The Myanmar dairy sector

A quickscan of opportunities

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LIVESTOCK RESEARCH
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DRAFT FOR DISCUSSION

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Samenvatting
Dit rapport beschrijft de zuivelsector in Myanmar en de kansen voor ontwikkeling, zowel voor private als voor publieke partijen. Het beschrijft de zuivelmarkt, melkveehouderijsystemen en de institutionele omgeving voor melkveehouderij. Een aantal kansen voor het bedrijfsleven worden op een rijtje gezet. Het rapport rond af met een aanbevelingen op het gebied van melkveehouderijclusters, zuivelbeleidsontwikkeling, en trainingsactiviteiten.

Summary
This report describes the Myanmar dairy sector and opportunities for development, for private as well as public actors. It describes the dairy market, dairy farming systems, and the enabling environment for dairy. A number of business opportunities are listed. It concludes with recommendations on dairy clusters, dairy strategy development , and capacity development activities.

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Foreword

This report is one in a series of sector assessments commissioned by the Netherlands Economic Mission in Yangon in an effort to lay the foundation for the intended Myanmar-Netherlands cooperation programme in the field of agriculture, livestock, and fisheries, and to identify investment opportunities in the agri-food sector of Myanmar.

This report once again shows the rich diversity and potential of Myanmar. It came about after intensive and pleasant consultation of a range of dairy sector stakeholders in Myanmar. With the team I am very grateful to the farmers, processors, government staff, scientists, shop owners, and project staff who so liberally shared their insights and data over the course of the assessment.

The FAO paper by Hinrichs et al. (2014) was particularly helpful, and was published officially 'just in time' during the mission.

I hope this report will be helpful to all stakeholders for further discussion on meaningful development pathways for the dairy sector and helps interested companies in the further development of concrete investments in the dairy sector.

Geert Westenbrink
Agricultural Counselor
Netherlands Economic Mission, Yangon

Key abbreviations and conversion rates

AI	Artificial insemination
LBVD	Livestock Breeding & Veterinary Department, part of MLFRD
MCC	Milk collection centre
MDA	Myanmar Dairy Association
MDL	Mandalay
MLF	Myanmar Livestock Federation
MLFRD	Ministry of Livestock, Fisheries, and Rural Development
NE	Net milk equivalents – the measure to compare dairy products, calculated as the milk required to produce them
NEM	Netherlands Economic Mission, Yangon, Myanmar
NPT	Naypyitaw
TNE	Tonnes NE
UHT	Ultra Heat Treated
UVS	Yezin University of Veterinary Science
YAU	Yezin Agricultural University
YNG	Yangon

Exchange rates used

1 €	= 1.246 Kyat
1,000 Kyat	= 0.775 €
1 US $	= 975 Kyat

Weight conversions

1 Viss (*peittha*)	= 1.63293 kg
1 kg milk	= 1.027 – 1.033 litre

Executive summary

Recent changes in governance of the Republic of the Union of Myanmar have led to renewed government-to-government cooperation between Myanmar and the Netherlands. As the two countries both boast rich agricultural potential, exploration of cooperation in the agricultural sector has been at the forefront of government interaction. The Netherlands Economic Mission in Myanmar has initiated a series of sector assessments, including this one on dairy.

With a population of some 50-60 million people, a growing urban population, and high expected economic growth, good opportunities exist for the dairy sector. Dairy has become part of the diets in the country ever since colonial times, when European and Indian immigrants started local production and processing.
The established dairy tradition results in the practice that people will purchase dairy products once their incomes permit, especially for child nutrition. Awareness on 'the goodness of dairy' is widespread among the urban population.

Consumption, production, and imports
In general the main use of dairy products in Myanmar is the use of (condensed) milk in tea and coffee. Next to fresh and condensed milk, people increasingly consume other dairy products. Pasteurized milk, yogurts and ice-cream are supplied by local processors to retail outlets in the cities. A wide range of dairy products is being imported, mainly through Singapore. These include a range of processed/value added products like UHT milk, condensed milk, evaporated milk, butter, cheese, ice cream, and flavoured yogurts, but also milk powder that is repackaged or used in the local production of condensed milk, yogurt etc. These products are distributed across the entire country (non-chilled) or to areas with more or less dependable electricity supply, where a cold chain can be maintained. These are primarily the major towns like Yangon, Mandalay, and Naypyitaw, and to some extent smaller towns in Bago and Mandalay regions en-route between Yangon and Mandalay.

Supply from production and imports is estimated at 600,000 tons NE, which would put per capita consumption at 10 kg/person/year, as compared to national 2012-2013 statistics of 28.2 kg/person/year (LBVD). Official imports stay stable at 50-55,000 tonnes NE. The parallel import of dairy products is estimated to be some five times the volume of official imports. Currently less than 50% of consumption is covered by local production, and this figure is dropping.

Based on consumption, production and importation practices, different value chains can be distinguished.

Milk is primarily produced in Mandalay region, Yangon region, and around the capital Naypyitaw. Three main farming systems are practiced, i.e. "road side farming" , low intensity medium size farms , and medium/larger scale farms with free housing systems. Dairy cattle are fed a limited amount of forage, supplemented with readymade concentrates and/or a wide range of agro-industrial by-products including brewer's grain. Only the commercial farms are growing forage crops. Although genetics are a limiting factor, productivity of the existing local breed can easily be doubled, from the current 400 to 800 kg/lactation to 1,500 to 2,000 kg by providing more forage and water. Similar increases can be expected for crossbred and grade cows. Farm gate prices for raw milk around Mandalay are 500 to 800 K/Viss (€ 0.25 to € 0.41/kg); around Naypyitaw at 800-1100 K/Viss (€ 0.28 to € 0.45/kg), and around Yangon at 900 to 1500 K/Viss (€ 0.46 to € 0.76/kg). At the level of farmers and collectors little to no awareness on milk quality is present.

Some 50 plants produce sweetened condensed milk and some 15 plants produce pasteurized milk, yogurt and butter. Total local processing is estimated to be in the neighbourhood of 150,000 kg/day.

Business climate and services

The government generally is much in favour of private investments in the dairy sector, be they from national or international companies. History shows that the government provides much space for entrepreneurship in this sector, but it also shows the need for tailor-made policies and service provision that give the local sector a fair chance. Importation of dairy products and other food stuffs is not subject to custom duties, but the usual 3-5% trade duties do apply. Myanmar has no VAT regulations. Taxes have to be paid on company profits.

Various local and international companies are planning to develop new large dairy products manufacturing facilities, likely based on imported milk powder.

Service provision to the dairy sector is in the early stages. The shortage of proper education, extension and research is hampering the development of the entire agricultural sector. Except for university level veterinary sciences and the short-term training centre for government staff at Mingaladon, Yangon, no structural education and training on dairy is available. Next to what the veterinary university has to offer, there is a small governmental livestock extension service and very small livestock research capacity. A few bilateral and UN projects focus on dairy development . The Myanmar Livestock Federation plays an important role in the dairy sector. It represents its members in liaison with government departments, international organizations like FAO, and international contacts.

SWOT analysis of the sector

Opportunities - The Myanmar dairy sector is a sector at early stages of development. The current economic and political environment offer a unique opportunity to rebound to the strong growth era of the seventies and eighties of the previous century. In particular the following factors contribute to these opportunities:

- strong expected growth of demand for (quality) dairy products, as the middle & affluent consumer class, and hence dairy consumption, is expected to double in 8 years' time;
- abundant agricultural resources create a conducive environment for dairy, in particular the availability of energy- and protein-rich by-products and of grazing areas at intermediate altitude in Shan, Kachin, and Chin States;
- increasing support for policies that help substitute imports
- interest in investments in inputs & services, specifically for areas with a higher concentration of dairy production
- good cooperation between chain actors, with sector coordination already being in place;
- world market prices for dairy are showing an upward tendency, giving local production an advantage vis-a-vis imports.

Key bottlenecks - A number of factors hamper the development of the dairy sector: the high preference of farmers (and the therewith related governmental policy) to produce rice, the scarcity of land, limited infrastructure, limited access to credit, as well as lack of skilled labour.

To capitalize on the above opportunities, the public and private actors in the sector together will need to work on two key issues to enhance competitiveness:

1. **The cost price of milk** needs to become competitive in the global market; as feeding costs generally constitute two-thirds of the cost price, improving the availability and quality of fodder - and to a lesser extent feed – is of prime importance; next to that, higher productivity can only be achieved if farm management is beefed up.

2. **The quality of local dairy products** needs to meet the standards of middle and affluent class consumers – in terms of taste, shelf-life, presentation, and public health / food safety standards.

Reduction of cost price and improvement of quality both require:

- conducive policies that support growth, especially around land tenure; the dairy sector clearly needs a well-defined and structural development strategy to be able to cover a substantial amount of its national milk requirement.

- a clustering of dairy production to a density and size that attracts private investments in inputs and services
- investment in public services like education, research, record keeping, and quality assurance.

Recommended strategies

Dairy clusters

To develop a strong and suitable dairy sector, resources and efforts of various Ministries should be combined to develop dairy zones in selected regions of Myanmar. By developing special dairy zone's, research, education, extension, animal health, commercial support services (testing, finance and input supply) as well as the processing industry can be concentrated and thus more effective in reaching interested farmers. Moreover, development of rural infrastructure (electrification, roads and communication) should be an integral part of development of these special dairy zones.

In these areas specialized forage production farms could be established to cover the need for high quality forage whole year round (incl. silage and hay production). Furthermore, governmental farmer support services such as a central lab for soil, water, forage and milk analyses should be established in order to introduce quality based milk production and to produce food safe milk and dairy products.

Potential milksheds in Shan and other States, and Magwe and Sagaing regions need to be scouted to identify suitable areas where sufficient land and interested farmers are available. The process of developing dairy clusters could include the following steps:

a. Dairy cluster design – Development of a first design to be discussed with interested companies and with MLFRD
b. Feasibility study dairy cluster - Scouting of prospective dairy zones, possibly in combination with a trade mission; feasibility assessment; development of second version dairy cluster design.
c. Public-Private Partnership for dairy cluster development - Identification of partners; design production support, collection grid, UHT plant, input & service providers incl. farm advice; could include an investment component; a smallholder inclusion component; and a capacity development & innovation component.
d. Further R&D support - research & development in connection to b and c.

Dairy strategy development

- As follow up to dairy cluster planning, MLFRD could be assisted in developing a dairy strategy.
- A national dairy forum to develop strategy and coordinate inputs between the various public and private actors involved (Myanmar as well as region); seek support from and alignment by development partners like JICA, KOICA, USAID, ACIAR, NZAid, and FAO.

Capacity development interventions

Short term training activities, like

a. Cow Signal training for groups of farmers in Tatkone/NPT, maybe MDL, YNG, using a BTEC approach, in collaboration with the NZAid MDE project.
b. PUM Netherlands senior expert program – senior expert deployment for business planning and operational support to a range of companies.
c. Tailor made training chain-wide learning for dairy chain development that analyses the dairy chain and identifies strategic joint actions.

Longer term training activities

d. University - Assist Yezin University of Veterinary Science in developing animal science BSc and MSc curriculum, and to improve action research and outreach, possibly through a NICHE project.
e. Sector organizations – like MLF/MDA.
f. Producer organizations – farmer groups for collective marketing and input provision.

A note on school milk

The school milk programme promoted by the Government of Myanmar with the help of FAO and company donations (i.e. local processors and Tetrapak) can play an important role in supplementary

feeding of children, accustoming them to dairy products. However, to be fully effective this program needs to be accompanied by increased availability of and access to dairy products, as well as a program that focuses on the more critical first 1000 days of child nutrition. Moreover, the strategy to scale this program to 5M children needs additional attention, especially when it comes to financing and seasonality of consumption (less than 200 schooldays / year).

Potential business cases

The following potential business cases for (Dutch) agribusiness have been identified:

1. Calf milk replacer - Currently limited amounts of raw milk are provided to the calves, mostly by letting the calf suckle the udder after milking. Obvious this limited supply of milk hampers good development of the calves and thus poor youngstock growth.
   Provision of calf milk replacer is a good opportunity not only based on calf needs, but also from a financial point of view as it is anticipated that 1 litre of milk based on milk powder is costing less than the sales price of 1 litre of fresh milk. A point of attention for the introduction of calf milk replacer is the provision of lukewarm water
2. Improved dairy concentrates - Currently only a few concentrate factories are active in Myanmar, which are focused on processing pig and poultry feed. Only CP from Thailand is producing cattle concentrates (feeding quality is not known). As the government is promoting and stimulating milk production, the demand for good quality (high protein) concentrates for cattle and youngstock will increase.
3. Dairy cattle minerals and vitamins - Along the lines of what is mentioned above, minerals and vitamins are to be provided to dairy cattle to stimulate milk production and youngstock growth. These are not yet available.
4. Semen for AI - Currently only 30,000 doses of bull semen of a dairy type bull are produced in Myanmar. This is by far insufficient in terms of volume, moreover the genetic quality of these local bulls are unknown. Most "larger scale" farms occasionally are importing semen from NZ, USA and Germany, but they demand a more regular supply of semen as well as a wider range of bull choices.
5. Stainless steel buckets and cans - Only aluminium/steel/plastic cans are used for milk storage and transport. Stainless steel is not available and would contribute to a better milk quality and product shelf life.
6. On-farm can cooling - Cooling of milk within 2 hours prevents the growth of bacteria present in raw milk. Milking times at farms and transportation to collection points and consumers in many cases require over 2 hours. To introduce simple ice bank-based can coolers (e.g. solar energy based) would be an eye-opener.
7. Milk cooling tanks - The larger dairy farms do need on-farm milk cooling tanks (200 to 1,000 ltr) to cool and store the milk. In this way they could milk the cows twice a day; cooling of the milk will lead to a longer shelf life of the "heat treated" milk and milk products.
8. Milk collection centres - As the commercial oriented dairy is at its infant stage and as the Myanmar dairy sector has great development potential, milk processing companies will start with establishment of rural milk collection centres. These require a range of equipment.
9. Milk testing and analysing equipment (MCC- and processing level) - Currently milk quality is only tested with an alcohol and resazurin test. In the future more and better testing is required. Provision of simple testing equipment such as a lactoscan/milkotester is required. For the larger scale processing plant more accurate testing equipment is needed to determine milk composition and quality.
10. Mini milk processing plants - Currently almost all larger scale farms have a milk heat treating facility, putting milk cans in boiling water. This is by far insufficient in terms of food safety and processing larger volumes. Introduction of small-scale milk processing plants able to pasteurize milk in batches (300 to 1,000 ltr/day) or continuous-flow pasteurizers (500 to 1,000 ltr/hour) would be a significant step up. Such plants could also produce yogurt and cheese products with longer shelf life.
11. Forage testing and analysing equipment - No feed or forage testing facilities are available to farms. Establishment of a central testing laboratory(s) under the umbrella of the Myanmar Livestock Federation will support the development of the dairy sector.
12. Herd administration - Any form of herd administration is lacking in Myanmar. Introduction of a basic administration (paper or electronic) will surely support farm management and thus farming results. Introduction of ear tags would already be a good step forward.
13. Improved forage varieties - A limited range of forage crops are used, introduction of better forage crops such as Rhodes grass, luzerne/alfalfa, and sorghum will improve milk production output.
14. Basic irrigation systems for forage production - Myanmar has abundant water resources. To increase fodder production (yield, quality, seasonality), simple sprinkler irrigation systems are required. Some larger scale farmers are using these systems and are enthusiastic about the increase forage yields.
15. Bush mowers for forage harvesting - Cutting fresh grass for the cattle is a time consuming activity that has to be done 365 days/year. Time seems to be a limiting factor in the number of cows one family can manage. Introduction of a handheld motor bush mower will increase the volume of grass provided to the cattle and also the cattle numbers/family.

1 Introduction

1.1 Background

Recent changes in governance of the Republic of the Union of Myanmar (Myanmar) have led to renewed government-to-government cooperation between Myanmar and the Netherlands. As the two countries both can boast rich agricultural potential, exploration of cooperation in the agricultural sector has been at the forefront of government interaction. The Netherlands Economic Mission in Myanmar has initiated a series of sector assessments, of which this dairy sector assessment is one.

1.2 Scope and objectives

This Myanmar dairy sector report is the result of a sector assessment mission in Myanmar in October 2014. This mission by Wageningen UR Livestock Research (plus international and local consultants) was carried out on behalf of the Ministry of Economic Affairs of the Netherlands under the leadership of the Netherlands Economic Mission in Yangon. The objective of the assessment was to explore the current status of the dairy sector in Myanmar, to identify likely development pathways, and to identify a range of short and medium term opportunities for private and public engagement (see appendix 2 for ToR).

Figure 1.1 *Map of Myanmar with capital cities and major dairy production areas circled in red.*

1.3 Methodology

The mission consulted with key actors and resource persons in the Myanmar dairy sector, based on an initial assessment carried out by the three Burmese authors of this report (results of this assessment formed the basis for this report). Appendix 3 outlines the people interviewed and the visits that were made to farms, processors, retail outlets, and institutions around Yangon, Naypyitaw, and Mandalay (see figure 1.1). Relevant literature was consulted (see appendix 1). Based on field data and literature, scenarios for development and possible approaches were drafted and discussed with a group of stakeholders organized in cooperation with the dairy sector organization, the Myanmar Livestock Federation (MLF). The results of this process were presented to the Minister of Livestock, Fisheries, and Rural Development (MLFRD).

1.4 Outputs

Next to this report on the sector and its development opportunities, a business opportunity brief is published, as well as power point presentations used in the stakeholder meeting and the meeting with MLFRD.

2 Country background

Myanmar has a significant population of some 50-60 million people (the results of a recent census have not yet been published). 33% of the population lives in urban areas, the urban population is growing with 2.7% per year (World Bank). What is even more important for dairy marketing prospects is that the current policy environment is expected to result in high economic growth, welcoming a growing number of households into middle class income levels– a doubling in 8 years (see figure 3.1).

A recent Asian Development Bank report (ADB 2014) mentions three scenarios for growth, of which the highest growth projections (9-10% per year) would result in an increase of per capita income with nearly 500% between 2010 and 2030 (see table 2.1).

Since 2010 the country is divided into 21 administrative subdivisions, which include 7 states, 7 regions, 1 union territory, 5 self-administered zones and 1 self-administered division (see figure 1.1). The regions can be described as ethnically predominantly Burman (Bamar), while the states, the zones and Wa division are ethnic minority-dominant. In terms of population, Mandalay Region is the largest, Kayah State the smallest and Yangon Region the most densely populated. In terms of land area, Shan State is the largest and Yangon Region is the smallest.

States and Regions are divided into 67 districts, which in turn consist of 325 townships that include towns, wards and village-tracts. Village-tracts are groups of adjacent villages.

Myanmar knows three seasons: The rainy monsoon season (June-October), the dry cool season (November – March) and the dry hot season (March-May). Table 2.2 and annex 4 offers additional data on climate and population. Annex 7 offers key data relevant to dairy production and marketing.

Currently milk is primarily produced in Mandalay region (55% of dairy cattle), Yangon region (15% of dairy cattle), and the union territory around the capital Naypyitaw (fig 2.1).

Table 2.1
Growth scenarios for Myanmar

Growth Scenario	Projected Gross Domestic Product per Capita by 2030 ($)	Changes in Per Capita Income from the 2010 Level
Current growth (5%–6%)	2,051–2,479	more than 2 times
Medium growth (7%–8%)	2,992–3,603	more than 4 times
High growth (9%–10%)	4,333–5,201	almost 6 times

Source: ADB, 2014. Myanmar, unlocking the potential

Table 2.2
Climate data, altitudes, and population of some key cities in Myanmar

	Naypyitaw	Yangon	Mandalay	Lashio
Population (million, est.)	0.9	4.5	1.2	0.1
Altitude	118	15	76	749
Annual rainfall (mm)	1470	2681	915	1381
Average temperatures (min-max)	21-33	22-32	21-33	15-29
- Cold season (min-max)	15-30	19-33	14-29	7-25
- Summer (min-max)	25-38	24-36	24-37	17-31
- Rainy season (min-max)	25-33	24-30	26-34	21-29

3 The dairy market

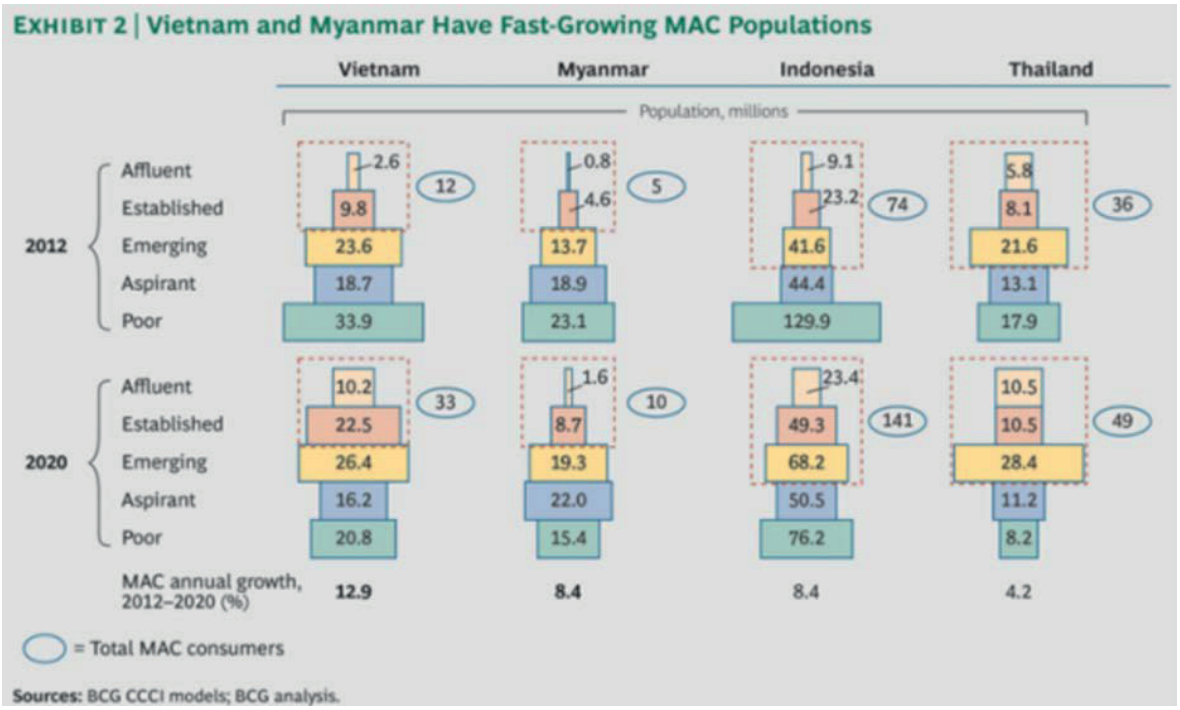
3.1 Consumption

3.1.1 Consumption patterns

In general the main use of dairy products in Myanmar is the use of milk in tea and coffee. At home and in teashops, fresh or condensed milk is boiled along with tea (*chai*), or added to coffee and tea at a later stage. The urban population consumes more coffee and *chai* and hence more dairy products than people in the rural areas. Condensed milk is from both local and imported products, the majority is of imported brands. Other traditional products include dry flakes of milk (used in cooking and produced in the farmer household with the sap from a locally available plant), traditional yogurt produced in clay pots and consumed with sugar syrup, and traditional sweets. Although not always abundant, such products are available in most parts of Myanmar where dairy farms exist. Indian descendent communities produce a large variety of traditional products such as 'Peda', 'Barfi', 'Gulab jamun', etc. (Hinrichs et al., 2014).

Next to fresh and condensed milk, people increasingly consume other dairy products: heat treated / "pasteurized[1]" milk, UHT milk, milk powder, evaporated milk, butter, cheese, ice cream, and flavoured yogurts. Pasteurized milk, yogurts and ice-cream are supplied by local processors to retail outlets in cities like Yangon, Naypyitaw, and Mandalay. Most other dairy products are imported. Fresh processed products are available within the cities only, within the reach of cold chain logistics. Evaporated milk and milk powder are available more widely as well as the so-called 3 in 1 sachets containing coffee/tea/chocolate, sugar, and non-dairy creamer.

Figure 3.1 *Myanmar's middle & affluent class is expected to double in eight years' time*



Source: http://mmbiztoday.com/articles/middle-class-myanmar-double-2020

[1] to "pasteurize" milk, milk cans are put in a boiling water bath and kept in hot water for 30 to 40 minutes. Therefore, it is not known to what temperature and how effectively the milk is heat treated.

3.1.2 Per capita consumption and demand growth

According to official figures, per capita consumption of milk was 28.2 kg NE in 2012-2013 (LBVD). However, based on production and importation estimates detailed below, actual consumption is estimated at 10 kg per capita per year (see par. 3.3).

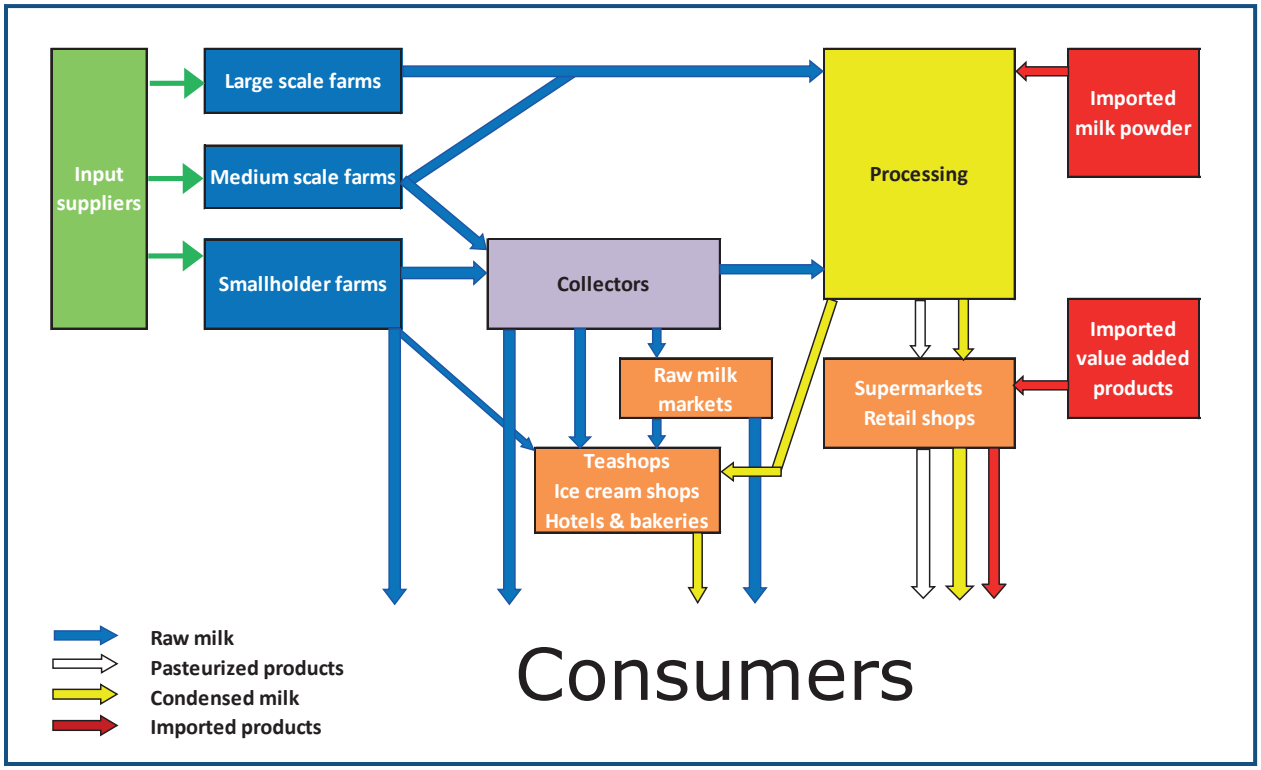
An important trend is the increasing use of dairy products by the growing middle class. As Myanmar's middle class is expected to double over the next 8 years, dairy consumption can be expected to increase at a similar rate (see figure 3.1). Demand growth is evidenced by growth of processed milk in the Yangon area: Processors increase output with 10-15% per year: 15,000 tonnes are currently processed per year, against 10,000 tonnes three years ago.

3.2 Dairy chains

3.2.1 Variation in chains across the country

Based on consumption, production and importation practices, a number of different value chains can be distinguished within the country (figure 3.2). This paragraph outlines the major ones, first giving an overview in two major cities, then detailing by commodity.

Figure 3.2 *Flow of dairy products in the Myanmar dairy chains*



Source: Adapted from Inception Workshop on Smallholder Dairy Development Programme in Myanmar, Naypyitaw, 6 October 2011, using own observations and field data

Yangon - Milk from farms in Bago, Ayerawaddy, and Mandalay Regions is consumed along with milk from farms in Yangon Region. Milk is marketed through open air markets in Insein (for producers to the North and East of Yangon) and Tamwe (for producers to the West of Yangon), where it is sold to hawkers, bakeries, tea shops, and individual customers. A second part of the milk is processed into condensed milk for the army (see par 3.2.4). A third part of the milk is processed into pasteurized milk (full cream and skimmed milk), and yogurt products (see par 3.2.5). These pasteurized products

are marketed through supermarket channels. Significant amounts of dairy products are imported (see par 3.2.3 and 3.3.1). See table 3.1 for products and prices.
Mandalay - Raw milk from farms in Mandalay and Sagaing Regions is marketed largely through teashops. Another part of the milk is processed into condensed milk in two larger factories (Myabuyin/Kyaukse and Mandalay) and a number of smaller ones. A third part of the milk is processed into pasteurized milk (full cream and skimmed milk), and yogurt products. Some of this processing is actually done in Yangon. In Mandalay region supermarkets are less prevalent than in Yangon and pasteurized milk is consumed on an even smaller scale compared to Yangon (Hinrichs et al., 2014). See table 3.1 and 3.2 for products and prices.

In other parts of the country, dairy is mainly marketed in two ways: Local production is marketed as raw milk and traditional dairy products (see above), and condensed milk from Mandalay and Yangon is sold in shops and markets.

Milk for processing is collected via networks of milk collectors. Milk producers are highly reliant on the market access that milk collectors are providing. Milk collection with a driving distance of up to 30 miles has been reported (Hinrichs et al., 2014). For local processors see above. For producers see chapter 4. For input & services see par 5.4.

A few local manufacturers have tried to produce milk powder, but could not sustain production.

Table 3.1
Prices of domestic and imported products available in supermarkets in Yangon, Naypyitaw, and Mandalay

Products	Brands	Volume/weight	Price (Kyat)		Price in Euro	
			min	max	min	max
Pasteurized milk	**Local:** Fun Hwa; Kyalsinthant; Royal; Supercow; TM; Walco	1 litre	1,200	1,600	0.96	1.28
other brands & volumes:	**Local:** Silvery Pearl **Imported:** Meji	200, 220, 250, 500, 950 ml				
Yoghurt, usually sweetened	**Local:** Fun Hwa, Royal, TM	1 litre	1,600	1,800	1.28	1.44
other brands & volumes:	**Local:** YCON, Yoon, Silvery Pearl, Royal, Kyalsinthant, Happy Foods **Imported:** Casel, Dutchie, Ehrman, Meji, Bulla	85, 100, 120, 140, 150, 160, 180, 200, 220, 240, 250, 400, 700 950 ml				
UHT milk - full cream or skimmed	**Imported:** Anchor, Cowhead, Emborg, Magnolia, Paul's, President	1 litre	1,580	1,950	1.26	1.56
Milk powder	**Local:** PEP, Premier **Imported:** Cowhead, Ensure Life	400 gr	2100	16300	1.68	13.04
Butter	**Imported:** Danish, Lurpak, Fresh Dew	250 gr	4750	6700	3.80	5.36
Condensed milk	**Local:** OK, One Tea, Dairy Queen, Happy Cow, etc **Imported:** Tun, Ship, Falcon, MyBoy, Sun, Noon Gold, Dawn, Noon	390 gr	520	845	0.42	0.68
Evaporated milk	**Imported:** OK, Dawn	400	770		0.62	-
Ice cream	**Local:** KYK, Polar, Hawaii, Happy	1000-1500 (and others)	3250	3950	2.60	3.16
	Imported: Magnolia, Nestle, Walls	420	2350	4300	1.88	3.44
Cheese	**Imported:** wide variety of types & brands					

Source: Observations

Bottled yogurt

Pasteurized milk

Pasteurized milk pouch

Cup yogurt

3.2.2 Milk prices

Prices of raw milk vary according to the location of the collection sites and markets. Table 3.1 shows prices of milk and dairy products that were recently spotted at organized market places (retail prices). Table 3.2 presents the farm gate and factory reception prices that were quoted by farmers and processors, and the shop prices observed at supermarkets.

Table 3.2
Milk prices along the chain (in Euro/kg)

Region		farm selling @	processor buying @	consumer buying @
Yangon	min	€ 0.46	€ 0.62	€ 0.80
	max	€ 0.76	€ 0.91	€ 1.28
Naypyitaw	min	€ 0.28	€ 0.30	€ 0.55
	max	€ 0.45	€ 0.68	€ 1.28
Mandalay	min	€ 0.25	€ 0.33	
	max	€ 0.41	€ 0.34	

Farm gate prices for raw milk around Mandalay are 500 to 800 Kyat/Viss (€ 0.25 to € 0.41/kg); around Naypyitaw at 800-1100 Kyat/Viss (€ 0.28 to € 0.45/kg), and around Yangon at 900 to 1500 Kyat/Viss (€ 0.46 to € 0.76/kg). The highest prices in Yangon are clearly contingent on quality and timeliness. The lowest prices are paid for milk that goes to condensed milk plants.

The differences between farm gate and factory gate prices can be ascribed to costs of collection and transportation.

Consumer prices for milk depend on brand and retail location, but also whether milk is processed or not. The price of pasteurized milk of a particular brand does not vary much over different locations (usually range of 100 Kyat or <10%).

3.2.3 Imported products and products based on imported products

A wide range of dairy products is being imported. Singapore especially functions as an import hub for supply from the world market, as illustrated in tables in appendix 8. Imported products include a range of processed/value added products like UHT milk, condensed milk, evaporated milk, butter, cheese, ice cream, and flavoured yogurts, but also milk powder that is repackaged or used in the local production of condensed milk, yogurt etc. These products are distributed across the entire country (non-chilled) or to areas with more or less dependable electricity supply, where a cold chain can be maintained. These are primarily the major towns like Yangon, Mandalay, and Naypyitaw, and to some extent smaller towns in Bago and Mandalay regions en-route between Yangon and Mandalay. Official imports stay stable at 50-55,000 tonnes NE (see table A in appendix 8). The parallel import of dairy products through cross-border trade from China and Thailand and through "filling up empty space in

containers" from Singapore are hard to trace down, so can only be estimated. Based on calculations and interviews, this report estimates these to be some five times the volume of official imports (see figure 3.3).

3.2.4 Condensed milk

Condensed milk is sold widely throughout Myanmar as beverage creamer, either as 390 gr tins for retail or in 14 Viss/22.5 kg boxes for commercial use. It is produced in a large number of small plants and a few larger ones, notably Mya Bu Yin dairy in Kyaukse near Mandalay (capacity of 60 tonnes/day), Mandalay plant (20 tonnes/day), and the Yangon Myanmar Economic Corporation plant that produces for military rations (6 tons/day). These plants may source raw milk locally or may mix in (recombined) imported milk powder.
Over the past decades over 85% of these plants have ceased operations. According to the Myanmar Dairy Association (MDA), reasons include:

- supply of local milk - dwindling production, relatively high prices for raw milk, quality issues
- supply of imported products - increase of evaporated milk creamer; replacement of sweetened condensed milk (based on milk powder) by sweetened creamer (based on cheaper skimmed milk powder or whey powder)
- taxation issues – trade tax for imported dairy products is only 3%, but local processors have to pay import tax for each ingredient (refined sugar, refined edible oil, skimmed milk powder and tin sheath).
- demand side - competition from non-dairy creamer in the increasingly popular 3-in-1 sachets of tea, coffee and Ovaltine; consumer preferences for imported brands.

3.2.5 Pasteurized products from small local processors

Pasteurized products primarily are marketed by companies that integrate production and processing in one company. Large farms in the country generally have their own processing i.e. milk heating facility, however basic these may be. A part of these processors do source additional milk from smallholders or medium sized farms in their neighbourhood, like Fun Hwa in Naypyitaw. Double Cow seems to be the only or one of the few processors transporting chilled raw milk from Mandalay area to their plant in Yangon.

These small-scale processors generally market pasteurized milk and/or yoghurt through major supermarket channels in the major cities, and to some extent to outlets in smaller towns along the road from Mandalay to Yangon.

Processing methods are rather basic and traditional without application of modern technology (putting milk cans in boiling water). Ordinary boilers, cooling fans and water tanks are used as production equipment. Bottling in high-density polyethylene (HDPE) plastic bottles is done by hand, with plastic or aluminium sealing with ordinary irons.

Apart from pasteurized milk and yogurt, these farms-processors supply raw milk to bakeries and ice cream shops. Bakeries and ice cream businesses are found all over the country, the largest being located in Yangon.

Bottling milk

Milk collector

Milk market Yangon

3.2.6 Fresh milk marketing

Significant amounts of milk never reach a processing plant, but are sold raw, directly by farmers or by collectors (see par 3.3.2). Most collectors collect milk once a day, leaving farmers the choice to milk another time for home consumption and local sales or to leave the milk to the calf.

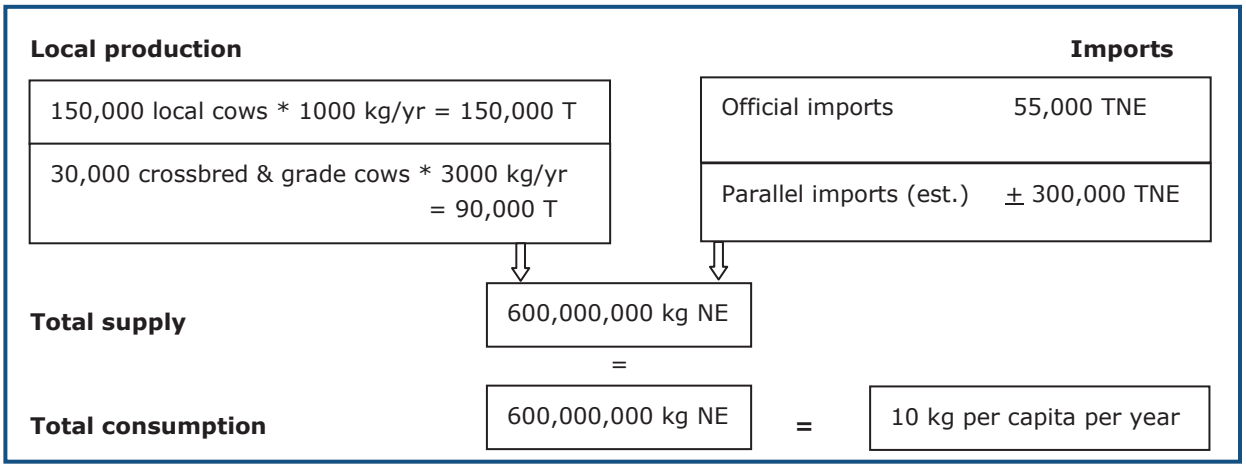
Milk is supplied to tea shops, restaurants, and private consumers in various ways, depending on the distance between farmer and consumer: i) directly by the farmer; ii) by collectors who collect milk from the farmers and deliver it to the consumers; iii) by hawkers who buy milk from farmers or collectors directly; or hawkers who buy milk from collectors in open milk markets (in Yangon).

3.3 Volumes & quality produced, processed, and consumed

3.3.1 Production volumes

The milk consumption in a country is constituted of local production plus imports, minus exports. Estimates are summarized in figure 3.3 and elaborated below.

Figure 3.3 *Estimated annual local production, imports, and consumption of milk and dairy products*



Source: Key informants, official statistics, and field data

- According to the Ministry of National Planning and Economic Development, Myanmar produced 1,205 million Viss of milk, equivalent to 1.9 million tons of milk in 2013-2014.
- Annual production equals the number of milking cows * average yield per cow per year. Based on field data, above figures have to be modified:
    - MLF puts the number of dairy cattle at circa 600,000 (table 3.3). Based on discussions and available data (table 3.3 and 3.4), we estimate the number of local cows that are actually milked at a maximum of 150,000 (table 3.5). Including home consumption, production is not expected to exceed (200 days * 3 Viss/5 kg =) 1,000 kg/year/cow * 150,000 cows = 150,000 tons/year nationwide.
    - The number of crossbred milking cows is estimated at a maximum of 30,000 (see figure 3.3 and table 3.4). Including home consumption, production is not expected to exceed (300 days * 6 Viss/10 kg =) 3,000 kg/year/cow * 30,000 cows = 90,000 tons/year nationwide.

Typical grocery store selling UHT flavoured dairy drinks

Imported dairy products in Yangon supermarket

- In addition to the number of dairy cattle, over 10 million cattle and buffaloes are kept mainly to provide meat and draft power for the cultivation of rice and other crops.

Exports

- No dairy products are exported. All milk produced in the country is used for domestic consumption.

Imports

- Official imports stand at 55,000 tons NE.
- Parallel imports are estimated at ca. 300,000 tons NE.

Consumption

- Whereas combined supply from production and imports is estimated at 600,000 tons NE, consumption cannot exceed this amount.
- Per capita consumption would then stand at 600,000 tons NE / 60 million population = 10 kg/person/year.

Table 3.3

Overall cattle and dairy cattle population in Myanmar, 2007

	State/Region	All cattle	Dairy Cattle	% of dairy cattle
1	Mandalay	2,186,000	342,500	55%
2	Sagaing	2,399,000	62,200	10%
3	Shan	1,493,000	51,800	8%
4	Bago	1,491,000	46,600	8%
5	Yangon	634,000	46,500	8%
6	Magwe	2,607,000	36,250	6%
	Other 8 States/Regions	5,675,000	31,328	5%
	Total	**14,994,000**	**617,178**	**100%**

Source: Ministry of Livestock, Fisheries and Rural Development, 2007; Myanmar Dairy Association/Myanmar Livestock Federation – Dairy Cow population 2007

Table 3.4

Number of dairy farms and dairy cattle in Mandalay Region in 2014

	Local breeds		Crossbreds	
Farm size	**No of farms**	**No of dairy cattle**	**No of farms**	**No of dairy cattle**
1 - 5 cows	72,463	179,773	2,391	6,314
6 - 10 cows	873	6,244	143	1,123
11 - 20 cows	271	4,551	41	704
21 - 50 cows	257	7,468	22	767
50 + cows	28	1,868	10	1,773
Total	**73,892**	**199,904**	**2,607**	**10,681**

Source: field data and extrapolations

Table 3.5

Estimated number of dairy cattle and milking cows in Myanmar, 2014 (based on tables 3.3 and 3.4)

No	State/Region	Local dairy cattle	Crossbred and grade dairy cattle	Total dairy cattle (est.)	Milking cows (est.)
1	Mandalay	199,900	10,700	210,600	100,000
2	Yangon				15,000
3	Other 8 States/Regions				(est.) 65,000
	Total				**180,000**

Source: field data and extrapolations

3.3.2 Processed volumes and market shares

According to MDA information, there used to be 440 processing plants in Myanmar in 2006. Some 90% of them were small sweetened condensed milk (SCM) processors. Currently not more than 50 SCM plants are left across the country (mainly in Mandalay & Sagaing Regions) (see 3.2.3 for reasons for this decline).
Currently there are 8 dairy processing plants in Yangon and 7 in Mandalay that produce pasteurized milk, yogurt and butter. Their capacity ranges from 2-8 tons intake per day. Total volumes processed are estimated at 50,000 kg/day, 18,000 tonnes/year. In most towns and cities ice cream is produced from raw milk or from milk powder, but volumes are not significant.

Based on the data collected, total local processing is estimated to be in the neighbourhood of 150,000 kg/day, 55,000 tonnes per year. However, it is likely that a significant amount of this milk is imported as milk powder, which is mixed into the production of condensed milk. According to Hinrichs et al. (2014), one Livestock Breeding and Veterinary Department (LBVD, under MLFRD) official put the actual intake of raw milk at 21,672 tons/year.

Market shares of the various chains are thus hard to put in percentages, but could be estimated as:

-	Consumption of unprocessed milk	185,000 TNE/year
-	Consumption of locally sourced condensed milk	37,000 TNE/year
-	Consumption of locally pasteurized milk & yogurt	18,000 TNE/year
-	Consumption of imported products	355,000 TNE/year
	Total	**600,000 TNE/year**

3.3.3 Product quality

Milk is transported in plastic jars and aluminium cans, using bicycles, motorbikes, cars, or public transport. Milk is not chilled along the entire collection and distribution chain. Some "large scale" milk processors and bakeries have a basic check on milk quality by using a lactometer and conducting the resazurin and alcohol tests at reception.

Milk processors use basic tests like alcohol tests at reception (65 to 75% alcohol). Beyond that milk testing is limited to a few individual companies. Large bakeries like Shwebazawn use a lactoscan to test incoming milk, and are willing to pay a premium of 50% for quality milk (1350 Kyat/Viss or 850 Kyat/kg). A few processors catering to niche markets use quality-based milk payment for their suppliers, e.g. Double Cow (bakeries) and Walco (top-segment pasteurized milk for retail). Double Cow has a good lab testing various milk quality and milk composition parameters – as they ship chilled raw milk from Mandalay region to their plant in Yangon, their attention to quality is essential.
At the level of farmers and collectors little to no awareness on milk quality is present. This is evidenced for example by how quality is tested on the fresh milk markets in Yangon: buyers put their entire hand in the milk can and watch the milk flow back into the can; hands are not washed between cans.

Rice husk stove for can pasteurizer

Locally made chilling tank in condensed milk factory

Milk condenser

4 Dairy farming systems

4.1 Farming systems

Three main farming systems are practiced i.e.:

- "Road side farming" - grazing, local breeds, low intensity; sell milk to the collector, to shops, or to neighbours;
- Medium size farms keeping the animals tied-up to a pole - Low intensity, Holstein Frisian cross-bred;
- Medium/larger scale farms with free housing systems – high intensity, crossbreds and 100% Holstein Friesian (see also Hinrichs et al., 2014).

Smallholders are keeping 2 or 3 cows, having no land to grow fodder crops[2]. These farmers have their cattle grazing along the roadsides and/or are fed chopped grass. Cattle are tied at poles near their houses and are occasionally provided some agro-industrial by-products. Average milk production is around 1 to 2 kg/day for a period of 7 months. Milking is done by a milk collector, who pays the cow owner 700 to 800 K/Viss i.e. € 0.34 to 0.39 per kg.

Medium size farms are having 20 to 40 cows and are located in "marginal" land along the edges of paddy fields and river banks. In some places the farmers have to leave their place during the raining season due to flooding. The cows are tethered to a pole and are fed cut grass, rice straw, agro-industrial by-products, and concentrates sold by traders. Sufficient water is provided to the animals. Artificial Insemination (AI) or natural mating is practiced and all animals are vaccinated by the governmental services. Cows are milked by the farmers and/or the milk collectors.

Approximately 200 **commercial farmers** are found in Myanmar, although These farms are keeping 80 to 200 dairy cattle, 30-150 milking cows (mainly crossbred Friesian) housed in cattle sheds, either tied-up at concrete feeding troughs (often individual) or a combination of tied-up and free housing systems. Most farms have own land for growing grass, which is cut and chopped at the farm and fed fresh to the animals, along with purchased agri-industrial by products. No minerals or vitamins are provided to the cattle. Fresh water is provided 24/7. Calves are fed fresh milk up to a period of 2 to 3 month (sucking the udder after the cows has been being milked). Adequate care of young stock is not practised resulting in poor young stock growth and a late age of first calving i.e. 3 years. Milking is done either by trolley milkers or a vacuum pipeline with milking buckets. All farmers have problems with irregular supply of electricity and face huge fluctuations in amperage. Provision of spare-parts is problematic. Manure is sold, discharged near the farms, or used for fertilization of crops. Bio-gas systems are not common.

Traditional draught cattle

Riverside grazing Mandalay

Commercial farm Yangon

[2] *2000 Viss of milk require 1 acre of land for fodder*

Table 4.1
Basic data on selected commercial farms

Farm	No. of milking cows / total cattle	Land size (acres)	Productivity animal kg/day	Workers perm.+daily
Super cow (YNG)	102	70	6	35
Kyalsinthant (YNG)	20	-	12	6
Fun Hwa (YNG)	225	50	9	50
Aungkyantha (NPT)	40 /70	*)	10	7 + 10
Super Cow (NPT)	30 /85	*)	19	4 + 8
Fun Hwa (NPT)	30	*)	6.5	25 + 6 (incl.processing)
Unison (NPT)	30 /150	*)	5	15 + 12
Shwelamin (Pyawbwe)	90 /200	19	11	18
Patheingyi 1 (MND)	28 /42	3	8	7
Patheingyi 2 (MND)	33 /72	5		
Riverbank farmer 1 (MND)	40	-	8	
Riverbank farmer 2 (MND)	15 /33	-	7.5	
December (POL)	60 /200	100	11	25

**) land tenure arrangements in Tatkone breeding zone near Naypyitaw did not become clear to us*

Table 4.1 presents some basic data on commercial farms visited in Yangon (YNG), Naypyitaw (NPT), and Mandalay (MND) regions.

Productivity per cow/lactation is very low, mainly due to:

- Insufficient feeding of forage (volume and quality)
- Insufficient provision of water (volume and availability)
- Low genetic potential (low productive performance of local bull semen and/or local bulls).

Poor feeding results in very short lactation periods i.e. from 6 to 7 months and long calving interval i.e. 14 to 18 months. It is estimated that around 50 to 60% of the adult cows are not productive, thus consuming only forage for body maintenance.

Although genetics are a limiting factor, productivity of the existing local breed can easily be doubled. from the current 400 to 800 kg/lactation to 1,500 to 2,000 kg by providing more forage and water, as some farmers show.

Costs and price details on various products and inputs are provided in Appendix 7.

4.2 Distribution across the country

Currently milk is primarily produced in Mandalay region (55% of dairy cattle), Yangon region (15% of dairy cattle), and the union territory around the capital Naypyitaw (fig 2.1).

In Yangon most dairy cows are concentrated in 8 townships. The prevailing crop in these areas is paddy rice. Production is said to increase by 15% this year. This region has only 10 commercial farms, more medium scale and smallholders. Together they keep some 20,000 dairy cattle, ca. 15000 milking cows. New opportunities were reported for Hlegu (10 km North of Yangon) and Taigyi (40 km North) along the road to Pyay.

In Mandalay, farms are located in some10 townships surrounding the city, as well as in neighbouring townships of Sagaing region (across the river). A second dairy area can be found in 6 townships along the road to Meikthila and Naypyitaw, close to the Eastern mountain range. The prevailing crops in this area are rice, oils seeds and pulses.

In the latter dairy area, a breeding zone has been constructed around Tatkone near Naypyitaw, including land, paved road, for livestock, dairy production. A number of commercial farms operate here, some four of them supply their milk to Fun Hwa processing facility. The prevailing crops in this area are rice, sugarcane, and pulses.

4.3 Animal nutrition

Forage production - Only the commercial farms are growing forage crops to feed the cattle, to varying extents and often in addition to natural grasses. Main crops are Elephant grass (Napier) and maize. These crops are cut by hand, transported to the farm and copped by a stationary chopper. Manure is used for fertilization of the fields. Chemical fertilizers are hardly applied. Small scale and roadside farmers are only feeding roadside grass, mostly bought from local traders.

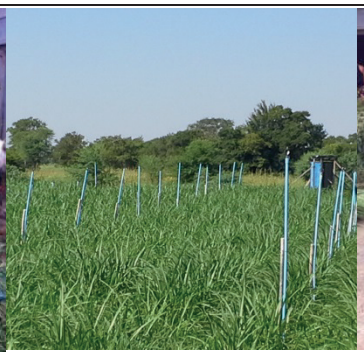
Silage making to preserve forge for the dry season is hardly practiced. During the dry seasons (Oct-Feb) cattle are fed rice-straw. According to farmers they are able to maintain production fairly well throughout the year.

Most farmers are interested to have more land to grow forage crops, however they all but t hose in the Tatkone breeding zone complain that land tenure arrangements are not clear whereas purchase and rental prices are very high.

Feeding practices – As mentioned, cattle are fed a limited amount of forage (covering only an estimated 40 to 50% of the dry matter requirement) supplemented by additional readymade concentrates and/or a wide range of agro-industrial by-products such as rice bran/polish, such as bean- and oilseed cakes (cotton, sesame etc.), bean and rice powder, rice bran, and rice polish. Farms located near to beer-factories are also feeding brewer's grain.

Farmers are not testing the forages and agro-industrial by-products on feeding value, nor do they have an estimate on the total volume of feed provided to the cows (in terms of dry matter).

Cut natural grass



Irrigated Napier

Brewer's waste

4.4 Animal health & reproduction

Animal health - Most cattle in and around the villages are vaccinated for Food & Mouth Disease (FMD), Anthrax, Black Quarter and Haemorrhagic Septicaemia (in those areas where it is recommended). The vaccination is provided free of charge by the government whereas farmers have to pay a token for transportation cost (300 to 1,000 K / € 0.25 to 0.75/visit).

According to the farmers, mastitis is only a problem during the rainy season (as evidenced by low somatic cell counts, SCC). Liver fluke are also not identified as a major problem. Reports on the impact of tick-borne diseases vary. Veterinary services seem to be well-organized, although in several areas the availability of veterinarians seems to be a problem.

Reproduction and Artificial Insemination - Commercial farms are importing semen themselves from USA, Germany, Thailand and New Zealand. Some farmers complained about the shortage of liquid Nitrogen to be used for filling the semen storage containers. Small holder farmers are mainly using local bulls, not knowing the genetics of these bulls. See also par 5.4.2.

4.5 Sale of milk and animals

Except for the commercial farms, most farmers do not milk their cattle themselves, but rather have the milk collector milking the animals (once/day). Farmers explained that they are too busy with field work and collection of forage to milk the cows themselves. The farmers and milk collector generally have a good and long-lasting relationship and are working together based on trust and verbal commitment. The milk collector has a contractual relationship with a milk processor and in some cases provides advances to the farmer. In other cases he is selling the milk on the fresh market, to teashops, or to bakeries.

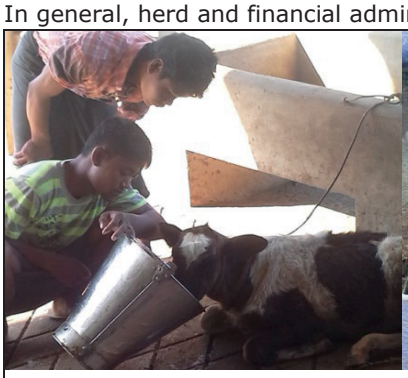
Almost all commercial farms are processing their own milk at the farm by putting milk cans into a water bath which is heated up to 100 °C. After 30 to 40 minutes the cans are taken out, assuming that the milk is "heat treated" and suitable for consumption.

Male calves are either directly sold or kept for fattening purposes and sold at an age of 1.5 to 2 years.

4.6 Farm management practices

In addition to family labour (men and women) all farms are using external labour to work on the farm. They often distinguish between employed staff and daily labourers (hired labourers are mostly men). As hardly any mechanization is done, almost all work is done manually. Some farms have a stationary forages chopper and a very few farms have a mechanic milking system. On-farm milk cooling tanks are not available. All farmers are complaining that skilled labour is not available due to lack of education and training.

In general, herd and financial administration is not being practised.



Calf feeding

Dairy ration: Chopped grass, rice bran, and bean meal

Milking machine

Hay making

Manure storage

Hand milking

5 The context for dairy

5.1 Infrastructure

Roads - Main roads in the country are well maintained, especially in Central Myanmar / Ayerawaddy Delta. Many highways are privatized toll ways. For example, Mandalay-Yangon (350 miles/570 km) can be covered in 6-7 hours. Many roads other than highways often are either not so well maintained or may not be paved at all.

Fuel, water and electricity - Availability of fuel generally is alright, with prices of diesel around 1 US$ and petrol slightly more. Since 2010 the government has allowed private companies to import fuel. Availability of electricity and piped water is very variable and generally restricted to towns and cities. Power cuts have reduced in severity, but most companies have backup generators. Prices are very reasonable (75 Kyat (7.5 $ cents) / kWh for industrial use, 35 Kyat (3.5 $ cents)/kWh for household use). As groundwater and water aquifer levels in the dry zones are dropping, tube wells need to reach lower levels.

5.2 Dairy tradition & nutrition habits

Dairy has become part of the diets in the country ever since colonial times, when European and Indian immigrants started local production and processing. The descendants of Nepali Ghurkha veterans settling after leaving the colonial army and Punjabi migrant workers turning farmers and traders still form an important skill core of the dairy sector, but many local businessmen and farmers have taken up dairy.

As described above, for a large part of the population consumption of dairy products is limited to condensed milk, and to a much lesser extent ghee, which needs to compete with vegetable oil and lard. Those living on or close to dairy farms consume fresh milk and traditional yogurt and value these as healthy foods for their children. It is especially the urban middle and higher income groups who can expand the range of products consumed, moving to milk powder, cheese, butter, yogurts, and ice cream.

While rich in pulses, the Burmese diets often are short in essential micronutrients for which dairy is an important source. A bottleneck in terms of nutrition is that especially food insecure households that who do not have balanced diets, have limitations in terms of access to and utilization of dairy products.

Consumption of dairy products has been introduced into Myanmar by immigrants from Asia and Europe during colonial times. In the period after the second World War dairy consumption was well-established, with products coming from local production and imports. Some large World Bank and AusAid dairy development projects in the 60’s - 80’s have boosted local production and processing capacity. However, the past two decades have seen little large scale investments in the sector, resulting in an increasing dependency on imports. The number of smallholder farmers involved in dairying is said to be dwindling, although no data on this trend have been found. The dairy tradition is strongest among the descendants of former South-Asian immigrants, like Ghurkha and Punjabi. More recent investments by local businessmen have resulted in the commercial farms and processing plants now operational (see appendix 6).

The established dairy tradition results in the practice that people will purchase dairy products once their incomes permit, especially for child nutrition. Awareness on ‘the goodness of dairy’ is widespread among the urban population, as interviews with consumers evidenced. The large scale dependence on sweetened condensed milk does have some undesirable side effects in terms of acquired taste (sweetening) and effects on dental health.

5.3 Business climate

Myanmar ranks 177th out of 189 in the World Bank's "Ease of doing business rank"[3]. High scores are for ease of getting electricity, taxation, and trading across borders; low scores are for ease to start a business and enforcement of contracts.

The government generally is very much in favour of private investments in the dairy sector, be they national or international. History shows that the government provides much space for entrepreneurship in this sector, but also the need for tailor-made policies and service provision that give the local sector a fair chance. The demise of condensed milk factories as a result of competition with imports, as discussed in par 3.2.4, shows the sensitivity of the sector vis-a-vis developments in the global dairy sector.

As member of the Association of Southeast Asian countries (ASEAN), Myanmar is expected to follow developments in ASEAN free trade and regional integration.

Financially strong local companies and international *fast-moving consumer goods* companies are planning to develop new large commercial dairy products manufacturing facilities. They are likely to use the imported milk powder for their products. Such new investments are very likely to affect to local dairy business. Initiatives mentioned include those by FMI/Yoma, DoubleCow with Dutch Mill and the MK group, and Lo Hein (Alpine water) who will recombine milk powder to flavoured drinks.

Alcohol test at reception in condensed milk plant

Generator for on-farm equipment

Cold storage in processing facility

5.4 Services

5.4.1 Laboratories soil/milk/feed testing

There used to be a milk quality laboratory at Insein, Yangon, but reportedly this is not functioning anymore. The feed testing facilities at Yezin University of Veterinary Science are operated with help of CP company. No information was obtained on soil and water testing facilities.

5.4.2 Artificial Insemination services

At the MLFRD AI centre, 10 bulls are kept for the production of semen for AI. Since 2013 the centre has two dairy type bulls (Holstein Friesian breed) producing 30,000 straws annually. These straws are distributed to two regional centres and used by LBVD AI technicians in 5 selected townships. Semen is provided free of charge, but farmers have to pay a service fee to cover transportation cost of the veterinarian. Significant issues with skills of inseminators were reported. Farmers do not have a choice on semen. Additional AI centres are planned for Mandalay, Lashio, and Taunggyi.

[3] www.doingbusiness.org, last visited 24-11-2014

5.4.3 Animal health infrastructure / Veterinary services

According to Hinrichs et al. (2014) the most common dairy herd productivity or health problems reported by herd owners are: 1) fertility/reproduction problems; 2) mastitis; 3) leg joint and claw problems; 4) digestive tract problems: ketosis and displaced abomasum; 5) coughing of cows. Disease treatments are done by private veterinarians or the herd owners. Medication is bought from pharmaceutical supply shops and no shortages have been reported.

Vaccinations against anthrax, haemorrhagic septicaemia, FMD, black quarter, and brucellosis (some dairy cattle only) are carried out on request of the farmer, who also has to keep records of vaccination himself; a PC3 document is issued by the township office. Diseases such as FMD have reportedly occurred in some of the visited herds in the past. Some farmers do not perceive FMD as a major threat and treat FMD symptoms with traditional medication methods. LBVD officers are delivering vaccinations. For twice annual FMD vaccinations farmers are charged 1,000MK/shot (Hinrichs et al., 2014).

According to Hinrichs et al. (2014) the main vector for the spread of infectious diseases are the milk collectors. Potential outbreaks are likely to follow the collection network of milk collectors. No cleaning or disinfection of hands or boots is done by the milk collectors. Myanmar joined the World Organization for Animal Health (OIE) as partner country in 1989.

5.4.4 Education, extension, and research

The agricultural education system in Burma includes three universities, all under different ministries and focused on different segments of the agricultural sector. The Yezin Agricultural University (YAU), under the Ministry of Agriculture and Irrigation (MOAI), covers crop sciences and in addition offers some courses in animal sciences and fisheries. YAU also operates seven regional research stations where it deploys students to conduct (crop) research during their final year. The University of Veterinary Science (UVS), also in Yezin but under MLFRD - covers veterinary sciences and fisheries but not crop agriculture. The University of Forestry (UOF) under Ministry of Environmental Conservation (MOEC) specializes in issues of land management, environment and forestry. In addition to these degree-conferring institutions, seven State Agricultural Institutes (SAI) under the MOAI offer the agricultural education diploma program for high school graduates (Khin Mar Cho, 2013).

UVS educates 250 students/year till BVM level. A BSc course in Animal Sciences will start this December. It has 90 staff, including seven professors, one assistant professors, and seven lecturers at the basic science departments. It carries out research on animal nutrition, health, and breeding; MSc and PhD work on dairy includes work on the nutrition effect on udder health, effect of yeast additives on milk production, and aflotoxin/mycotoxins in feed stuff. 90% of graduates is employed by LBVD as township veterinary officer, assistant veterinary officer, or in the AI program; the remainder by the private sector.
The university poultry and dairy farms are run by CP. At YAU, Animal Sciences is a minor department that only runs an introductory course for all students (2 hrs/week for 1 year). YAU cooperates with IRRI, ACIAR, JICA, KOICA, SEARCA. Cooperation with ACIAR on legumes, animal production. JICA and SEARCA will help with development of animal sciences and agricultural engineering departments.

5.4.5 Financial services – access to credit

Bank regulations for credit for farming activities effectively exclude dairy farming, as loans have to be repaid within a year and interest rates are steep. For dairy farmers this is not considered doable.

To alleviate credit access issues, in its Rural Development program MLFRD provides credit to farmers. Condition for credit provision is that farmers are in formal groups. More informal smallholder farmer groups/villages can receive a credit fund that is charged 13% interest per year. This fund is however too small to allow for cattle purchases.

5.4.6 Producer organizations

No dairy farmer organizations seem to exist. However, informal networks between larger producers appear to be strong. We heard about the existence of one dairy cooperative, Myazeyaung, but were not able to get further details.

5.5 Sector organization and policies

5.5.1 Policies

The Government of the Republic of the Union of Myanmar has been operating since 2011, following the 2008 Referendum on the new Constitution and the December 2010 elections. These ended nearly 50 years of military rule and resulted in an elected parliament and majority party government. These changes have resulted in a thorough review of the legal framework and a flurry of policy development activities. While the government at large and the individual ministers in particular are very aware of the need for a comprehensive policy framework, it is inevitable that this will take some years to accomplish.

The dairy sector is influenced by a number of different ministries, including first and foremost the Ministry of Livestock, Fisheries and Rural Development, but also the ministries of Agriculture and Irrigation (e.g. on fodder cropping), of Commerce (dairy imports), of Industry (processing), of National Planning and Economic Development, of Health (nutrition and health issues), and Finance (taxes). The Ministry of Cooperatives seems less relevant to the dairy sector.

Importation of dairy products and other food stuffs is not subject to custom duties, but the usual 3-5% trade duties do apply. Myanmar has no VAT regulations. Taxes have to be paid on company profits.

Policies around Animal Health & Development as published on the website www.mlfrd.gov.mm[4]. The ambitious Rural Development Strategy for Poverty Reduction is included in the reference list.
A major current legislation issue is the regulation around land ownership and use. For historical reasons, change of designated land use type is extremely difficult, e.g. paddy land cannot be changed to forage land. The government is processing a bylaw to create the possibility to use paddy land for dairy when it is not fit for paddy. The category "wasteland" refers to land belonging to the government, this can be acquired cheaply.

5.5.2 Ministry of Livestock, Fisheries and Rural Development

The Ministry of Livestock, Fisheries and Rural Development (MLFRD) is responsible for the entire livestock sector, including the dairy sector. Under MLFRD, the Livestock Breeding and Veterinary Department (LBVD) is the responsible focal department for the following activities:

- Collection and analysis of data on animal breeding and production
- Production of animal drugs/vaccines
- Animal health care activities - treatment and prevention
- Encouraging pasture development
- Artificial Insemination
- Certification of exportation/importation of animals and animal products
- Conducting training, research and laboratory work
- Establishing livestock breeding zones.

[4] http://www.mlfrd.gov.mm/images/stories/Laws/7.%20animal%20health%20and%20development%20law00001.pdf
http://www.mlfrd.gov.mm/images/stories/Laws/8.%20directives%20related%20to%20animal%20health%20and%20development%20law00002.pdf
http://www.mlfrd.gov.mm/images/stories/Laws/8.%20directives%20related%20to%20animal%20health%20and%20development%20law00003.pdf
http://www.mlfrd.gov.mm/images/stories/Laws/09.regulations%20of%20import%20%20export%20in%20myanmar%20en.pdf

Another MLFRD directorate, the Directorate of Livestock, Fisheries and Rural Development (DLFRD) is responsible for planning, review and evaluation of projects, international relationships, commerce and trade. Given its structure and set up, DLFRD is supposed to perform the following functions that will relate to the activities of overseas development partners:

- Formulating and design of policy and projects
- Developing the program of investment in livestock sector
- Conducting research for market opportunities and livestock production
- International relation with UN organizations, Non-government organizations and private sector.

According to a 2013 newspaper report, formation of a National Dairy Development Board is in process as part of the plan to develop the country's dairy cattle breeding sector. A five-year draft plan (2013-18) was discussed at a stakeholder consultation workshop with Myanmar dairy sector representatives. The report quoted Minister of Livestock and Fisheries H.E. U Ohn Myint as saying that regional dairy development boards have been formed across the country, stressing the need for more efforts to establish dairy cattle breeding farms and value-added dairy product factories[5].

5.5.3 Myanmar Livestock Federation and Myanmar Dairy Association

Another institution that plays an important role in the Myanmar dairy sector is the Myanmar Livestock Federation (MLF), the sector organization for the livestock sector. It is the umbrella organization for a number of associations, including the Myanmar Dairy Association (MDA). Leading dairy product producers, industry experts and other capable businessmen are part of MLF and MDA (see www.myanmarlivestock.org). It has 15,000 members and associations in each State/Region. One needs to be member to attend training course and study tours. Milk collectors are member of MDA through the processors they supply to.

MLF represents its members in liaison with government departments, international organizations like FAO, and international contacts. It also registers companies for import/export licenses. Overseas counterparts and dairy development project promoters dealing with the Ministry also deal with MLF and MDA for the required activities, events and discussion for the development of dairy sector in Myanmar.
The MDA was established in 2004. It has eleven Central Executive Committee members. Five state and regional dairy associations are member as well. It has 1,200 members all over the country. The MDA has 1300 dairy farmers as members, mainly medium scale (20-100 cows, many farms) and commercial (100+, of which there are only 20-30 farms). Next to the MDA, the MLF has some 12 associations, which include the Animal Health Products and Equipment Importers Association; the Livestock Breeding Association; and the Feed Association. The veterinarians have a separate association outside MLF, the Myanmar Veterinary Association.

Commercial farm in Pyin Oo Lwin

Feed fed with water

Yezin Agricultural University animal science classroom

5 http://www.business-standard.com/article/news-ians/myanmar-drafts-five-year-dairy-development-plan-113051000178_1.html. May 10, 2013, last visited 24-11-2014

5.6 Dairy related projects

Most projects in the livestock sector so far have focused on animal health issues as well as zoonotic diseases, e.g. those by FAO, IAEA, USAID, and KOICA. These projects do not focus specifically on dairy. A number of bilateral donors do support the livestock sector in general (see support to the Yezin Universities in par 5.4.4), or are tentatively addressing the dairy sector (Italy, Thailand). According to the NGO Food Security Working Group (FSWG) and the multi-donor Livelihood Trust Fund (LIFT), no NGOs do have projects that focus on dairy.

The main bilateral and UN projects that focus in dairy sector development include the following:

School milk program - MLFRD and FAO started a school milk program in 2012 for 3,500 children in Yangon, Naypyitaw and Mandalay based on imported (Thailand) UHT milk in 250 ml packs. Donations of local companies play an important role in financing the scheme. The program is gradually expanding (to areas like Kayah and Chin States, with targets of 30,000 children in 2013 and 51,000 children in 2014). The support of Tetrapak has significantly increased numbers, but has also increased dependence on imports. LBVD has bought some 40 small batch pasteurizers from Belgium, which are meant to be used for small-scale processing for the school milk program all over the country (Myaseinyaung brand).

Smallholder Dairy Development Programme (Bangladesh, Myanmar and Thailand), in Myanmar implemented by FAO, LBVD and MLF and funded by the Common Fund for Commodities with US$2.5M, is focused on the enhancement of productivity and market access of smallholder milk producers, linking rural school milk programmes with smallholder dairy development. 5,000 smallholder dairy households from Milk Producers' Organizations or dairy farmer groups participate in the project. Target areas in Myanmar include Mandalay (1,100 households), Yangon (300 households), Naypyitaw (100 households).

Myanmar Dairy Excellence Project – implemented from 2014 till 2019 by the AgriBusiness Development Group Ltd with LBVD, funded by New Zealand government (NZAid) with US$4.8M. In the first phase of 18 months a number of interventions in feed & fodder, genetics, farm management, milk quality, and capacity development are piloted, that will be scaled up after evaluation. It will work with chain actors and with 7 nucleus farms in Yangon, Meiktila, Mandalay, and Pyin Oo Lwin, who through smallholder focus farms will ultimately service 1600 smallholders. A number of potential dairy advisors are currently being trained in New Zealand.

6 Dairy development prospects

6.1 SWOT analysis of the dairy sector

Based on the findings presented above, this report has identified the strengths & weaknesses, opportunities and threats of the Myanmar dairy sector as displayed in table 6.1. With 'dairy sector' we here mean the local production and processing of milk and dairy products – imports and consumption as such are seen as external factors.

Table 6.1
SWOT analysis of the Myanmar dairy sector

Strengths	Weaknesses
▪ established dairy tradition ▪ lowland dairy milksheds are close to cities and have favourable micro-climates (close to mountains or rivers) ▪ well-working vaccination service ▪ basic population of crossbred dairy cattle ▪ abundance of agri-industrial by-products used ▪ recognized need for long-term dairy development policies that facilitate investments ▪ high milk price favours farmers ▪ high retail price is boost to sector.	▪ small average farm size ▪ high cost of locally produced milk & dairy products ▪ low skill level of most dairy farmers; poor on-farm record keeping ▪ minimal animal husbandry education, research, and extension capacity ▪ low availability and quality of forage; low use of feed and feed additives ▪ limitations in breeding & AI services; import of cattle is perceived as "fix it all" ▪ tick-borne and other diseases not under control ▪ lack of awareness on milk quality, milk composition and food safety issues among chain actors; no relationship between milk quality and milk price ▪ insufficient laboratories for feed, soil, water and milk analysis.
Opportunities	**Threats**
▪ growing demand for quality dairy products against competitive prices ▪ highland areas available with conducive weather conditions, land space, and water ▪ government in favour of import substitution ▪ investments in inputs: feed & fodder technology, high quality concentrates, premixes, milk replacers; good quality, affordable vaccines & drugs, incl. vaccines for brucellosis and TB; semen for crossbreeding; cold-chain logistics like milk collection centres; processing equipment like batch pasteurizers, mini milk processors, pouch packagers, ESL / UHT technology; bio-gas and solar energy for on-farm use ▪ investments in services: private farm advice services; private or public laboratories for quality testing of feed, soil, water and milk testing; curriculum development for animal husbandry education at diploma and university level.	▪ imports increasing due to high cost price and poor quality of local products; dropping cost price of imported condensed milk (composition and scale) and imported milk powder; free-trade agreement with ASEAN and other countries ▪ scarcity of available land close to cities; expansion of farms limited by difficult land market and ineffective farm size policy; limitations in land use regulations reg. acreage available for dairy ▪ limited infrastructure (roads, electricity) ▪ increasing use of 3-in-1 / non-dairy creamers ▪ side effects of unchecked commercialization, like unfavourable contract farming arrangements and food safety issues – toxins, antibiotics, masking additives to circumvent quality control ▪ credit - high cost and short duration of loans; shortcomings financial services ▪ job opportunities for trained personnel (city or abroad).

The key constraints are summarized under "Threats": The sector can't compete with imports due to i) relatively high cost price of milk resulting from poor access to factors, inputs & services, and ii) poor quality of dairy products along the chain. This means that the growing demand is primarily met by imports, and to some extent by use of non-dairy creamers. Underlying factors of the weak competitive position include amongst others, the high preference of farmers (and the therewith related governmental policies) to produce rice and other cash crops, the scarcity of land, limited infrastructure, limited access to credit, and the competition for skilled personnel. These constraints have to be overcome to reverse the downward spiral that the sector has come in. Sector actors are

very much aware of this, and recognize the need for long-term dairy development policies that help to catch the opportunities. It is obvious that 95% of the existing subsistence dairy farmers cannot be developed to become commercial dairy farms due to lack of land and interest.

On the other hand, the opportunities are significant as well: Rising incomes and growing consumer awareness on nutrition and food safety result in a growing demand for quality dairy products (against competitive prices), that could be met by local production. This generates interest in investments in inputs & services, specifically for areas with a higher concentration of dairy production. There is increasing support for policies that help substitute imports. Due to the competition for land around the cities, the expansive highland areas are becoming an option to consider. We will further elaborate on these in the next paragraphs

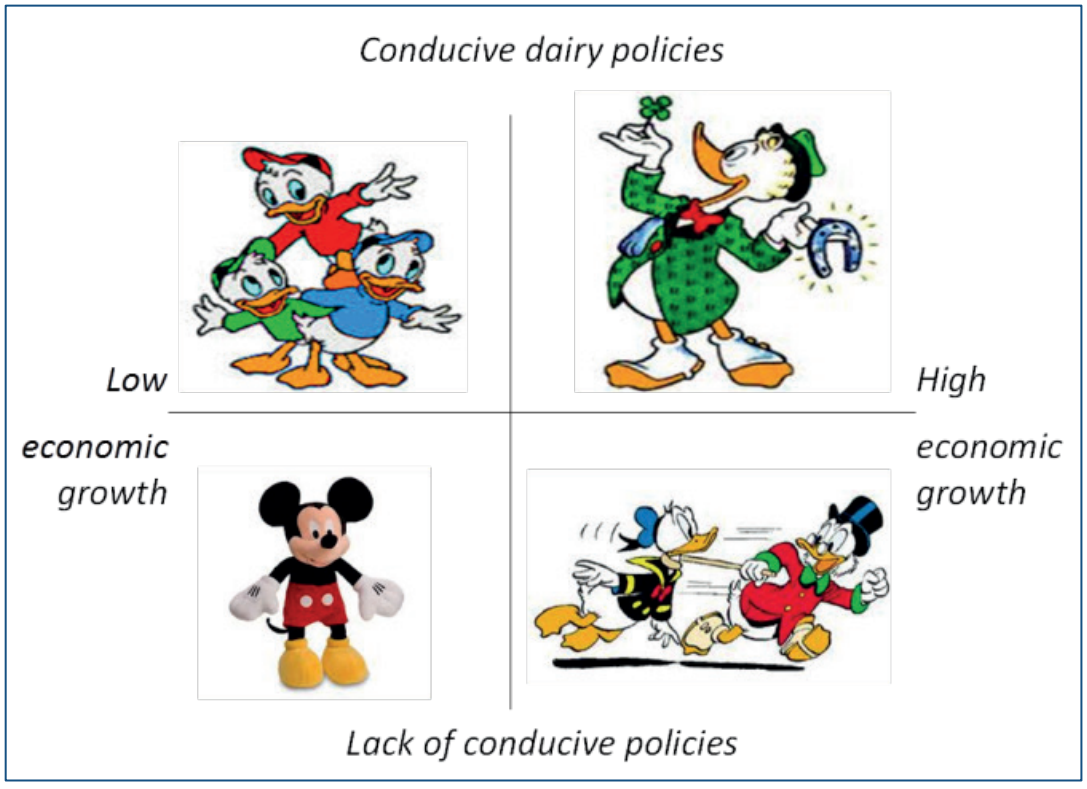
6.2 Development scenarios

The dairy sector in Myanmar is in an early stage of development and clearly needs assistance to grasp the opportunities. We consider i) the need for conducive policies and ii) the degree of economic growth as the two most uncertain constraints for the dairy sector in Myanmar, and hence have charted four scenarios along these two axes (see figure 6.1).

To elaborate on these two key constraints:

- a well-defined and structural development policy is essential to be able to cover a substantial amount of national milk requirement by local production, rather than by imports; currently less than 50% of consumption is covered by local production, and this proportion is declining; the formation of conducive policies is difficult at any rate;
- while a general optimism on the economic prospects of the country prevails, the country is still in transition to a free market democracy; economic growth is dependent on a range of rather uncertain factors.

Figure 6.1 Scenarios for Myanmar dairy sector development

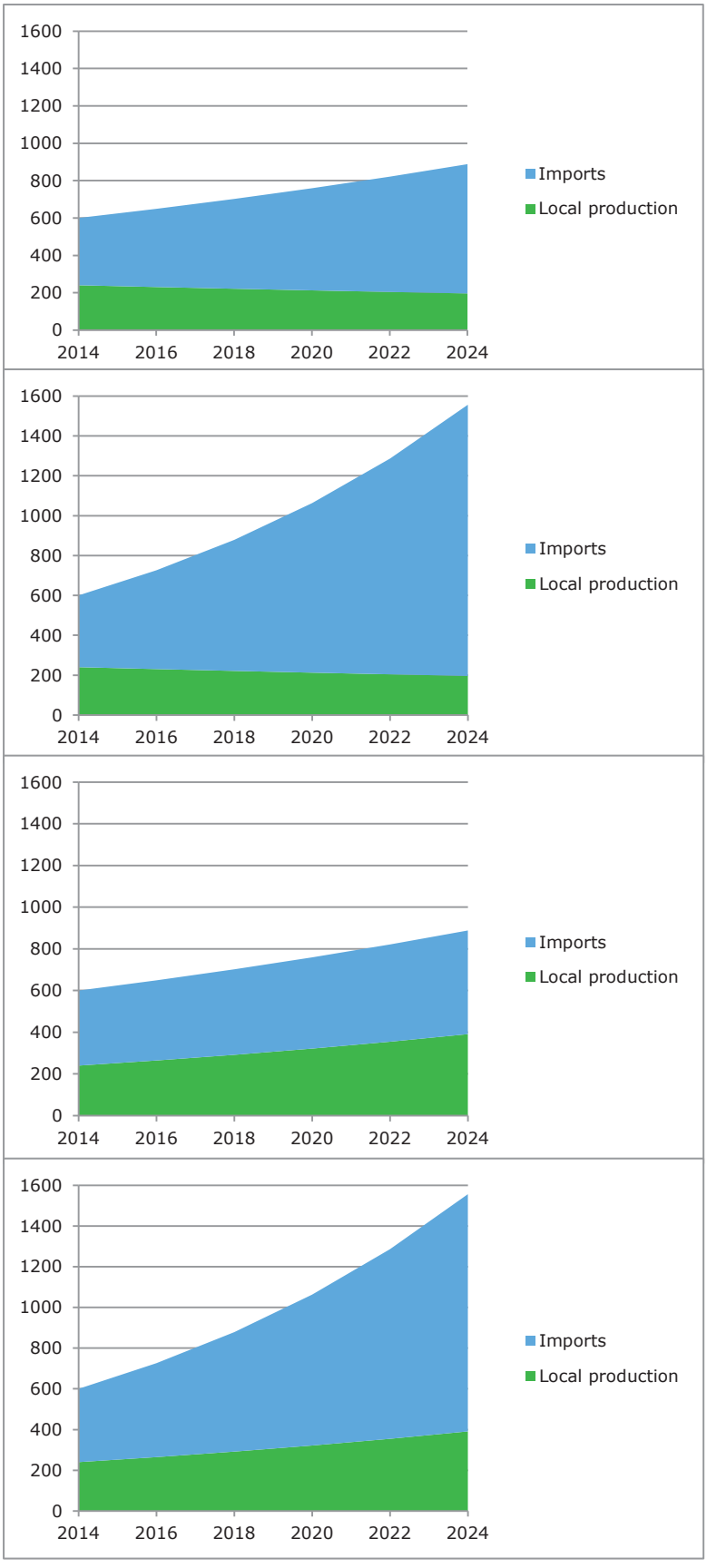


Based on the two conditions of economic growth and conducive policies, the following four, rather extreme, scenarios are elaborated for the coming 10 years, with the following conditions:

- "Low economic growth" is calculated at 4% per year, "High economic growth" at 10% per year;
- "Lack of conducive policies" results in 2% annual decline in local production, "Conducive policies" in 5% annual growth in local production *(5% can be considered as maximum potential growth for a dairy sector).*

Figure 6.2 Scenario projections for the next decade

All graphs: Consumption = Local production + Imports, in 1000 MT/year.



A. *Mickey Mouse scenario*

When neither conditions of economic growth and conducive policies are met, the downward spiral of the sector is likely to continue, and the sector will "shrink to mouse size". More processors will go out of business or compete in the high-end niche market. Dairy will get less attractive for farmers, who will turn to other livelihood activities.

B. *Donald Duck scenario*

When high economic growth occurs, local actors will try hard to meet increased demand (+150% in 10 years). However, if policies are not conducive, with high cost prices and poor quality the sector will not be able to compete with imports. Scrooge McDuck, the rich uncle in Singapore, will reap the benefits. The farmers will be no better off than in the Mickey Mouse scenario.

C. *Huey, Dewey, and Louie scenario*

With annual economic growth of 4%, consumption is not likely to grow more than that (<50% in 10 years). If conducive policies would make local production grow with 5%, local production would grow its market share vis-a-vis imports. Actually this would be a positive effect. It may be hard to achieve.

D. *Gladstone Gander scenario*

At first sight this looks like the ideal scenario. Growth of the sector by profitability along the value chain, resulting in upscaling of farms and companies, better margins through lower cost prices, and local products that can outcompete imports in terms of quality and price. However, both conditions of economic growth and conducive policies need to be met to achieve this. And as it is very difficult to make local production

grow by more than 5%, most of the extra consumption will need to be met by extra imports.

As macro-economic growth is beyond the control of dairy sector actors, in the remainder of this chapter we will focus on policy aspects and approaches for sector growth.

6.3 Suggested interventions

6.3.1 Dairy clusters

To develop a strong and suitable dairy sector, resources and efforts of various Ministries could be combined to develop dairy clusters in selected regions of Myanmar. The idea behind clusters is that a number of advantages can be achieved by clustering farms and services in a geographic area. These advantages include:

1. **Fodder** – Provided that land is made available for the purpose of dairy production, more / sufficient fodder can be produced; some farms could specialize in fodder production to cover the need for high quality forage whole year round (incl. silage and hay production). To cover the forage need, a ratio of 1 milking cow (+ youngstock) per acre / 3000 kg milk per acre could be used as rule of thumb.
2. **Extension** - Farmers can more easily learn from each other, as they are in closer proximity; farm advisers can reach more farmers in shorter time and can work with groups rather than with individuals. Same for researchers.
3. **Milk collection** – Collection is made more easy when farmers are together. Shorter collection lines improve quality of milk, as milk reaches the factory more quickly. Bulked supply of milk makes investments in processing facilities more lucrative.
4. **Input and service supply** – public and private suppliers of inputs like feed, health care, AI, and equipment will be more interested to reach farmers. They can bring down costs as they can more easily reach farmers.
5. **Shared facilities** – Farms could share facilities that are too expensive for one farmer, e.g. harvesting equipment and chilling tanks. Both cooperative and private ownership models are possible. The same is true for companies, e.g. laboratory facilities.
6. **Infrastructure** – investments in electrification, roads and communication may be more cost-effective
7. **Smallholder inclusion** – dairy clusters offer interesting opportunities for inclusion of smallholder dairy farmers in commercial dairy farming, gradually growing their farm size to that of a "specialized family farm" that is large enough to provide a decent income. Judging from the current size of medium size commercial farms, that would be around 30-50 milking cows. Such farms could co-exist with larger commercial farms, each having their own advantages. See further under 6.3.4.

6.3.2 Dairy strategy development

Possibly alongside dairy cluster planning, MLFRD could be assisted in developing a strategy for dairy strategy. Such a dairy sector strategic plan, with associated legislation & enforcement, may need to cover land, water, electrification, milk quality standards, laboratories, vaccination, disease control (incl. borders), training & education, farm advice, breeding strategy, imports, financing, and environmental care.

As part of this process, a national dairy forum could be organized to develop strategy and coordinate inputs between the relevant public actors and private companies from Myanmar, Thailand, Vietnam and beyond. This process may look for support from and alignment by development partners like JICA, KOICA, USAID, ACIAR, NZAid, FAO. and NGOs specializing in dairy development.

6.3.3 Capacity development

Considering the early stages the dairy sector is in, significant investments need to be made in capacity development all along the chain and in the enabling environment. These would need to include:

- **Education of technical staff** for cattle management, dairy processing and AI provision (vocational / diploma level)
- **Higher education** – animal husbandry, animal nutrition, fodder production, animal breeding, farm management milk processing, food safety
- **Higher education** – extend activities to research and outreach
- **Farm advisory services** – be they private or public; for smallholders and commercial farms; focus on cattle management, nutrition, health & reproduction, milk handling, farm management
- **Entrepreneurship** – business planning and operations; for companies and commercial farms
- **Producer organizations** – establishment and capacity building of private or cooperative farmer groups for collective marketing, input supply and service provision; at primary level as well as higher levels
- **Financial sector** – for banks and MFIs to cater to the needs of dairy farms and firms
- **Sector representation** – coordination and representation of dairy sector actors across the chain
- **Innovation platform -** chain-wide learning for dairy chain development to identify and carry out joint strategic actions for the dairy chain.

6.3.4 Smallholder engagement

Enlarging the number of milk suppliers can be achieved by new investments in commercial farms or by bottom-up growth of smallholder farms. As commercial farming has its own limitations and as livelihood development of smallholders is a stated objective of the government, the question of strategies for smallholder dairy development warrant some attention.

Practice in different contexts shows the need for sustained public investment in development of smallholder farms, where draught or beef cows are milked without further investment in production and marketing, to more productive and viable dairy farms connected to dairy supply chains. Private investors are willing to contribute to this development process once marketed surplus (per farm and per geographic region) is surpassing certain minimum amounts, or in other words, once sufficient scale is reached.

Myanmar already has a practice in which private processors invest in collection schemes for condensed milk production. Processing plants contracted large numbers of smallholder farmers to keep one or more dairy cows, from which milk was collected on a daily basis. Details differ from case to case, with either the farmer or the processor owning the cow, and either the farmer or the collector being responsible for feeding and/or milking. Due to the demise of the condensed milk production, this practice is under pressure, and alternative models warrant exploration.

Options for consideration include, either as stand-alone or in combination (see also par 6.3.1):

- **Nucleus farms** - Outgrower schemes with larger farms serving surrounding smallholder farms in areas of milk collection/marketing, feed & fodder production, AI & health care, extension etc. The NZAid Myanmar Dairy Excellence Project is using this approach in a two-tiered system: A larger "demo farm" serves a number of "smallholder nucleus farms" who in terms serve groups of smallholder farms.
- **Dairy villages** – Groups of smallholder dairy farmers share facilities like a milking parlour, cooling tank, etc. This model is popular in China.

- **Dairy cooperatives** – Farmers form a cooperative that takes care of i) milk collection, bulking, marketing, and sometimes processing; ii) collective purchase of inputs; iii) provision of services; or a combination of these. Basically the Dutch cooperative model / the "Amul model" from India.
- **Producer companies and groups**– Rather than forming a cooperative, in some contexts farmers prefer to create a private company that offers services to its shareholder farmers. A more informal structure of producer groups could be a starting point.

6.3.5 Dairy for child nutrition

The school milk programme promoted by the Government of Myanmar with the help of FAO and company donations (e.g. local processors and Tetrapak) can play an important role in supplementary feeding of children, accustoming them to dairy products. However, to be fully effective this program needs to be accompanied by increased availability of and access to dairy products, as well as a program that focuses on the more critical first 1000 days of child nutrition. Moreover, the strategy to scale this program to 5M children needs additional attention, especially when it comes to financing and to seasonality of consumption (less than 200 schooldays / year).

7 Conclusions & recommendations

7.1 Conclusions

Opportunity calls - The Myanmar dairy sector is a sector at the early stages of development. The current economic and political environment offer a unique opportunity to rebound to the strong growth era of the seventies and eighties of the previous century. In particular the following factors contribute to these opportunities:

- strong expected growth of demand for dairy products, as the middle & affluent consumer class and hence dairy consumption is expected to double in 8 years' time;
- abundant agricultural resources create a conducive environment for dairy, in particular the availability of energy- and protein-rich by-products and of grazing areas at intermediate altitude in Shan, Kachin and Chin States;
- good cooperation between chain actors, with sector coordination already being in place;
- world market prices for dairy are showing an upward tendency, giving local production an advantage vis-a-vis imports.

"Demand is expected to double in 8 years"

Key bottlenecks - To capitalize on these opportunities, the public and private actors in the sector together will need to work on two key issues to enhance competitiveness:

1. **The cost price of milk** needs to become competitive in the global market; as feeding costs generally constitute two-thirds of the cost price, improving the availability and quality of fodder - and to a lesser extent feed – is of prime importance; next to that, higher productivity can only be achieved if farm management is beefed up.

   Reduction of cost price hence requires:
   - conducive policies that support growth – land for fodder
   - improved input supply
   - service provision across the chain.

"One cannot build a sector on roadside grass"

2. **The quality of local dairy products** needs to meet the standards of middle and affluent class consumers – in terms of taste, shelf-life, presentation, and public health / food safety standards.

   Improvement of quality requires:
   - conducive policies that support quality assurance
   - cold-chain logistics and transportation.

" Garbage in – garbage out"

Policy development – MLFRD is already supporting the development of the dairy sector in general and smallholders in particular. Dairy farms and firms are expecting much better support from the Ministry and LBVD. Key areas of policy development include access to land, financing, capacity development/know how, and trade policies and import regulations.

Capacity building - The shortage of proper education, extension and research is hampering the development of the agricultural sector. Except for University level in veterinary sciences and the short-term training centre for government staff at Mingaladon, Yangon, no structural education and training on agriculture are available. There is a small governmental livestock extension service and no livestock research capacity, next to what the veterinary university has to offer. A number of capacity building activities in this area will be much appreciated, be they for groups of farmers or for individual companies.

Smallholder inclusion - This report has to limit itself to staging the discussion, indicating that smallholder inclusion likely warrants a public-private partnership in which companies, knowledge

institutes, and NGOs cooperate with support of local governments and bilateral aid. As none of the NGOs present in Myanmar seems to have experience with dairy development, introduction of specialized INGOs may be needed (FSWG communication).

7.2 Potential business cases

Based on this quick scan of the dairy sector in Myanmar, the following potential business cases for (Dutch) agribusiness are identified (in random order).

1. Calf milk replacer
   Currently limited amounts of raw milk are provided to the calves, mostly by letting the calf suckle the udder after milking. Obvious this limited supply of milk hampers good development of the calves and thus poor youngstock growth.
   Provision of calf milk replacer is a good opportunity not only based on calf needs, but also from a financial point of view as it is anticipated that 1 kg of milk based on milk powder is costing less than the sales price of 1 kg of fresh milk. A point of attention for the introduction of calf milk replacer is the provision of lukewarm water

2. Improved dairy concentrates
   Currently only a few concentrate factories are active in Myanmar, which are focused on processing pig and poultry feed. Only CP from Thailand is producing cattle concentrates (feeding quality is not known). As the Government is promoting and stimulating milk production, the demand for good quality (high protein) concentrates for cattle and youngstock will increase.

3. Dairy cattle minerals and vitamins
   Along the lines of what is mentioned above, minerals and vitamins are to be provided to dairy cattle to stimulate milk production and youngstock growth. These are not yet available.

4. Semen for AI
   Currently only 30,000 doses of bull semen of a dairy type bull are produced in Myanmar. This is by far insufficient in terms of volume, moreover the genetic quality of these local bulls are unknown. Most "larger scale" farms occasionally are importing semen from New Zealand, USA and Germany, but they demand a more regular supply of semen as well as a wider range of bull choices.

5. Stainless steel buckets and cans
   Only aluminium/steel/plastic cans are used for milk storage and transport. Stainless steel is not available and would contribute to a better milk quality and product shelf life.

6. On-farm can cooling
   Cooling of milk within 2 hours prevents the growth of bacteria present in raw milk. Milking times at farms and transportation to collection points and consumers in many cases requires over 2 hours. To introduce simple ice bank-based can coolers (e.g. solar energy based) would be an eye-opener.

7. Milk cooling tanks
   The larger dairy farms do need on-farm milk cooling tanks (200 to 1,000 kg) to cool and store the milk. In this way they could milk the cows twice a day; cooling of the milk will lead to a longer shelf life of the "heat treated" milk and milk products.

8. Milk collection centres
   As the commercial oriented dairy is at its infant stage and as the Myanmar dairy sector has great development potential, milk processing companies will start with establishment of rural milk collection centres. These require a range of equipment.

9. Milk testing and analysing equipment (MCC- and processing level)
   Currently milk quality is only tested with an alcohol and resazurin test. In the future more and better testing is required. Provision of simple testing equipment such as a lactoscan/milkotester is required. For the larger scale processing plant more accurate testing equipment is needed to determine milk composition and quality.

10. Mini milk processing plants
    Currently almost all larger scale farms have a milk heat treating facility, putting milk cans in boiling water. This is by far insufficient in terms of food safety and processing larger volumes. Introduction of small-scale milk processing plants able to pasteurize milk in batches (300 to 1,000 kg/day) or continuous-flow pasteurizers (500 to 1,000 kg/hour) would be a significant step up. Such plants could also produce yogurt and cheese products with a longer shelf life.

11. Forage testing and analysing equipment
    No feed or forage testing facilities are available to farms. Establishment of a central testing lab(s) under the umbrella of the Myanmar Livestock Federation will support the development of the dairy sector.

12. Herd administration
    Any form of herd administration is lacking in Myanmar. Introduction of a basic administration (paper or electronic) will surely support farm management and thus farming results. Introduction of ear tags would already be a good step forward.

13. Improved forage varieties
    A limited range of forage crops are used, introduction of better forage crops such as Rhodes grass, luzerne/alfalfa, and sorghum will improve milk production output.

14. Basic irrigation systems for forage production
    Myanmar has abundant water resources. To increase fodder production (yield, quality, seasonality), simple sprinkler irrigation systems are required. Some larger scale farmers are using these systems and are enthusiastic about the increase forage yields.

15. Bush mowers for forage harvesting
    Cutting fresh grass for the cattle is a time consuming activity that has to be done 365 days/year. Time seems to be a limiting factor in the number of cows one family can manage. Introduction of a handheld motor bush mower will increase the volume of grass provided to the cattle and also the cattle numbers/family.

7.3 Recommended strategies

7.3.1 Strategy development - Dairy clusters and dairy forum

The dairy strategy development process desired by MLFRD will benefit from grounding in practice, gathering evidence from recent experiences and from pilot initiatives that could be purposefully designed. Components could be experiences of the Myanmar Dairy Association, of the FAO SDDO project, of the NZAid Myanmar Dairy Excellence project, etc. Experiences in neighbouring countries, notably a country like Vietnam that recently has faced similar developments, could be a source of inspiration and learning as well.

This report recommends that a consultative process of dairy strategy development will be set up, that incorporates recent experiences in Myanmar and neighbouring countries. A national dairy forum may be part of a process of developing a dairy strategy and coordinating public and private investments.

This report also recommends piloting of dairy cluster formation for additional learning – a public-private partnership effort to facilitate growth of dairy production and marketing in a geographic area, jointly making available land, inputs, services, and dairy market access to a community of farmers.

The process of developing a dairy cluster pilot could include the following steps:

a. Dairy cluster design – Development of a first design to be discussed with interested stakeholders.
b. Feasibility study – Potential milksheds in Shan and other States, and Magwe and Sagaing regions need to be scouted to identify suitable areas where sufficient land and interested farmers are available. This should be followed by a feasibility assessment; development of second version dairy cluster design.
c. Public-Private Partnership for dairy cluster development - Identification of partners; design production support, collection grid, UHT plant, input & service providers incl. farm advice; could include an investment component, a smallholder inclusion component, and a capacity development & innovation component.
d. Further R&D support - research & development / innovation support in connection to b and c.

7.3.2 Capacity development interventions

This report recommends NEM to start a set of capacity building activities that will support the Myanmar dairy sector in key areas of capacity needs, as outlined below. Such activities will form an important source of learning about the sector and are expected to yield insights regarding additional involvement of Dutch actors. These activities should be carried out in close cooperation with sector actors, notably the NZAID MDE project.

Short term training activities

a. Cow Signal training for groups of farmers in Tatkone/NPT, maybe MDL, YNG, using a BTEC approach, in collaboration with the NZAid project.
b. PUM Netherlands senior expert program – senior expert deployment for business planning and operational support to a range of companies.
c. Tailor made training chain-wide learning for dairy chain development that analyses the dairy chain and identifies strategic joint actions.

Longer term capacity development activities

d. University - Assist Yezin University of Veterinary Science in developing animal science BSc and MSc curriculum, and to improve action research and outreach, possibly through a NICHE project.
e. Sector organizations – like MLF/MDA.
f. Producer organizations – farmer groups for collective marketing, input supply and service provision.

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Appendix 2. Terms of Reference for Dairy Sector Assessment Myanmar

1. **Context and background**
   The Ministry of Economic Affairs would like to explore the opportunities for supporting the development of the Myanmar dairy sector. Given current government policies (Aid & Trade, top sectors) such support may focus on private sector driven development. A leading role from Dutch agribusiness and a supporting role from the Dutch government seem desirable.
   EZ would like to see an inventory and analysis of the current status of the dairy sector and policy context, activities and interests of Dutch entrepreneurs, and programs already implemented or planned. The Agricultural Counsellor in collaboration with the Dutch Embassy can then use such an assessment to start a proper process of further exploration of opportunities for cooperation.

2. **Scope of assignment**
   An assessment should be carried out that explores the current status of the dairy sector in Myanmar, identifies likely development pathways, and identifies a range of short and medium term opportunities for private and public engagement.

3. **Assignment**
   Carry out an assessment in Myanmar with consultation of key actors and resource persons, leading to a report on sector development, a business opportunity brief, and an investment summit.

   The assessment should cover:

   a. Current context
   - Current status of the Myanmar dairy industry at chain and sector level (chains, products, prices and volumes, added values, expected trends). Qualification and quantification of the different chains and actors; SWOT of the sector and enabling environment; with attention for economic, social and environmental aspects
   - Dairy sector organizations - strengths and strategies of farmers' associations, leading industry associations, and sector organizations
   - Relevant government policies in the field of dairy production and marketing (legal framework, physical and service infrastructure, breeding programs, animal disease and food safety control systems, education and research, (sector) organizations; relevant policies & programs on rural development/poverty reduction, food security, livestock sector development
   - Business climate - priority of dairy sector in government policies, foreign investments
   - Overview of relevant donor programs, with aim, scope, approach, activities, implementing agencies, budgets, and key results so far; future plans and focus of donors
   - Current Dutch activities - Current Dutch actors and activities, incl. purpose and scope.

   b. Directions & opportunities
   - Main strengths & weaknesses, opportunities & challenges for the sector (3-5 years)
   - Scenarios for sector development that can be anticipated on; Priority issues and challenges to be addressed at various aggregation levels. Potential contributions by national governments, private sector parties, civil society actors, and donor agencies.

   c. Recommendations
   - Recommendations for development strategies of the dairy sector in Myanmar
   - Key investments that could be made by private and public actors
   - Options for coordination of joint action by Dutch private sector actors
   - Options for possible Dutch involvement in the dairy sector development (taking into account Dutch policy context and the tools available); Possible connections to Global Agenda of Action of the Livestock Dialogue; Opportunities for inclusion of smallholders in dairy value chains.

4. Team

- Team leader - Leads the team, communicates with Agricultural Counsellor, and takes responsibility for timely deliverable of work plan and report.
  Requirements: proven experience in study team leadership; able to make in-depth analysis of issues and opportunities across production and marketing systems, enabling environment, and sector development in ASEAN and other developing countries.

- Team member - business opportunities and SWOT analysis.
  Requirements: Proven experience and expertise in dairy business planning in range of countries including ASEAN.

- Local member (optional) – Analysis of value chain and/or enabling environment.
  Requirements: Experience and expertise in value chain analysis. Intimate knowledge of dairy production and marketing in Myanmar, and of policy context. Myanmar speaker.

5. Timing and deliverables:

- Mission in October 2014
- Debriefing to agricultural counsellor at end of mission
- Report and business opportunity brief within 1 month after mission
- Preparation and implementation of a one-day investment summit in Jan/Feb 2015.

Appendix 3. Mission schedule and people consulted

Date	Activity	People met	Email address
21-10-2014	Briefing Netherlands Economic Mission	Mr Geert Westenbrink, Agricultural Counsellor Saw Jackson, Assistant Agricultural Counsellor	Geert.westenbrink Jacksonkalipo@gmail.com
	Team meeting with Empower to discuss mission schedule and draft value chain description	U Aung Myo Thant, director U Thiha Oo, consultant U Pyi Kyaw Lynn, consultant	agmyothant@empowermyanmar.net
22-10-2014	Visit to open milk markets Insein and Tamwe	Local milk collectors and traders	
	Visit to Ocean and Gandamar supermarkets in Yangon		
	Interview	Dr Than Myint, FAO National technical expert	Myint.than@fao.org Thanmyint358@gmail.com
	Visit AI station Mingaladon	Dr Khin Maung Oo - Deputy Director	kmowtv0770@gmail.com
	Visit Food Security Working Group	Dr Min Ko Ko Maung, deputy coordinator	fswg.deputycoordinator@gmail.com
23-10-2014	Visit to commercial farms and processing plants around Yangon - Super Cow (farm and MCC) - Fun Hwa - Farmer Kyalsinthant		
	Interview	Mr Jeff Parry, consultant	milkmast@gmail.com
	Meeting at NEM	Mrs Carola Baller, Chargé d 'Affairs Mr Geert Westenbrink, Agricultural Counsellor Mr Jackson Kalipo, Assistant Agricultural Counsellor	carola.baller@minbuza.nl
24-10-2014	Travel to Mandalay (group 1) - Mya Bu Yin dairy plant - Double Cow MCC	 -Meeting with Owner and Director -Meeting with MCC operator	
	Travel to Naypyitaw (group 2) - Visit Yezin Agricultural University - Visit Yezin Veterinary University & farm - Meeting at Livestock Breeding & Veterinary Department, MLFRD - Visit to Ocean supermarket and Capital Hypermarket	 Prof dr Myo Kywe, rector Prof dr Ye Htut Aung, pro-rector Dr Zaw Lun Aung, Assistant director Dr Ok Kar Soe, deputy director	 Mkywe1@gmail.com Yehtutaung78@gmail.com Drzawlun084@gmail.com Okkar92vet@gmail.com
25-10-2014	Visits Mandalay (group 1) - Visit to 2 large dairy farms - Visit to 3 land medium sized farms without land - Meeting with roadside farmer - Visit to supermarkets - Meeting with Mandalay Area manager Myanmar School milk program	 Mr. Thura (MK group of companies)	 thuramg@gmail.com

	Visits Naypyitaw (group 2) - Aungkyantha farm - Super Cow farm - Fun Hwa farm and dairy plant - Unison farm - Shop of Mandalay Group - Kandar Ae village	U Maung Maung	
26-10-2014	Visits Pyin Oo Lwin (group 1) - Farm at Nan Qa Win Quarter - December dairy farm Visits Pyawbwe (group 2) - Shwelamin farm & condensed milk factory - Travel to Pyin Oo Lwin	U Thein Aung	
	Team meeting Pyin Oo Lwin		
27-10-2014	Travel to Yangon		
	Meeting with Myanmar Livestock Federation (MLF)	Dr Khin Hlaing, secretary Myanmar Dairy Association	drkhinhlaing@gmail.com
28-10-2014	Stakeholder meeting at MLF	*See separate list of names*	
	Meeting FrieslandCampina	Mr Ralf Roex, FC marketing manager	ralf.roex@frieslandcampina.com
	Visit to City Mart supermarket	Mya Thet Khine, merchandizing executive	myathet@city.com.mm
29-10-2014	Travel up and down to Naypyitaw Meeting at MLFRD	H.E. U Ohn Myint, Minister Dr Aung Myat Oo, deputy minister	
30-10-2014	Debriefing NEM Visit to UNOPS/LIFT	Mrs Carola Baller, Chargé d 'Affairs Dr Curtis Slover, Program Officer Rural Finance & Value Chains U Than Tun, off-farm income generation officer	carola.baller@minbuza.nl curtiss@unops.org thant@unops.org
	Visit to Yangon Region LBVD	Dr Myint Swe, director	
	Visit to MLF	Daw Nilar Hlaing, head of office	myanmarlivestock@gmail.com
	Apart from mission		
	Mr Sybren Attema	Friesland Campina	
	Mr Geoff Mavromatis	Project Director, Myanmar Dairy Excellence Project	geoff@agribusinessgroup.com
	Mr Lammert Fopma	The Friesian	

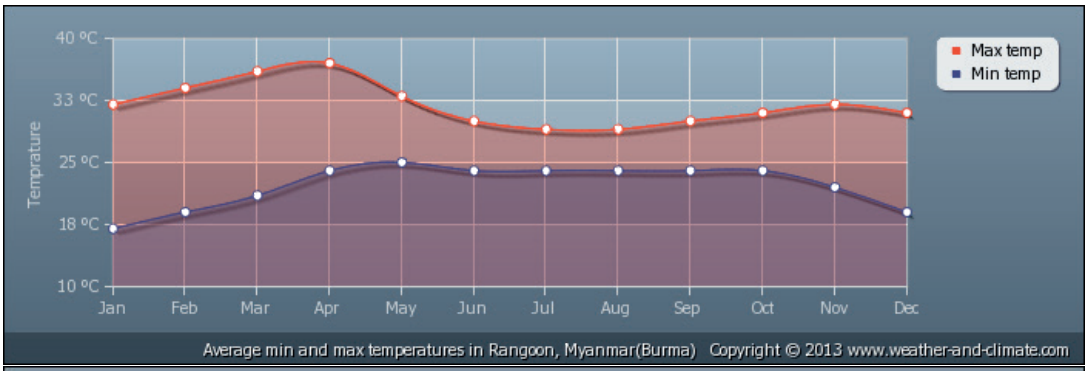
Appendix 4. Participant list stakeholder meeting

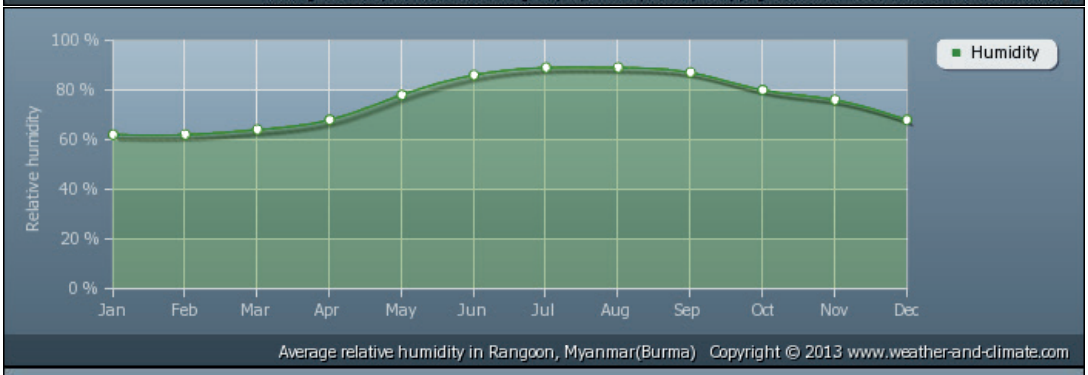
No	Position	Business & position	Phone
1	U Win Sein	Vice Chairman, MLF	09-5003393
2	Dr Than Hla	Executive Advisor, MLF	
3	Dr Khin Hlaing	Secretary General, MLF	09-8503075
4	Dr Pe Tin	Vice Chairman MAA	09-450024238
5	Dr Soe Min	Secretary Myanmar Vet Association	09-5188298
6	Dr Hla Hla Thein	Vice Chairman (3), MLF	09-5147058
7	Dr Min Soe	Rector(retired), University of Vet Sc.	01-501029
8	Mrs Carola Baller	Head of Mission Netherlands	09-402532314
9	U Hlaing Win Lwin	Director, Silvery Pearl Dairy	09-5062648
10	Daw Than Than Maw	WALCO	09-5411467
11	U Maung Maung Aye	WALCO	09-5416207
12	U Kyaw Soe Lin	Double Cow	09-5351122
13	U Thant Zaw Hein	Double Cow	09-5351122
14	U Kyaw Soe Lin	Double Cow	09-5013558
15	Dr Thet Ni	PEP Dairy products	09-976415508
16	Mr Neil R. Macintyre	Dairy Myanmar	09-250722029
17	Dr Than Myint	Consultant-FAO / L.B.V.D.	09-421125369
18	Dr Su Su Hla Win	L.B.V.D. (South Dagon Township)	09-250191566
19	Dr Win Nandar Khaing	L.B.V.D. (Shwepyithar Township)	09-31518939
20	Dr Su Myat The	L.B.V.D. (Thanlyin Township)	09-43035307
21	Dr Aung Aung	L.B.V.D. (Shwepyithar Township)	09-31070669
22	Dr Sein Sein Gyi	L.B.V.D. (Mingaladon Township)	09-421060357
23	Dr Tin Tun	L.B.V.D. Township Vet Officer	09-5193656
24	Dr Than Lwin	L.B.V.D. Township officer	09-5150784
25	Dr Kyaw Ko Ko Maung	L.B.V.D. Township officer	09-250102503
26	Dr Than Myo Oo	L.B.V.D. Township officer	09-420120279
27	Dr Min Ko Ko Maung	FSWG - NGO network	09-250102503
28	Mr Martin de Jong	Agri works	
29	Dr Xin Ying Ren	Wageningen UR Livestock Research	
30	Mr Jan van der Lee	Wageningen UR Livestock Research	
31	U Aung Myo Thant	Empower	
32	U Thiha Oo	Empower	
33	U Pyi Kyaw Lin	Empower	
34	Daw Su Su Naing	Empower	
35	Ko Zar Ni	Silver Sea Journal	09-43125185

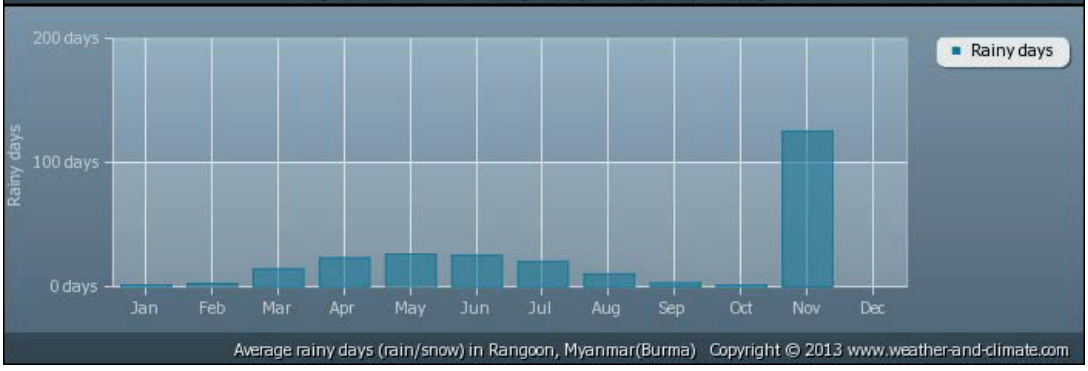
Appendix 5. Climate data Yangon and Mandalay

Yangon

- The months June - September have a comfortable average temperature.
- On average, the temperatures are always high.
- Rainy season during the period of May - October.
- Dry period December-April.
- On average, the warmest month is April and the coolest is July.
- August is the wettest month while February is the driest.

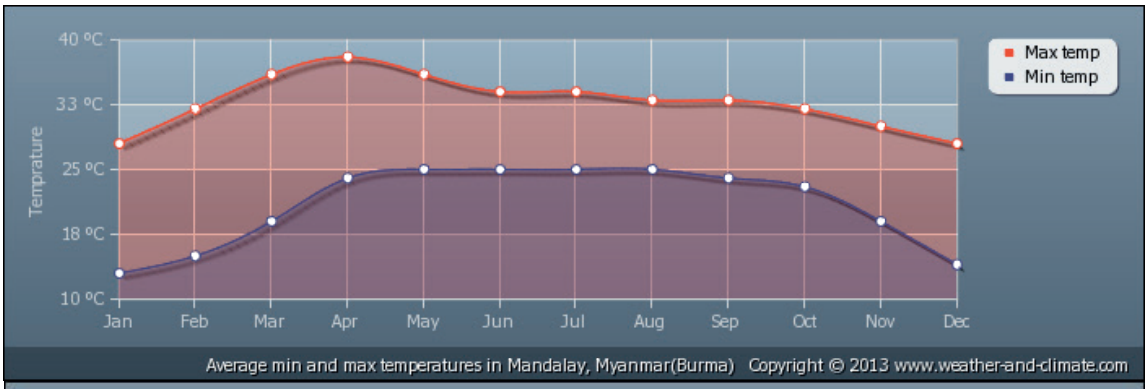


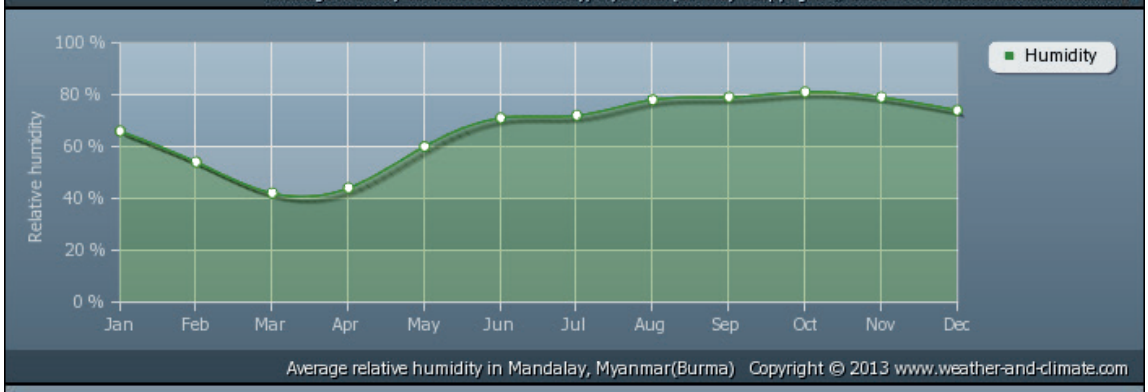




Mandalay

- The months November -February have a comfortable average temperature.
- Rainy season is May - October.
- Dry period December- March.
- The warmest month is April and the coolest is January.
- October is the wettest month, while March is the driest.





Appendix 6. Key processors and commercial farms

Myabuyin
Myabuyin is the biggest sweetened condensed milk in Myanmar, located in Kyaukse area of Mandalay. The plant is currently processing 60,000 kg of fresh milk per day. Myabuyin is the only one sweetened condensed milk manufactured by using pressure pump technology while the other smaller producers are processing by traditional method. Myabuyin has no own cattle farm now. It has 1,200 contracted farms of total milking capacity of 50,000 cows. Myabuyin also owns a sugar mill located in Naungshwe, southern Shan State, with production capacity of 16,000kg per day/200,000 (40kg) bags / year. 80% of sugar production goes to its own sweetened condensed milk and the rest go to soft-drink manufacturer and wholesales market.

TM
TM has experience for farming business over 40 years. TM owns two firms, one in Yangon (30 acres) with 1,100 dairy cows and the other one in Naypyitaw with 50 dairy cows. It has production capacity of 1,600 Viss/2,560kg/day from the firms. Current production is pasteurized milk 80% and yogurt 20%. The process kills bacteria at 100 degree temperature to have pasteurized milk. One production run is 350Viss/560kg, taking 2.5 hr. TM mainly distributes to supermarkets and bakery shops. Main product size is 1 litre PE bottle targeted for family consumption. Demand for TM milk is increasing and plans to expand production line by increasing cow capacity. TM also own additional 1.5 acre land for new factory and new production line.

Fun Hwa
Fun Hwa own 300 cows in Yangon and 100 cows in Naypyitaw. Total production capacity of both farms is 1500Viss (2.4MT) per day. Fun Hwa also collects raw milk around 1,500-2,000 Viss (2.4 ~ 3.2MT) from nearby contracted farms. It said production is limited by the availability raw milk. Main customers are famous bakery shop such as SEASON, hotels such as Chatrium and supermarkets. It produces yogurt also. Ranging from 30% to 70% of milk production goes to yogurt depending on the situation. Fun Hwa said so far long shelf life span is not required because of end user's daily purchase. Main production is 1 litre bottles of pasteurized milk. Shelf life is 7 days maximum. Fun Hwa is thinking to expand cow capacity to 1,000 cows in 3~5years if better longer shelf life technology can be applied.

Super Cow
Super Cow has now 360 cows in Yangon farm on 27 acre land (and 50 cows in Naypyitaw). Among them, 100 cows are producing. Total production is 350 Viss/560kg/day. Most of the cows are local hybrid cows that can yield 3.5 Viss/5.6kg/cow/day while Frisian cows can produce 8 Viss/12.8kg/day. Apart from the own production, the Yangon farm also collects 1000kg/day from contracted farm. Main production is 1 litre bottles, mainly delivered to supermarkets and bakery shop. Super Cow said cow capacity cannot be increased due to shelf like problem. Shelf life of Super Cow pasteurized milk is only 5 days. They are interested in UHT filling machine with pouch for production cost saving. They plan to increase cow capacity only after investing in UHT machine. Super Cow gets semen straws supplied by AI/FAO. AI distribute only 20~25 straws per month at 5,000~6000 Kyat per straw. Super Cow feed cut grass, sesame oil cake and brewery waste. Super Cow buys brewery waste from Dagon Brewery operated by Myanmar Economic Corporation.

The farm in the Naypyitaw breeding zone in Tatkone has 85 heads of which 30 are being milked. Production is 12 viss/20 kg per cow per day. They feed on chopped natural grass, brewers' waste from Yangon, rice bran and bean meal. In the dry season corn straw and rice straw replaces grass. Recently Napier was planted. Calving interval is 12 months, with AI or natural mating. When milk production goes down, bulls are sold to buy additional heifers. As the owner is of Indian descent, getting credit is difficult. Even though crossbreds are a bit less productive, he prefers them, as they are more sturdy. Milk is sold to Shwebazon bakery at 1350 Kyat/viss (good quality only) and to Fun Hwa yogurt factory at 800 Kyat/viss (guaranteed throughout the year).

Aungkyantha farm
The farmer ofd this new farm in Tatkone is a son of the Super Cow farmer nearby. He is milking 40 out of 70 cattle, that produce 6 Viss/day per head. Cattle were purchased from other farms. They feed on grass, chopped Napier, and brewers' waste. Manure is sun dried and turned to get granules.

Double Cow
Double Cow has no own cattle farm. They collect milk from small scale dairy farm in Mandalay area, then transports to Yangon to process. They are also establishing processing plant in Mandalay. Double Cow's production volume is 8,000kg per day (6,000kg for pasteurized milk and 2,000kg for yogurt). Double Cow engaged with MK group and Tetra Pak for joint-venture business to produce UHT milk.

Walco
Walco is also collecting milk from contracted cattle farm to produce pasteurized milk and yogurt. Owner is Dr Khin Hlaing, Secretary of Myanmar Dairy Association. Walco supplies its products to super markets, retail outlets, hotels, bakeries and home delivery.

Ngwezinpale (Silvery Pearl)
They are one of the biggest milk and yogurt manufacturers in Yangon. They have knowledge about UHT milk pouch application. Total milk production volume is 6MT/day, roughly 4MT/day is for fresh milk (no sterilization) and 2MT/day is pasteurized milk, which is packed in PE pouch with heat-seal, PE bag with rubber band and, PE bottle. Pasteurized milk has 10-12 days shelf life in chilled storage.

Kyalsinthant
It has 200 cows, including contracted farms. Out of 200 cows, 100 can work for productions, the rest include pregnant & baby cows. Raw milk 800 Viss (1.3MT), 8 Viss/cow, can be collected from own farm. Out of 800 Viss, 70% is for pasteurized milk and the rest quantity for yogurt. Feeds for the farm include cut grass, sesame oil cake, mixed feed and brewery waste.

Unison
Unison owns 200 cows in a 143 acre farm in NPT. Production is 300 Viss/480kg/day. Unison produces raw milk, yogurt and milk powder. The farm has 4 homogenizers (2 units in Naypyitaw and 2 units in Mandalay). Also, they have 2 boiler units (1 unit in Naypyitaw and 1 unit in Mandalay). Nan Wai brand milk powder production is now stopped due to competition from imported milk powder, especially from China. The farm has close relationships with Ministry of Livestock, Fisheries and Rural Development. At time of visit, the farm was gradually transitioning to pig production. Cattle were fed very poorly.

Shwelamin
This new farm of an seasoned condensed milk factory in Pyawbwe, between Naypyitaw and Meikthila, is hailed as the "best farm design in Myanmar". 2 concrete floored feeding sheds and 3 dirt floored laying sheds are positioned parallel to each other. Some 100 cows out of 200 cattle are milked and produce 7 Viss/day per head. Cows are fed on irrigated napier (4 acres), which is cut at 45 days, chopped corn straw (15 acres), rice bran, bean meal, sesame cake; no brewers waste as it is unavailable. Supplements are fed dissolved in water (individual). Calving interval is 12 months. All manure goes to the Napier.

December
December owns 134 acres of land in Pyin Oo Lwin. The farm is located alongside the Mandalay-Muse high way. They own 200 cows including pregnant cows. Among them, some are imported Friesian cows imported/purchased from Choi Chai farm of Thailand. Current production is 400 Viss or 650kg/day. Selling price of raw milk in Pyin Oo Lwin is 900 Kyat/Viss and 1000 Kyat/Viss in Mandalay. Raw milk delivered to own restaurant in Pyin Oo Lwin, supermarkets in Mandalay and some to school milk. December farm plans to increase farm areas in resort area and cow capacity to 500 in the future. After investing in UHT machines, cow capacity can be increased and also increase raw milk collection from contracted farms. December farm owners have already studied about UHT milk processing plants overseas. They visited to Shanghai and other areas of China to check UHT machine supply sources. December estimates investment cost up to USD 2 million for the whole factory set up (machines, services & technical knowhow). December plans to apply for a factory license for pasteurized milk and UHT production.

Appendix 7. Input and product prices

Fuel & electricity

• Diesel	@ 950 Kyat/litre
• Electricity for industrial use	@ 75 Kyat/kWh
• Electricity for household use	@ 35 Kyat/kWh

Ingredients and packaging

• 1 ltr bottle	@ € 0.07 - € 0.18
• sugar	@ € 0.47/kg

Calf growth

• Calves after 3 month	@ live weight of 25 kg
• Calves after 24 month	@ live weight of 260 kg

Livestock selling/buying

• Selling male after 24 month at live weight 277 kg	@ € 201 (Yangon)
• Selling bull calf < 1 week	@ € 44.14 to € 48.16/head (Mandalay) @ € 16,05/head (Yangon)
• Selling bull calf at 5 month of age	@ € 120/head (Yangon)
• Selling adult cow for meat	@ € 321 to 401/head (Mandalay)
• Selling heifers of 14/16 month of age	@ € 401/head (Mandalay)
• Selling fresh cow + calf	@ € 1.035/set
• Buying adult cow	@ € 1,205/head

Feed stuff

• Cottonseed cake	@ € 0.25/kg
• Sesame seed cake	@ € 0.59/kg
• Rice powder	@ € 0.08/kg
• Bean powder	@ € 0.22/kg
• Brewers grain	@ € 24 - € 30/ton
• Sugarcane pallet	@ € 0.49/kg
• Fresh grass	@ € 0.20/kg / € 0,08/bundle
• Rice straw	@ € 0.08/kg - € 0.09/kg
• CP concentrates	@ € 0.32 - € 0.49/kg

Land

• Yangon, 1 acre	@ 1.605 i.e. @ 3.933/ha – € 2,408/ha

Imported Semen **@** € 8

Labour

• Yangon	manager	@ € 121/month
	supervisor	@ € 80/month
	labour	@ € 56/month

Appendix 8. Data on imported products

The data in this appendix illustrate the registered import of dairy products into Myanmar for the period of January 2012 – August 2014.

Table A

Import Statistics for Dairy Products (January 2012 to August 2014)

SR	PRODUCT	2012 (Jan-Dec)	2013 (Jan-Dec)	2014 (Jan -Aug)
		Qty (TNE)	Qty (TNE)	Qty (TNE)
1	EVAPORATED CREAMER	23,525	24,828	17,346
2	MILK POWDER	7,249	6,873	4,825
3	SWEETENED BEVERAGE CREAMER	18,190	13,479	11,839
4	WHOLE MILK		355	2,772
5	FUL CREAM MILK	1,375	988	852
6	BEVERAGE CREAMER		3,786	1,612
7	BUTTER	765	1,181	506
8	PURE MILK	36	1,214	326
9	WHEY POWDER	1,192	1,453	1,222
10	SKIM MILK POWDER	611	199	408
11	UHT MILK	1,555	893	1,359
12	CHEESE	354	315	370
13	DAIRY PRODUCT	417		
14	WHIPPING CREAM	47	119	38
15	SWEETENED EVEPORATED FILLED MILK	47		402
16	CONDENSED MILK	0	186	237
17	UNSWEETENED EVAPORATED FILLED MILK	195	14	
18	FORMULATED MILK		9	22
19	EVAPORATED FILLED MILK		22	143
20	YOGHURT	42		38
21	TOPPING CREAM		68	53
	TOTAL	55,602	55,983	44,371

Source: Custom Department, Ministry of Commerce.

Table B

Importers of Dairy Products (January 2012 to August 2014)

SR	PRODUCT	2012 (Jan-Dec)	2013 (Jan-Dec)	2014 (Jan -Aug)
		Qty (TNE)	Qty (TNE)	Qty (TNE)
1	PUNYOMA INT'L CO LTD	10,244	15,931	11,102
2	SEIN MYO DAW CO LTD	6,746	11,794	2,859
3	LAMINTARYAR MINING CO LTD	1,292	2,641	2,182
4	SEIN WUT HMON CO LTD	4,001	2,814	8,050
5	SUPER ONE INTERNATIONAL LTD		4,274	6,630
6	MOE HTET GABAR CO LTD	698	846	429
7	MOON TEN TRADING CO LTD	5,401	3,301	
8	PAHTAMA GROUP CO LTD	518	580	644
9	PREMIER CO LTD	1,295	693	650
10	YE NADI CO LTD	5,552	411	408

11	FU XING BROTHER CO LTD	581	647	731
12	STAR WAY CO LTD	4,184		
13	HEIN GOLDEN GLOBAL	1,111	2,145	1,119
14	TRIANGLE TRADING CO LTD	207	151	106
15	TOP CO LTD	3,192		
16	LAMINTARYAR CO LTD	1,053		
17	SERVICE CITY TRADING	56	49	297
18	TAUNG PYAR DAN CO LTD	1,088	1,675	3,200
19	PREMIUM FOOD SERVICE	274	828	551
20	ORIENTL ASPIRATION	233	318	98
21	OTHER IMPORTERS	7,885	6,435	5,273
	TOTAL	**55,602**	**55,983**	**44,371**

Source: Custom Department, Ministry of Commerce

Table B shows regular importers of dairy products into Myanmar. They can be categorized into the groups of: distributors, food processors, supermarket and retail outlets, hotels and suppliers to the government procurement.
The importers at the top of the table such as PUNYOMA INT'L CO., LTD and SEIN WUT HMON are importers of well-known condensed milk Dawn and OK respectively. Dawn and OK are top selling brands for the use at tea shops.

Table C

Myanmar Dairy Product Imports by Country of Origin

SR	COUNTRY OF ORIGIN	2012 (Jan-Dec)	2013 (Jan-Dec)	2014 (Jan -Aug)
		Qty (TNE)	Qty (TNE)	Qty (TNE)
1	SINGAPORE	44,705	46,963	35,861
2	NEW ZEALAND	3,008	2,737	2,762
3	AUSTRALIA	2,157	829	1,007
4	MALAYSIA	887	1,079	1,202
5	THAILAND	1,230	615	1,126
6	UNITED STATES OF AMERICA	1,247	101	111
7	CHINA	657	928	335
8	INDONESIA	303	472	78
9	POLAND	106	262	288
10	VIETNAM	81	96	89
11	NETHERLANDS	199	163	44
12	INDIA		171	307
13	GERMANY	140	325	59
14	IRELAND	50	12	50
15	FRANCE	53	77	35
16	PHILIPPINES	19	54	54
17	UNITED ARAB EMIRATES		320	85
18	SWITZERLAND		254	12
19	REPUPLIC OF KOREA	77	18	5
20	DENMARK	37	86	8
21	OTHER COUNTRIES	647	422	854
	TOTAL	55,602	55,983	44,371

Source: Custom Department, Ministry of Commerce

Myanmar imports dairy products from the countries shown in table B. Given the import volume, New Zealand and Australia top the list in table C, while Singapore is just a transit country in terms of trade and logistics.

Table D

Imported dairy product brands

1	ANCHOR	18	GOLD	35	MOZZA
2	ANLENE	19	HAI HAI & GUN GUN	36	MOZZARELLA
3	APPETON	20	HAMMER	37	NESTLE
4	BULLA	21	HAPPY COW	38	NGUYEN
5	CHAMP	22	HOCH LAND	39	NZMP
6	CHEDDAR	23	JUNIOR	40	OK
7	COW BELL	24	KRAFT	41	PARMESAN
8	COWHEAD	25	LA VACHE	42	PAULS
9	DAWN	26	LACTASOY	43	PEDIASURE
10	DUGRO	27	LACTOGEN	44	PRESIDENT
11	DULAC	28	LACTOSE	45	RAINBOW
12	DUMEX	29	LUCKY COW	46	REDMAN
13	DUPRO	30	LUCKY ONE	47	SANDWI
14	DUTCH LADY	31	MAGNOLIA	48	SIMILAC
15	ENSURE	32	MARIGOLD	49	STAR
16	GAIN IQ	33	MEDOW	50	VIVOS
17	GLUCERNA	34	MLEKOMA		

Source: Custom Department, Ministry of Commerce

Table D shows, in alphabetical order, the brands of all dairy products officially imported into Myanmar in the period January, 2012 to August, 2014.

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