Domestic production/aver. consumption	percent	9.1	10.3	11.7

Note: mill. and aver. denote million and average, respectively.

Source: Computed by authors based on data from Statistical Department (2002) and Ministry of Agriculture and Rural Development (2000).

capita domestic milk output. On average, each person produced only 0.5 kg of milk in 1999 while consuming 5.7 kg in a year (Table 3). It means that the amount of milk produced by the nation in 1999 accounted only 9.1 percent of the total milk consumption. In 2001 the milk consumption per capita reached some 7 kg, and almost 12 percent of that was produced by the nation. Although milk consumption per capita in Vietnam trend upwards, it is still very low compared to 34 liters in Malaysia, 27 liters in Thailand and up to 150 liters in some European countries (Australian Trade Commission).

Trend of imported milk products

The growth of milk production in the country has not kept pace with population growth as well as increasing consumption demand for milk. Therefore, the milk importation has been increasing to meet this demand. In 1992 Vietnam imported 8.6 thousand tons of powder milk, after 5 years that figure reached almost 50 thousand tons (Cat, 1998). According to Duc (2002), Vietnam imported about 450 thousand tons of fresh milk equivalent in 2000 (If to produce 1 kg of powder milk needs about 6.5 kg of fresh milk, the amount of powder milk imported in 2000 would be almost 70 thousand tons).

The demand for dairy products in Vietnam consists of raw materials for the food processing industry and finished products for domestic consumption. It is estimated that about 90 percent of the imported milk is in the form of skim milk and whole milk powder. Almost 70 percent of the total imported milk went to the dairy processing plants to reconstitute a number of different products, including UHT, pasteurized milk, flavored milk, condensed milk and powder milk (Australian Trade Commission).

MAJOR MILK PROCESSING COMPANIES IN VIETNAM

Existing milk processing factories in Vietnam are usually located in big cities such as Hanoi, Ho Chi Minh, and Binh Duong. Most of them were initially constructed without regards to the region of milk materials; they are heavily dependent on imported materials.

Vietnam imports most materials and products required for the dairy food manufacturing and dairy food service sectors. The major dairy imports in 2001–2002 were: milk and cream, skim milk powder, whole milk powder, whey powder, butter and fat derived from milk, butter oil substitutes and processed cheese mainly from New Zealand, Australia, France and Singapore. Condensed milk, powder milk, sterilized milk and yogurt are the main milk products produced in the nation.

The major milk food producers and processors in Vietnam are briefly described as follows:

Vinamilk: This is a state-owned company with a diversified range of dairy products. It produces now more than 90 milk products including sweetened condensed milk, powder milk for babies, children and adults, nutritious cereal powder, biscuits, UHT milk, soya milk, ice-cream, yogurt, cheese and fruit juices. The company has 7 milk processing factories and 1 enterprise, which are located in Hanoi, Ho Chi Minh, Can Tho, Nghe An and Binh Dinh provinces. Marketing networks cover 61/61 provinces of Vietnam with 1,335 agents. Some Vinamilk's products have been exported to other countries (i.e. in 2002 the company exported dairy products with worth of about US\$166 million to the Middle East and the Africa). Vinamilk dominates the domestic market with 70–90 percent market share (depending on kinds of products) and an annual growth rate of 15–20 percent. Currently, the company has helped farmers to build collecting stations and bought most of the milk materials produced in the country (Australian Trade Commission, VNS and Vinamilk)

Vietnam Foremost Company: The company is a joint venture between Friesland Frisco Domo of Holland and Song Be Production Import–Export Company. Its products include sweetened condensed milk, yogurt milk, full cream fresh milk and milk powder. The company exports about 9–10 percent of the total output to Singapore and Hong Kong, with domestic sales also growing strongly.

Nestle' Vietnam: This is a wholly foreign-owned company which produces sterilized fresh milk and instant coffee, other beverages, tea, cream powder, powdered milk and cereals. Products of Nestle' Vietnam are on sales and consumed widely throughout Vietnam. Currently, Nestle' Vietnam has two main distributors in Hanoi and more than 40 agents nationwide. A milk processing branch of the company located in Hatay province entirely uses domestic materials to produce pasteurized fresh milk and cup yogurt with natural flavors.

Walls: Walls is a 100 percent foreign-owned enterprise, one of four operational subsidiaries of Unilever (Holland) in Vietnam, producing ice cream products, processed tea and instant noodles.

Dong Nai Dairy Joint Venture Co. Ltd. (Lotha Milk): The company is a joint-venture between the Great Water International Corporation (Taiwan) and An Phuoc Milking Cows, with a capacity of about 4000 liters of sterilized milk per day.

F&N Vietnam Foods Company: The dairy products of the company have just introduced in market at the end of 2002. The factory is wholly invested by the Singapore-based Fraser & Neave (F&N Group). It manufactures a wide range of dairy products such as condensed and evaporated milk, soya milk, pasteurized milk, yogurt and other beverages and juices.

Based on the report of Agricultural and Forestry Extension Center (2002), the average amount of raw milk produced in the nation was about 260 tons per day in 2002, of which almost 66 percent was bought by Vinamilk Company (the volume of 170 tons/day). Vietnam Foremost company daily collected 47 tons, which accounted for 18 percent of the total raw milk output. Nestle' Vietnam Company shared only 3.8 percent. Remainders were flowed to small enterprises and largely used for home-consumption.

MAJOR SERVICES AND RESOURCES FOR DAIRY PRODUCTION

Artificial insemination service

Artificial insemination (AI) has been applied in animal sector of Vietnam for ages. According to Vang (2000) about 95–98 percent of the dairy cow population in Vietnam is applied AI service. Each province has at least one AI station, which can store and deliver viable semen to farms in the districts. Artificial inseminators can store semen for 2–4 days and then supply it to the animal producers or the farms.

Veterinary services

In a few areas, there are quite good veterinary networks with diagnostic centers and veterinary stations from which veterinarians can provide assistance to the farmers in preventative vaccination and treatment. Nevertheless, in general, veterinary services are still poor in Vietnam. There is a lack of good veterinarians in many zones, especially remote areas. Our surveys conducted in Hanoi, Hatay (1999) and Angiang, Tiengiang (2003) show that farmers usually have difficulty in finding qualified veterinarians to treat their cows.

Concentrated feed

At the end of 1999 there were 105 feed processing manufacturers in Vietnam with the total capacity of 2.8 million tons per year; of which 62 percent and 22 percent were local private and state owned mills, respectively. Foreign and joint-venture firms had a proportion of 12 percent. Most of the feed manufacturers have small capacity (i.e. nearly 45 percent of the total mills have their capacities of less 5,000 tons per year). Only 9.5 percent of them own the capacities of over 50,000 tons/year. Two major kinds of feed produced in Vietnam are complete feed and concentrated feed. In general, foreign and large newer mills tend to produce concentrated feed, whereas most local private and state-owned mills mainly produce complete feed (IFPRI and ICARD, 2002).

In recent years, the feed production of Vietnam dramatically improved. The amount of complete feed increased from 24.2 million tons in 1993 to 27.6 million tons in 1998, while the volume of concentrated feed increased from 5,876 tons in 1993 to 7,543 tons in 1998. Feed processing companies vary by feed type, quality and price. Local private mills mostly target at the lower end of the market by selling a higher volume of lower quality less expensive feed to producers, while foreign firms focus on an opposite segment. Feed produced by foreign mills have a higher level of protein, so were sold at higher prices than the same type of feed produced by local private mills. In general, prices of feed in Vietnam are assessed to be high by international standards, particularly for high protein raw materials such as maize and soybeans. This may be because of limited local production, low yield and import duties (IFPRI and ICARD, 2002).

Natural pasture

Vietnam has very few large areas of natural pasture. With the increase in human population and the establishment of new economic zones, natural pasture has been cut into small areas and mixed with crops and construction areas. Some mountainous and hilly regions are quite steep to graze dairy cattle. Moreover, the soil of these regions is

too poor and arid to cultivate grass (Ly, 1996).

Cultivated grasses

Grass cultivation has been practiced on state enterprises and farm households for ages. Many varieties of grass have been studied, and some of them were developed in large areas. Three varieties of grass mostly cultivated are elephant grass (*Pennisetum purpureum*), guinea grass (*Panicum maximum*) and pangola grass (*Digitaria decumbens*). They are highly productive, i.e. yield of the elephant grass is around 200 tons/ha/year equivalent to 22 tons of dry matter (DM) depending on the amount of fertilizer applied. *Panicum maximum*, which has high drought tolerance, may yield 100 tons/ha/year (19 tons of DM). These grass varieties can be grown in the garden and have higher yields under better level of management (Ly, 1996).

Over 90 percent of the cow population in Vietnam was fed in farm households with the small herd size (i.e. 3–5 heads/household). Moreover, most of farm households had a moderate area. Therefore, except for large dairy farms cultivating fodder, small households tended to utilize their family labors to collect grass in public areas. Based on our survey, only half of the interviewed farmers in Hanoi city devoted their land for growing grass with an area size of almost 700 m² per household. As a result, they usually face with a lack of fodder when it is not available, especially in winter season.

Agricultural by-products

In addition to grass, farmers used a large volume of agricultural by-products to feed their cows. Normally, farmers can cultivate two, and in some places, three rice crops per year. In the northern Vietnam, there are two rice crops and one winter cash crop grown each year. Cash crops such as maize, soybean, potatoes and other vegetables are cultivated during the cold season and harvested within three months. In some southern provinces, because of high temperature and ample radiation throughout the year, rice can be grown and harvested three times per year. From these crops, rich sources of agricultural by-products can be derived and become important components in the diet of cow cattle and others, especially in the dry season.

Rice straw occupies a very important place in dairy feeding. In Vietnam there is about 20 million tons of rice straw produced each year (Ly, 1996). A part of which is directly used or treated with urea to feed dairy cows and cattle. Rice straw is normally piled up and then stored over a lengthy period. Other agricultural by-products such as rice bran, molasses, sweet potato vines, peanut and soybean stems are also an important feed source for raising cows. Especially, molasses is a high energy feed source broadly used in many dairy farms.

OPPORTUNITIES AND CHALLENGES

The opportunities for dairy development

Large market potential

During the period of 1999–2001, the growth rate of average milk consumption level in the country was 11.1 percent. Demand for milk and milk products was forecasted to have an annual growth rate of 10–15 percent in 2000s due to urbanization and increases in the

level of a household's income (Agricultural and Forestry Extension Center, 1998). Moreover, the amount of cow milk produced by the nation at present meets less than 12 percent of the total domestic milk consumption. Consequently, there are large opportunities for milk producers in the nation to reap benefit from the available potential of the market.

Encouraging policies of the Government

The Vietnamese economy has changed to a market-oriented one. Farmers are now free to decide what to do, how to produce, and how to market their products. Private traders have equal rights to the state-owned enterprises in doing business. The law system has been improved in order to give advantage to business units to operate efficiently. Therefore, private sector involved in milk marketing (i.e. collectors, owners of fresh milk shops) has more chance to develop. This helps to provide alternative markets for raw milk producers.

In October 2001, Vietnam government issued decree No. 167/2001/QĐ-TTg on measures and policies for dairy cattle development in Vietnam during the period 2001–2010. The target shall be 100,000 dairy cows by 2005 meeting 20 percent of domestic milk consumption demand, 40 percent of domestic milk consumption demand by 2010 and reaching 1.0 million tons of milk a year in the following years. To achieve the target, the government issued a series of intensive measures related to cow breeding, credit, sources of concentrated feed and fodder, marketing systems, etc. This is a large opportunity for the dairy sector to take off.

Abundant labor force and benefits of dairy cow raising

Vietnam is assessed to be an abundant labor country. Along with the creation of new jobs in the nation, the government annually sends laborers to work abroad in order to reduce unemployment pressure. The labor export surged from 10,000 workers in 1998 to 21,000 in 1999 and 30,000 people in 2000 (Linh, 2001). However, unemployment rate of the nation is still high. The urban joblessness ratio across the country was at 6 percent by the end of 2002 (Kenneth, 2003). According to the survey conducted by Statistical Department (2002), about 3.7 percent of rural people being over 15 years old did not have jobs during last 12 months. In addition, the average ratio of labor time used in a year in rural areas was 74 percent in 2000. These facts show that the labor resource for dairy production is available.

Further more, increasing income especially cash income is linked with dairy farming. The results of the survey conducted by the authors in 1999 revealed that raising a cow in Hanoi generated almost 3 million VND of net return to family labor* in a year. Similarly, Nguyet (1998) indicated that Hanoi farmer could get almost 1 million VND of net return from raising a 1/2 HF blood cow. Moreover, all available physical resources of households like family labor force and on-farm feed stuffs can be transformed into cash quickly (i.e. every day in lactation cycle). Compared to rice production –a main crop of Vietnamese farmers, the total number of man-days used in raising a dairy cow in a year was almost 10 times and 7 times higher than that in cultivating 1 sao (360 m²) of rice per year in Hanoi and Hatay, respectively (survey, 2000). From this characteristic, raising cow is considered as ideal occupation to create employment opportunities for rural laborers.

* Net return to family labor = Net return plus family labor cost

Progress in crossbred activities and technological application

Vietnam successfully applied some different crossing formulas. Raising practice confirmed that the crossbreeds (i.e. 1/2 and 3/4 HF blood cows) are suitable for the climate and socio-economic conditions of the country. In addition, they can afford to produce a high yield of milk.

Technologies for dairy production and milk processing are being broadly adapted and improved to suit to Vietnamese conditions. Moreover, production technologies have been transferred to farm households for sustainable and integrated systems.

Challenges for the development*Lack of good cow breeds*

After the decree No. 167/2001/QĐ-TTg was issued, raising dairy cattle has become an attractive occupation for farm households. Therefore, demand for cow breed has sharply went up, while breeding centers of Vietnam could not afford to meet the demand in a short period. Although the government has implemented a series of measures (i.e. importing dairy cows, supporting breeding centers), the prices of cow breeds at present are still high. According to Dat (2002), the price of a HF crossbred cow in Vietnam was about 60,000 VND/kg of live weight (almost 4 US\$/kg). This price level is assessed to be very high in the world (i.e. the price levels in Thailand and Indonesia were around 35,000 and 30,000 VND/kg of live weight, respectively). High level of investment combined with poor situation of veterinary services is a large obstacle for Vietnamese farm households to expand dairy farm sizes.

Limited levels of production organization and management

Some regions in Vietnam have the most favorite condition for raising dairy cows such as Lam Dong province, Moc Chau (Son La province), but there exist no milk processing factories (Lich and Tuyen, 2002). Most milk factories are located in big cities where natural resources such as land, pasture field and climate condition are limited and less suitable. Therefore, Vietnam in next years has difficulty in expanding dairy size in some potential regions.

As mentioned above, most dairy cows in the country are raised in small households. Vietnamese farmers are diligent, but have low capital and limited knowledge on raising technology and herd management. It becomes more difficult for them to expand dairy size when weather condition of Vietnam is hot and humid in summer and spring, which easily causes tropical diseases for cows. Thus, the government should pay attention on training dairy farmers and providing them with credit to achieve the goal of increasing in cow population.

Further, task of herd management is still weak. Profiles of dairy cows are not regularly reported, so buyers usually get poor access to information related to the cows sold. As a result, some farmers had to buy the unexpected cows with low milk yields. Moreover, crossbreeding activities are also affected. According to Nam (2002), about 37 percent of the cow population inseminated in Ho Chi Minh city was not reported. In addition, 32 percent of the total female cows in the city was inseminated by semen with unclear origin. Based on current management level, crossbreeding between lines having close blood will be easy to happen in Vietnam. Our fieldtrip to Okinawa (Japan) in March 2003 shows that information related to dairy cows such as their parents, heights, weights, milk

qualities, etc., is reported systemically by Japanese officials. As a result, they have selected good cow herds with high milk yield. For example: average milk yield of milk cows registered (or reported) reached 8.2 tons/milking cycle, while average yield of the whole milk cows (including both registered and un-registered cows) was only 6.6 tons/milking cycle (Okinawa Dairy Cooperative, 2002). Consequently, the Vietnamese government should improve the level of breeding management.

Poor situation of cow health and veterinary services

Although achieving certain progresses in the supply of veterinary medicine and vaccines, cow health and veterinary services in Vietnam in general are still poor. Both farmers and field service level have relatively low level of cow health knowledge, which leads the low adoption of proven disease control measures. At the national level, a reasonable legislative and regulatory base for disease management is eroded by weak chain of command to the field level, under resourced institutions with inadequately trained staff and poor data collection, storage and retrieval systems (IFPRI and ICARD, 2002). Dairy farmers are reluctant to report an outbreak of disease, while the veterinary service officials cannot afford due to limited budget. Market for veterinary medicines sometimes is not managed well, so a few medicines with bad quality are still existed in market. As a result, some dairy cows could not be treated in time. Cows are said to be the whole assets of farmers, so poor status of veterinary services make dairy production highly risky.

Lack of planted grass and high feed price

Vietnam has not large natural meadows, and so raising dairy cows has to rely on planted grass fields, agricultural by-products and by-products of food processing industry. However, areas allocated for cultivating grass in the country are still limited. According Hung (2002), at present grass production in Vietnam only satisfied about 30 percent of the consumption level. Especially, Ho Chi Minh city fed almost 33 thousand heads of dairy cows in 2002, but it had less than 300 ha of planted grass (less 100 m²/head). Meantime organized market for fodder has not been formed yet, this fact shows a strategy of fodder development is very necessary for Vietnam. Therefore, the government should pay attention on zoning for fodder and encouraging farmers to restructure the cultivation sub-sector.

High price of feed that affects per unit production cost is another constraint for the dairy development of Vietnam. According to Duc (2002), the per unit price level of mixed concentrate in the country was equal to 71 percent of the price level of raw milk. It means that when selling 1 kg of milk materials, Vietnamese farmers only could buy 1.4 kg of mixed concentrate. Meantime, our fieldtrip in March 2003 shows that farmers in Okinawa (Japan) might exchange 1 kg of milk materials to 2.8 kg of mixed concentrate. IFPRI and ICARD (2002) also indicate that prices for feed in Vietnam are high by international standards, particularly for high protein raw materials such as maize and soybean. Ms. Anh (2003), a head of Agricultural and Forestry Extension Center, admitted that the feed prices in Vietnam were about 10–30 percent higher than those in neighbor and other countries (<http://www.vnn.vn/442/2003/5/13378/>). While price of milk materials is pre-determined, high price of feed has significantly affected the tempo of dairy development in Vietnam.

Environmental aspects

With the development of dairy production in small farm households, competition

between humans and animals coexisting in the same places has become severe. Farmers' settlement lands are limited, while sheds are usually located in the same areas as their houses. Our surveys in 1999 show that average homestead land per Phu Dong farm household (Hanoi City) was only 180 m², whilst she/he raised an average of 3.6 heads of dairy cows*. Furthermore, many farmers have limited capital, which make them unable to apply methods of environmental control (i.e. biogas digester). As a result, environmental pollution from animal waste (i.e. manure, urine) has been serious in some zones. Although making great contributions to the dairy industry, smallholder producers negatively impacted environment. This is also one of the major constraints for dairy development in Vietnam and needs to be paid attention by government and dairy farmers as well.

SUMMARY AND CONCLUSION

We have described the general picture of dairy production in Vietnam. Although cow population has increased at a high rate over last years, the domestic milk production has not met the demand for milk and milk products. Milk processing factories in the country heavily depend on the milk materials imported. Some major resources and services for dairy production such as concentrated feed, natural and cultivated grass, services of veterinary and insemination are existent but in relatively limited and poor conditions.

There are some factors that give opportunities for the development of Vietnamese dairy sub-sector, i.e. large market potential, encouraging policies of the government, abundant labor force. However, it is also facing with a lot of challenges such as a lack of good cow breeds, limited level of management, poor status of veterinary services, high price of feeds and environmental pollution.

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* In some zones (especially in the North) of Vietnam, settlement land is separated from cultivated land.

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