Canadian Exports to Nepal
Dairy Cattle Genetics from Semex®

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PART 1: PRODUCT INFORMATION

Dairy Cattle Genetics

Healthier, more fertile, and higher producing cattle improve a farmer's net income through more efficient feed conversion and higher milk yield. An effective way to improve herd quality is to invest in quality genetics. Thanks to improved genetics in dairy cattle, cows are producing more than double the amount of milk that they produced 40 years ago (Oltenacu, 2010). Artificial insemination (AI) has gained enormous popularity in the dairy industry since the 1940s as an effective way to improve herd genetics without the need to purchase or transport desired bulls (Foote, 2002). AI allows farmers to purchase top genetics without the expenses associated with owning sires (FAO/IAEA, n.d.), while allowing genetic suppliers to maximize the use of top bulls by diluting semen so that one ejaculation can inseminate 250 females (Food and Agricultural Organization, n.d.). AI can also reduce disease transmission between animals and decrease injuries during breeding (FAO/IAEA).

Sexxed® Semen from Semex Canada

Canada is a huge player in the dairy genetics industry, supplying 20% of the world's genetics (McGill University, 2014). Semex is a Canadian company with 55 years experience working in the genetics industry (Semex, n.d.). Based out of Guelph, Ontario, Semex has 110 distributors in 80 countries (Semex, n.d.). Their outstanding global reputation is one of many reasons why Semex is the company from whom Nepal should purchase genetics. Semex also supplies Sexxed® semen, which would be ideally suited for Nepal. Due to the predominance of Hinduism in Nepal, cattle are not eaten because they are considered sacred, so bulls have little

use (Agoramoorthy & Hsu, 2012). Sexed semen is widely used in India because of similar religious ideals, and would be successful in Nepal (ABS India, 2014).

Alta Genetics is another large Canadian company that exports dairy cattle genetics, but their genetics are much more expensive, and therefore unaffordable to a poor Nepalese farmer (Schuurmans, 2014). Table 1 compares the average prices of Semex and Alta Genetics semen. Table 2 provides contact information for Semex Canada if further information is required about their products.

Table 1: Comparative Price Analysis of Canadian Companies

	Semex	Alta Genetics
Standard Semen	$3-4/dose	$30/dose
Sexed Semen	$15/dose	$50/dose

(Schuurmans, 2014), (Sayles, 2014)

Table 2: Contact Information

	Phone	Email
Semex Canada	(519) 821-5060 ext225	info@semex.com
Brad Sayles: VP Global Marketing	(519) 635-2200	bsayles@semex.com

(Sayles, 2014)

Canadian Benefits of Exporting Semen

Increased Canadian Revenue

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Although Nepal's dairy industry is primitive, exporting semen would increase revenue for Semex. Selling to a small market may not generate enough income to develop a new line of genetics or build a new office building, but it would help to spread fixed costs (Sayles, 2014).

More Canadian Jobs

Semex semen is obtained from Canadian bulls (Sayles, 2014). As more Canadian semen is sold, more work becomes available in the production of semen. Exporting semen begins by

obtaining semen from sires (Parks, n.d.). The semen must then be processed, a technique that includes determining sperm concentration, adding antibiotics to prevent disease transmission, and dilution to increase the semen doses obtained from one ejaculation. Semen is then cooled, glycerol is added, semen is deposited into 0.5mL straws, and semen is frozen and stored. Glycerol prevents damage to the sperm while semen is frozen (Parks, n.d.). This process requires manual labour, and increased demand for semen means more Canadians will be employed to provide the product.

"First to Market" Benefits

Nepal imports most of its genetics from New Zealand and the USA (Ghimire, 2014). Although Canada would not be the first country to export genetics to Nepal, some first to market benefits would still apply if genetics were exported. Reduced competition is a major benefit of being first to market, and because only New Zealand and the USA sell genetics to Nepal, there are only two major competitors.

Canada would have the opportunity to dominate in Nepal as an innovator, leader, and major supplier of genetics. There is minimal infrastructure in Nepal to maximize the benefits of using better genetics (Singh, 2002). A company willing to help install infrastructure to train breeders and transport milk would have much more success than a company that simply sells their product to the customer. Investing time into their customers would prove Semex to be a leader, and would help gain business and respect from Nepalese people.

Semex would have the chance to shape consumer preference in Nepal by developing a breed tailored specifically for Nepalese environment. A specially developed breed would have more success than a Holstein or Jersey cow, which are not ideally suited for Nepalese environment (Sayles, 2014). Farmers would buy this breed because it is more successful. Breed

development would help to secure customer loyalty by demonstrating that the company cares about Nepal's success, and not just profit.

Additional Benefits

Better genetics would improve the quality of Nepalese cattle, which would improve the Nepalese dairy industry. An improved dairy industry in Nepal would increase the demand for more genetics. Improved milk yields would generate more income for dairy farmers who would have income to purchase more livestock, which would increase the demand for semen.

Support Available for Exporting Project

There is support available for Canadians exporting agricultural products (Potter, 2014). The Ontario Chamber of Commerce offers the Ontario Exporter's Fund which is designed to help businesses access global markets (Ontario Exporters Fund, n.d.). There is support available through the Ontario Ministry of Agriculture, Food, and Rural Affairs that helps create sales opportunities and provide research and marketing education (OMAFRA, 2014). Agriculture and Agri-Food Canada offer $341,000,000 of funding every 5 years in an Agri-Marketing program to help agricultural businesses gain access to markets (Government of Canada, 2014). Funding from this type of grant can be used to bring potential buyers to Canada to look at Semex bulls and learn about Semex genetics (Potter, 2014).

Process of Export

The first step in exporting to Nepal is obtaining semen health charts which would list health criteria that imported semen must meet (Sayles, 2014). Obtaining health charts would require working with the Canadian Livestock Genetics Association (CLGA) and the Canadian Food Inspection Agency (CFIA), who would both communicate with Nepalese government. The next step would be to set up a Nepalese importer. This would likely be a dairy cooperative or

processor, who would distribute semen to breeders, who would distribute semen by breeding cattle. Semex uses airlines and companies like FedEx, Purolator, and UPS to ship semen. Semen must be shipped in liquid nitrogen, so Semex would also have to obtain a permit to ship hazardous materials to Nepal (Sayles, 2014).

PART 2: POTENTIAL BENEFITS TO NEPAL

Nepal's Developing Dairy Industry

Nepal is a small country with a population of 28 million (World Bank, 2013). Agriculture accounts for approximately 40% of total GDP (DOA Nepal, 2014), and 80% of Nepalese people live in rural areas and practice subsistence farming (IFAD, n.d.). Like most Nepalese agriculture, the dairy industry in Nepal is primitive in terms of mechanization (Khanal, 2014). Many rural Nepalese own crossbred Holstein and Jersey cattle (NARC, 2007). Farmers own small herds, cows are milked by hand, and infrastructure is lacking with regards to shipping milk and providing inputs and services needed for dairy farmers to maximize outputs (Singh, 2002). Exporting dairy cattle semen from Canada to Nepal would result in huge profit surges for Nepalese farmers and dairy processors, and would assist in improving quality of life for many Nepalese (UNDP, 2013).

A study was done to evaluate rural farming in Nepal (Joshi, D. D., n.d.). This study represents approximately 75,000 rural farmers who produce and market milk. Subsistence farmers produce milk primarily to feed their families, and excess milk is sold to the Milk Producing Co-operative Society (MPCS) or other dairy cooperatives. Farmers are paid for their milk every 15 days. Pay is calculated based on milk quality. One farmer under study owned two

cows which he milked by hand twice daily. Average combined production from the cows was 10L/milking, but there was no evening market available to sell milk, so only the morning milk was sold (Joshi, D. D., n.d.). The primitive state of the Nepalese dairy industry leaves room for improvement.

Benefits to Nepal

Semex genetics would be a huge asset to Nepalese agriculture. Genetics would increase herd production and health without requiring excessive inputs from farmers. In addition, Nepalese people would not be hurt by the import of this product because genetics are already imported from other countries (Ghimire, 2014). Improving the dairy industry in Nepal would not only benefit farmers, but would increase GDP and improve quality of life for many Nepalese.

Milk Production

Milk production per cow in Nepal is less than half of the production of an average Canadian cow (IFCN, 2012). Milk production is one of the most important factors considered when improving a herd of dairy cattle. Whether a farmer operates on a large commercial scale, or the farmer's main focus is providing milk for his family, higher milk yields directly translate into more income. A farmer that transitions from using Nepalese bulls for breeding to Semex genetics would see a milk yield increase of at least 50% in one generation (Sayles, 2014). This jump in production would have huge benefits in terms of increased income for farmers.

Better Bloodlines

Improved genetics result in improved health, feed conversion efficiency, longevity, fertility, and production (Agriculture and Agri-Food Canada, n.d.). Improved health will decrease expenses related to sickness. Improved feed conversion efficiency means that the farmer can invest less money into feed and maintain high production. Longevity, fertility, and

production all result in more valuable cattle that produce better calves. Cattle that pass on traits such as improved fertility will have higher value if the farmer decides to sell cattle. The farmer would be able to make more money when renting out bulls for breeding if his bulls possess superior qualities than standard Nepalese livestock. Breeding a cow to a superior bull is essential to improve herd quality, and Canadian bulls are superior to bulls used in Nepal (Tweed, 2009).

Fewer Bull Calves

Nepal's Hinduism renders bulls useless except for in breeding (Agoramoorthy & Hsu, 2012). If a bull was raised for breeding, small herd sizes mean that the bull is likely related to the rest of the farmer's herd. Inbreeding can lead to genetic defects in offspring, so it is impractical for small-scale farmers to raise bulls that are related to their herd (Ochad, 2004).

www.issuu.com/semex2010/docs/aus_apr13_final_lr2/52

A cow's gestation period lasts 9 months (Livesay, 1945). Every 9 months that a cow is pregnant with a bull is 9 months that she cannot be producing a heifer. Bulls will use the same resources as a heifer (food, shelter, care), but will never compensate for these resources like the heifers when they mature, calve, and produce milk later. In addition, if a cow produces two heifers as her first calves, her lactations will have higher milk yields than if she had bulls (Semex, 2014).

Livestock Transitioning

Nepal is undergoing transition from buffalo to cattle in dairy production (Khanal, 2014). Dairy buffalo have been used for in Nepal for many years, but there are issues with buffalo production that are motivating farmers to use cattle instead (Hayashi, 2013). Buffalo are less heat tolerant than cattle, so they require shelter and cannot graze when the sun is hottest (Skunmun,

2001). Cattle genetics are more accessible than buffalo genetics, and government policies favour cattle production in Nepal over buffalo production (Skunmun, 2001). Cattle are also more successful than buffalo in Nepal's hilly regions (Joshi B. R., n.d.).

Dairy goats would be a viable industry in Nepal due to goats' ability to survive in harsh climate on adverse food supplies, but there are few dairy goats in Nepal (FAO, 2010). Setting up a dairy goat industry would require purchasing livestock and genetics, investing in training to educate farmers about dairy goat care, and would involve costs associated with setting up a new industry. It is more practical to improve dairy genetics instead of introducing a new industry.

Potential for Dairy Exports from Nepal

Nepal is 99% self-sufficient in milk production (IFCN, 2012). Nepal does not, however, export dairy products out of the country. There are large milk deficits east of Nepal in countries including Bangladesh, Thailand, Myanmar, Vietnam, and southeast China. If Nepal is able to significantly increase milk production with genetics, they could export milk to these countries and increase revenue for milk processors and farmers (IFCN, 2012).

Meeting the Growing Demand for Milk

Increased milk production would allow Nepal to meet its growing demand for milk. Dairy consumption is increasing by 2.6% per year, and population is growing by 1% per year (IFCN, 2012). Better genetics would allow Nepalese farmers to meet this demand.

Quality of Life

Nepal is one of the world's most malnourished countries (WFP, 2014). Malnutrition has extreme impacts on economy, decreasing productivity by reducing physical and cognitive health (WFP, 2014). Milk contains many nutrients, including calcium, phosphorous, and protein (The

Dairy Council, n.d.). Increased milk production in Nepal would make dairy cheaper and more accessible to Nepalese people due to increased supply, which would improve Nepalese health.

Quantities and Costs Associated with Export

Cost to Farmer

Sexxed® semen is $15/dose, and would cost farmers about $16 once shipping is accounted for (Sayles, 2014). Compared to regular semen ($3-4/dose), Sexxed® semen is expensive, but will save the farmers money in the long run. Table 3 describes the costs of using Sexxed genetics versus regular semen. Regular semen is a viable option for use in Nepal, but it is important to keep in mind that an increased heifer rate would have a much higher significance on a farm with fewer animals. One bull on a farm with 3 milking cows is 25% of the herd, which would account for a significant increase in inputs that the farmer must invest (Sayles, 2014). It would not make sense to accommodate this bull when it is of such little value (Sayles, 2014).

Table 3

Sexxed® Semen				
Number of Breedable Cattle Owned	1	2	5	10
Doses of Semen Required Annually	2.5	5	12.5	25
Cost to Nepalese farmer/year (CDN)	**$40.00**	**$80.00**	**$200.00**	**$400.00**
Standard Semen				
Number of Breedable Cattle Owned	1	2	5	10
Doses of Semen Required	2.5	5	12.5	25
Cost to Nepalese farmer/year (CDN)	**$10.00**	**$20.00**	**$50.00**	**$100.00**

Note: Cost includes transport, but not breeder fees

Potential Export Quantity and Revenue

In India, 50,000,000 doses of semen are used annually (Sayles, 2014). Using the cattle population ratio between India and Nepal, it can be estimated that 1,800,000 doses of semen are used annually in Nepal (Government of Nepal, 2012). This creates an export potential of up to

$27,000,000 worth of semen. Although this is not a realistic estimate of actual purchases, these calculations demonstrate the potential to export semen to Nepal.

Challenges of Exporting to Nepal

A key part of maintaining and increasing demand for genetics is creating a successful market for farmers and processors. There are challenges associated with shipping to poor countries, but there are also ways that Canadian companies like Semex would be able to assist Nepal with dairy industry improvement.

Lack of Infrastructure in Market

The Milk Producer's Cooperative Society (MPCS) in Nepal mediates between rural farmers and milk processors (FAO, 2010). Ideally, the MPCS would help sell and ship milk from farms to processors, but the society is disorganized and inefficient, which leaves farmers without support. The Dairy Development Corporation (DDC) is also involved in bringing milk from farms to market. The biggest problem that the DDC faces is lack of quality milk, but the DDC has not developed programs to support rural farmers. The National Dairy Development Board (NDDB) is responsible for developing the dairy industry in Nepal, but their activities are limited by lack of capital and staff. Nepal has many different systems designed to help improve dairy production, but none have been of great benefit in terms of developing the dairy industry in Nepal. Farmers have trouble accessing input supplies for their operations, they struggle to increase production, and the industry is not efficient (FAO, 2010).

Poverty in Nepal

A major challenge associated with exporting to Nepal is that fact that Nepal is extremely poor, with 1/3 of its population surviving on less than $14US per month (IFAD, n.d.). Poverty is

higher in rural areas than in urban environments, which poses a challenge for exporters, as their target market would be rural farmers with livestock (IFAD, n.d.).

No Previous Genetic Exports to Nepal

Semex has never exported to Nepal (Sayles, 2014). This means that export would require research into Nepal's dairy industry and the living environments of Nepalese cattle. Although Semex has not shipped genetics to Nepal, Semex is doing work in India, which has a similar industry to Nepal (IFCN, 2012). Environmental studies, marketing strategies, and specialized breeds developed for market in India could be used in an export project into Nepal due to industry similarities. This would assist in decreasing costs associated with export (Sayles, 2014).

www.semex.com/br

To ensure the success of Semex genetics in Nepal, it would be wise to develop a new dairy breed that would be suited to the environment, diseases, and parasites facing Nepalese cattle. Part of Semex's work in Brazil included developing the Girolando, a breed designed to have good heat tolerance, resistance to Brazilian parasites and diseases, while maintaining a Holstein's production (Sayles, 2014). The crossbreeding involved resulted in hybrid vigour, further increasing the benefits of the Girolando (Sayles, 2014). Breed development programs in Nepal would have similar benefits (Embassy of Nepal, n.d.).

Challenges of Artificial Insemination

It is important to perform AI correctly to have high conceptions rates (DeJarnette, 2012). Nepal's AI conception rates are about 50% (Ghimire, 2014), but gaining access to breeders, AI training, and proper supplies is a struggle for farmers (Donnges, C.). Semen storage is another

challenge, as semen must be stored in liquid nitrogen (Sayles, 2014). Liquid nitrogen storage is too expensive for individual farmers as the tanks cost $500-$1,000 each (Select Genetics, n.d.).

Transport of Product to Farmers in Remote Areas

Due to lack of good roads, transporting genetics to remote areas is a challenge because farms are often difficult to access (Donnges, C.). Unless rural farmers own semen storage tanks, quick transport would be required to ensure that semen is used before semen perishes or cows go out of heat.

Lack of Agricultural Education

Nepalese farmers are often uneducated, making marketing strategies a key part of export (World Bank, 2013). Farmers would need to be educated about the benefits of using Semex genetics, and about heat detection in cattle to know when to call a breeder (Sayles, 2014).

Time Required to See Changes in Production

Due to the 9 month gestation period of a cow, the benefits of improved genetics are not immediately observable (Livesay, 1945). The time between a cow being bred with Semex genetics and that Semex heifer beginning her first lactation could take 3 years (Livesay, 1945). This is disadvantageous because herd improvement would be a slow process.

Government Related Challenges

The Nepalese government owns breeding centres for livestock, so it may be a challenge to convince Nepal to allow genetic imports from Canada, as this would decrease governmental income (Sayles, 2014). Overcoming this challenge would involve marketing to the governments to demonstrate the benefits Semex genetics would have on the country (Sayles, 2014).

Trade Barriers

According to the World Bank, Nepal is one of South Asia's "most open and trade-dependent" countries (World Bank, n.d.). Nepal joined the World Trade Organization in 2004, which is helping develop more trade opportunities (World Bank, n.d.).

agritech.tnau.ac.in/animal_husbandry/animhus_cattle_AI.html)

RECOMMENDATIONS FOR EXPORT

To maximize the success of genetics in Nepal and reduce drawbacks created by challenges with marketing, some major changes should be made in the current Nepalese dairy industry. Challenges associated with lack of AI training and transporting semen to farms could be solved by setting up breeding systems similar to those found in India (Sayles, 2014). In India, dairy cooperatives help organize groups of AI technicians that travel and breed cattle. Each breeder uses a motorcycle to travel to farms, and brings with him a small semen storage tank. Farmers contact breeders when a cow comes into heat, and the breeder travels to the farm and breeds the cow. Each breeder can reach 20-30 cows/day depending on their jurisdiction size (Sayles, 2014). Establishing this system in Nepal would make purchasing semen affordable, because large quantities could be bought by dairy cooperatives, and farmers would pay only for breeding services and the semen doses that they use.

It would take considerable work to install this system, but considering long-term improvement, it would be incredibly effective. 94,000 AI technicians are employed in India, and each are responsible for a jurisdiction with approximately 1,000 breedable cattle (Honnappagol, 2014). Using a ratio of cattle populations between India and Nepal, it can be calculated that approximately 3,400 people could be employed to service AI needs Nepalese farmers (NDDB, 2007). This would create jobs for Nepalese and improve Nepal's dairy sector.

Organizations such as the MPCS, DDC, and NDDB should be contacted to develop systems involving breeders and supplied genetics. Large organizations have contact with farmers and would be able to organize initial contact between breeders and farmers. The organizations would also be able to purchase semen and distribute it to the breeders, taking a portion of the revenue from fees that the farmer pays when a breeder breeds his cows. Organizations could help assist in initial purchase of semen storage tanks and other necessary inputs to ensure the breeding system is successful. Dairy processors could also be contacted, as they are very supportive of the industry (Sayles, 2014). Higher milk yields from farmers translate into more milk in processing plants, increasing revenue for processors. Between dairy organizations and processors, it is extremely feasible for this system to be installed in Nepal. Contact information for dairy cooperatives can be found in Table 4.

Marketing is key to ensure that farmers buy Semex genetics. Large-scale farmers and cooperatives should marketed to first because they have more dairy and agricultural knowledge than farmers that own one or two cattle (Sayles, 2014). They would be more likely to invest, and once small-scale farmers see the improvements in milk yields that these farms would demonstrate, they will want to invest in genetics too. Education about the benefits of better genetics should be the main focus of marketing. Using statistics and examples of how genetics have improved herds will play a major role in convincing farmers to invest in Semex.

Table 4: Dairy Organizations and Processing Plants in Nepal

	Phone	Email
Dairy Development Corporation	977-441-1710	info@dairydev.com.np
National Dairy Development Board	977-152-5400	nddb@mos.com.np
Nepal Dairy	977-1-4220674	nditm64@gmail.com
Himalayan Dairy	977-1-5522469	todaymilk@wlink.com.np
Sitaram Dairy	977-522092	kedia@atcnet.com.np
Kathmandu Dairy	977-424-4155	ktmdairy@ecomail.com.np

(Das, 2014)

Future Studies

If this project is to be pursued, there are some steps that will be necessary to ensure success. It will be necessary to contact dairy cooperatives and processors in Nepal to determine specific companies that would import genetics and work with breeders to distribute them. It will also be necessary to look into costs related to training AI technicians and training farmers to detect heat in cattle. Environmental studies would be required to develop a dairy breed suited to Nepalese environment.

COMPETITIVE PRODUCTS

The majority of Nepal's dairy genetics are imported from the USA and New Zealand (Ghimire, 2014). In 2010, the American Breeders Service (ABS) began operating in India as "Genus India" (Marathe, 2010). India's proximity to Nepal and ABS's status as the largest genetics company in the world make Genus India a strong competitor in the market (Marathe, 2010). Genus India also sells sexed semen, but their heifer rate is 2% lower than the heifer rate of Semex Sexxed® semen (ABS India, 2014). ABS has much higher prices than Semex, which would make it difficult for rural farmers to afford their products (Vellenga, 2014). Nepal also imports genetics from New Zealand from companies like Liberty Genetics, but Liberty's prices are also high when compared to Semex (Liberty Genetics, 2014) . Table 5 shows the comparative semen prices between Semex, ABS, and Liberty.

Table 5: Comparative Pricing of Semex and ABS Genetics (Average Prices)

	Semex	ABS	Liberty
Standard Semen	$3-4 /dose	$40/dose	$9.50/dose
Sexed Semen	$15/dose	$40-100/dose	$38.00/dose

(Sayles, 2014), (Vellenga, 2014), (Liberty Genetics, 2014)

Semex could reduce competition by maintaining low prices and developing a breed tailored for Nepalese environment. A specially developed breed would have more benefits for

Nepalese farmers than standard Holstein or Jersey genetics, and would have higher sales than standard genetics from New Zealand or the USA.

Semex genetics would be an extremely valuable resource for Nepalese farmers. The export of semen would benefit companies and individuals from Canada and Nepal. Although challenges exist when exporting to impoverished countries, many of these challenges can be alleviated through the installment of basic infrastructure in the dairy industry. The export of dairy cattle genetics to Nepal is a promising business venture that should be pursued.

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