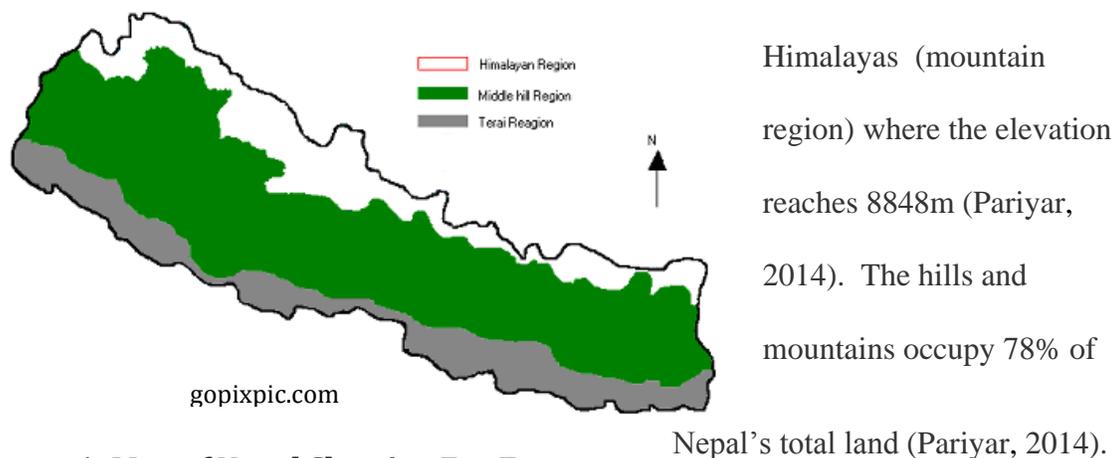


# Exportation of Boar Semen From Canada to Nepal

Katie Illick

## Introduction to Nepal

Nepal is a small land base country of 147 181 km<sup>2</sup> and has a dense population of 27.8 million people (World Bank, 2013). Nepal is an agrarian country so agriculture provides employment to 66% of the population, contributes 39% of the Gross Domestic Product and 13% of total foreign trade of the country (DOA, 2014). As a result of the poverty in Nepal, agriculture is the major sector of the Nepalese economy (DOA, 2014). Many farmers in Nepal are subsistence farmers so produce enough food for their families and excess is sold at local markets. The government of Nepal has many goals for the future of Nepal's agriculture however, "the broad objective of this department has been to support and help achieve food security and poverty alleviation by the transformation of agriculture through diversification and commercialization" (DOA, 2014). With the use of modern technologies, Canada has a prosperous agricultural economy so Canadian products can be implemented in Nepal to improve the logistics of Nepal's agriculture. Nepal has 3 topographic zones: the Terai, Hill and Mountain regions seen in Figure 1. The Terai region is the flatlands of southern Nepal and occupies 22% of the total land mass (Pariyar, 2014). Above the plains are the mid and high hills with an elevation ranging from 1300-5000m (Pariyar, 2014). To the north of these are the



**Figure 1: Map of Nepal Showing Eco Zones**

Agriculture is found in all parts of Nepal however the different environmental conditions affect the type and practices of agriculture and specifically the breeds of pigs. The product focused on in this paper is the exportation of Canadian boar semen.

#### Comparison of Hog Farming in Canada and Nepal

Nepal has approximately 935 000 hogs and the majority of the hog population is located in the mid hills and Terai regions; this is seen in Table 1 (DLSR, 2005). Pork is becoming a popular meat source for Nepalese so farmers must increase production to meet the demand and maximize earnings. Nepal currently has a low pork production of

<u>Eco-zone</u>	<u>Population</u>	<u>% of population</u>	<u>Meat production (t)</u>	<u>% of meat production</u>
High hill	102,893	11.0	1,255	8.16
Mid hill	492,598	52.68	8,449	54.90
Terai	339,584	36.32	5,685	36.94
<b>Total</b>	<b>935,075</b>	<b>100.00</b>	<b>15,389</b>	<b>100.00</b>

**Table 1: Pig Population in Nepal by eco-zone**

<http://ilri.org/>

approximately 16 000 metric tons per year (DLSR, 2005). This is a result of the small breeds in Nepal.

Currently Nepal's hog industry contains many native breeds; some of which include: Jangli Bandel, Hurra and Chwanche (FAO, 2009). The Jangli Bandel breed weigh between 200-250 kg and have 4-6 piglets/litter (FAO, 2009). Hurra pigs are very small as they only weigh 45-49kg and have an average litter size of 5.71 piglets (FAO, 2009). These pigs are found in the Terai region (FAO, 2009). Chwanche pigs are found in the mid hills of Nepal and have an average litter size of 7.33 piglets (FAO, 2009). Nepalese have began crossbreeding their hogs with some exotic breeds such as Yorkshire, Landrace and Duroc (FAO, 2009). These 3 breeds are the most common

breeds used in commercial Canadian herds. Yorkshires weigh between 250-450 kg and average 12 pigs each litter (FAO, 2009). Also, Yorkshires have a short sexual maturity at 200 days and have more beneficial traits such as increased number of teats (FAO, 2009). Landraces typically weigh between 310 and 350 kg and wean 11 pigs/litter (FAO, 2009). Generally, Landrace and Yorkshire are crossbreeds (F1's) that are used as breeding stock. These animals are then bred to Duroc to produce efficient market hogs. With the superior genetics in Canadian pigs, exporting boar semen to Nepal will allow for their herds to also become more advanced.

Nepalese breeds tend to be smaller and their sows wean less pigs/sow/year. In order to increase efficiencies, good genetic lines from sows that possess desirable traits must be present. For example, a good breeding gilt would be one who has good conformation so strong feet and legs, more than 12 teats and is from a sow who weaned more than 9 piglets per litter (FAO, 2009). Desirable breeding boars also have good conformation, full hams, and uniform curve at back (FAO, 2009). Seeing as Nepal does not have a wide variety of hogs, finding supreme genetics is much more difficult. In Canada, there are a large variety of high quality animals to choose breeding boars from. The selected boars have detailed records of their genetic lines, so it is guaranteed that their offspring will possess beneficial traits. In addition, Nepalese farmers exchange boars within communities. It is essential that genetic lines do not get too similar to prevent inbreeding. By exporting boar semen from Canada, there a variety of boars therefore it is much easier to avoid inbreeding. Not only does exporting semen prevent inbreeding but it also allows small Nepalese farmers, who cannot usually afford valuable boars, to have access to high genomics. Farmers will no longer have to house and feed

several boars, as breeding will now be done by artificial insemination. Most importantly, the introduction of Canadian genetics will significantly increase the efficiencies in Nepalese market hogs. For example, pigs will gain more weight per kg of consumption. Currently Nepalese pigs average a feed conversion ratio of 5:1 whereas Canadian pigs have a feed conversion ratio of 2.75:1 (FAO, 2009; ADC, 2014). By reducing this ratio, pigs will grow faster and larger therefore farmers raise a larger hog in the same period of time. With better genetics, the composition of the pig will also be better since the boars have been selected for traits such as level of back fat, loin depth and intramuscular fat marbling (ADC, 2014). Finally, a major benefit to importing boar semen is that the number of pigs per sow will increase. As previously mentioned, Nepalese breeds tend to have 5 piglets per sow whereas Canadian hogs have approximately 12 piglets per sow (FAO, 2009). Despite the cost of the semen, farmers will now have more piglets at farrowing with no additional cost. However farmers must be able to provide enough feed to raise the additional hogs.

#### Companies Involved

Alliance Genetics Canada is a Canadian genetics company providing hog farmers with boar semen for over 50 years (AGC, 2014). The company is located in St. Thomas, Ontario and has a company size between 11 and 50 employees (AGC, 2014). AGC consists of 13 breeders with a total of 8000 purebred sows that are used to select boars from (McIntosh, 2012). Alliance Genetics breeds for strong appetites, outstanding feed conversions, rapid growth and number of pigs/sow/year; all desirable traits in the pork industry (AGC, 2014). The company states that they can, “Deliver optimum level of backfat, loin depth, intramuscular fat marbling, colour and texture to meet each unique

market” (AGC, 2014). Alliance Genetics Canada has a wide selection of different breeds of boars ranging from Landrace to Yorkshire, Duroc and Pietran (AGC, 2014). The semen is sold by the service, which is 2 bottles since sows are bred twice during their heat (AGC, 2014). One service costs between \$13.50 and \$15.50 depending on the boar of choice (AGC, 2014). However AGC provides discounts for customers buying more than 17 services (AGC, 2014). For more information about Alliance Genetics, there is a link to email the company found on their website. The link is:

<http://www.alliancegeneticscanada.ca/contact-us/>.

Seeing as the hog industry in Canada is large, companies are very competitive therefore there are many possible companies that can export semen. Two other major Canadian genetics companies are Fast Genetics and Genesis. Fast Genetics is headquartered in Saskatoon, Saskatchewan and provides genetics for many large herds worldwide (Fast Genetics, 2013). Fast Genetics specializes in improving their sire lines and currently supplies to the Asian and Chinese market (Fast Genetics, 2013). For more information, phone numbers to many locations can be found on their website:

<http://www.fastgenetics.com/contact-us/> . Genesis’ head office is located in Oakville,

Manitoba and has many locations throughout North America (Genesis, 2010). This company has many maternal lines, which have proven excellence to better serve their customers (Genesis, 2010). For more information, Jim Long the President/CEO can be contacted at 1-519-471-6800 and there is a link to contact the company at

<http://www.genesus.com/contact>.

Not only are other Canadian companies competitors but also there are many genetics companies worldwide whom can compete for business to Nepal. Hog genetics

are technologically advanced in Europe and Asia therefore they would be able to provide Nepal with semen for cheaper since the cost of delivery would be much less as they are located much closer to Nepal than Canada is. Topigs is an international genetics company who has a mission of delivering genetics that provide the most economic solutions for professional producers (Topigs, 2011). Topigs aims to produce pigs that gain the most kilograms of pork per kilogram of feed (Topigs, 2011). Topigs delivers to over 50 countries and is proud to be the global leader in pig breeding and artificial insemination (Topigs, 2011). Topigs' closest location to Nepal is in Belgorod, Russia (Topigs, 2011). For more information, they can be contacted at +7 4722 22 09 44.

#### Benefits to Canada

The exportation of boar semen to Nepal brings many advantages to Canada. Firstly, it is a new market for Canadian companies. Since there will be more exportation, production must increase. With the increase in production, farmers will make more money selling the semen to companies. As a result of higher production, more jobs will be available for the collection and processing of the semen. Exporting boar semen will be beneficial to genetics companies because they will be selling more therefore earning higher incomes. By selling semen to Nepal, there is further potential for more business between Canada and Nepal. If successful, Nepal may begin to look for more Canadian technologies and products that will assist in improving their agricultural industry. Therefore exportation of boar semen will benefit Canadian farmers and companies which in turn will benefit the pork industry and potentially increase the amount of business with Nepal.

#### Extenders

Boar semen is different from other semen. It is very temperature sensitive and is best used fresh. It cannot be frozen therefore extenders must be used so that the semen can last for more than a few days. Extenders are added to semen to increase time of storage and quality. The use of extenders in semen is essential in order for the semen to be stored and still useful after several days.

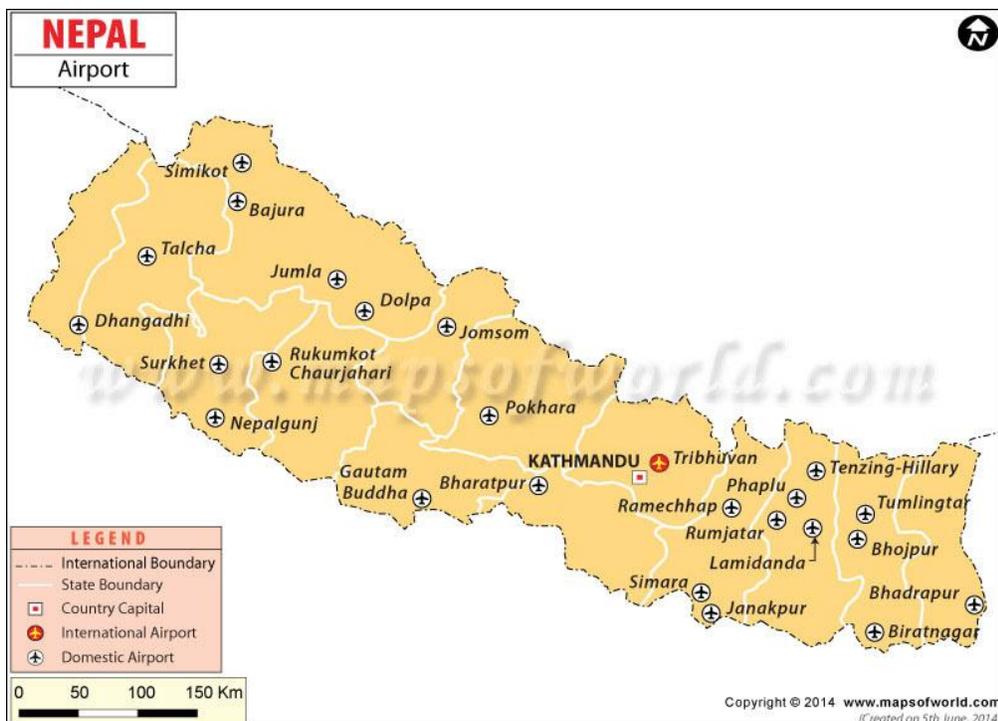
Extenders function to allow multiple inseminations from a single ejaculate. Extenders provide temperature protection for sperm while reducing the metabolic rate of sperm cells in cool storage. The extender functions to provide membrane stabilization in cool temperatures, energy sources for sperm metabolism, pH buffering from sperm cell waste, ions for membrane and cell balance, and antibiotics to prevent growth of microbes that can cause disease and compete for nutrients. Various extenders can be used (Knox, 2001).

Therefore, extenders are essential to maintain the viability of the semen and are required to last for the delivery to Nepal.

#### Delivery of Boar Semen

The most beneficial way to sell semen to Nepal would be to gather a group of Nepalese farmers who are interested in investing in Canadian genetics. With this group you would get them to either merge together and have one large farm or synchronize their sows so that the sows will come into heat within a week of each other. The advantage of having a large farm is that hogs would be moved from roaming outdoors to a more intensive farming style. This way, hogs are on a precise diet that will ensure maximum feed consumption and high daily gains.

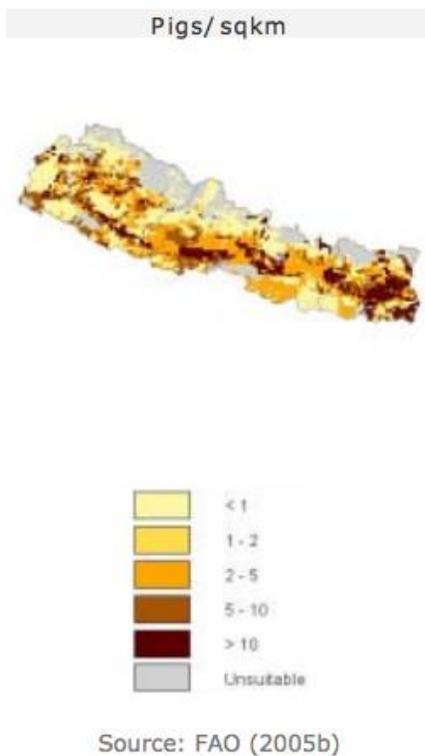
The purpose of synchronizing the sows is because semen does not last very long so must be used within 2 weeks of packaging. With the use of extenders in the semen, it is projected that the semen has a shelf life of 2 weeks however most people do not encourage this and use it within a week (Illick, 2014). To ensure that the semen arrives in Nepal quickly, the following transportation route would occur. With these specific requirements, proper delivery procedures must be followed. The semen would be packaged in St. Thomas, ON. From there, it is a 2-hour drive to Pearson International Airport. The flight from Pearson to Tribhuvan International Airport in Kathmandu, Nepal is approximately 20 hours. However, after researching airfares, it is determined that the time of delivery is 4 days. Once the semen arrives in Nepal, it must be driven to



**Figure 2: Location of Kathmandu on a Map of Nepal**

the farm locations which may range anywhere from 1 to 4 hours away. Therefore the total estimated time of the trip is just over 4 days. The semen is flown into Kathmandu because it is the only International airport in Nepal, as seen in Figure 2. From analyzing Figure 3, it is seen that the most dense hog population is South East of Kathmandu in Bhojpur. According to MapQuest, the drive from Kathmandu to Bhojpur is 3 hours.

During this trip, it is essential that the semen remains in identical conditions throughout



**Figure 3: Population of Hogs in Nepal**

the journey. Semen is very sensitive to temperature change so it is best to transport the semen to Nepal in a temperature-controlled storage box (BPEX, 2012). Boar semen must *always* be stored between 15 and 19 °C (BPEX, 2012). This is because temperatures over 19 °C decrease the shelf life of sperm (BPEX, 2012). Since sperm are alive, they require energy however when they are stored at around 17 °C, they become slightly immobile thus using less energy (Illick, 2014).

Therefore when the semen is kept at temperatures above 19 °C, the sperm use their energy and die becoming useless (Illick,

2014). Conversely, if sperm experience temperatures below 15 °C, they suffer cold shock and die (BPEX, 2012). Also, boar semen cannot experience excess light exposure since it also damages the sperm (BPEX, 2012). By transporting the semen in a temperature-

**Figure 4: Cost of Delivery From Pearson International Airport to Kathmandu Airport**

A Rate	From	To	Length	Width	Height	Weight
	L5P 1B2	Nepal	35.00 cm	35.00 cm	35.00 cm	15.000 lb.

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<input checked="" type="checkbox"/> Signature Option	Incl.	Coverage* \$ <input type="text" value="0"/>	\$0.00
		<a href="#">Update</a>	
		Fuel Surcharge	\$64.67
		Options	\$0.00
		Tax	\$0.00
		<b>Total</b>	<b>\$603.62</b>

controlled box it ensures that a constant temperature and favourable conditions are maintained.

Once the semen has reached its final destination, it is essential that the semen remains in these conditions until use. This means that farmers must invest in storage equipment such as a refrigerator if they start artificially inseminating their sows. The major cost for Nepalese to import boar semen is the cost of transportation.

Assuming that the dimensions of the delivery box are 35x35x35 and weighs 15 lbs., the cost of delivery via Canada Post's airmail, it will cost \$603.62 as seen in Figure 4. A reason the delivery cost is so expensive is because it is Priority mail. This is because Priority mail provides the shortest delivery time, which is 4 days. In addition to the airmail delivery cost, the cost of driving from St. Thomas to Pearson Airport and from Kathmandu to the farms must be considered. It is estimated that the cost of gas to drive from St. Thomas to Pearson is \$31. This is estimated because they are 186km apart. Assuming that a vehicle's fuel economy is 15L/100km, you can divide the fuel economy

by the distance to find how many litres of fuel are required. Multiply this by the cost of gas to determine the total cost of travel.

$$186\text{km} / (15\text{L}/100\text{km})$$

$$=27.9 \text{ L} \times \$1.10/\text{L}$$

$$= \$30.69$$

### Recommendations

It is believed that exporting boar semen has many benefits to both countries. If Nepalese farmers were to import semen, their pork industry would become more prosperous and farmers would make more money. It would also bring many benefits to Canada, as companies would have more business. However, the cost of delivery is just too much to send to Nepal. Nepalese farmers simply cannot afford the cost of the semen plus the cost of delivery. An option that may be easier and more beneficial is selling a high genomic boar from Canada to Nepal. This way, the boar can be used in many herds and there is no issue with preserving semen and Canadian companies will still be benefitted.

Realistically, if Nepalese hog farmers wanted to import boar semen, it is most beneficial for them to import from countries that are closer. This way they could possibly afford it as they would not have such high delivery costs.

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