DAIRY VALUE CHAIN ASSESSMENT FOR YANGON AND MANDALAY REGION, MYANMAR

Prepared by **Jan Hinrichs**

with contributions from **Murray MacLean, Wah Wah Han, Ye Tun Win, Tun Min**

Asia Dairy Network Working Paper 1

The Asia Dairy Network (ADN) was established in 2012 by the Animal Production and Health Commission for Asia and the Pacific (APHCA) as part of a Smallholder Dairy Development Program supported by the Food and Agriculture Organization of the United Nations (FAO) and the Common Fund for Commodities (CFC). The main objective of this network is to improve the communication between the various dairy industry stakeholders in the Asia region so as to facilitate in the sharing of knowledge and experiences.

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Summary

Consumption of fresh (pasteurized) milk has been limited to infants and elderly people. Milk processing is mainly oriented towards producing sweetened condensed milk to supply consumer preferences for tea with added sweetened condensed milk. Milk processing is in most cases done without any official certification or quality control. Domestic production is currently not competitive with imported dairy products. 18,000 tons of sweetened condensed milk have been imported at an average import price of USD 0.973/kg in 2010/11[1]. The average domestic wholesale price level is more than 100% above the import prices and varies between USD 1.14/kg and USD 2.70/kg.

Milk for processing is collected via networks of milk collectors. Milk producers are highly reliant on market access which milk collectors are providing. Milk collection with a driving distance of up to 30 miles has been reported.

Three different production systems can be classified: 1) Low intensity native cattle systems; 2) Low intensity Holstein Frisian cross-bred dairy systems; 3)High intensity Holstein Frisian cross-bred dairy systems.

The most common dairy herd productivity or health problems reported by the herd owners are: 1) Fertility/reproduction problems; 2) Mastitis; 3) Leg joint and claw problems; 4) Digestive tract problems: Ketosis and displaced abomasums; 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. Infectious 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.

A 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.

[1] Based on market exchange rate of 850MK/USD for 2010/2011

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Milk consumers

Milk is mainly consumed in the form of hot tea with condensed and evaporated milk. Consumption of fresh (pasteurized) milk has been limited to infants and elderly people. Tea shops do not generally have pasteurized milk available to serve a cup of hot milk and would use sweetened condensed milk with water for this. Interviewed dairy farmers in Mandalay region were generally not consuming any milk. However, compared to the consumers in Mandalay region urban consumers in Yangon have more access to supermarkets and are consuming slightly more fresh (pasteurized) milk and different varieties of yoghurt are also introduced into the market. In Yangon area a school milk programme for one village school has been initiated and funded by a dairy processing plant for 6 years and this programme has recently been expanded on a rotational basis to other schools in collaboration with a meat processor (see Annex 1 – Field data documentation - Mingaladon, Yangon, (08:14) pm 16/08).

Although sweetened condensed milk is representing the bulk of domestically produced products, a large variety of milk products is available. One milk storage product for farmers is 'solid milk' which is produced in the farmer household with the sap from a locally available plant. Indian descendent communities produce a large variety of traditional products such as 'Peda', ' Barfi', 'Gulab jamun', etc. (see Annex 1 – Field data documentation - Htun township/ pm-17/08).

Liquid milk

Sweetened and unsweetened, pasteurized and unpasteurized milk is bought in supermarkets in plastic bottles or plastic bags in serving sizes from 220 to 2,000ml. Low fat and full cream variations of pasteurized milk are also available. Retail prices for unsweetened full cream pasteurized milk in Yangon supermarkets vary between 1.33 to 1.86 USD/litre (1,600 to 2,240 MK/viss). Although pasteurized milk is available in Yangon supermarkets and raw cow and buffalo milk is available in two milk markets in Yangon it is still a niche market. In Mandalay region supermarkets are less prevalent than in Yangon and pasteurized milk is consumed on an even smaller scale compared to Yangon.

Milk powder

Milk powder is mainly used for the production of condensed milk and a smaller amount is sold as actual powder for household use. Milk powder is available in supermarkets and sold as hot beverage creamers or as infant formula. Foreign branded products are predominant. Only one company in Mandalay region possess the technology to produce milk powder and would mainly use it as a longer term raw milk conservation tool to eventually produce condensed milk (see Annex 1 – Field data documentation - 22/08-14:57).

Yoghurt

Freshly served bulk yoghurt is available and consumed with sugar and fruits added in newly opened shops in Mandalay. Cup yoghurt and drinking yoghurt from domestic production and with foreign brands are available in Yangon supermarkets. Yoghurt is still representing a very

small niche market in Yangon and Mandalay region. However, more domestic milk processors are entering this market. Retail price examples for yoghurt are:

- USD 1.50/kg (1,800 MK/viss) for unsweetened yoghurt sold in 0.178 kg plastic cups in Mandalay shops
- USD 1.69/kg (2,036MK/viss) for 8% sweetened yoghurt sold in 0.220 kg plastic cups in Yangon supermarkets
- USD 2.22/kg (2,667 MK/viss) for bulk yoghurt served in 0.3 kg bowls with sugar and fruits added in yoghurt shops/restaurants in Mandalay

Sweetened condensed milk

By far the largest proportion of milk is consumed as sweetened condensed milk in tea. It is bought in plastic bags in card board boxes or plastic bins. Tin cans of sweetened condensed milk are also available in the market. Wholesale prices for sweetened condensed milk vary between USD 1.14/kg and USD 2.70/kg (Table 1). The average domestic wholesale price level is more than 100% above the average import price of USD 0.973/kg in 2010/11 (Table 5).

Table 1 Sweetened condensed milk wholesale prices

Scale	Township	USD/kg	MK/viss	Characteristics
Large scale Mya Ba Yin (95% production in Mandalay area)	Kyaukse	1.90	2,286	30 % sugar content, agent, Yangon train station
Large scale	Mektila	2.05	2,461	Yangon agent train station
Medium scale	Sagaing	2.70	3,250	35% sugar
Small scale bathtub production	Monywa	1.41	1,700	30% sugar, delivery to local tea shops included
Average		**2.01**	**2,424**	

Evaporated milk

Evaporated milk is added, in addition to sweetened condensed milk, to hot tea at varying levels to complete the taste. Reportedly only one company (‘Dairy Queen’) in Mandalay region possesses the technology for evaporated milk production.

Estimated quantity of domestic milk consumption

The total urban milk consumption can be estimated at 1,5 million metric tons per year. This estimation is based on an assumed daily consumption of 1.5 cups of tea with 0.08 kg condensed milk and half this amount of evaporated milk (Table 2). In 2010/11 a raw milk equivalent of 132,061 metric tons has been imported which represents 8.60% of the estimated urban milk consumption per year.

Table 2 Estimated urban milk consumption

Item	Quantity	Source/Assumption
Mandalay and Yangon population	53,999,804	CIA factbook
Urban %	34%	CIA factbook
Urban population	18,359,933	
Condensed milk consumption/capita/day (kg)	0.080	1.5 tea cups/day
Evaporated milk consumption/capita/day (kg)	0.040	50% of condensed milk
Raw milk equivalent consumption/capita/day (kg)	0.23	
Annual milk consumption/capita (kg)	83.60	
Annual urban milk consumption (metric tons)	1,534,831	
Annual import raw milk equivalent (metric tons)	132,061	
% proportion import/domestic consumption	8.60%	

The quantity of raw milk delivered from dairy herds for processing was estimated by Dr. Ye Tun Win (LBVD) at 21,672 tons/year (Table 3). This estimate is about 65 times less than what the estimated demand based on assumed tea consumption in Table 2 suggests. Further primary data collection on the consumption of milk would be required to verify the estimates in Table 2 and Table 3.

Table 3 Estimated milk delivery per region

Region	Milk delivered viss/day	Milk delivered kg/day	Milk delivered ton/year
Mandalay	60,000	96,000	35,040
Meikthila & Pyawbwel & Yamethin	10,000	16,000	5,840
Yangon	10,000	16,000	5,840
Monywa	10,000	16,000	5,840
Pyinoolwin	5,000	8,000	2,920
Total	**95,000**	**152,000**	**55,480**

Source: Dr Ye Tun Win, LBVD presentation 'Study of the Dairy Husbandry in Mandalay Region'

Milk imports

In addition to the domestically produced milk imports of sweetened condensed milk, milk powder and evaporated milk are consumed. In 2010/11 the import of 18,081 metric tons sweetened condensed milk, 5,081 metric tons milk powder and 18,577 metric tons evaporated milk amounted to an import value of USD 47.94 million (Table 4). The value of milk product imports has steadily increased during the last 4 years at an annual rate between 2 to 5 %. A total raw milk equivalent of 132,061 metric tons has been imported in 2010/11.

Table 4 Milk product import quantity, value and raw milk equivalents from 2007 to 2011

Year (April - March)	Sweet Condensed Milk (metric tons)	Milk powder (metric tons)	Evaporated (metric tons)	Total value (USD millions)	Raw milk equivalent[2] (metric tons)
2007-2008	31,321	6,047	1,763	35.94	122,111
2008-2009	20,964	1,604	15,354	41.03	90,024
2009-2010	23,494	5,115	14,661	45.91	131,379
2010-2011	18,081	5,081	18,577	47.94	132,061

Source: Ministry of Commerce and own calculations

Sweetened condensed milk

Imported condensed milk is consumed in tea shops as a substituted to domestically produced condensed milk. Consumers reportedly pay a premium for tea with imported condensed milk, although the input price for imported condensed milk is lower. A tea shop in Mandalay area is using about 50g, equivalent to MK 67, per cup of tea. Domestically produced milk is used by the same tea shop at a purchase price MK83 per cup (see Annex 1 – Field data documentation - 20/08-13:16). The main sources of sweetened condensed milk imports are Singapore, Malaysia and Thailand. from 2007-2011 the quantity and value of imported sweetened condensed milk has decreased. In 2010/11 a raw milk equivalent of 29,163 metric tons at the unit cost of 973 USD/ton or 1,323MK/viss has been imported (Table 5).

Table 5 Sweetened condensed milk import quantity, value and raw milk equivalents from 2007 to 2011

Year (April - March)	Sweet Condensed Milk (metric ton)	Total value (USD millions)	USD/ton	Total value (million MK)[3]	MK/kg	MK/viss[4]	Raw milk equivalent (metric tons)
2007-2008	31,321	26.08	833	33,904	1,082	1,732	50,517
2008-2009	20,964	20.87	996	22,957	1,095	1,752	33,812
2009-2010	23,494	23.58	1,004	23,580	1,004	1,606	37,894
2010-2011	18,081	17.59	973	14,952	827	1,323	29,163

Source: Ministry of Commerce and own calculations

Milk powder

Milk powder has been imported from New Zealand, Singpore, Malaysia, Philippines and some skim milk powder border trade with China has been reported. Import quantity as well as unit values for milk powder have been relatively volatile from 2007-2011 (Table 6). In 2010/11 a raw milk equivalent of 56,455 metric tons at the unit cost of 2,509 USD/ton or 3,413 MK/viss has been imported.

[2] Raw milk equivalents: Sweetened condensed milk: 1.61, Milk powder: 11.11, Evaporated milk: 2.5
[3] Assumed market exchange rates: 2007: 1,300 MK/USD, 2008: 1,100 MK/USD, 2009: 1,000 MK/USD 2010: 850 MK/USD
[4] 1 viss = 1.6 kg

Table 6 Milk powder import quantity, value and raw milk equivalents from 2007 to 2011

Year (April - March)	Milk powder (metric tons)	Total value (USD millions)	USD/ton	Total value (million MK)3	MK/kg	MK/viss	Raw milk equivalent (metric tons)
2007-2008	6,047	8.28	1,369	10,764	1,780	2,848	67,187
2008-2009	1,604	4.72	2,942	5,192	3,236	5,178	17,826
2009-2010	5,115	8.15	1,593	8,150	1,593	2,549	56,833
2010-2011	5,081	12.75	2,509	10,838	2,133	3,413	56,455

Source: Ministry of Commerce and own calculations

Evaporated milk

Evaporated milk has mainly been imported from Singapore and Malaysia. In 2010/11 a raw milk equivalent of 46,444 metric tons at the unit cost of 947 USD/ton or 1,288 MK/viss has been imported (Table 7).

Table 7 Evaporated milk import quantity, value and raw milk equivalents from 2007 to 2011

Year (April - March)	Evaporated milk (metric tons)	Total value (USD millions)	USD/ton	Total value (million MK) 3	MK/kg	MK/viss	Raw milk equivalent (metric tons)
2007-2008	1,763	1.58	896	2,054	1,165	1,864	4,407
2008-2009	15,354	15.44	1,006	16,984	1,106	1,770	38,385
2009-2010	14,661	14.18	967	14,180	967	1,548	36,652
2010-2011	18,577	17.6	947	14,960	805	1,288	46,444

Source: Ministry of Commerce and own calculations

Milk processors

Industry structure

Milk processing is mainly oriented towards producing sweetened condensed milk to supply consumer preferences for tea with added sweetened condensed milk. Within the Yangon catchment area 7 milk processors are situated to supply the urban market. Within the wider Mandalay/Monywa/Mektila one very large scale, 4 larger scale sweetened condensed milk producers and several small scale producers can be found. Processors do usually also operate a large scale intensified cross-bred dairy production system.

Raw milk input market

Competition for raw milk inputs for milk processing around Yangon is limited to a regional oligopoly of 7 large scale milk processors. As a result there is not a strong price competition among these processors for raw milk and a common price is jointly agreed. Mandalay area is dominated by one company collecting by far the largest share of raw milk for processing. This

company sets the price level for milk in the region. About 4 other medium scale milk collectors are also operating besides several small scale sweetened condensed milk producers.

Milk producers are highly reliant on market access which milk collectors are providing. Their bargaining power is relatively low and milk price and delivered quantity information can in many cases not be verified. Milk prices are not stratified for quality characteristics such as fat and protein contents or cell counts which leaves producers with no economic incentives to improve the quality of their milk.

Raw milk input collection

In addition to the raw milk supply from the own dairy herd milk processors collect milk via a a network of milk collectors and milkers from other smaller scale producers. Milk collection with a driving distance of up to 30 miles has been reported. Within this network the following actors and business characteristics can be distinguished:

Independent milk collector

A milk collector operates his business economically independent from the milk processing plant. A contractual business relationship with the milk processing plant is established via the provision of a deposit of 300,000 to 400,000MK/10viss/day by the processor in exchange for the right to receive daily the specified amount of raw milk from the collector. The farmer is paid an advance payment of 50,000 – 100,000MK/viss of daily milk delivery in exchange of the right to collect the milk from an identified cow. The collector usually employs 2-3 milkers who receive an average salary of up to 2,000 MK/day. Milk is transported in plastic or metal bins containing an average of 11 - 14 viss milk. The main mode of transport are bicycles and motorbikes. A motorbike can transport up to 5 bins and a bicycle is limited to transporting one milk bin. In Mektila township each collector delivers about 95 kg (60 viss) of milk per day.

Employed milk collector

Milkers are employed by either the milk processing plant or an independent milk collector. For example in Mektila township employed milkers collect about 23kg/day each which is the equivalent of one 14 viss plastic bin. According to milk processors in Kyaukse district about 1.4 viss (2.24kg) per cow are collected and the average herd size is 2-3 milking cows. Hence, one milker would need to twice daily collect milk from 2-3 farms to fill up one collection bin of 23 kg per day.

Testing, trading practices and rules

Actors in the milk collection network have established a long-term business relationships which reduces the risk of moral hazard such as adding water or other substances to the milk which the collector can not detect immediately at the farm gate. Quantifying the water, protein and fat content can only be conducted at the processing plant or its collection points with the presence of milk processing plant employees. Common testing practices are the use of Lactoscan, Lactometer and/or weighing the amount of milk solids by coagulating them with acidic acid. In some cases additional milk samples are taken for random laboratory analysis. The milk price is either reduced or milk is rejected if larger proportions of water are identified. The delivered milk volume is documented after quantifying with a scale. Milk payment to the collector is done every 5 to 10 days according to the documented amount.

Milking is usually done by the collector or employed milker or by the farmer and his employees with the presence of the milk collectors. The reason for this is twofold: a) Milk can not be cooled and therefore not be stored for a long time; b) Once the milk quantity is specified by using 1 viss cups and the milk is handed over to the milk collection bin of the collector the transfer of ownership is completed. The collector will pay the farmer every 5-10 days according to the agreed milk price and the quantified amount at the farm. The collector has to bear price reductions from the milk processor for added water or other quality reductions. Hence the collector needs to ensure the quality of the milk when collecting it at the farm.

If a community of farmers decides to milk themselves and to organize the delivery of milk via one farmer with a car or motorbike enough trust has to be established to ensure the selected farmer is not facing milk price reductions at the processing plant due to added water by farmers. Due to mixing of milk from several farms in one bin the delivering farmer would not be able to determine from which farmer the low quality milk was sourced. To overcome this, one community of farmers is taking small separate milk samples at the farm gate. In case a low milk quality is identified at the milk processing plant the separate samples would be tested individually to identify the source of low quality milk.

Production systems and products

Certification and quality control

Milk processing is in most cases done without any official certification or quality control. In preparation for the ASEAN free trade zone some milk processors have started preparation to get accredited for certification by the responsible Food and Drug Agency. A ‘Halal’ lable is in many cases demanded by the milk processors to enhance marketing of their products. Official testing or quality control for residues is not conducted by any public agency on a regular basis.

Sweetened condensed milk

Small scale sweetened condensed milk production is done with fire heated bathtubs filled with raw milk and added sugar. Larger scale production is done by using water steam to condense a mix of milk and sugar in an upright standing larger round container. The production of 1 kg of 40% sugar content condensed milk requires 1.6 kg of raw milk and 0.65 kg of sugar. Based on input prices of 500 MK/viss raw milk and 1,200Mk/viss sugar the production of 1 kg of 40% sugar content condensed milk results in input costs for milk of USD 0.67 and for sugar of USD 0.64 with a total input cost for the milk and the sugar inputs of USD 1.31. The average wholesale price for 1 kg of 30- 40% sugar content condensed milk is USD 2.01 (see Table 1).

Yoghurt

Yoghurt is produced with adding imported yoghurt cultures to cooled and pasteurized milk or by mixing pasteurized milk with plain yoghurt. 2 kg of raw milk at an average price of USD 0.83/2kg are required to produce 1 kg of yoghurt wich is sold at an average price of USD 1.5 to USD 2.22/kg (see section above on ‘Milk consumers’).

Transport costs

Transport costs are adding a significant proportion to the production costs of milk products. The transport costs for milk products in Table 8 were reported my milk processors. Milk collectors subtract 50MK/viss (about 10% of the milk price) for milking and transport of milk from the farm to the processing plant.

Table 8 Transport costs for milk products

Transport	Costs
Condensed milk from Meiktila-Yangon train	400MK/14 viss condensed milk container
Condensed milk from Meiktila-Yangon car	1,000MK/14 viss condensed milk container
Raw milk from milk collection point to processing plant estimated at 120 MK/viss	120MK/viss
Milk transport from farm to collection point including milking costs	50MK/viss

Milk producers

Production System

The observed dairy herds dairy production systems can be classified in three different production systems by a) the used breed, b) the feeding intensity and housing system and c) the milk marketing and processing system:

1. Low intensity native cattle systems
2. Low intensity Holstein Frisian cross-bred dairy systems
3. High intensity Holstein Frisian cross-bred dairy systems

The low intensity native cattle herds are the source of milk production in the Mandalay area. About 75% of the delivered milk in Kyaukse township and 86% of the delivered milk in Ngazon township is coming from native cattle herds (data from milk processing companies collected by Dr Ye Tun Win, LBVD presentation 'Study of the Dairy Husbandry in Mandalay Region').

Low intensity native cattle herds

Low intensity native cattle herds mainly used for draft in the field which are milked in competition to the suckling calve. An average delivered milk yield per cow and of about 1kg per day has been reported (data from milk processing companies collected by Dr Ye Tun Win, LBVD presentation 'Study of the Dairy Husbandry in Mandalay Region'). The main feed source is provided by grazing on pasture, roadsides and other communal land. A survey of 98 farmers with local cattle in city outskirts, villages or migratory herds found that between 45% to 92% of these herds are owned by landless farmers (Dr. Ye Ye Tun Win). Natural reproduction methods are used and own replacements are raised.

Low intensity Holstein Frisian cross-bred production system

Low intensity Holstein Frisian cross-bred dairy herds with often no more than 2 milking cows. The herd is raised at a relatively low intensity with relatively low milk yields per cow and relatively long inter-calving intervals of about 18 month. First calving would be at an age of 3 years with a maximum of 6 lactations or up to 10 years. An average delivered milk yield per cow and of about 4 kg per day has been reported (data from milk processing companies

collected by Dr Ye Tun Win, LBVD presentation 'Study of the Dairy Husbandry in Mandalay Region'). The cows are mostly kept stationary on ground/mud next to the owners houses and are occasionally led to communal grazing areas. By-products from crop production are fed and low cost locally available concentrate feeds are bought in addition. A survey conducted with 110 (55) owners of cross-bred dairy herds in city outskirts (villages) showed that 28% (73%) of the owners do not own land (Dr Ye Tun Win, LBVD). Milking by hand is done twice daily. The morning milk is marketed via a milk collector who usually milking the cow and transporting the milk. The evening milk might not be collected due to a lower amount and high transportation costs. In this case calves are given a larger share of the milk in the evening and the milk is turned into solid milk or kept as raw milk and marketed locally. A proportion of female calves are raised to replace and keep the number of milking cows stable. However, replacement cows are also bought from other herds. Male calves are sold with 7-8 month of age. Bulls from other farms are used for breeding.

High intensity Holstein Frisian cross-bred production system

High intensity Holstein Frisian cross-bred dairy herds are kept stationary on concrete in open barns. All feed including the roughage is bought and a variety of self mixed concentrates are fed to achieve high milk yields per cow. Cows are milked by hand and the milk is collected or delivered twice daily. An average delivered milk yield per cow of about 7-11 kg per day or 2,530 kg per 300day lactation has been reported (data from FAO breeding project collected by Dr Ye Tun Win, LBVD presentation 'Dairy Cattle Improvement in Myanmar Project Completion Workshop Mandalay (TCP/MKA/3201) 13 May 2010). Larger herds would also have their own milk processing facilities and collect raw milk from other dairy farms. Owners use Holstein Frisian bulls for breeding and/or Artificial Insemination if it is locally available. Herd owners aim for a first calving age of 2 years and an inter-calving interval of 12-18 month. Cows are kept for a maximum of 10 years or 6 lactations. Male calves are sold at an age of 7-8 month and some are kept to be sold for mating to other farms. A regular contact with local veterinarians is kept to apply all required vaccinations and to treat occasionally occurring disease.

Herd structure and size

Herds of sizes between 1 and 150 (average 45) Holstein Frisian milking cows were visited in the Mandalay and Yangon area. A total herd size comprising of all dry cows, males and female replacement stocks of up to 560 cows has been observed. It can be assumed that a large proportion of the selected farms are representing the highest quartile of dairy herd sizes present in Myanmar. The average delivered milk yield is 9.13kg/cow/day, ranging between 3 to 19 kg/cow/day. A breed improvement project funded by FAO recorded an average milk yield of 7.24 kg/cow/day for a total of 1,229 cows in all participating herds (Dr, Ye Tun Win). More detailed description of herd structures and sizes are documented in Table 9 and Annex 1.

A relatively high proportion of dry cows within the larger scale herds classified as high intensity Holstein Frisian cross-bred production systems has been observed. A one year inter-calving interval with 2 month dry period in a herd with non-seasonal calving and no purchases of new cows or extended fattening periods of dry cows for culling would result in a dry cow proportion of 17% of the total herd. The larger herds have an average proportion of

34% dry cows which would correspond with a 15-16 month inter-calving interval and a 5-6 month dry period. Seasonal calving from October to December during dry season in Amarapura township was reported by one farmer. Seasonal calving from February to March was reported for a large herd with 45% dry cows in the herd in Mektila township.

Table 9 Herd structure and milk yield examples of visited farms

Location of visited farm	Milk yield (kg/cow/day)	Milking cows	Total (milking and dry)	% dry cows	Female young-stock >1 year	Female calves <1 year	Male calves <1year	Bulls	Total
Yangon Region, Mingaladon township	8.37	43	67	36%	53	30	-	-	150
Yangon Region, Mingaladon township	8.96	42	82	49%	26	18	12	-	138
Hlegu Township	6.52	130	n.a.	n.a.	n.a.	20	24	9	324
Hlegu Township		17	n.a.	n.a.	n.a.	10	6	n.a.	50
Yangon Region, Taikkyi township	4.0	20	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	80
Yangon Region, Taikkyi township	3.2	50	60	n.a.	n.a.	n.a.	n.a.	n.a.	90
Mandalay area, Amarapura township	10	8	n.a.	17%	20	n.a.	n.a.	n.a.	30
Mandalay area, Amarapura township	3.2	1	2	n.a.	n.a.	2	1	n.a.	n.a.
Mandalay area, Amarapura township	-	-	2	n.a.	1	0	0	0	3
Mandalay area, Aung Myae TharZan township	11.2	10	n.a.	n.a.	n.a.	3	3		26
Mandalay	8.0	80	125	36%	n.a.	n.a.	n.a.	n.a.	200
Mandalay Region, Mektila township	5.33	150	272	45%	n.a.	78	n.a.	n.a.	560
Mektila township	8.89	90	150	40%	n.a.	30	30	n.a.	300
Sagaing region, Monywa township	19	8	n.a.	n.a.	6	4	n.a.	1	29
Sagaing region, Monywa township	19.2	5	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	20
Monywa District, Chaung-U township	12	24	28	14%	n.a	5	5	n.a.	59
Average	**9.13**	**45.20**	**88**	**34%**	**21.20**	**18.18**	**10.13**	**3.33**	**137.27**
Max	**19**	**150**	**272**	**0.49**	**53**	**78**	**30**	**9**	**560**
Min	**3**	**1**	**2**	**0.14**	**1**	**0**	**0**	**0**	**3**

Source: Visited farms (see Annex 1)

Breed Inputs

Most of the low intensity as well as the high intensity Holstein Frisian production systems use cross-bred Holstein Frisian bulls for reproduction. These bulls would either be owned by the owner of herd or by other farms in the neighbourhood. Commonly quoted prices are 5,000 MK/mating with a free second service within 30 days. Artificial insemination with semen straws from Holstein Frisian bulls had been used more commonly in the past. Local availability of semen straws, inseminators and liquid nitrogen led to the decreased use of artificial insemination. The only remaining artificial insemination centre operated by the Ministry for Livestock and Fisheries in Yangon is selling about 400 semen straws from 50-75% Holstein Frisian bulls per month at 500 - 600MK/straw. The utilization of imported of Holstein-Frisian semen has also been reported by some visited farms.

In addition to raising replacement cows from female calves many farmers also buy heifers just before or after the first calving to replace less productive milking cows or to expand production.

Feed Inputs

Daily cut fresh grass, chopped or whole rice straw or ground nut hay are the most commonly fed roughage. Grass is cut either by the herd owners employees or by independent labourers from roadsides and other communal land. In Mandalay area also Napier grass is planted on very small plots near farms and used as roughage feed. Some visited farmers mentioned the need to cultivate pasture or grassland in order to have more high quality grass available during dry seasons when no grass from communal land is available and grass has to be substituted with rice straw. Conserving grass by making silage has been promoted by the LBVD office in Mandalay, but sustainable uptake of this practice by farmers has not yet been achieved.

A relatively large variety of protein and energy rich concentrate feed sources from crop production is available from the main crop production regions in central and northern Myanmar. To a large extend by-products are used. Examples seen on the farm are:

- Husks from: rice, pea, ground nut and bean,
- Cake from: sesame and cottonseed
- Glass noodle production by-products in liquid or solid form
- Brewer grains from beer factories

Although three sugar cane production factories are situated around the Mandalay region none of the visited farms were feeding sugar production by-products such as molasses. Husks, cakes and other dry crop/grain flours are traded in 25-30 kg bags. Farmers were either buying and transporting these bags directly from the crop/grain mills or buying them from local trading shops. In many cases the milk collectors would also make feeds available through its milk collector network. Commercial pre-mixed feeds with different formulas were also used in intensified production systems.

Some examples of a typical daily ration for herds with cross-bred milking cows is given in Annex 2. In Table 10 a summary of average feed ration costs per cow and day and per kg milk is given. Feed costs per kg of milk delivered vary considerably within and between regions between USD 0.18 and USD 0.50 with an average cost of USD 0.32/kg milk.

Table 10 Feed ration costs and milk price examples per cow/day and per kg milk in different townships

Township	No of cows	Feed price USD/day/cow	Feed price USD/kg milk	Milk price USD/kg milk	Gross margin USD /kg milk
Chaung-U	59	3.21	0.27	0.37	0.11
Mektila	90	2.77	0.31	0.42	0.10
Patheinguyi	80	2.60	0.32	0.42	0.09
Amarapura	8	1.80	0.18	0.50	0.32
Taikkyi	20	1.99	0.50	0.62	0.12
Average	**51**	**2.47**	**0.32**	**0.47**	**0.15**

Source: Own calculation based on farm examples in Annex 1 and Annex 2

Profitability

An investment of about USD 665 for a 2.5 year old cross-bred dairy cow plus the variable expense in feed and treatment of more than USD 3,000 over 5 years (4 lactations) will result in a non-discounted gross-margin of USD 1,331 (Table 11). The calculated production costs are USD 0.33 per kg (396 MK/viss) of produced milk over the entire production period of 5 years with 4 lactations and an average daily milk yield of 8kg (5 viss). This example is based average data from intensified cross-bred dairy production system herds visited in August 2011. Additional costs for housing, labour, water, electricity etc. occur and need to be covered by the gross margin.

Table 11 Milk production costs and gross margin for intensive cross-bred dairy production system

	Price USD	Quantity	Unit	Milk production costs USD/cow	Milk production costs USD/ton/milk	Assumptions
Milking cow	665	1	cow	665	68.12	2.5 year old 500,000 MK for 5 viss per day production cow
Feed milking	2.47	1,220	day	3,018	309.24	Average milking cow feed costs per day for 10 month milking per lactation, 4 lactations
Feed dry cow	0.06	610	day	35	3.57	Daily feed costs dry cow for grass and straw for 5 month dry period
Vaccinations	4.65	5	year	23	2.38	Twice annual vaccination for FMD, annual Anthrax, HS and Black leg
Costs				**3,741**	**383.32**	
Culled cow	266	1.00	cow	266	27.25	500 kg life weight at 400MK/kg life weight
Calf	73	3.60	calf	263	26.98	Calves sold at 7-8 month for 55,000MK; 10 % mortality
Milk delivered	0.47	9,760	kg	4,543	465.43	5 viss for 10 month for 4 lactations
Milk production cost (Costs +culled cow + calves)				3,212	329.09	
Revenue				**5,072**	**519.65**	
Gross margin				**1,331**	**136.34**	

Source: Own calculations based on production parameters and prices documented in Annex 1

Milk price

The milk price level has strong influence on the profitability of milk production. The milk price level in Mandalay region is significantly lower compared to Yangon area (Table 10). Dairy farmers around Yangon with good access to milk processors obtain USD 0.62/kg (700MK/viss) milk, if they can deliver the milk themselves and bear the transportation costs. Smaller scale producers who are based further away from the milk processor usually have to rely on milk collectors who reduce the milk price paid to the dairy farm in order to cover the higher transport costs (See paragraph on milk collection). Dairy farmers situated around milk processing or milk collection points around Mandalay receive an average milk price of USD 0.42/kg (500MK/viss). About 72% - 87% of the collected milk around Mandalay (Kyaukse & Ngazon) is produced with native breed cows (Dr Ye Tun Win, LBVD presentation 'Study of the Dairy Husbandry in Mandalay Region'). Although these cows do not achieve high productivity, the produced milk does not demand high input costs. The farmer may rather see this a by-product to the main purpose of raising cows for meat production and draft. A high

proportion of this production system results in a lower price floor for the milk market with a very high elasticity towards milk price changes.

Breed outputs

Male calves and cows for culling are usually sold to licensees who collect them from the farm. The life weight price is estimated on the farm and MK 400/kg life weight is paid. For religious reasons some herd owners do not sell cows for slaughter and keep them until they die on the farm. Cases of selling dead cows to specialized traders for 1/3 of the life weight market price or giving them away to nearby villages have also been described as common practices by some herd owners.

Heifers and bulls from larger scale intensive cross-bred dairy herds are sometimes sold directly to other farmers for natural service mating and to expand the herd with better genetic material.

Health situation and veterinary inputs

The most common dairy herd productivity or health problems reported by the herd owners are in order or frequency:

1. Low conception rates of dairy cows: Fertility/reproduction problems
2. Mastitis
3. Leg joint and claw problems
4. Digestive tract problems: Ketosis and displaced abomasums
5. Coughing of cows

Infectious 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. However, the larger scale and more intensive production system herd owners are alerted to protect against the herd against potential production losses from infectious diseases.

A main vector for the spread of infectious diseases are the milk collectors. Potential outbreaks are likely to follow the collection network or pattern of milk collectors. No cleaning or disinfection of hands or boots is done by the milk collectors.

Movement of cows is mostly done within villages. The main movements are cows for natural service to herds with improved Holstein Frisian breed genetics. However, movement of cows from Mandalay region to expanding farms around Yangon was also reported. No licensees were interviewed on the movement patterns for cows and bulls for slaughtering.

During the raining season flooding leads to moving of cattle along the roadside which subsequently increases contact rates between herds and opportunities for disease to spread between herds.

Disease treatments

Except for farms where specialized LBVD veterinarians are employed on a part time consultancy basis, these treatments are done by private veterinarians or the herd owners. Medication is bought from pharmaceutical supply shops and no shortages have been reported. In more remote areas around Mandalay limited knowledge on dairy cow diseases and their

treatments is available. It remains to be seen whether a private sector will develop to supply this service of if the LBVD can increase their capacity to supply this service.

Awareness and knowledge about required milk and meat withholding periods after antibiotic treatments is relatively low. None of the visited milk processing plants were testing for antibiotics. Since the bulk of milk processing is for sweetened condensed milk they have little economic incentives to do so.

Vaccinations

Most of the visited farms had their cattle vaccinated for FMD, Hemorrhagic septicaemia (in areas where it is recommended), Anthrax and Black Leg. Farmers do usually not know the diseases the covered by the vaccinations. LBVD officers are delivering and in most cases also administering the vaccinations. For twice annual FMD vaccinations farmers are charged 1,000MK/shot for the vaccine including the administration. The service charge for all other vaccinations is 300 to 500MK. The vaccination coverage information is likely to be biased because only LBVD known farms were visited.

Units and Abbreviations:

1. 1 viss = 1.6 kg, 1 kg = 0.6 viss
2. Myanmar Kyats = MK , Exchange rate during time of data collection: 752 MK/USD
3. A 'Ward' in urban area is equivalent to a' village'
4. Sugar 1 bag = 30.62 viss x 20 bags = 1ton
5. LBVD = Livestock, Breeding and Veterinary Department

Annex 1 – Field data documentation

Location/date	**Yangon Region, Minglardon township, Paungu village, north of Yangon / (3:32) am-16/08/2011**
Respondent	Than Than Maw, General Manager and Dr. Khin Hlaing, Managing Director (& Secretary of Myanmar Dairy Association) of Win Agro-Livestock Co., Ltd, marketing name 'WALCO'
Company type	Processor, no own milk production, established in 1995 after Government decided to stop processing in 1992, 50 employees for production and delivery
Milk Supply	7 suppliers in an exclusive region with max. distance of 30 miles (mainly by bicyle) with 5-10 cows each who also collect milk from about 50 other farms with about 1-5 cows each. Twice a day delivery in a 40 litre tin or aluminium cans owned by processing company and washed with soap at the company, 8-11:30am and 5-7 pm supply of milk, 70% in the morning. 850 MK/viss set price, no variation for quality or fat content. Rejection if more than 3% water added. No written contracts with suppliers, but long lasting trading relationship with built trust. Payment every 10 days. Interest free credit provided to farms for new cows etc. upon request and subsequently deducted from milk price. Training of collectors in clean milking with proper disinfection.

Milk quality and safety testing	Milk is filtered at delivery. Lactoscan used to test for fat, SNF, Density, Lactose, Solids, Protein, Added water and Freez. Point within 2 minutes upon delivery. Once a week LBVD testing for bacteria growth, TB, Brucellosis. LBVD testing is required by the 5 star hotels that are delivered directly. No somatic cell count and antibiotic test. FMD and heat changes milk composition towards more water. Dirty milk is common problem.	
Equipment	lactoscan from bulgaria which is regularly calibrated by supplier. Pasteurizer (Thailand) with steam heated by wood, ice water production, cooling tank.	
Milk marketing.	Wide variety with many innovations. High quality self produced PET bottle packaging (expensive, costs 85 MK per 1 litre bottle): Full cream pasteurized milk (60% of total production) for 1,400 MK/litre, low fat pasteurized milk for 1,300 MK/litre, full cream yoghurt, low fat yoghurt, salted and unsalted butter 2,000 MK/200grams, butter milk, liquid butter. No condensed milk is produced since imports are too cheap. No milk powder because of expensive technology and cheap imports (but three other plants in Myanmar: Yangon, Naypyidaw, Mandalay). Products are delivered by 3 cars. Paid once a month by supermarkets and hotels. Is not borrowing money via formal credit from bank. High interest rates of 17% p.a. would apply.	
Marketing channels	In 2010: 24% supermarket, 29% retail, 16% home delivery, 11% bakeries, 10% hotels	
Outlook/Challenges	More automation with investments in food hygiene to compete with potential competitors especially after 2015 with ASEAN free trade. Wants to sterilize products to market yoghurt and milk into other parts of the country, so far is bound to Yangon market. Ensuring more and stable milk supply is a challenge.	
Location/time	**Yangon region, Mingaladon township, Paungu village, / am 16/08**	
Company type	Artificial Insemination Station under Ministry of Livestock and Fisheries	
AI	Several donor projects in the past and ongoing FAO project to improve genetics and availability of AI. Selling about 400 straws/month of dairy cattle semen from 50% and 75% Frisian bulls and Pyazein. 75% Frisian: 600MK/straw, 50% Frisian: 500 MK/ straw. Also produce liquid nitrogen for 1,300 MK/litre and can get additional supplies from another Ministry. Many farms mention shortage of liquid nitrogen as reason for not using AI. Only AI supplier for entire Myanmar. Many distribution points were closed since the 1970s.	
Feed	Feed ingredient testing and research on suitability of feed rations.	
Location/time	Mingaladon, Yangon/ am 16/08	
Company type	Artificial Insemination Station under Ministry of Livestock and Fisheries	
AI	Several donor projects in the past and ongoing FAO project to improve genetics and availability of AI. Selling about 400 straws/month of dairy cattle semen from 50% and 75% Frisian bulls and Pyazein. 75% Frisian: 600MK/straw, 50% Frisian: 500 MK/ straw. Also produce liquid nitrogen for 1,300 MK/litre and can get additional supplies from another Ministry. Many farms mention shortage of liquid nitrogen as reason for not using AI. Only AI supplier for entire Myanmar. Many distribution points were closed since the 1970s.	
Feed	Feed ingredient testing and research on suitability of feed rations.	
Location/time	**Mingaladon, Yangon/ (05:52) pm 16/08**	
Company type	Shwe Pu Zum Dairy farm, since 1989 existing and expanding, 10 employees on the farm and another 200 it the cafeteria and bakery in outskirts of Yangon	
Respondent	LBVD veterinarian Mr. Htwe Myint, a LBVD veterinarian employed by the farm	
Herd structure	Dry cows	40
	Milking	42
	Heifers (pregnant)	13
	Young stock >1 year <15 month	40

	< 1 year female		30	
	Total		155	
Production System description	Dairy cows kept all day all year in barn fixed on concrete in open barn. A maximum of 6-7 calvings per cow, the oldest cow in herd is 10 years old. Reproduction is the main problem. Previously AI was done, but not anymore due to lack of liquid nitrogen. Most male calves are kept until 1 year age. Calves are weaned at dry off of cows. First calving age with 24 months. 18 month inter-calving period, although goal is 10 month lactation and two month dry period. Cows are fed and milked twice daily. Manure is removed and concrete washed with water.			
Feed Inputs	Product	Price	Source	Frequency
	Sesame cake	485 MK/viss	Wholesale market Insen	monthly in bags
	Bean husk	210 MK/viss	Wholesale market Insen	monthly in bags
	Rice bran	220 MK/viss	Wholesale market Insen	monthly in bags
	Yellow corn powder	300 MK/viss	Wholesale market Insen	monthly in bags
	Grass	23 MK/viss	Surrounding area	Daily by sellers
Breed inputs	Self replacing Holstein Frisian local cross-bred herd with natural service bull.			
Veterinary inputs	LBVD does vaccination: FMD, Anthrax, HS, 'Black Quarter'. Treatments such as antibiotics are bought from importing shops and everything is always available. LBVD does treatment or trains herdsman.			
Milk inputs	Buying 2,000 viss from 7-8 collectors, the supplying farms are checked every 6 months, milk from owners rather than collectors or middlemen is preferred but due to shortage collectors are accepted and in this case at least minimal fluctuation of farms preferred. No credit is provided to the supplying farms. Milk is delivered directly to the bakery and not the farm.			
Health situation	Once a TB positive case, which was kept on farm until died, 2-3 Mastitis/month, 2-3 Ketosis/month, Displaced abomasums, Milk fever, 2-3% calving mortality,			
Manure output	Biogas and then cropping land			
Breed output	Male calves sold to other farms for breeding at an average weight of 90-100 kg and price of 100,000 MK. Non productive cows are not sold directly to slaughter but licensee, for religious reasons slaughter is not preferred, 2-3 low producing 1st lactation cows/year sold to licensee, old cows kept until death for religious reasons and buried on farm ground.			
Milk output	4% fat, 235 viss/day; 5.6 viss/cow; milk is delivered twice daily to bakery			
Milk marketing and hygiene	Hygiene check of supplying farms every 6 month, own farm no testing by LBVD, no cell count., Wide range of bakery, ice cream and pudding products.			
Location/time	**Yangon Region, Mingaladon township, Kone dalabaung village, (08:14) pm 16/08**			
Company type	Silvery Pearl Dairy, more than 300 employees, established 9 years ago as hobby by engineer working for ministry. Wife and daughters involved too but now daughters working in Singapore.			
Respondent	Wife of the owner and LBVD veterinarian employed by the farm			
Herd structure		Female	Male	
	Dry Cows	24		
	Milking cows	43		
	Heifers	26		
	Calves	18	12	
	Total	123		
Production System	Dairy cows kept all day all year in barn fixed on concrete in open barn. AI			

<table>
<tr><td>description</td><td colspan="4">and ear tags from FAO project. Male calves are sold at 6 months age. Calves are weaned at dry off of cows. AI of young stock starts with 15 month, hence first calving age with 24 months. Goal is 10 month lactation and two month dry period. Maximum age is 9 years, on average 2-3 lactations. Cows are fed and milked twice daily. Manure is removed and concrete washed with water.</td></tr>
<tr><td>Feed Inputs</td><td colspan="4">CP 005 mixed feed given 1 month before and three months after calving at 19,000 MK/50kg, or CP 006 for 15,000MK/30kg bag. After that home made concentrate again with and sesame cake, bean meal, bean husk raw materials from wholesale market. Daily fresh delivered grass at 16 MK/viss, chopped corn leaves. During dry season grass shortage and switch to rice straw at 60 MK/viss.</td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td>Breed inputs</td><td colspan="4">AI of Holstein Frisian genetics via FAO project</td></tr>
<tr><td>Veterinary inputs</td><td colspan="4">LBVD: FMD, Anthrax, HS; test somatic cell count by smeer test. Drugs and other treatments bought in veterinary supply shop.</td></tr>
<tr><td rowspan="12">Milk inputs</td><td>Village name</td><td>No. of farmers</td><td>No. of cows</td><td>Milk collected/day</td></tr>
<tr><td>Lay daunk kan</td><td>40</td><td>600</td><td>700-800viss</td></tr>
<tr><td>Kone Dalabaung</td><td>10</td><td>70-80</td><td>100-150</td></tr>
<tr><td>Hmawbi</td><td>2</td><td>-</td><td>120</td></tr>
<tr><td>Pyimabin to Hlegu</td><td>1 collector</td><td>-</td><td>100-200</td></tr>
<tr><td>Paungu- shwe nanthar</td><td>1</td><td>-</td><td>80-90</td></tr>
<tr><td>Nwe kwe- Htauk kyant</td><td></td><td></td><td>80-90</td></tr>
<tr><td>Ngwe Pinle (MEC)</td><td></td><td>250</td><td>70-200</td></tr>
<tr><td>Baw Le,Htantabin,thin gan kyun,thitseint kone, wireless</td><td></td><td></td><td>200-300 viss</td></tr>
<tr><td colspan="4">1,780 viss/day at 800 MK/viss from 70-80 farms who are provided with cows, credit and also feed at no interest and paid back by proportional deduction from milk price. Steel or Aluminium bins provided by company which is washed at company by collectors. Buy antibiotic milk in separate bin for half price and throw away at farm. Give gloves and chlorine towels to farmers. Organized 3 day trainings on hygiene.</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>Health situation</td><td colspan="4">2-3 mastitis/month. Dead cows and calves given to villages around for consumption.</td></tr>
<tr><td>Manure output</td><td colspan="4">Sold out in3 ton trucks for 30,000 MK in dry season for fertilizing the plantation but just let them drain into the nearest creek in the rainy season.</td></tr>
<tr><td>Breed output</td><td colspan="4">Male calves sold with 6 month at 80,000 MK/calve to surrounding farms for natural mating. Milking cows sold at 100,000 (500,000) MK/cow producing 1 (5) viss/day to milk supplying farms. Old and non performing cows sold to licensee for up to 300,000 if fattened.</td></tr>
<tr><td>Milk output</td><td colspan="4">360 litre/day and 8.3 litre/cow</td></tr>
<tr><td rowspan="6">Milk marketing and hygiene</td><td>Product</td><td>Proportion</td><td>Price</td><td>Packaging</td></tr>
<tr><td>Raw milk</td><td>70%</td><td>1,400/viss</td><td>Bags: ¼ viss and ½ viss</td></tr>
<tr><td>pasteurized milk</td><td>20%</td><td>1,600/viss</td><td>Bags: ¼ viss and ½ viss</td></tr>
<tr><td>yoghurt (Belgium bacteria strain)</td><td>10%</td><td></td><td>PET bottle</td></tr>
<tr><td colspan="4">No condensed milk since it is too cheap due to low price milk powder imports. Lactoscan of milk upon delivery. No regular testing which is only required by 5 star hotels. Applying for Hallal label from Myanmar Muslim Ulama Organisation Head Quarter, and - Sanitation, GMP, Product hygiene and safe to consume etc. from FDA. 4 cars deliver daily to 41 supermarkets and shops and also have two self owned retail shops with fridge. In addition drop of mobile sellers at 11 places. In supermarkets bulk milk is filled into bags. Supermarkets need to be checked for keeping temperature. Charge 10% commission and left over needs to be recollected by company. Returned milk</td></tr>
</table>

<table>
<tr><td></td><td colspan="3">is used for yoghurt production. High deman during Ramadan. Low demand during Burmese New Year (10 days) and Chinese New Year (1 week), during this phase donations to Meditation centres etc. Since 6 years donate milk for school feeding surrounding village for 500 students, 200 ml each. In addition together with CP school milk and sausages for free to monthly alternating schools</td></tr>
<tr><td>Outlook/challenges</td><td colspan="3">ASEAN competition, need FDA approval/hallal label and more hygiene packaging to compete with imports. Price expected to drop due to free trade in 2015. Ordered milking machine.</td></tr>
<tr><td>Location/time</td><td colspan="3">Hlegu township veterinary office/ am-17/08</td></tr>
<tr><td>Dairy cattle statistics</td><td colspan="3">1518 cross-bred dairy cattle producing at least 2 viss/day (cut off point for statistics) in 123 farms in the township</td></tr>
<tr><td>Location/time</td><td colspan="3">Fun Hwa dairy farm and processing plant, Hlegu township, in the neighbourhood is a beef export company. (05:10) am-17/08</td></tr>
<tr><td>Company type</td><td colspan="3">Milk processing plant, dairy farm, pig production, fish ponds, commercial chicken chicken, 7 acres or rice, 70 employees on the whole farm for production, processing and marketing</td></tr>
<tr><td>Respondent</td><td colspan="3">Brother of the owner, a Shan family, started 15 years ago with 6 cows after they had been working and learning in Taiwan on cattle/dairy farms</td></tr>
<tr><td rowspan="5">Herd structure</td><td>Age group</td><td>Female</td><td>Male</td></tr>
<tr><td>< 1 year</td><td>20</td><td>24</td></tr>
<tr><td>1-3 years</td><td>26</td><td>7</td></tr>
<tr><td>> 3 years</td><td>245</td><td>2</td></tr>
<tr><td>Total</td><td>291</td><td>33</td></tr>
<tr><td>Production System description</td><td colspan="3">Dairy cows kept all day all year in barn fixed on concrete in open barn. Moved around systematically to different age groups according to age and lactation status. Calves, heifers, first 3 month of lactation, another 3 month of lactation, until dry period, dry period, gestation group. Most male calves are kept until 1 year age and then sold to villages for breeding, remaining stays in farm for breeding and fattening. AI of young stock starts with 15 month, hence first calving age with 24 months. Most cows are artificially inseminated and ear tagged by FAO project. 18 month inter-calving period. Maximum age of dairy cows is 8-9 years. Cows are fed and milked twice daily. Manure is removed and concrete washed with water.</td></tr>
<tr><td>Feed Inputs</td><td colspan="3">8 truck loads of daily fresh cut grass from roadsides and delivered for 13,500 MK/truck containing of 1.5 kyin (1 kyin = 10 feet x 10 feet x 1 foot) in cash upon delivery. During dry season this is replaced by rice straw at a price of 14,00 MK/truck containing 3 kyins.
Concentrate feed from CP (CP 972 (9,500 MK/30kg bag) up to 2 month lactation, CP 974 (8,000 MK/30kg bag) after 2 month lactation). Delivered by CP twice a week and paid for in cash upon delivery.
Feed ration for dairy cow: CP feed #006
- milking cows; CP 8 bags + sesame cake 6 bags(20 viss each) x 13,000/-
pea bran 2 bags(20 viss each) x 8,500/-
bean husk 2 bags(25 viss each) x 7,500/-
- other cows; CP 7 bags +bran 1 bag +husk 1 bag
- Concentrate given 2 times a day, 5-9 am and 3-5 pm followed by grass
No extra salt or minerals, already included in CP feed</td></tr>
<tr><td>Breed inputs</td><td colspan="3">Semen from FAO project, self replacing herd, but bought some cows from Mandalay and Shan area.</td></tr>
<tr><td>Veterinary inputs</td><td colspan="3">LBVD TVO veterinarian vaccinates for FMD, HS, Anthrax and Brucellosis, Treatment done by farm employees and bought from pharmaceutical shops. No availability problems.</td></tr>
<tr><td>Milk inputs</td><td colspan="3">Buying 220 viss/day from 30 farmers (within 2-3 km with1-5 cows) who deliver themselves in plastic and metal bins and wash bins at milk delivery point. These are long lasting business relationships of about 10 years. Some</td></tr>
</table>

<table>
<tr><td></td><td>farmers may even collect additional milk from neighbours on the way to processing plant. 2/3 of delivery in the morning from 7-9 am and 1/3 in the afternoon from 3-4pm. Milk is filtered and checked for taste and smell, lactotest. Price is set at 800 MK/viss for more than a year but likely do decrease due to appreciation of MK against the USD. Price will be negotiated directly with farmers and not with other processors in Yangon, because Fun Hwa is in another township and therefore independent. Credit to farmer for buying cows is provided. Milk delivering farmers are also offered to buy concentrate feed from processing plant.</td></tr>
<tr><td>Health situation</td><td>1-2 abortions/year, 1-2 dead cows/year, 10 dead calves/year, 1-4 Mastitis/year</td></tr>
<tr><td>Manure output</td><td>Biogas and then on owned fields</td></tr>
<tr><td>Breed output</td><td>Dead animals buried on farm, male calves to other farms for 100,000 MK, fattened bulls of about 3 years for 300,000 MK up to a premium of 1,000,000 at muslim festivals for neighbouring villages.</td></tr>
<tr><td>Milk output</td><td>Daily average for 130 cows is 530 viss/day = 4 viss/cow. Peak lactation about 7.5 viss/cow.</td></tr>
<tr><td>Milk marketing and hygiene</td><td>FDA or LBVD test once or twice a year. Supplying supermarkets in Yangon daily with 300 bottles of pasteurized milk without sugar and 100 bottles of pasteurized milk with sugar. Sizes: 220ml, 950ml, 2,000ml; yoghurt with sugar in 220 ml and 980 ml bottles. Sale price is 2,000 MK/2,000ml bottle, 280MK/220ml bottle, sent to 6 supermarkets in Yangon. Sugar is bought from Mandalay and added to yoghurt at 8% weight proportion and to milk at 5% weight proportion. Supermarket charges 10% commission on sale price and left over has to be picked up. Milk older than 4 days is picked up and transported back to be fed to pigs. Twice a week the capital Naypyidaw is supplied.</td></tr>
<tr><td>Location/time</td><td>Flower producing village in Hlegu township/ am-17/08; the whole village has about 25 farmers with a total??? of 40-50 cross-bred dairy cows</td></tr>
<tr><td>Company type</td><td>3 month ago newly built farm. A herdsman with previous experience (supervisor) is hired for expertise in dairy husbandry plus another 3 employees.</td></tr>
<tr><td>Respondent</td><td>Young shan man, also growing and selling flowers on 2 acres, the whole village has 200 acres, learned about dairy farming from buying manure for flower growing for dairy farm.</td></tr>
<tr><td>Herd structure</td><td>50 cross-bred cows with 17 milking and wants to double next year with another new barn do be built, but 700 MK/viss too low.
<table>
<tr><td>Age group</td><td>Male</td><td>Female</td></tr>
<tr><td>< 1 year</td><td>6</td><td>10</td></tr>
<tr><td>1-3 year</td><td>3</td><td>6</td></tr>
<tr><td>> 3 years</td><td>2</td><td>23</td></tr>
<tr><td>Total 50</td><td>11</td><td>39</td></tr>
</table></td></tr>
<tr><td>Production System description</td><td>Cross-bred cows fixed in closed barn on concrete. Fed and milked twice daily.</td></tr>
<tr><td>Feed Inputs</td><td>
<table>
<tr><td>Product</td><td>Packaged</td><td>Daily Ration</td><td>Price</td></tr>
<tr><td>Sesame cake</td><td>1 bag = 30 viss</td><td>1 bag</td><td>11,000 MK/bag</td></tr>
<tr><td>Bean powder</td><td>1 bag = 20 viss</td><td>1 bag</td><td>4,500 MK/bag</td></tr>
<tr><td>Bean husk</td><td>1 bag = 20 viss</td><td>½ bag</td><td>4,500 MK/bag</td></tr>
</table>
Delivered directly from crop production area in central Myanmar. In addition cut grass at sideways.</td></tr>
<tr><td>Breed inputs</td><td>Bought 20 cross bred milking cows for 300,000 MK/3viss/day cow and 500,000 MK/5viss/day cow and 5 pregnant cows for 350,000 MK/cow from different farms in ???,</td></tr>
<tr><td>Veterinary inputs</td><td>LBVD office vaccinates: Anthrax, FMD, HS. Treatments are sold by vet who comes to farm</td></tr>
<tr><td>Milk inputs</td><td>-</td></tr>
</table>

Health situation	Parasites are problem and is treated with Ivomec		
Manure output	To field for flower production		
Breed output	Not yet		
Milk output	45viss/17milking cows/day		
Milk marketing and hygiene	700 MK/viss. Milk collector milks and buys twice a day, transports in plastic bin to 4-5 tea shops in Yangon and sells for 800 MK/viss, no processing is done by farmer nor by collector. Collector pays every 10 days. Bins are washed outside farm.		
Location/time	**Yangon Region, Taikkyi township / (08:07) pm-17/08;**		
Company type	**Dairy farm**		
Respondent	Indian decedent 25 year old was trading bricks and repairing cars before. 6 Month ago started dairy farming. Is advised by employed herdsman. Family has 62 acres with rice and fruit trees such as Guava, Pomelo, Ginger, 2 fish ponds and 10 acres rice for family and workers consumption.		
Herd structure	27 female, two male, 9 milking		
Production System description	Open barn, fixed cows on concrete fed and milked twice a day. Calves are led to cows for suckling just before milking.		
Feed Inputs		Ration per cow	
	Sesame cake	3 viss	
	Bean meal	1 viss	
	Bean husk	2 viss	
	Feed is bought in township market. CP premixed feed and grass cut on roadsides		
Breed inputs	Cross-bred cows bought from farms in Yangon		
Veterinary inputs	HS and Anthrax vaccinated		
Revenue/month	800,000		
Feed costs/month	400,000		
Labour costs/month	140,000		
Gross margin/month	260,000		
Milk output	40 viss/day/9cows, 700 MK/viss		
Milk marketing and hygiene	22 viss by collector in the morning and sold to Walco 30 miles away in Yangon. Afternoon milk themselves about 18 viss in plastic bin and sell in neighbouring villages to Muslim people who buy for 800-1,000 MK/viss.		
Location/time	**Yangon Region, Taikkyi township, Kalagone village / pm-17/08;**		
Company type	19 Indian descendent famers with a total of 600 dairy cattle, got FAO award in 2003 for village with larges dairy population		
Respondent	60 year old, 3 sons one daughter, inherited dairy from father, has 5 employees, 20 acres of rice,		
Herd structure	80 cross bred dairy cattle, 20 milking cows, 50viss/day, 4 draft cattle		
Production System description	Outside grazing system. Cows currently moved up mountain 3 miles away due to floods. Intend 1st calving at 24 month. 18 month intercalving interval. Max 7-8 calvings and 15 years per cow. Male calves weaned at 9 month. Old cows kept until they died due to religion. Bull for mating, did AI before but shortage of liquid nitrogen and close distribution centre for semen straw.		
Feed Inputs	Product	Daily ration (+1 basket of grass)	Price
	Sesame cake	1 viss	500 MK/viss
	Bean powder	1 viss	300 MK/viss
	Bean husk	1 viss	200 MK/viss
	Grass	1 basket	500MK/basket
	Total	1,500MK	
	Buy every 10 days 30 bags sesame cake, 30 bean meal bags and 25 bean busk bags in Tai Ci township collective for all villagers, Same amount every 5 days after rainy season in September due to higher demand from cows...		
Breed inputs			

Veterinary inputs	LBVD vaccinates: FMD only once in a while when outbreak around because is not seen as a problem, LBVD called to treat FMD secondary infections, HS, Anthrax
Milk inputs	750 MK/viss from other villagers, these are the 19 villagers, they may collect from others
Health situation	No Brucellosis detected during JICA project 6 years ago and also recently tested my LBVD, Rarely mastitis and if so call vet for treatment, are aware of withholding milk with antibiotic
Manure output	Dried manure used in mud walls and for fuel
Breed output	Males at 9 month for 100,00 MK to other villages for breeding,
Milk output	50viss/day/20cows
Milk marketing and hygiene	Milk themselves and collect from other 19 in the village, take individual sample to trace bad milk, use lactometer in village, transport in 35 viss metal bins (15 nos) a total of 500 viss/day by car twice daily to Walko (originally had a plant here and initiated dairy production) in Yangon, get paid transport costs by other farmers, if rejected by Walko due to too high water content then sold in Yangon milk market between 300-1,000 viss/day. Clean bins three times: at Walco with water and soap, evening with ash and straw, next morning with water. They also produce a large variety of traditional products such as 'Peda', ' Barfi', 'Gulab jamun', etc.
Respondent	**Neighbour in Kallagone village, 70 years old, all his life dairy farming, 10 acres for rice, has 7 employees**
Herd structure	More than 90 cross-bred dairy cattle, 50 milking cows give 100 viss/day, 30 pregnant out of which 20 are heifers and 10 dry cows..
Location/ Date	**Milk market near LBVD Headquarter, Yangon/ 11:30 am-18/08/2011**
Volume	Twice daily: 9-12 am and 3-5 pm. 2,200 viss per day during Ramadan otherwise 3,000 viss per day. During Ramadan people consume more milk and get it directly delivered to their houses, therefore the volume is now lower. There is another milk market in Yangon with a similar daily trading volume but a higher proportion of buffalo milk.
Price	1,100 MK/viss is very high due to Ramadan, buffalo milk for 100-200 MK more per viss
Hygiene	Milk is delivered warm, because of perception: cold =old, Signs with clear rules of no direct hand touching of milk, using lactometer, tasting only with small cup.
Location/time	**Mandalay area, Amarapura township, Tharyar Aye village/ 09:41 am-20/08; total of 120 cows and 60 milking in village**
Company type	Dairy farm in middle of village, no own land for crops or rice
Respondent	30 years already in business and inherited cows and business from father. Has 3 sons. He and his family do not drink milk.
Herd structure	30 dairy cows around the year. Had 50 native cows and started crossing with Frisian 20 years ago. 8 milking cows kept stable.
Production System description	Cross-bred cows fixed at poles next to house on earth/mud ground and during floods moved to other areas with occasional grazing. Milked and fed twice daily. Seasonal calving from October to December during dry season. Starts 2-3 month after calving with fertilization. Aim for 2 month dry period. 2-3 times with AI for one conception. Use AI and bull. If more than 5-7 failed trials then send cow to slaughter. Start breeding females with 2 years. Cows have maximum 10 calvings and reach maximum 13 years. Almost no culling for low production.
Feed Inputs	Volatile feed price. Bean meal and sesame cake is available at wholesale market, but bought from dairy farmer close by in village for cash.

	Product	Typical daily milking cow ration (8 cows)	Price
	Sesame cake	6-7 viss	450 MK/viss
	Bean meal	20 viss	250 MK/viss
	Grass, self cut on sideways	5 baskets	500MK/basket
	Straw	20 bundles	?
Breed inputs	AI for 5,000 MK/straw by vet by motorbike, Bull for 5,000 MK per mating, second time free, third time 50%. Bull from neighbouring village. Milking cows with 3 viss/day cost 300,000 MK/cow. Buying and selling milking cows from/to neighbour.		
Veterinary inputs	LBVD vaccinates, but farmer does not know for what; they vaccinate for FMD (1,000 MK/shot) Anthrax (500 MK/shot), HS (500 MK/shot), Black Leg (500 MK/shot). Sometimes clinical signs after FMD vaccinations observed by farmer. Mastitis is treated with antibiotics by farmer.		
Milk inputs			
Health situation	6 years ago brucellosis testing negative in whole village; recent mastitis testing with smeer test found 15 positive out of 88 total milking cows tested in the village.		
Manure output			
Breed output	Old cows are kept until dead, culled cows for licencee at estimated weight for 400 MK/viss life weight.		
Milk output	50viss/8 milking cows, production is lower in dry season due feed (grass) shortage.		
Milk marketing and hygiene	Sons milk 30viss in morning and bring to 5 tea shops in plastic and metal bin by motorbike. 600MK/viss. Constant demand, constant price, but a bit higher during the dry season from October. Afternoon 30 viss milk is turned into solid milk with plant sap. Made by wife and daughter in law and sold next day in the market. 1 viss milk is turned into 0,25 viss solid milk and sold for 4,000 to 6,000 MK/viss. After antibiotic treatment milk is only withhold for 1 day, because no tests are done either.		
Location/time	**Mandalay area, Amarapura township, Thugetaw village / 11:07 am-20/08, 110 dairy cows and 40 cattle in village kept by 80 farmers, rough estimate for whole village: 2viss for 200 days and 1 viss for 100 days per cow per year**		
Company type	Dairy farm/house in village		
Respondent	U Htay Maung, Farmer with wife and 6 children, very poor, started 10 years ago, also weaving and other odd jobs to survive, no land, do not drink the milk because have to sell to trader		
Herd structure	1 cross-bred milking cow, 3 calves, 2 dry cows		
Production System description	Cross-bred cows fixed around house on earth/mud with calves scavenging. Cows led into forest and common land to find feed. Sells male calves when 1.5 years old, can not have more than total of 3 milking cows due to feed and space limitations. Removes ear tag because causes bad wound. 3 year first calving, 18 month intercalving period. Natural service		
Feed Inputs	Cut and carry feeding of cut grass and straw. Otherwise grazing in forest.		
Breed inputs	Cross bred Frisian native, natural service for 5,000 MK and next service free within 1 month		
Veterinary inputs	Vaccination for 500 MK/shot		
Milk inputs			
Health situation	No disease problems and if then uses traditional medicine		
Manure output			

Breed output	Sells male calves at 1.5 years for 80,000 MK		
Milk output	2 viss/day/1 cow, 550MK/viss,		
Milk marketing and hygiene	got a 100,000 viss credit from trader/milk collector for the right of collector to exclusively get milk from one cow to repay the credit with 450MK/viss. Milk from 2 other cows (without credit) 550/MK viss, paid every 10 days		
Location/time	**Mandalay area, Amarapura township, Shan lay kyun village, on river island/ 11:48 am-20/08, 80 farmers, 100 dairy cows with 40 milking cows**		
Company type	Dairy farm with 5 acres of ground nuts. Labour is only hired for nut planting.		
Respondent	Living in village on island in river. Has big family all living in houses around with grocery store, selling food, chew tobacco etc.		
Herd structure	2 cross-bred dairy cattle and draft cattle. Currently no milk production with one heifer in 5th month and a youngstock.		
Production System description	Cattle fixed under stilted houses with straw upstairs. Milked and fed twice daily. Maximal 6 calvings and 10-12 years old dairy cows. Male calves sold 1½ years		
Feed Inputs	Rice straw-3 bundles (1.5 viss) for 100MK/viss, ground nut hay from own farm, Pea bran for 1,000MK/viss and bean paste 500MK/viss Rice straw, ground nut hay, Pee bran for 500MK/viss from village shop bought in bags fed at 1 viss/day for 4 cattle		
Breed inputs	Natural mating with bull.		
Veterinary inputs	LBVD vaccinates but farmer does not know for what. FMD (1,000MK/shot); (HS, Black Quarter Anthrax: 300-500 MK/shot). Sickness treatments are done by official vet, since it is not easy to get medicine.		
Milk inputs	When milking then 7-10 viss/day on average.		
Health situation	Diarrhoea sometimes		
Manure output	for own groundnut fields		
Breed output	Male calves for 80,000 at 1 ½ years		
Milk output	500 My/viss from collector (2-3 milkers working for one middleman) who can get up tp 1,000 in city, but farmer too busy to sell by himself. Gets paid every 14 days. Can get credit from processing plant.		
Milk marketing and hygiene	Collector comes and milks twice a day.		
Location	**Mandalay area, Amarapura township, Shan lay kyun village On river island/am-20/08**		
Company	Local tea shop, using imported (800 MK/can used for 12 cups) and condensed milk from local production (2,500MK/viss used for 30 cups). Selling the imported at a higher price to tea consumer.		
Location/time	**Mandalay area, Aung Myae TharZan township, Ooboketaw ward# 34/ village/13:16 pm-20/08, in this village 15 farmers-170 dairy cows at average herd size of 3-5 cows, except 2-3 farmers with more cows.**		
Company type	Dairy farm in Mandalay suburban in a muddy street.		
Respondent	U Pyu, 60 year old muslim with 8 children, total of 20 family members, also started own tea shop.		
Herd structure	20 cross-bred dairy, 10 female plus 6 calves, 3 bulls for fattening for muslim festival		
Production System description	Fixed cows on concrete bud below stilted house and in backyard, very muddy, wet etc. Cows fed a milked twice daily. 3 year first calving age. 5-6 calvings about 10 year old maximum for cows.		
Feed Inputs	Beer soluble (spent grain by-product from beer factory at 1,000MK per bag) when available. Gets grass with own horse cart for 4,000 MK for 2 workers to cut from communal land. Low quality rice straw gets chopped at farm and bought for 1,000 MK/cart. Concentrates are bought from factory every 5 days:		
	Bean husk	125viss/day	100MK/viss
	Bean powder	50 viss/day	300 MK/viss
	Sesame cake	20 viss/day	450 MK/viss

Breed inputs	Heifers 2 year old, Natural mating with own 50% Frisian bull, buys milking cows giving 8-9 viss/day at 500,000 MK from village Tadaoo. 5 viss cow is not even with feed cost.		
Veterinary inputs	Not vaccinating (too expensive) and not cooperating with LBVD. Calls muslim vet from zoo to deal with health problems.		
Milk inputs	Buys sweet condensed milk for own teashop at 2,000 MK/viss.		
Health situation	Many calves dying in rainy season due to bad keeping conditions. 3-5 calf mortality every year, Coccidiosis. Cows catching cold and getting mastitis.		
Manure output	Can only sell in dry season for 10,000MK per truck, otherwise dumps in the street.		
Breed output	Male calves for 80,000 MK at 1 year old to others for breeding or to lincesee for slaughtering. Old cows (5-6 calvings) sold to licensee at 400MK/kg life weight estimated on farm. Dead cows buried because of Muslim religion		
Milk output	70 viss from 10 milking cows.		
Milk marketing and hygiene	Consume 1 viss/day (with tea) in family. 3 milkers come twice daily and pay 700 MK/viss, bring own containers, he is not trusting their size. Can not sell directly to tea shops and would not like to do because this won't ensure the same stable demand for quantity. Owned tea shop needs 4-5 viss per day for which they keep a 5viss cow		
Location/time	**Mandalay city, shop/factory at #11, 82nd street, Mandalay; farm in Patheingyi township, kalama taung village, 15:57 pm-20/08,**		
Company type	Dairy farm and yogurt factory 'Shwe OO', 3 acres of land, kept dairy for 20 years than handed over to brother and started sunflower/seed production for 34 years, re-started dairy 7 years ago after, also runs a tea shop/restaurant with marketing of yoghurt, ice production, 15 employees, out of this 8 for milking.		
Respondent	Shen/Chinese descendent with wife and 4 children		
Herd structure	Total 200 cross-bred cows, 125 female, 80 milking, 70 male and female young stock under 1 year old, 5 bulls for service		
Production System description			
Feed Inputs	Buy from 14-15 pea/bean mills, pea and bean meal stored average 8,000 - 10,000 viss in warehouse. Warned him of fungus and Aflatoxin problems.		
		Daily for milking cows	Unit price
	Pea husk	100viss	80MK/viss
	Beanpaste	100viss	280/viss
	Sesame cake	160viss	
	Cotton seed cake	80viss	
	Grass	1,000 viss	15MK/viss
	Straw	500 viss	25MK/viss
Breed inputs			
Veterinary inputs	Vaccination by LBVD; Anthrax, BQ, HS, FMD, 400-500/- per shot		
Milk inputs	Buys from max. another farm at premium price of 800 MK/viss, no testing other than the yoghurt result. If it turns out bad next time reduces price by 50%.		
Health situation			
Manure output			
Breed output			
Milk output	400 viss/day/80milking cows		
Milk marketing and hygiene	500viss/day: -75viss for raw milk -50 viss pasteurized milk - hot milk 500MK/350ml - 150 viss yoghurt from 300 viss raw milk: 500MK/0.2kg - 30 viss Sorghum/Tapioka mix milk: 500MK/0.2kg		

	- fried milk curd balls for longer storage of left over milk in 200ml plastic containers: 1,000MK/9 balls (from 1viss of milk) - solid milk on demand for longer storage or left over: 1.15 viss raw milk used for 0.15 viss solid milk and sold at 1,800 MK/0.15 viss Bulk yoghurt stored with ice in big cool boxes sold in bowls for 500MK serving of about 300mg; pasteurized milk sold for 500 MK/beer glass (about 300 ml), other family members are also starting yoghurt marketing, very simple production method in back of kitchen: buys yoghurt from other companies and mixes with milk for the culture, beliefs this is more natural than buying a culture. Sells in own shops in Yangon and Naypyidaw and intends to open new ones. No interest to sell in supermarkets because has to deal with leftovers and requires packaging which will require more formal testing and certification, is not interested in Halal or other FDA lables. Also markets to gold mines in the north but this only with the yoghurt made from bought milk. Advertising daily in newspaper for products and shops.
Concerns/Future thoughts	Want to plant grass for pasture but not allowed. Not concerned about ASEAN free trade. Government want to form groups of producers to prepare them for competition but he is not interested.
Location/time	**Mektila, district/township, LBVD veterinary office/ am-21/08,**
	Decline in total cattle population during the last 5 years due to a)low price for milk, b)Mechanisation c) unofficial export of cattle in emergency for cash; average wage: 2,000MK/day
Location/time	**Mektila township, Taw Ma ward/village 13:59 am-21/08,**
Company type	Kaung Htet San Dairy Farm, Condensed milk Processor WinWin Tama, since 40 years in dairy inherited from parents, since 15 years condensed milk, owner also involved in furniture production and trade; 28 employees for dairy and 50 for condensed milk + 68 milkers employed by farm to collect from others, Employees earn 2,000 MK/day
Respondent	Son of the owner (U Win Maung) and manager
Herd structure	560 cross-bred dairy, 150 milking cows, 122 dry cows, 78 female calves below 6 month
Production System description	Cross-bred cows on concrete kept free ranging in two production groups. 1st calving at 3 years, 6 calvings maximum, intercalving period of 16 month, restart breeding 4 month after calving, seasonal calving with most calves in February and March, use AI from LBVD since 3 years, before bull, tried to use milking machine, but switched back to hand milking, no reliable milkers and cows are not used to machine, male calves sold at 7-12 month
Feed Inputs	Chopped rice straw, corn and grass form pasture and field,

Rice straw	2 viss/cow/day	Bought: 50MK/viss
Cotton seed cake	3viss/cow/day	Factory: 268MK/viss
Pea bran	1.5vis/cow/day	Agent: 340MK/viss
Pea husk	1.5 viss	Factory: 125 MK/viss
Broken rice	???	???

Breed inputs	Introduced Frisian breed in 1975, buy replacement cows in surrounding villages, 3,000MK/straw of semen, no natural service, AI by farm staff trained by LBVD, 3,000 MK/straw of semen(LBVD German) but after 3 AI, try natural service with 2 own bulls and if not successful sold out
Veterinary inputs	Vaccination by LBVD. Medicine in store and vets, for own farm as well as contract farmers
Milk inputs	**500** viss/day = Milk from own farm, **1,000** viss/day = 68 employed milkers (in 18 lines) from farms /villages where farmers are given a credit (cow & feed) based on quantity of milk delivery which buys the collector the right to collect the milk from a specific cow

	2,100 viss/day = 25 independent milk collectors, each with 2-3 employed milkers ; 25 x 2-3milkers x 30 viss = 1,500-2,250viss/day Pay 2,100 viss/day at 650 MK/viss (fixed price over the year) collected from surrounding farms, would reach up to 3,000 viss/day at the end of rain season; 5 years ago collected 5,000 viss/day which declined to 3,000 viss/day now due to less cows, number of farms has remained the same. Reason is a 4-5 time increase in feed price. Contracted farmers are provided with: a) 50MK/viss reduced price cottonseed cake for 300 MK/viss b) Vaccinations at market price c) Medicine at market price d) Napiew grass seeds e) Credit Lactoscan of delivered milk. Problems are water, rice grain/sugar cane extract for weight, starch/urea powder added for protein. Amount of water added is subtracted from milk price. Quantification on farms by cups, which are not always accurate. Payment is done every 5 days.
Health situation	Reproduction is main problem? No still birth, no calf mortality but diarrhoea sometimes
Manure output	Used in own field and pastures
Breed output	Old cows sent to slaughter, male calves sold to licensee for 400MK/viss life weight or as mating bull for 200,000 MK/bull
Milk output	No testing of milk is done
Milk marketing and hygiene	Produce 6 batches/day of 600 viss/batch condensed milk and put in 14 viss containers. Condensed milk in plastic containers for 34,000MK/14 viss container to tea shops in whole country: Meiktila, Yangon by train to station from there picked up by agent (400MK/container +50MK to station) and cars (1,000MK/container), containers are sent back after agent accumulates 100 otherwise has to pay 3,500 MK/container, agents are buying product and can sell under any label they want. Agent give feed back to quality problemsn and reports sales price back to control price by company: about 36,000MK/container Yangon: 6 agents sell 42,800viss/month Pyi???: 1 agent sells 2,100viss/month Napyidaw: 1 agent sells 2,100viss/month Tangg???: 1 agent sells 700 viss/month Meigktila: own delivery to tea shops 3,000viss/month Buy sugar every 3-4 month from agent in Naypidaw: 1,500 bags x 30viss/bag x 1,450MK/viss, (45,000MK/30viss bag)
Concerns/Future thoughts	3 big competitor but not seen as a problem, they can always sell through their agents, imports are cheaper and problem, price of sugar is too high 1,450MK/viss, price was 700MK/viss in 2009, 960MK/viss in 2010
Location/time	**Mektila township, Kan Oo ward/village 15:50 pm-21/08,**
Company type	Dairy farm Win Myittar, condensed milk production just restarted 2 month ago after they lost quota with military camp to supply the condensed milk, 4 acres of grass and some rice, 10 workers for factory,7 workers in farm, 6 workers for cleaning, 7 employed milkers in farm and 15 milkers for outside farms
Respondent	U Win Nyunt Aung, Dairy farmer and wife
Herd structure	300 total, 90 milking cows, 60 dry cows, 90 calves 1-6 month old, 60 young stock 6month to 3 years
Production System description	Cross-bred fixed on concrete in open barn, fed and milked twice daily, first calving at 3 years, maximum 6-7 calvings, intercalving 15 month, mainly AI from LBVD FAO project, self producing replacement
Feed Inputs	Daily ration milking cow

	Cottonseed cake from factory	3viss/day/cow	250MK/viss +15My delivery	Buy 1,200 viss every 5 days from factory
	Pea bran from Mandalay wholesale	2viss/day/cow	340MK/viss +15 delivery	Buy 6,000 viss /month from Mandalay region
	Pea husk from Mandalay	3viss/day/cow	130 MK/viss	---//---
	Grass from roadside		300 MK/basket	Napier in 4-5 months
Breed inputs				
Veterinary inputs	Vaccination for FMD, blackwater, Anthrax, private vet does vaccination and charges 300MK/shot excluding vaccine, Private veterinarian (retired LBVD)for health of cows.			
Milk inputs	1,000 viss/day collected by 15 employees who are paid 2,500 MK/day, from 200 farmers with 2 cross-bred milking cows each, giving deposit of 70,000 - 100,000MK for each cow as long as keeping dairy cows, total of 1,000 viss collected from 350 cows milk at 530 MK/viss, 160 free hand collectors each with 5-10viss and max 40-50 viss, pays 600MK/viss at processing plant, use lactometer and lactoscan for milk quality and content, Iodine test and check cream with manual and motor cream separator, from 1 viss each from all 15 milkers and 160 collectors. 1 minute-1 viss milk by manual and 1 min. 3 viss milk by motor cream separator, pays every 5 days, containers for collection provided by processing plant, give advice on feeding etc., gives male calves as gift 2-3 times a year, even kept collecting milk while he was not able to sell condensed milk to military for 1 year			
Health situation	2 years ago late abortions, FMD outbreak 6-7 years ago with very low milk production			
Manure output	Manure flushed in drainage system around			
Breed output	Male calves at 1 year old to licensee for 150,000MK, old cow (6-7 calving) for 400,00MK to licensee, they come and pick up.			
Milk output	500viss/day/90 cows			
Milk marketing and hygiene	30% sugar condensed milk. Batch: 29 viss milk add 3 viss sugar result in 33 containers with 14 viss condensed milk ???, buy sugar for 1,150 MK/viss (1200-1500 tons of sugar per year). Selling 925 containers (14viss) every 10 days to military for 30,500MK/14 viss container, sell 5 containers (14viss) per day with 14 viss each to local tea shops, no problems no feed back. Fungus after 1 ½ month, Use rice husk and plum broken seeds for fuel for boiler, 1,000-1,200 viss /batch of 1 1/2 hour cooking			
Concerns/Future thoughts	Highly dependent on military for marketing			
Location/time	**Mandalay Region, Kyaukse district/township, Sulegone village 11:17 am-22/08,**			
Company type	Milk collection point for **Mya Ba Yin** condensed milk factory,			
Respondent	Employees testing and traders delivering			
	6 employees, 3 testing, 3 weighing and filling in truck, Salary 3,500MK/day/worker, 2,500 viss/day collected, test for taste, density and take samples to be sent to milk processing plant, pay every 15 days, no rejection during last 6 years for quality, just adjust for water content, delivery in 11 viss containers, pay 500 MK/viss at collection point, farmer in village gets 450 MK/viss, 42 collectors deliver every day, 1 collector has 2-3 milkers and sells 8 containers from 40 farmers, 4,000viss/truck go to plant at 1pm, everything else than comes in needs to be collected with passive cooling			

	system truck because it was collected longer ago and further away. Max 50 miles collection.
Location/time	**Kyaukse township, Soon Ye ward/village 14:57 pm-22/08,**
Company type	Mya Ba Yin condensed milk plant, largest company in Mandalay area, also dairy cows reduced from 400 to 200 but not visited, 200 employees with monthly wage of 60,000- 150,000 MK averaging at 80,000 MK.
Respondent	Owner, took over from grandfather, started with bathtub condensed milk system, these are now collection points, originally in Mandalay but had to move out due to Australian project
Production System description	Condensed milk in multiples of the systems used by smaller condensed milk producers, milk powder production with equipment from China to store excess supply of milk, take cream over 4% in raw milk off for bakeries, condensed milk also in tins
Milk inputs	35,000viss/day from 25,000 milking cows, 2-3 cows per farmer, 25 year old relations with traders and farmers, 20 collection points one already concentrates, testing for water, fat, starch, urea and if they find abnormality they call trader. Testing of samples is only done randomly, no test for cell count, antibiotics or other residues, transport costs from collection point to plant estimated at 120 MK/viss plus wages, Milk transporter has 4,000 viss capacity, passive cooling system transporter has 1,000 viss capacity. In total the company has 3 X 4,000 viss trucks, 6 X 1,000 viss cooling trucks, 25 X 1,200-1,500 viss trucks. Road quality is limiting factor in increasing delivered milk quantity, no exclusive area, 500My/viss, milk price is adjusted with a formula between rice price for farmers and import price of condensed milk (1 can of milk equals one can of rice, the price of rice is expressed as price of 1 bushel. e.g. 1 bushel = 8 cans of rice = 800 MK, thus 1 can of rice = 100 MK = 1 can of milk x 5 cans = 1 viss of milk= 500MK), sets price and others follow,
Health situation	
Sugar input	Price in Malaysia, Thailand and Singapore 50% lower, in Myanmar level is 1,200 MK/viss, but company secured contract for 5 years for 500MK/viss
Milk marketing and hygiene	Cream for bakeries, Condensed milk is done with 30% sugar content total of 1,200 containers with 14 viss/day = 16,800 viss/day, plus 200 cardboxes containing 48 cans x 0.25 viss condensed milk = 2,400 viss can be stored up to 4 month, milk powder can be stored up to 12 month, currently producing 40 bags with 25kg each, used again for condensed milk and small amount marketed through supermarkets, in March/April milk supply is low but demand for condensed milk high, test condensed milk in own laboratory, no LBVD involvement anymore, also produces 7,500 condensed milk cans/day with technology from Thailand. Total of 1,200 boxes with 14 viss total production per day, 25% or 300 delivered and sold to 3 agents in Yangon for 32,000MK/viss, advance payment required, only sold under their label, 75% sold direcly in Mandalay area, Stable production in last 5 years, increasing demand is met with imports of condensed milk, fresh milk and yoghurt need better quality which can not be delivered by farmers, raw milk quality can be improved by more milk collection centres and cooling system but costs and electricity availability is problem
Concerns/Future thoughts	Domestic condensed milk was cheaper before but now exchange rate MK/USD makes imports cheaper, increase milk production is difficult because farmers don't know how to handle cross-bred cows, anecdotes of villages with introduced cross-breds and failure, extension services to farmers by the company is not possible because the farmers are too many and too far away, a leader with a role model would be required in each village, no fear about ASEAN free-trade because sugar will also be cheaper and technology

	can be bought.
Location/time	**Sagaing region, Monywa township, Industrial zone (No.1) 12:02 pm-23/08,**
Livestock and noodle production zone	83 plots (20 x 27 metre) of land with a total of 15.05 acres, land price: 1,200,000 MK/acre, a committee has money and is preparing to upgrade roads, to build drainage, to connect electricity (use generator now for 100MK/3hours), but wait for approval from minister, use Frisian cross-bred cows, some farmers own the land they keep their cows but many only rent from owners who want to keep the land for crop production (chew tobacco leaves were produced before the zone was started) have 15 years experience since they started the zone and even kept cows in village before farmers followed the 26 noodle factories that moved into the zone, most farmers still have their house in the village and only the cows in the zone. All milk is collected by Mya Ba Yin milk collection point close by for 500My/viss and was at 450 in 2010, only 5% sold to local tea shops, hire a milker for 150MK/day/cow (30 milkers) who milks twice a day, payment every 10 days, 200,000MK/10viss credit given to farmers by milk processor and paid back by 10% milk price reduction, no other formal credit available to farmers without land ownership, milker hired because farmers don't know how to milk, dairy is side business, they all have other odd jobs too,
Production system and herd structure	about 5-10 cows minimum and 30 cows maximum per farmer, AI used for the last two years but now switched to bull (1,000 MK/mating second service within 30 days for free), because no liquid nitrogen is available, noodle production by product is supplied by noodle factories with ' tologies' once per day, 1st mating with 2 years, 1st calving with 3 years, 18 month intercalving period, average 3-4 maxium 6 calvings per cow, 10 years max age for milking cows, male calves sold at 7-8 month for 400 MK/viss live weight almost no pigs are kept except for some factory workers, farmers are afraid of losing pigs to PRRS outbreak,

	Farmers	cattle				Total in farm			Milking cows	Milk in viss/day
		Adult male	Adult female	Young male	Young female	male	female	Total		
In Zone	37	4	348	-	17	108	136	613	331	2,171
Outside zone	96	4	448	1	36	161	130	780	410	2,648
In village	282	8	971	25	102	237	397	1740	705	4,304
Total Monywa	416	16	1,767	26	155	506	663	3,133	1,446	9,123

Health situation	Production problems are muddy/wet conditions which cause mastitis and other infections, farmers have very limited knowledge on diseases and how to cure them. LBVD vaccinates for FMD, HS, Anthrax, a FMD outbreak occurred 3-4 years ago, generally dead cows are sold for 1/3 price to a dead cow dealer after approval from LBVD			
Feed	Noodle factory liquid by-product is main component for feed and delivered very liquid with little trucks 'tology' (trawler jeep) for MK 3,000/tology, is not always available, during strong rains no noodle production and very watery by-product, if at all			
	Product	Daily ration for milking cow giving 6.25 viss/day	Price in MK/viss	Costs in MK/day/cow
	Bean husk	4 viss	130	520
	Noodle factory solid	2 viss	200	400
	Noodle factory liquid	5 buckets	40/bucket	200
	Sesame cake	1.5	450	675
	Straw	10 bundles	20/bundle	200
	Milker		150/cow	150
	Total feed and milking costs			2,145
	Average milk yield 6.25viss x 500MK			3,125
	Gross margin			980

<table>
<tr><td>Location/time</td><td>Sagaing region, Monywa township, Industrial zone No.1, 13:56 pm-23/08,</td></tr>
<tr><td>Company type</td><td>Milk collection point with pre-concentrating of milk for Mya Ba Yin condensed milk factory, established in 2006, 14 employees,</td></tr>
<tr><td>Respondent</td><td>Manager for the collection point</td></tr>
<tr><td>Milk inputs, processing and outputs</td><td>Morning 6 – 10 am milk input: 7,000viss and evening 3-7pm milk input: 5,000; due to heavy rain with reduced feed availability and difficult road conditions milk input down to 12,000 from 14,000
<table>
<tr><td></td><td>2005</td><td>2006</td><td>2007</td><td>2008</td><td>2009</td><td>2010</td><td>2011</td></tr>
<tr><td>Milk input viss/day</td><td></td><td>8,000</td><td></td><td></td><td></td><td></td><td>12,000</td></tr>
<tr><td>Milk price MK/viss</td><td>275</td><td>300</td><td>350</td><td>450</td><td>450</td><td>550</td><td>500</td></tr>
</table></td></tr>
<tr><td></td><td>On average 100 viss collected from 12-13 farmers by 221 collectors who pay 450MK/viss to farmers in village, usual problems with milk are a) water added in which way they pay less b) dirty milk in rainy season c) already spoiled due to staying too long uncooled in hot season, 4 workers filter and weigh, 4 workers testing and sampling, 2 workers mixing milk with sugar, 2 workers concentrating milk, result is a 50% pre-concentrated sweetened condensed milk for further processing in the main plant, Batch: 2,500viss raw milk plus 450 viss sugar cooked for 3 hours results in 1,100viss concentrated milk, put in 350 blue containers which leave at 12 pm by truck and arrive by 5 am in main processing plant and arrives back at 3 pm, heating of water for steam done with wood: 10 units(10*10*1 foot)/day of wood chips from river for 14,000MK/unit, 8 units of ply wood for 12,000MK/unit, everything else done by Diesel generator with 15 gallon/day and 3,900MK/gallon,</td></tr>
<tr><td>Location/time</td><td>Sagaing region, Monywa township, Payit kone(north) village 15:58 pm-23/08,</td></tr>
<tr><td>Company type</td><td>Dairy farm in the backyard of noodle factory with direct access to liquid by-product but outside the livestock production zone, owns 1.2 acres of land. One worker for 75,000MK/month excluding meals</td></tr>
<tr><td>Respondent</td><td>Farmer and owner, has wife and 4 children, started when got married in 1982 with 2 local cows, got idea from model farm in close by from where he also bought a 75% Frisian bull,</td></tr>
<tr><td>Herd structure</td><td>29 cows total with 8 milking cows, 6 pregnant, 2 * 9 month old, 2 * 7-8 month old, 2* 4-6 month old,</td></tr>
<tr><td>Production System description</td><td>Cows kept fixed on concrete in open barn, fed and milked twice daily, milking done with calve next to it, calves suckle after milking, 1st mating with 18 month 1st calving 2 ½ years, intervalving 12 month, 2 month after calving first mating again, male calves kept until 1 year age, bull used for mating, own replacement raised but also selling and buying cows, 3-4 calvings after buying and then sold, oldest cow is 5 years,</td></tr>
<tr><td>Feed Inputs</td><td>
<table>
<tr><td></td><td>MK/viss</td><td></td><td>Daily milking cow ration???</td></tr>
<tr><td>Bean husk from factory</td><td>120 + 15 delivery</td><td>750 viss/batch every 40 days</td><td>???</td></tr>
<tr><td>Sesame cake from factory</td><td>450 + 15 delivery</td><td>500viss/batch every 40 days</td><td>???</td></tr>
<tr><td>Sunflower cake</td><td>200 +15 deliver</td><td>Tology/batch every 40 days</td><td>???</td></tr>
<tr><td>Ban powder left over from ??? by motorcycle</td><td>120</td><td>60viss/batch</td><td>???</td></tr>
<tr><td>Straw</td><td>70,000MK???</td><td>4,000/bundles???</td><td>???</td></tr>
<tr><td>Grass by hired cutter from roadsides</td><td>1,500MK/day???</td><td>???</td><td>???</td></tr>
</table></td></tr>
<tr><td>Breed inputs</td><td>Buys milking cows at 450,000 (750,000)MK/cow which gives 7.5 (11) viss/day, from other farmers in village</td></tr>
<tr><td>Veterinary inputs</td><td>LBVD does vaccination for: FMD, Hemorrhagic septicemia (HS), Anthrax, Blackleg; antibiotics for mastitis are bought from LBVD and milk is discharged after treatment, in case of chronic Mastitis longer treatment costs 20,000 to 30,000MK otherwise for one off treatments 5,000 MK, treatments</td></tr>
</table>

	are done by private veterinarian,
Construction costs	300USD for concrete flooring and 300USD for roof in 2006, rubber tire for trough for 90,000MK
Health situation	No abortions or stillbirths,
Manure output	With water in local drainage system
Breed output	Male calves sold at 1 year for 120,000 MK to other farmers for mating for up to 150,000MK, other farmers also use his bull for 5,000MK/mating with second service for free, dead calves and cows are sold to trader,
Milk output	95viss/day/8cows =11.88 viss/day/cow
Milk marketing and hygiene	Milker comes twice daily and transports in plastic container to company, milker is paid 50MK/viss, milker pays every 10 days when gets money from milk factory, Got credit from milk collector of about 2,000,000MK 40 days ago which is now 1,400,000MK pay back is flexible depending on cash situation of farmer, Monthy profit of about 650,000MK
Concerns/Future thoughts	No desire to expand, since this would be too much trouble with hiring extra labour
Location/time	**Sagaing region, Monywa township, Payit kone (south) village, 17:16 pm-23/08,**
Respondent	U Tun Wai
Company type	Small scale bathtub condensed milk producer with dairy cows, in 2010 processed 350 viss raw milk per day, in 2011 down to 35viss/day due to high sugar price, cream (3,500 MK/viss) is sold every 15 days to bakeries in in Pyin Oo Lwin township in Mandalay Region, where milk products are produced since colonial times.
Milk processing system	Batch: 30 viss raw milk, extract 3 viss cream, 27 viss skimmed milk left, add 30 % sugar, in two bathtubs with 15 viss each, heat and stir continuously with wooden paddle for ½ hour and result in 16 viss condensed milk(8 viss from each tub, cooled down and packed in 14 viss containers, or sold at 1,700MK/viss packets
Herd structure	20 cows, 5 milking cows 7 pregnant cows, producing 40-50 viss/day in morning used for condensed milk;15 viss in evening which is delivered to Mya Ba Yin for 500 MK/viss
Health situation	LBVD does vaccinations and provides multivitamin
Marketing	3 tea shops and 3 agents from other township buy condensed milk for 1,700MK/viss
Location/time	**Sagaing region, Monywa township, village??? 17:41 pm-23/08,**
Company type	Small scale condensed milk producer with two bathtubs, owner has owner has no own farm, gives credit to 30 other farmers for a total of 8,000,000MK, 5 milkers for 50,000/month each who collect twice daily from 30 farmers,
Respondent	Long time employee, Owner (Mrs) Daw Nwe Yee not at home.
Processing system	13 viss raw milk creamed off for 7 minutes should result in 0.7 viss cream otherwise the farmer is checked, Batch 1: 6-8am , 300 viss milk delivery, processing 8-12am, 7-8 bathtubs: Batch 2: 3-5m , 100 viss milk delivery, processing from 4 pm,5 bathtubs: 1 bathtub is 20 viss milk plus 6 viss sugar for ½ hour, afterwards stored in 80 viss container to cool down, then put in 12 viss container x 8 nos daily for distribution to Monywa tea shops or cold drinks shops for 1,700 MK/viss, Fuel; saw dust 20 baskets daily, one 3 tonne truck load (80,000MK) lasts 1 month
	Neighbour has 15 cows
Location/time	**Monywa District, Chaung-U township, "Unity" dairy farm and processing plant, 08:50 am-24/08,**
Company type	Six shareholders including 2 vets, 1. Small scale **Milk processing plant**, (past. Milk and yoghurt), since July,2011 . 2. **Dairy farm**, about 3.5 acres or rice, 13 employees on the whole farm for

<table>
<tr><td></td><td>production, processing and marketing, started in 2007, with 5 million kyats for 8 cows and 3 million kyats turning broiler chicken houses into cow sheds with spacious cement floor (after HPAI outbreak in nearby Monywa t/s in 2006),
3. Feed shop in Monywa, 3 tons daily, since 1996.
4. Commercial layer chicken farm (8,000 nos. of ckicken),since 1990, survived the trade ban in 2006 HPAI outbreak as eggs could be sold out.</td></tr>
<tr><td>Respondent</td><td>Dr. Soe Moe, owner vet,</td></tr>
<tr><td>Herd structure</td><td>
<table>
<tr><td>Age group</td><td>Female</td><td>Male</td><td>Total</td></tr>
<tr><td><1 year</td><td>5</td><td>5</td><td>10</td></tr>
<tr><td>1-3 years</td><td>11 pregnant + 10 heifers</td><td>-</td><td>21</td></tr>
<tr><td>>3 years</td><td>28 nos.- 24 milking</td><td>-</td><td>28</td></tr>
<tr><td>Total</td><td>54</td><td>5</td><td>59</td></tr>
</table>
</td></tr>
<tr><td>Production System description</td><td>Dairy cows kept all day all year in barn on concrete floor in 3 open barns. Moved around systematically to different age groups according to age and lactation status. Dry cows and heifers in one shed, Calves and cows of first 3 month of lactation in another and after 3 month of lactation, until dry period, in the last shed.
Natural mating with own bull before, but no bull at the moment, sold out with 750,000 kyats in 2010. Self AI with German straws from LBVD, 4,000 MK each, 2-3 straws/ cow till pregnant.
AI started at 16-17 month, hence first calving age about 30 months. 18 month inter-calving period. Maximum age of dairy cows is 9-10 years after 6-7 calvings (5 cows to be culled soon).
Maintain 20 cows in farm. Cows are fed and milked twice daily.
Manure is removed and concrete washed with water.</td></tr>
<tr><td>Feed inputs</td><td>
<table>
<tr><td colspan="3">Daily ration</td></tr>
<tr><td>Self made urea treated straw</td><td>230 viss</td><td>100MK/viss</td></tr>
<tr><td>Corn</td><td>60%</td><td></td></tr>
<tr><td>Sesame cake</td><td>20%</td><td></td></tr>
<tr><td>Rice bran</td><td>20%</td><td></td></tr>
<tr><td>Premix 2-3% mixed at feed mill</td><td>4 bags (25viss/bag)</td><td>960MK/viss</td></tr>
<tr><td>Noodle bean liquid</td><td>100 units(6 gals each)</td><td>150MK/unit</td></tr>
<tr><td>Cotton seed cake</td><td>43 viss</td><td>260MK/viss</td></tr>
<tr><td>Grass</td><td>11 viss</td><td>250MK/viss</td></tr>
<tr><td colspan="3">More sesame cake added for young calves</td></tr>
</table>
</td></tr>
<tr><td>Breed input</td><td>German straw from LBVD</td></tr>
<tr><td>Veterinary inputs</td><td>▪ Self vaccination by 2 vet owners, FMD, Anthrax and Black Quarter, not HS.
▪ Brucellosis tested but negative
▪ Hooves chopped by knives
▪ No availability problems from pharmaceutical shops</td></tr>
<tr><td>Milk outputs</td><td>180 viss per day from 24 milking cows</td></tr>
<tr><td>Health situation</td><td>No calf mortality, 2 abortions at 6-7 month old and 1 still birth assumed to be due to Jenner brand semen straws
Indigestion and bloat sometimes.
Mastitis and foot rot by antibiotics,</td></tr>
<tr><td>Manure output</td><td>Washed down from concrete floor into own small plantations around barns</td></tr>
<tr><td>Breed output</td><td>▪ Most male calves sold at 5-7 months old (50,000 to 60,000MK) to villages for breeding or for meat.
• Culled 2 cows after only 4-5 calvings, no success in getting pregnant, 4,000 MK/viss, 300,000MK/cow.</td></tr>
<tr><td>Milk output</td><td>▪ Daily send 150 viss of milk to one local SCM producer(brand-Anyar Myay).</td></tr>
</table>

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<tr><td></td><td>

Use 30 viss from selected cows for past. Milk and yoghurt every other day.
For full cream milk: 5 viss x 6 buckets with lid (probably Indian steel),
in hot water tub heated by rice husk stove below, maintain 70ºC by hot water outlet and cold water inlet taps, for half an hour, cooled down.
For yoghurt: Cream separated milk, same procedure, cooled down from70ºC, ½ hour, to 42ºC, put culture (super dragon brand, source?) Leave 6-8 hours...
kept in fridge and distributed into cups. Sealed by small machine.

</td></tr>
<tr><td>Milk marketing</td><td>Milk sent to condensed milk producers, .1 viss = 9 cups of yoghurt which last for max. 10 days, sold to 15 shops in Monywa every 5 days by car, sell for 150MK/yoghurt cup and shop charges 200MK/yoghurt cup,</td></tr>
<tr><td>Location/time</td><td>Sagaing region, Sagaing township, 11:30 am -24/08,</td></tr>
<tr><td>Company</td><td>‘Yadanar Sin Minn’, Medium scale condensed milk producer, bathtub system from 1976 to 1989 (14viss x 10 containers) then new company with technology introduced by a myanmar sailor/ sea man from Singapore and manufactured in Mandalay ‘Sein Pann’ Industrial zone. Since then,
1993- small scale factory- 14viss x 20 containers
1997- medium factory
2007- Tada Oo factory- 14viss x 130 containers</td></tr>
<tr><td>Respondent</td><td>U Nyo Thoung (Owner), Ms Khin Aye Kyu (daughter of owner) and employed manager</td></tr>
<tr><td>Milk inputs</td><td>4,000 viss/day supplied by 70 collectors from farmers (about 800 farmers if 5 viss/farmer) in region with long lasting relationship, about 5 viss per farm, provide credit to farmer of about 300,000 – 400,000MK/10viss milk, also provide feed, rice, oil at wholesale price from milk collector house for credit, payment every 15 days against milk cheque, a very detailed testing with lactometer, lactoscan and acetic acid (vinegar powder) coagulating the solid milk and weighing solid milk component which is perceived more accurate for milk from local cows,</td></tr>
<tr><td>Milk processing and hygiene</td><td>4,000 viss raw milk per day use, also re-use stored (up to 8 month, November to April is high milk delivery season) condensed milk: 500 viss sugar milk + 28 viss 35% condensed milk,
From another factory in TadaOo township where there are more small scale farmers with a cow or two, go and collect by a milk car with10-15% sugar(just enough to preserve the milk on the way without the cold chain) in the bowser of 2,700-3,000 viss and add more sugar accordingly when cooking.

No testing of finish products or at any step.Recommended FDA or LBVD’s nearest testing lab in Mandalay

-use wood to cook at costs of 140,000MK/day for 4000 viss of milk

Daily cost

- Milk 4,000 viss x 500 MK/viss = 2,000,000 MK/viss
- Sugar 500 bags x 30 viss x 1,200 MK/viss =1,800,000 MK/viss
- Firewood = 140,000 MK/viss</td></tr>
<tr><td>Milk marketing</td><td>
<table>
<tr><td>Product name</td><td>% sugar</td><td>MK/viss</td></tr>
<tr><td>Super (red label)</td><td>25</td><td>3,350</td></tr>
<tr><td>Super 1 (blue label)</td><td>30</td><td>3,250</td></tr>
<tr><td>Super 2 (green label)</td><td>35</td><td>3,150</td></tr>
<tr><td>Super 3 (yellow label)</td><td>40</td><td>3,050</td></tr>
</table>
100 viss raw milk plus 40% sugar = 62 viss condensed milk
100 viss raw milk plus 25% sugar = 37 viss condensed milk
</td></tr>
</table>

	50% of the production output is 40% sugar content and 50% production is 35% sugar content the other %, only by special order. Plastic container costs 4,000MK re-use Card board box 500MK mono use
Sugar inputs	Daily 500 bags with 30 viss/bag of 1,200MK/viss of brown sugar from 3 different sugar factories, Batch: 30 viss sugar + 30 viss water + 2 viss milk to bind brown sediments and achieve white sugar,
Future plans	Want to invest in evaporated milk (this is also minister directive), but need access to technology, can market directly to teashops how currently use evaporated milk from Thailand, Singapore, Malaysia,

Annex 2 – Feed ration and cost examples

Table 12 Feed and milk price examples in Chaung-U townships

Product	Quantity (kg/day/cow)	Price (MK/viss)	Price (USD/kg)	Price USD/day/cow
Self made urea treated straw	6.24	100	0.08	0.52
Premix (60% corn, 20% sesame cake, 20% rice bran)	2.71	960	0.80	2.16
Noodle bean liquid	38.50	6.60	0.01	0.21
Cotton seed cake	1.17	260	0.22	0.25
Grass	0.30	250	0.21	0.06
Total	48.91	-	-	3.21
Milk revenue	12.00	450	0.37	4.49
Gross margin				1.28

Monywa District, Chaung-U township, "Unity" dairy farm and processing plant, 08:50 am-24/08

Table 13 Feed and milk price examples in Mektila townships

Product	Quantity (kg/day/cow)	Price (MK/viss)	Price (USD/kg)	Price USD/day/cow
Cottonseed cake	4.80	265	0.22	1.06
Pea bran	3.20	355	0.30	0.94
Pea husk	4.80	130	0.11	0.52
Grass	Basket	300/Basket	0.25/Basket	0.25
Total				2.77
Milk revenue	8.89	500	0.42	3.69
Gross margin				0.92

Mektila township, Kan Oo ward/village 15:50 pm-21/08,

Table 14 Feed and milk price examples in Mandalay and Patheingyi townships

Product	Quantity (kg/day/cow)	Price (MK/viss)	Price (USD/kg)	Price USD/day/cow
Pea husk	2.00	80	0.07	0.13

Bean paste	2.00	280	0.23	0.47
Sesame cake	3.20	450	0.37	1.20
Cotton seed cake	1.60	260	0.22	0.35
Grass	20.00	15	0.01	0.25
Straw	10.00	25	0.02	0.21
Total				2.60
Milk revenue	8.00	500.00	0.42	3.32
Gross margin				0.73

Mandalay city, shop/factory at #11, 82nd street, Mandalay; farm in Patheingyi township, kalama taung village, 15:57 pm-20/08,

Table 15 Feed and milk price examples in Amarapura townships

Product	Quantity (kg/day/cow)	Price (MK/viss)	Price (USD/kg)	Price USD/day/cow
Sesame cake	1.30	450	0.37	0.49
Bean meal	4.00	250	0.21	0.83
Grass	5/8 baskets	500/basket	0.6/basket	0.42
Rice straw	20/8 bundles	20/bundle	0.027/bundle	0.07
Total				1.80
Milk revenue	10	600	0.50	4.99
Gross margin				3.19

Mandalay area, Amarapura township, Tharyar Aye village/ 09:41 am-20/08

Table 16 Feed and milk price examples in Taikkyi townships

Product	Quantity (kg/day/cow)	Price (MK/viss)	Price (USD/kg)	Price USD/day/cow
Sesame cake	1.60	500	0.42	0.66
Bean powder	1.60	300	0.25	0.40
Bean husk	1.60	200	0.17	0.27
Grass	1 basket	500/basket	0.66/basket	0.66
Total				1.99
Milk revenue	4.00	750	0.62	2.49
Gross margin				- 0.50

Yangon Region, Taikkyi township, Kalagone village / pm-17/08;