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Bringing Commercial Wine Production to Nepal

South Asian Nepal's food industry is quite self-sufficient; they grow what they need and sell excess products at the market. Nepal's population is just under $27 million and agriculture accounts for 36.1% of the countries GDP. Just over 76% of the workforce in Nepal is involved in either animal or crop agriculture (Bell 2014). Due to these statistics any improvement in yields or greater contribution to agriculture in Nepal would lead to substantial benefits to their growing country. Currently in Nepal wine is made from fermenting aiselu and chutro berries, which grow in the wild, in plastic barrels. Indulgence of wine in Nepal is steadily growing however it is most popular to the wealthy Nepalese and European tourists. The idea as a whole is to increase the production of traditional wine made in Nepal by exporting wine making supplies made by Canadian companies and shipping grape seeds, that are also produced in Canada, to be grown in vineyards in Nepal. Together, production of red and white wine can bring a source of income and jobs for the people of Nepal.

Product Information:

Both the aiselu and chutro berry grow in the wild in Nepal and are ripe for harvest from March to May. Traditional winemakers in Nepal hand pick these berries, mix them with sugar and yeast, and then let them ferment in plastic drums for a month at a time. The wine that is currently made in Nepal is in high demand in the European Union (EU) but the production could not meet the amount required and therefore income is limited for exports (Dahal 2010). The demand for wine around the world is constantly increasing, especially in China with just over 1.86 billion bottles of red wine sold to the country in 2013 (Willsher 2014). Tourists travelling around Nepal would also be interested to experience the traditional wine as well as wine made from white and red organic grape

varietals grown in Nepal. Considering the tourist industry accounts for 3% of Nepal's GDP, and most is from the EU, organic wine would be in very high demand (Lewis 2014).

Grapes are not currently grown in Nepal, but with modern-day grafting techniques and the use of terrace landscapes this fruit would flourish in the hill region farmland in Nepal (LaMar 2014). The grafting company that is willing to provide organic grape vines to export to Nepal is Vine Tech. This company is based out of the Niagara region and provides custom grafted organic vines or pre-grafted vines. Their price for 25-49 vines is $7.50 a vine, totaling $367.50 for 49 vines (Wiens 2013). Considering each vine yields 8-12 lbs per plant and each bottle of wine requires about 2.75 lbs of grapes 49 vines would provide the Nepali farmer with approximately 327L of wine and 245 of 750mL bottles of wine (Litawski 2014). The actually grape vines grow quite well on hilly and uneven soil making the hill region farmlands of Nepal perfect for the production of grapes (LaMar 2014). To plant the grape vines trenches that are 75 cm wide, 75 cm deep and 118 m in length are to be opened by the use of shovels and manual labor. After about 15 days of exposure to the sun the trenches are to be close with topsoil up to a height of 45 cm. In the gaps of every running meter length that remains the trenches are filled with a mix of about 50 kg cow manure, 2.5 kg of superphosphate, 0.5 kg of sulfate or potash, and 50g of $ZnSO_4$ and 50g of $FeSO_4$ (Shikhamany 2013). Based on information gathered from India in regards to grape types and yields the grapes with the highest potential yield are the Anab-e-Shahi varietal with the Bangalore Blue varietal following in a close second. India is chosen as a country of comparison due to its close proximity with Nepal. Figure 1 and 2 examine production, yields, and period of harvest of different varietals of grapes

found in India. This information collected from India is extremely helpful when deciding which grape vine varietals will be shipped to Nepal due to the similarities in climate, soil, weather patterns and landscape between the two countries.

Figure 1: Total Amount of Grape Varietals Grown and Produced in India

Shikhamany, S. D. (2013). Grape production in india.*5*(23), November 11, 2014. Retreived from http://www.fao.org/docrep/003/X6897E/x6897e06.htm

Variety	Area (ha)	Production (t)
Anab-e-Shahi (white, seeded)	3,000	135,000
Bangalore Blue Syn. Isabella (black, seeded)	4,500	180,000
Bhokri (white, seeded)	500	15,000
Flame Seedless (red, seedless)	500	10,000
Gulabi Syn. Muscat Hamburg (purple, seeded)	1,000	30,000
Perlette (white, seedless)	1,500	60,000
Sharad Seedless - A mutant of Kishmish Chorni (black, seedless)	1,000	20,000
Thomson Seedless and its mutants (white, seedless)	22,000	550,000
Total	**34,000**	**1,000,000**

Figure 2: Fertilizers Used and Amounts Needed to Successfully Grow Specified Grape Varietals

Shikhamany, S. D. (2013). Grape production in india.*5*(23), November 11, 2014. Retreived from http://www.fao.org/docrep/003/X6897E/x6897e06.htm

Cultivars	Yield (t/ha)	Amount of Fertilizer(kg/ha)				Amount of Manure (t/ha)
		N	P_2O_5	K_2O	CaO, MgO	
Delaware	15	150-170	170-180	150	800	15
Kyoho, etc.(tetraploidy)	12-14	60	150	120	1000-1500	15
Neo MuscatKaiji	18-22	160-200	150-170	150-160	1500	20
Muscat Bailey A Kosyu	22-24	130-210	190-260	130-150	1000-2000	15

Aiselu and Chutro grow wild in the Hill region of Nepal and bloom around springtime (Dahal 2010). Grapes, aiselu, and chutro will all be grown in the same place making harvesting by hand convenient. The mountainous landscape does not interfere with yields and therefore makes the difficult farmland very useful when it otherwise wouldn't be.

The machinery and equipment required to complete the project includes fermentation chambers, blending barrels, oak barrels to age the wine, carboys to bulk age the wine, and finally bottles. The winemaking equipment will be produced and shipped from a Canadian company known as Cellar Tech. After e-mailing Natalie Reynolds, a technical sales consultant at this company, the cost for the company to produce the machinery that will create 327 L of wine/ha averaged around $48,270. The company Cellar Tek imports metals and other raw materials essential to make the winemaking equipment from out of country (Reynolds pers. Comm. 2014). The winemaking equipment produced from Cellar Tek offers superior quality at a competitive price. Prices of winemaking equipment from competitive countries, such as Qingdao, are slightly more expensive. Competitors prices range from $50,000-$80,000 for the same equipment (Zhoa 2014). Other expenses include transportation of the wine equipment and grape vines to Nepal. The total estimated cost for the production of approximately 327L wine operation would be $11,594 US to start up, and the land, building costs, and machinery account for most of the investment and start-up costs (Combe 2013). See figure 3 for a breakdown of the estimated costs.

Figure 3: Approximate breakdown of cost for the start up of a vineyard and winery in Nepal

Investment	**Cost for production of 327 L wine/ha and year**
Land	$1715.74
Establishment, year 1	$520 *www.winepros.org, www.vinetechcanada.com*
Maintenance, years 2-3	$150 US$/year *www.fao.org*
Machinery for cropping	Labour 3 workers= $3381 US$/month *http://en.wikipedia.org*
Equipment for winemaking	$48,270 *Reynolds, pers. Comm. 2014*
Total investment	$53,887

Marketing	5%
Total	$55,000

Due to the fact that the wine is made from berries and grapes, and must be harvested and cultivated by hand, manual labor is essential to the business and workers must be compensated. Wine experts and workers must be present at fermentation chambers and the factory needs a manager and sales-associate. Fertilizers, pesticides, herbicides, as well as water from the Himalayan Mountains to help grow healthy crops with a very high yield are required and prices are accounted for in figure 3. Labor required would include workers to harvest the fruits by hand, a production manager, wine expert, and farmers to dig trenches and apply fertilizer. In total about 20 people are required to start up the winery and as production expands so will the work force. The average worker in Nepal is paid Rs 318 per day so then the daily cost of workers would be about Rs 6360, which is equal to $72.00 CAN (Bhatta 2014). There would be no issues with seasonality due to the fact that the climate in the hill regions of Nepal is very mild and the grape vines would be grafted to grow all year round. Grape vines grow quite well in several different types of soil but excel in well-drained soil conditions (LaMar 2014). These types of soil conditions are found in the hilly regions of Nepal adding to the fact that this region will produce excellent quality grapes with high yields. The health and nutritional benefits of drinking a glass of red wine a day has been extensively researched and the conclusion was that the lignin derived compounds can be extracted for the oak barrels during fermentation. These compounds are proven antioxidants, radical-scavenging, and/or chemo-preventative activities (Setzer 2010).

Wine is made in 4 major steps. These step include primary fermentation, blending, barrel aging, and bulk aging (OMAFRA 2009). Primary fermentation occurs when the sugar found in the grapes is consumed and converted into half CO_2 gas and half alcohol by weight. This process lasts for approximately three to five days and the optimal temperature range is anywhere between 70 and 75 degrees Celsius (Kraus 2014). The blending process comes into play when grapes grown in Nepal are fermented and then mixed with the fermented aiselu and chutro. The purpose of blending is to create a finished product that is of better taste and higher quality then that of its individual components. The blending process is for experimental purposes and would only be continued if the wine produced were of good taste and high quality. The next step in winemaking is barrel aging. Although it is not an essential part in the winemaking process, oak barrels are known to replace the rough taste of a young wine with a somewhat soft and smooth texture. Another reason to barrel age the wine is because of the fact that the wine tends to evaporate in wood barrels and therefore concentrating the flavours of the wine. Thirdly as time passes and the wine ages in the barrel wood flavours from the oak are leached into the wine creating desirable tastes and aromas. In general smaller aging barrels speed up the aging process and for this project barrels containing 55-60 gallons will be used to age the wine faster (Volecheff 2014). The final step in the winemaking process is bulk aging. Bulk aging can be performed in two different vessels, bottle or carboy, and time spent aging varies greatly based on the type of wine being produced. Many professional wine makers bulk age their wine in carboys because the wine is less susceptible to damage from air, light, and heat due to the large size of the

aging vessel (Kraus 2014). The wine in this project will be bulk aged in carboys to save space and time and also to produce the best quality wine possible.

Developing a better relationship with Nepal is just one of the many benefits that the execution of this idea would provide to Canada. Canadian companies supplying the grape vines and winemaking supplies would have an increase in profit and their brand would be more known worldwide. Part of this project may include hiring expert winemakers from Canada to offer education to the Nepali culture about winemaking. This would provide jobs and travelling opportunities for Canadians. The intent is to improve on their wine made from aiselu and chutro. Another part of this project is to graft French hybrid grapes, due to their superior quality, to suit the climate in Nepal and to increase maximum yield (Morris 2004).

Export Potential to Nepal

Alone Nepalese wine company, Makalu Wine Industries' Hinwa, exports some of their stock to the UK but cannot supply enough wine to meet the demanding market (Dahal 2010). Their wine is at full production in the spring and summer months because that is when the berries are ripe. Since there is a market for Nepali wine makers, an increase in yield and warehouse size to produce more wine may meet the demand. Exporting some of the wine produced to Canada may give local wine connoisseur a unique Nepalese experience and such health benefits as preventing colon and breast cancer (Setzer 2014). Transportation logistics include packaging the seeds and winemaking equipment and shipping it by air with DHL transportation. The estimated cost of shipping the package is around $749 per shipment by air. Transportation logistics

are straightforward and the package will be shipped by air directly to Kathmandu, Nepal from the DHL export headquarters (Nouvelle pers. Comm. 2014).

The necessary documentation required to ship the vines and winemaking equipment to Nepal by air include a certificate of origin, a transport document, and packing list. A certificate of origin must be certified by a legal chamber of commerce and can be ordered online at http://www.legalchamberofcommerce.ca/. A transport document is also required and metric units used for all weights and measurements. Since the shipment is travelling by air an airway bill is required all of these documents can be obtained from the company shipping the product (http://international.dhl.ca/en/logistics/freight_transportation/air_freight.html). Lastly, a packing list is required and 3 copies signed in blue ink and stamped with a seal of the company are needed. The packing list will contain the receipt, contents of the shipment, net and gross weigh of the container, and destination information. Net and gross weight in the packing list must match the information shown on the commercial invoice and bill of landing (Lewis 2014). Both companies, Cellar Tek and Vine Tech, must create this document.

Trade barriers would include language restrictions and the cost of shipping such a far distance. Due to the fact that Nepal is a land locked country in between India and China the winemaking equipment would have to shipped by air or into India if is by water. This makes shipping very costly and timely. For this product limited subsidy barriers exist. This is because Nepal doesn't have the appropriate resources to make winemaking equipment or grow grapes by themselves. The winemaking equipment currently in Nepal isn't producing high quality wine. The winemaking equipment that is to be exported would offer the Nepalese winemakers an excellent opportunity to make

top quality and award winning wines. The wine would be bottled in a new technology know as Tetra Pak cartons. These cartons are lighter, easier to transport, and are less susceptible to breaking during transport. The benefit of using these bottles is, given the potential quality of the wine, the Chinese and EU citizens would buy it and the bottles would cost less to ship. The cost of these bottles is taken into consideration in figure 3. The final target customers for the winemaking equipment include Nepalese wine makers, such as Makalu Wine Industries' Hinwa. The target consumers of the finished product, Nepalese wine, would include tourists from neighboring countries, wealthy Nepalese citizens, and possibly exportation to China and India. Another advantage is wine, grapes, and grape seeds do not need to be refrigerated there is no storage/refrigeration issue from post-harvest to market.

The most important process to create a sustainable and profitable country is education and jobs, and this innovative project offers both. By educating farmers on growing grapes and the creation of high quality wine this practice would offer a large salary. The actual operation would need several workers and harvesters, which would be directed to women and children of the family and village. To generate money, the product would be sold to restaurants. This way the tourists would be able to taste authentic Nepal-grown organic wine offering more profit for Nepalese restaurants and businesses. This project is an example of a very sustainable agriculture system because the land that would otherwise be used for nothing is being used to grow grapes and wild berries. This land type can be conquered due to the fact that grapes, aiselu, and chutro can strive on this difficult terrain and would be harvested without the use of heavy machinery. Considering the grape vines have very deep roots and crawl up terrace walls soil erosion would be

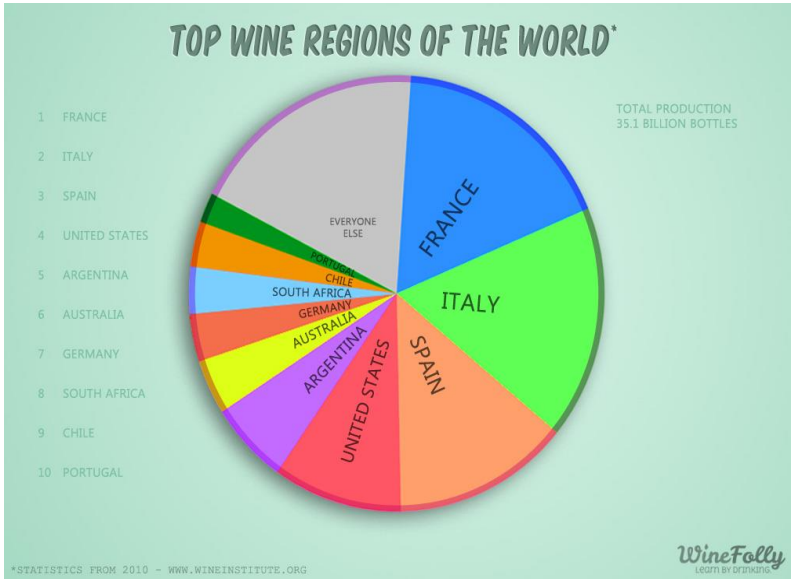
prevented on hillsides. In order to prevent damage to the surrounding environment the pesticide, herbicide, and fertilizers may be used in small quantities and closely monitored.

Canadian companies and contacts include Natalie Reynolds, a branch manager and winemaker at Cellar Tek, and Wes Wiens, a vine-grafting expert at Vine Tech. Natalie can be reached by phone at (905)-246-8316 or by e-mail at nreynolds@cellartek.com. Wes can be reached by e-mail at wes@vinetechcanada.com. Potential Nepalese wine companies that would be interested in buying the winemaking equipment and grape vines include Makalu Wine Industries'. Specifically, Mr. Ashraya at 977-25-533697.

Using a real world sales and marketing strategy, the plan would be to increase sales to EU tourists would be very interested in wine made using organic grape vines a well as Himalayan water. This combined with the wine made from wild berries only found in Nepal would offer these tourists as well as neighboring countries a unique wine experience. Wine connoisseurs would be very interested given there is high demand for new, unique wines and the fact that the berries native to Nepal can offer a different taste. The cost would also reflect the rarity of the wine and it could be sold at a higher price, which attracts the wealthy wine drinkers overall increases profit. In regards to government loans available the Canadian government offers a loan up to $350,000 for new/used machinery for an eligible small business that have no more than $5 million in annual gross revenues. The loan is given out at the risk of the Canadian government and a financing plan will be produced by a financial officer with the businesses approval (Canada Small Business Financing Program 2014).

Due to the fact that wine has been produced in France for several hundred years Nepal will have a tough time competing globally with them. However, because Nepal's wine is made out of aiselu and chutro instead of grapes this can offer a substantial advantage over the competitor. With the grapes grown in Nepal, and wine produced from organic Nepalese grapes and Himalayan water, the wines distinct taste can give the winemakers an edge in the competitive market. The follow pie chart, figure 4, is a representation of the top wine producing regions in the world according to a survey done in 2010.

Figure 4: Pie chart showing top wine producing regions of the world according to a survey done in 2010.
www.winefolly.com



As you can see in figure 4 France has a large advantage given their history in the production of wine and champagne. The major grapes grown in France include Merlot and Grenache. Italy is the next top competitor due to its climate, which is perfect for growing several different types of wine grapes such as Sangiovese and Trebbiano. Spain is 3rd in the rankings and is known for Tempranillo and Airen. Together, these regions produce just under half of the world's wine making them very tough to compete with globally (winefolly.com). Future studies required to properly evaluate the export potential consist of trials to see how well

the different types of grapes grow in Nepal. Also several different wine fermenting trials can be performed to see if a mix between wine made from aiselu and chutro and wine made from grapes would produce quality wines. Market evaluations to test sales in China can also be done considering it would be cheaper to send wine made in Nepal over to China than it is for China to acquire wine from Canada, Italy, etc.

Exporting winemaking equipment from Canada to Nepal would offer benefits to both countries involved. The benefits would include a better relationship between the two countries, profit to both the Canadian companies and the Nepalese winemakers, and long-term jobs and financial opportunities for Nepal. Winemaking equipment has proved that it is quite pricey and very few Nepali citizens would be able to afford to start up a new winery unless they are very wealthy. With that being said, although a winery would offer more income and jobs, the cost to start one is too high for the average Nepali citizen whose income is just under $1,200 US per year (Bell 2014). Companies producing the winemaking equipment should produce smaller scale equipment at a more affordable cost to provide the Nepalese with this winemaking opportunity. In conclusion, the incentive to invest in the potentially large wine industry within Nepal would benefit all parties involved.

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