AGR*1110 Export to Nepal Final Report

Milk Cooling and Storage Tank

Sarah Lynch

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PART II:

Introduction to Nepal and the export project

The purpose of this project is to introduce a product that would benefit the agri-food industry of Nepal. Agriculture is one of the leading industries in Nepal as far as export and income resource, therefore it is imperative that the industry thrives with the quality of their equipment and their efficiency of the equipment and lands use. This paper will introduce two milk-cooling tanks that would benefit Nepalese farmers with increasing yield and export potential, thus increasing economic connections and wealth.

Nepal is a landlocked nation situated between the northeastern edge of India and the southwestern Tibet region of China, and is home to 31 million residents (CIA world factbook. 2015) 18.6% of whom live in urban areas and are reliant on the agricultural work and imports from other nations. The country is governed by the Federal Democratic republic of Nepal with prime minister; Khadga Prasad Sharma Oli.

Politically, the nation is divided into 5 regions, 14 administrative zones and 75 districts. This is shown by figure one.

Geographically, Nepal is very unique with three long geographic regions, which include; the lower Terai

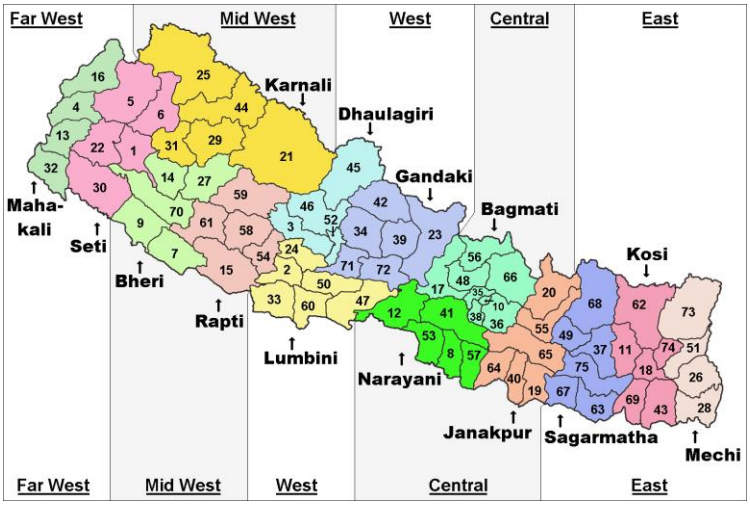


Figure 1: Political regions of Nepal, source: https://commons.wikimedia.org/wiki/File:Subdivisions_of_Nepal_EN.png

region along the south border which is characterized by flat plains. This is where the most densely populated areas are located; such as the Capital, Kathmandu.

North of the Terai is the hill region, or the midhills. This is where terrace farming is abundant, to get the most productivity out of the land as possible. Finally, there is the mountain region; typically used for grazing livestock, however vegetation is sparse as this is the commencement of the Himalaya mountain range. These regions are shown in figure two.

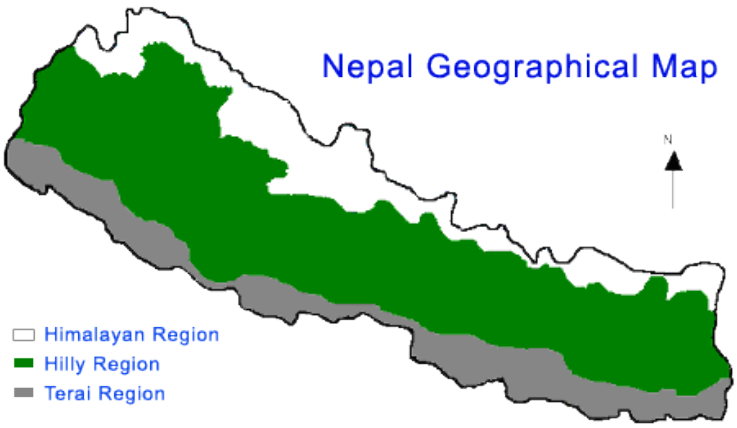


Figure 2: Geographic regions of Nepal Source: http://www.seenepal.com/nepal_geography.php

Coming back to the distribution of Nepalese throughout the country, the remaining 81.4% range from sustenance farmers, who grow enough food to supply for only their family throughout the year, to large scale farming as their career.

Dairy Farming in Nepal

The dairy industry is what will be focused on throughout this paper. Throughout Nepal there are both large scale farms that milk over 600 head of cattle, to areas where owning an individual cow per family is enough to sustain the family's dairy needs. This is called subsistence farming (Thapa. 1996), when you produce enough food to sustain your family, and maybe a bit extra to sell for an income. The dairy industry in Nepal includes both cow and buffalo that are evenly distributed

throughout the country. The main breeds that are kept in the country are Bos Taurus (temperate climate cattle): Jerseys and Holstein, and from Bos Indieus (Tropical/ hot climate cattle): Haryana and Sahiwal (Singh *et al*. 2005). The buffalo breeds are typically cross-bred between Murrah from India due to direct importation from Nepal's neighboring country. Figure three depicts the distribution of dairy cattle across the three geographic regions.

Region	Animals	Average Animal	Growth Rate	Share in Total(%)
Mountain	Cow	819,243	-0.43	11.66
	Buffalo	313,500	1.17	9.18
Hill	Cow	3,447,598	0.12	49.06
	Buffalo	1,939,134	1.17	56.77
Tarai	Cow	2,760,302	0.11	39.28
	Buffalo	1,163,435	2.56	34.06
Nepal	Cow	7,027,143	0.05	100.00
	Buffalo	3,416,069	1.64	100.00

Figure 3: Distribution of milking animals across the nation, source: Singh et al. 2005

Dairy animals are not only raised for milk, but also for their manure, (fertilizer and fuel), their draft power, meat, and their hide (Singh *et al*. 2005). Heifer calves will be raised as replacement cattle for the herd, while the bull calves are neglected and slaughtered early for meat (Singh *et al*. 2005). Figure four below shows the milk production and yield across the geographic regions in 2001.

Region	Livestock	Total Population	Milking Animal	Milk Production (in MT)	Milk Yield (Kg/Year)
Mountain	Cow	819,243	104,533	33,882	324
	Buffalo	313,500	81,802	57,632	705
Hill	Cow	3,447,598	459,703	178,907	389
	Buffalo	1,939,134	567,007	446,660	787
Tarai	Cow	2,760,302	288,347	129,949	450
	Buffalo	1,163,435	288,002	277,102	962
Nepal	Cow	7,027,143	852,583	342,738	401
	Buffalo	3,416,069	936,811	781,394	834

Figure 4: milk production and yield according to Geographic region, source: Singh et al. 2005

Further dairy development in Nepal

The national dairy development board of Nepal is committed to improving the quality and quantity of milk that is distributed to its population. In 1990, the ten-year plan was established to improve the quality of milk and dairy products and improve the lives of the farmers (Reporters Nepal. 2012). Dairy products also accounted for 6% of the total gross domestic profit (GDP) for Nepal and is a major source of income for the rural Nepalese farmers. In 2012, this rose to 9% of the GDP being provided by the dairy sector (Reporters Nepal. 2012).

In 2010 the twenty year plan was introduced that was established and geared towards developing more dairy industries, dairy-specific farms, milk processing plants and more efficient ways of transporting and exporting the finished product. All this is achievable with the product introduced below.

Milk cooling tank to encourage more dairy specific farms and less dairy subsistence farming

The products that will be introduced are two brands of milk cooling tanks that are very similar. DeLaval's DXOB, which is their smallest commercial tank will be evaluated which ranges in sized from 200 L to 2000 L (DeLaval Dairy. 2015) As well as Mueller's front mount pump milk cooler which will be much larger scale with sizes ranging from 300 gallons to 2000 gallons (Mueller Dairy. 2015)

DeLaval's DXOB is one of the smallest commercial tanks on the market. They feature very simple to install electrical outlets, and are highly energy efficient compared to large competitor tanks.

Figure 5: DeLaval's DXOB tank from: delaval.com

The tank's temperature is controlled with the electronic DeLaval control box MTR40 that features a digital display to make handling easy. It also controls the agitation and cooling time as well as the finishing wash for while the tank is empty after pickup.

The tank is comprised of double-walled stainless steal to assure cleanliness and durability. There is also a round shaped lid on top. This particular tank comes in sizes from 350 L to 2000 L with weights ranging from 145 lbs to 350 lbs. Both the DeLaval and Mueller smaller tanks are very similar in their size and requirements for installation. Below are lists of requirements for the Mueller Front mount pump cooling tank.

<u>Hot water requirements:</u>

In order for the wash cycle to run properly with the milk cooling tank, to kill any sort of bacteria that may develop inside the tank upon emptying, there must be an adequate supply of water that is able to be raised to temperatures of 160-170 F throughout the detergent wash cycle.

Water supply pressure:

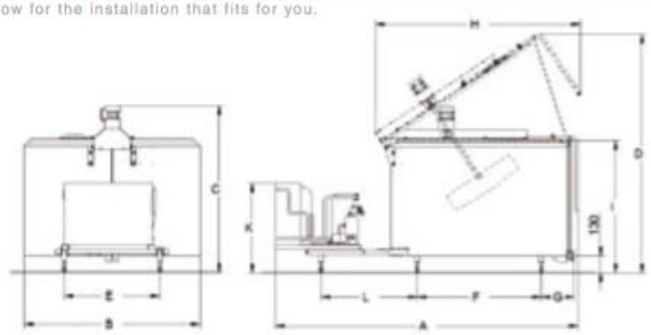
For the DXOB tank, water pressures between 20-60 psig must be maintained.

Electrical requirements:

Due to the 'HiPerForm II control system', an input of 200, 208-240/50-60/1 power supply must readily be available at all times.

Sizes and dimensions of tanks:

Please check the table below for the installation that fits for you.



Dimensions in mm; Capacity in litres; Weight in kg

Capacity nominal	Capacity maximum	A	B	C	D	E	F	G	H	I	K	L	Weight
300	355	1750 – 1890	1000	1070	1800	530	660	220	1430	800	580	640	129 + 145
400	427	1760 – 1890	1000	1200	1920	530	660	220	1430	920	580	640	146 + 156
500	537	1850 – 2020	1110	1200	2040	590	750	240	1550	920	720	650	158 + 199
600	611	1980 – 2020	1110	1290	2130	590	750	240	1550	1020	720	650	169 + 204
700	712	2130	1250	1220	1750	670	860	250	1440	950	580	690	187 + 187
800	815	2130 – 2170	1250	1320	1960	670	860	250	1440	1050	710	690	194 + 225
1000	1038	2310 – 2380	1400	1320	1900	760	990	260	1630	1050	710	760	220 + 254
1200	1202	2310 – 2420	1400	1450	2110	760	990	260	1600	1180	890	760	226 + 264
1400	1457	2500 – 2590	1600	1370	1960	880	1150	280	1830	1100	890	760	255 + 297
1600	1605	2550 – 2590	1600	1450	2130	880	1150	280	1830	1180	890	760	289 + 321
1800	2075	2550 – 2590	1600	1700	2380	880	1150	280	1830	1430	890	760	310 + 342

Note: the tanks 700 to 1800 are equipped with lid holder

Figure 6: Dimensions and weights of DeLaval DXOB tank. Source: delaval.com

HiPerForm II Control Cabinet and Milk Cooler Components

A. HiPerForm II Control Box Assembly	K. Pre-Start Cooling Switch/Indicator
B. Wash/Cool/Cycle Time Display	L. Temperature Alarm Indicator
C. Detergent Switch/Indicator	M. Sample Agitation Switch/Indicator
D. Advance Switch	N. Water Works Box
E. Acid Switch/Indicator	O. Cold Water Solenoid
F. Sanitize Switch/Indicator	P. Hot Water Solenoid
G. Cool/Off/Wash Switch	Q. Detergent Jar
H. Temperature Display	R. Acid/Sanitize Jar
I. Bottom Unit Cooling Switch/Indicator	S. Fill Line Disconnect, ⅜" x ⅝"
J. All Units Cooling Switch/Indicator	T. Flow Control Orifice

Figure 1 - HiPerForm II Control Cabinet and Milk Cooler Components

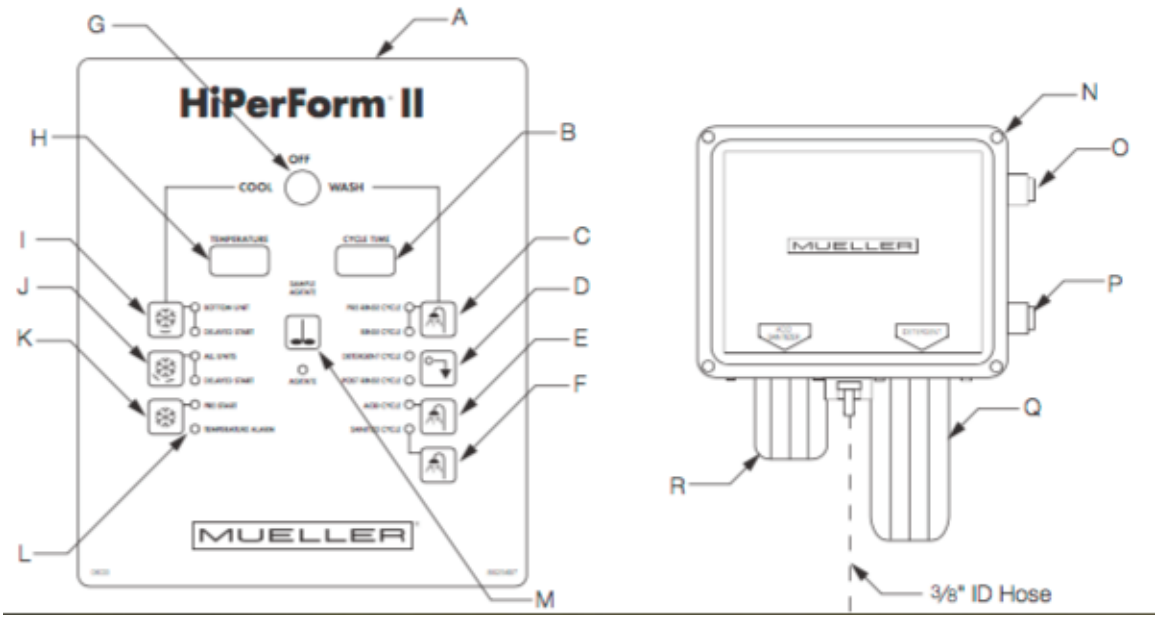


Figure 7: Mueller front mount pump HiPerForm II control information. Source: mueller dairy farm equipment

Labour, Machinery and benefits to Canada

Both DeLaval's and Mueller's products are not currently manufactured in Canada, rather they are completely build from various manufacturing warehouses in the United States and shipped to Dairy Supply stores around Canada. (DeLaval Canada. 2015) (Mueller Dairy. 2015) With the new products, companies such as Norwell Dairy would be shipping the product to Nepal. The second option, that involves the

shipment of the used cooling tanks, which are also managed by dairy supply companies would also be arranged through the supply retailers. There are different supply companies across Canada that would be able to participate in the shipment and sales of these used tanks.

The main benefit to Canada is the increase in export, as well as the local dairy supply retailers increasing their profits and economic connections. With the increase in labor required in the collection and shipment of the product, there would be an increase in jobs available for the shipment of the tanks. However, this is not a product that will be continually bought, therefore there will not be a continual internal revenue for the suppliers.

PART II: Export Potential to Nepal

Transportation of tanks to Nepal

Transportation to Nepal would not be easy, or cheap. For a single unit to be shipped to India from Toronto, Ontario, the cost would be $700 USD if shipped with A1 freight forwarding via trucks and cargo boat. This is based on the dimension of the 400 L cooling tank. Figure eight depicts the steps of transportation from Ontario, Canada, to farms in Nepal. The price would increase with size of desired tanks. The transportation costs associated with this product directly correlate with the competition on the global market.

Global competition

Because DeLaval products are also produced in China, there would be more of an incentive to order a milk-cooling tank from the Chinese manufacturing center.

However, not all models that are manufactured and shipped from China are the same as the ones made in North America.

Due to the cost of shipment, this product would not be the most realistic option for Nepal to pursue. Instead, further research into the shipment of the same, or similar product from China would have to be evaluated for its costs.

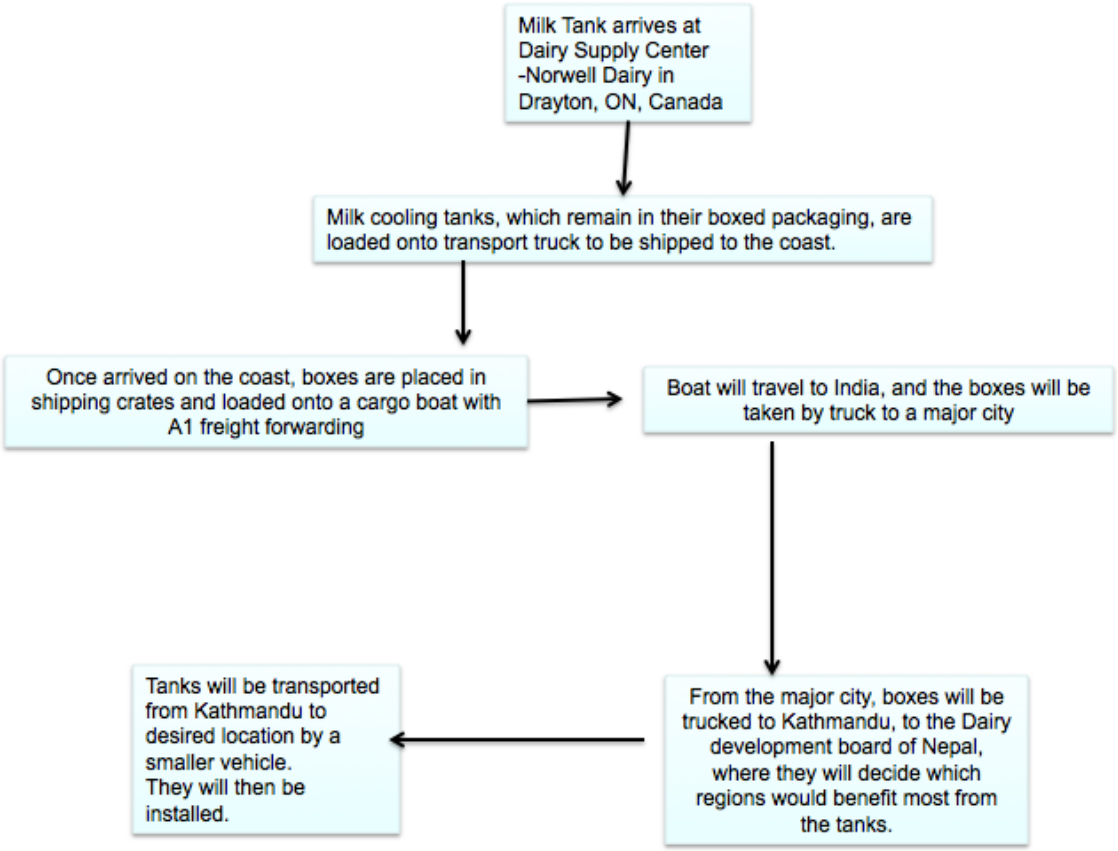


Figure 8: Steps for transportation of milk tanks to Nepal. Source: Sarah Lynch

Benefits to Importing Nation

Since the 83% of Nepal that is currently living in rural area rely so heavily on subsistence farming, having one larger tank per region of a certain number of residents would allow for more dairy specific farms, allowing for more

specialization in milk production. (Nepal's government braces for long-term dairy development policy. 2012) This also allows for more specialization for farmers not milking their cattle daily. Saving time to work on their main crop or mean of income.

Environmental impact and Energy required

Because the milk-cooling tank is something that needs to be held with a constant supply of electricity, it is imperative to examine the impact on the energy required for Nepal. There would be an environmental impact on the land for the increase in electricity consumption. Electricity would need to be more accessible to rural areas, and in a constant supply to avoid spoiling (DeLaval. 2015). There would also be an increase in transportation between rural milk areas. However the hope is that the milk will stay more local, which could reduce the transportation from smaller villages to milk processing plants.

Nepal currently produces 3.5 billion kWh (World Factbook. 2012) with 4 million kWh being exported primarily to India. Approximately 92.5% of electricity produced is created from hydroelectric plants. Nepal currently holds one of the lowest commercial energy per capita, around 500 kWh, (CITE) the nation, especially in rural areas, still rely heavily on traditional energy sources such as firewood and livestock residue (Nepal: Energy provision. 2015). Electricity holds only 1.8% of energy consumed, which is the typical source of energy to power the holding and cooling tanks. During milking, the cooling mechanism is working to chill the milk that comes out of the udder at 34 degrees Celsius, and bring it down to 4-6 degrees within a few minutes. It is unlikely that firewood, which supplies three quarters of

Nepal's energy (Nepal: Energy provision. 2015), would be able to provide the machinery with the electrical currently that it needs.

With that being said, further research that is currently being undergone in Nepal to harvest hydropower to use as a source of electricity. The Nation has the potential to generate up to 83 000 mw of hydropower (Nepal: Energy provision. 2015). Unfortunately, due to the current economic conditions of Nepal's economy, hydropower is not likely to increase for years to come (Nepal: Energy provision. 2015).

Financing to help get the project started

Rastriya Banijya Ban (RBB) ltd. Has recently researted their program to aid in the lending to clients for agricultural programs. Since agriculture is one of the most dominant sources of revenue and contributes to the largest percentage of the GDP, supporting the agricultural business is vital for the nations growth (Rastriya Banijya Ban ltd. 2015). RBB will lend loans to the following sub-sectors: agronomy, livestock (including the processing of animal products such as milk, beef, ETC), horticulture, floriculture, aquaculture/ fishery and apiculture/ bee keeping.

Recommendations for the Future:

Studies will have to be conducted to evaluate the electrical requirements and what is possible for the communities to produce. Regions will have to be divided up according to needs, and geographic distances to keep transportation costs low. DeLaval and Mueller should also look into lower-technology and cost products that would be more portable and easily moved to rural areas of Nepal.

Contacts for further information include:

Norwell Dairy: info@norwelldairy.ca

DeLaval Chinese Branch: G. Peng, expert in Milk cooling for Asian countries:

Guoqing.Peng@delaval.com

DeLaval Canada: info@delaval.com

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