

Assessment of Canadian Sap Spiles for Export to Nepal

Griffin Bailey

Part I – Introduction to Nepal, Product Information and Process Details

Nepal is a small landlocked country located in South Asia, occupying approximately 147,000 squared kilometers (Chapagain, T. 2016). Nepal is separated into three main regions, the



Figure 1 – 7/16” White Bucket spout

mountain region, hill region and the Terai (Chapagain, T. 2016). Nepal’s population is approximately 28

million and growing.

About 80% of the population resides in rural areas and relies on agriculture as their main

source of income (Chapagain, T. 2016).

The agriculture industry employs approximately 70% of the nation’s workforce and accounts for about 38% of the nation’s gross domestic product (Chapagain, T. 2016).

The product chosen for potential export to Nepal is a tree spile for the collection of birch and walnut sap (Figure 1). These

spiles are conventionally used in Canada for the collection of sap in sugar maple and black maple trees for the production of maple syrup. Sap is collected in Canada in the early spring when the temperature drops below 0°C at night and reaches positive temperatures during the day. Sap within the tree moves upwards through the tree as the temperature warms in preparation for leaf budding, and descends back down to the roots when the temperature drops again. By drilling a

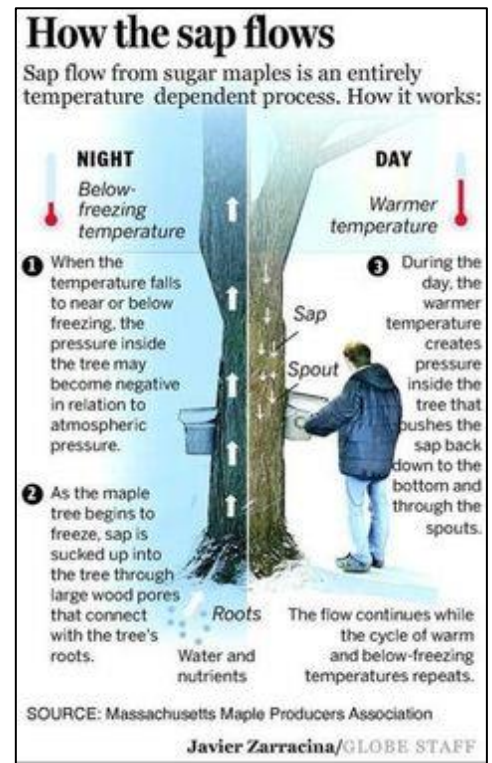


Figure 2 – Sap Flow



Figure 3 – A traditional stainless steel spile

small hole into the trunk of the tree and inserting the spile, the sap can be collected as it moves upwards through the tree as the temperature

warms (Figure 2). The spiles have a small hole in the bottom of the section that is inserted into the tree (Figure 3). The purpose of this hole is to intercept the flow of sap from the vascular canals in the tree that run vertically up to the branches. Major groupings of vascular bundles can be found vertically in line with a large root and branch. The majority of sap is collected as the temperature warms and the sap moves upward toward the branches of the tree, and into the hole in the bottom of the spile.

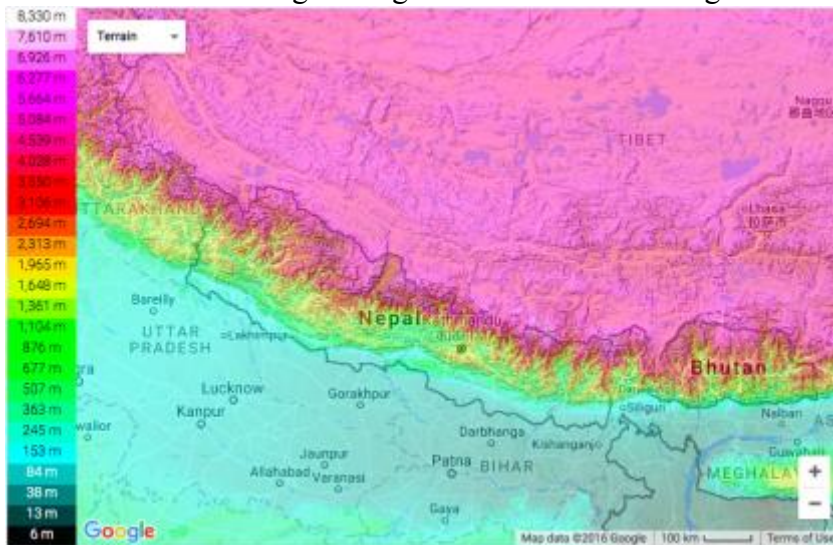
Nepal is home to many tree species, however, does not have any trees of the *Acer* genus (maple) that are suitable for sap harvest. Nepal is home to at least two species, *Betula utilis* (Himalayan birch) and *Juglans regia* (English walnut) (figure 4) (forestrynepal.org, 2014), that are capable and commonly used for the collection of sap and production of syrup. These two species are used in other parts of the world for sap harvest. Although the English Walnut is found in many regions of the world, commercial sap harvest is almost exclusively limited to The United States (Burbank, L. 2016). Walnut sugaring is not as common as other sap sugaring practices such as birch or maple, as the taste of



Figure 4 – Examples of *Betula utilis* (left) and *Juglans regia* (right)

the finished syrup does not remain as consistent as maple syrup (Noonan, 2014). In contrast, Birch syrup is very common, not only in the United States but in other regions such as Canada, Russia, Belarus, and Scandinavia (Caballero, 2013). Birch syrup has a consistency and flavor similar to maple syrup, although it requires a higher amount of boiling, as it has a lower sugar content than walnut and maple sap (Kallio, H. & Ahtonen A, 1987).

Both the *Juglans regia* and the *Betula utilis* grow at high altitudes where the climate is



suitable for sap collection (forestrynepal.org, 2014). For sap collection the region in which the tree grows must satisfy two criteria; the correct elevation and the correct climate.

The *Juglans regia* grows

optimally at an elevation of 1200-

2500m (forestrynepal.org, 2014) and also grows in some regions with the correct climate based on the average air temperature (figure 5&6). The *Betula utilis* grows at an elevation of 2700-

4000m, however optimal growth occurs at the higher end of the elevation range

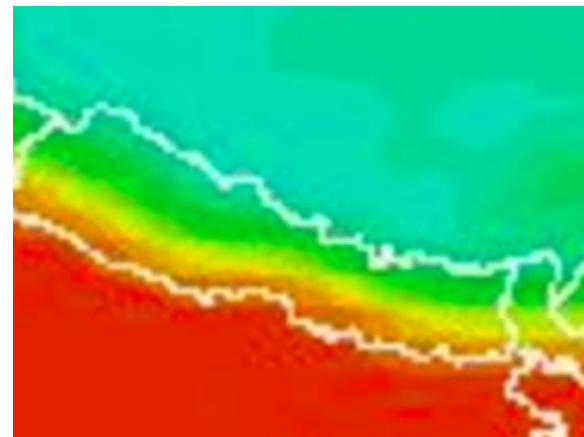
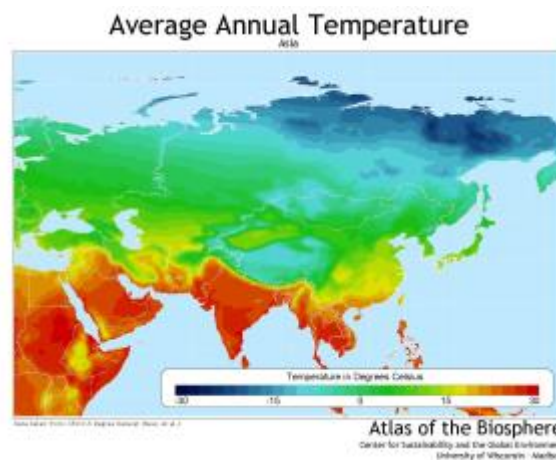


Figure 6 – Average annual temperature of Nepal

(forestrynepal.org, 2014). This species also grows in the correct regions for air temperature based on figure 5 and 6. In Nepal, the sap harvest season differs in time than the season for Canada. In Canada, the ideal air temperature range usually occurs in mid-March (weather-and-climate.com, 2016). In Nepal, the season is much earlier in the year; in January to February when the air temperature is less than 0°C at night, and reaches positive temperatures during the day (weather-and-climate.com, 2016). It has been found that Walnut sap can be harvested in the fall season as the temperature cools (Cornell, 2016), although the climate data for Nepal shows that that the seasonal temperature may fall too quickly, as it does in Canada, for significant yields to be achieved (weather-and-climate.com, 2016).

Part II – Benefits to Canada

Exporting Canadian spiles to Nepal has multiple benefits to Canada, including expanding the market for sap sugaring equipment and providing Canadian workers with more employment opportunities. These spiles are available from CDL Maple Sugaring Equipment Inc. The specific style of spile can be found in CDL's 2016 product catalog as item number 66055000A1 (en.cdline.ca, 2016). This is a Canadian, family owned company based out of St Lazare Quebec that was founded in 1991(en.cdline.ca, 2016). CDL fabricates and supplies Canada and the northern United States, as well as countries overseas such as Estonia, Switzerland and Japan, with premium maple sugaring equipment year round (en.cdline.ca, 2016). The company employs 200-300 people and dominates approximately 40% of the world's maple sugaring equipment industry (en.cdline.ca, 2016). The company is also partnered with IPL Plastics Inc., which actually manufactures the plastic spiles. IPL is based out of Saint-Damien-de-Buckland, Quebec

(Economic Development Canada, 2016). The company was founded in 1939 (IPL-plastics, 2016) and employs approximately 1000 workers (Economic Development Canada, 2016).

Birch and walnut sugaring are practices that are virtually non-existent in Nepal, based on annual recorded cash receipts (comtrade.un.org, 2014) and therefore the market for spiles is a very small one. By opening up the sap sugaring market to Nepal and possibly other regions in Asia, there will be a higher demand for not only spiles, but other equipment as well. This industry expansion will create careers for Canadians in manufacturing, transportation and sales. Because the concept of sap sugaring is likely unfamiliar to citizens in Nepal, CDL may have to provide some form of education to the farmers who will be utilizing their products. This education may come in the form of personal seminars or visual and text aids. Regardless of the form the information about the products and the industry are displayed in to the Nepalese farmers, there will be more careers created in promotion and education of the industry.

CDL Inc. is continuously involved in research and development to better their products for the environment. With environmental sustainability in mind, they are able to create products



Figure 7 – An “eco-spile” with a smaller diameter spout for reduced tree wound size, opposed to a traditional spile.

such as narrower spiles (Figure 6), to reduce the size of tree wounds (Holmes J, 2016). With the industry potentially expanding to Nepal, there may be other sustainability issues at hand, again calling for more workers involved in research in development. Because the environment and the tree species differ so much in Nepal as opposed to Canada and the United States, where most of the worlds sap sugaring occurs, research will have to be done to determine specific

environmental impacts that sap sugaring has on Nepal’s specific ecosystems. These expansions will again create new careers for Canadian workers.

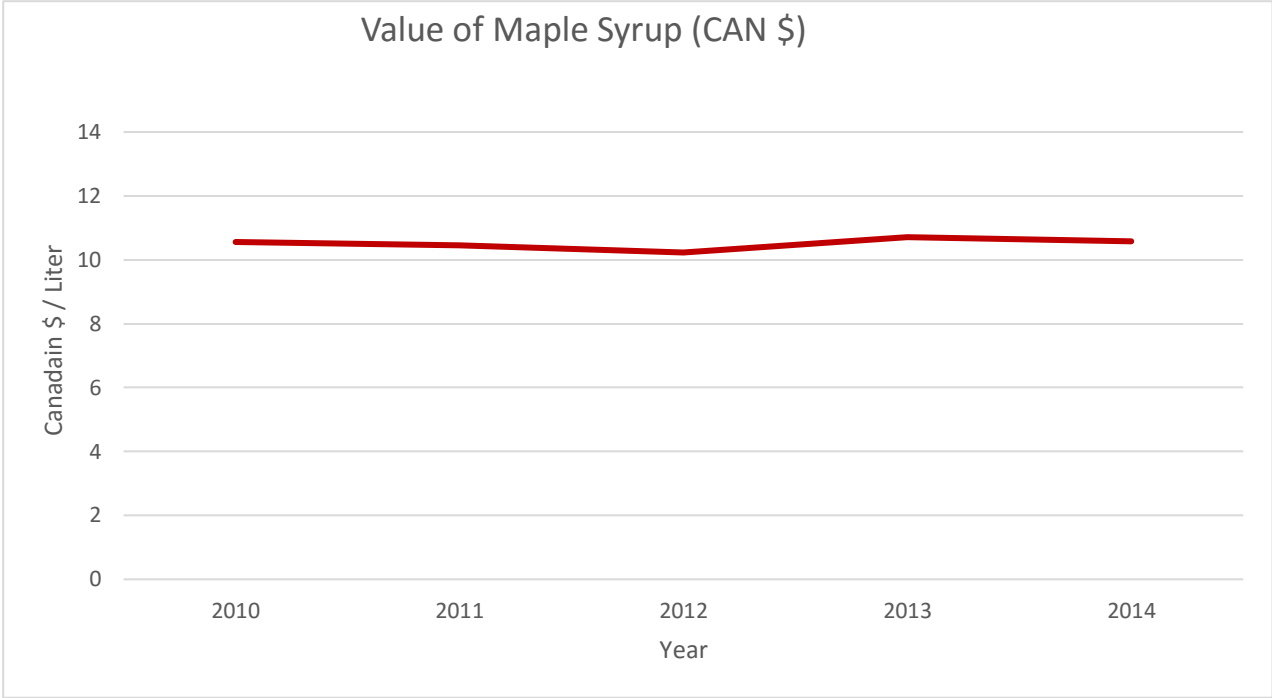


Figure 8 – Value of Maple Syrup (CAN \$)

Part III – Market Evaluation

The current market for sap sugaring is either non-existent or very minimal based on Nepal’s reported exports (comtrade.un.org, 2014). There is no sufficient evidence showing that farmers in Nepal practice sap sugaring, however it is evident that the Nation imports large amounts of sugar products. Nepal has imported an approximate average of \$213000 (USD) every year for the past 10 years according to the United Nations Comtrade database. Nepal is already a producer of sugar in the form of sugarcane and sugar beets (comtrade.un.org, 2014) and can continue to increase their production of sugar products though the production of birch and walnut

syrup. This increase in production would help to decrease the nation's high expense of imported sugars.

The production cost of sap sugaring is relatively low, and the value of the finished syrup is extremely high, making the production of birch and walnut sap a very profitable industry. It is a very low input practice, as the trees that are utilized can be harvested from in their natural, uncultivated form. The trees require no additional fertilization or maintenance and therefore no money needs to go into the upkeep of the tree's health and wellbeing. Trees can be tapped for sap harvest year after year and some trees, depending on the size, can be taped multiple times in one season. The highest cost associated with sap sugaring is the one-time investment of the equipment, such as the spile, which can be reused year after year, and also the bottling of the syrup itself. The average retail value of Walnut syrup in the North American market is \$125 (USD) per liter. Birch syrup is valued at \$190 (USD) per liter (amazon.ca, 2016). The price of syrup has remained fairly constant over the past years, and will likely remain constant in years to come. Maple syrup can be used as a model for the flocculation in value of Birch and Walnut syrup, and as seen in figure 8, the value has remained nearly constant for the past four years. The relatively low input cost and the extremely high value of the product, given the right market, demonstrates the potential profitability of using these Canadian spiles in Nepal to collect walnut and birch sap.

As previously mentioned, the sap sugaring industry in Nepal is very minimal, if not non-existent. There are not currently any large scale sugar bushes in operation, meaning that the target farmers of these Canadian spiles would use the trees they have available to them. The Himalayan birch, one of the species of trees of interest, grows very abundantly in Nepal, as it can be found at a wide range of elevation and is spread longitudinally across the entire country

(forestrynepal.org, 2014). This species of tree is very abundant and therefore is available for sap harvest to many farmers residing in rural areas. The English Walnut is not as widely spread of a species as the Himalayan Birch, however, Nepal does export a large amount of walnuts, implying that there are walnut groves present across the country. In 2014, Nepal exported approximately \$403 000 (USD) worth of shelled and in-shell walnuts (comtrade.un.org, 2014). This demonstrates that walnut farming is a significant industry in Nepal. It would be beneficial to these walnut farmers to practice walnut sugaring during the winter months as an extra source of income. It would also be more simple to insert spiles and collect sap in a cultivated orchard rather than a natural forest.

Part IV – Cost Breakdown and Transportation Logistics

The cost of one spile from CDL Inc. is \$0.75 (CAN) (en.cdinc.ca, 2016), making this a very affordable product for Nepalese farmers. Spiles are a one-time investment and can be reused year after year if cleaned properly. Farmers would require one spile for every tree they

wish to tap for sap harvest; possibly two spiles if the tree is larger than 18 inches in diameter (Fryer, J, 2016). Sap sugaring requires additional equipment other than just



Figure 9 – Additional Optional Sap Sugaring Equipment

the spile. The farmer requires equipment such as a container to collect the sap in, a place to boil it down, a drill to make the hole in the tree, a means of filtering the finished product and bottles to preserve the syrup in. The spile however is the most specialized piece of equipment required for the process and all other

materials can be items that the farmer already has or can otherwise acquire from retailers already present in Nepal. This generic equipment does not need to be exported from Canada immediately because farmers can produce syrup without 'sap sugaring specific' equipment. If the farmer wishes to purchase additional equipment (Figure 9) such as sap buckets, lids, and evaporation machines, CDL has the capability to ship them such equipment.

It was quoted by FedEx that it would cost \$312.59 (CAD) to ship 100 spiles from St. Lazare Quebec to Katmandu Nepal, with one spile at a mass of 0.05 lbs. (FedEx, 2016) (en.cdline.ca, 2016). 100 spiles was estimated to be a suitable number as a startup quantity. As the practice of sap sugaring gains popularity, CDL would be able to ship a larger amount of spiles to Nepal for a lower cost. 100 spiles is estimated to be sufficient for 3-4 farmers if they wish to peruse sap sugaring as a means of profit in addition to their current livelihood, as it would allow them to harvest sap from 25-33 trees. The spiles can be classified as agricultural imports, and therefore have a fixed tax of 10% upon entry to Nepal (nationsencyclopedia.com, 2016). Refer to Tables 1 and 2 for a complete cost and profit breakdown for a farmer tapping one birch or walnut trees for sap harvest. Refer to table 3 for a breakdown of profits (before cost of additional equipment, bottling etc.) if a farmer were to tap 25 trees for sap harvest. These profit values are before the costs of additional equipment, bottling and other variable factors. The additional costs would be dependent on the equipment the farmer would already have available to him/her, and packaging/labeling if the farmer desired. If the farmer wished to send the syrup back to North America to be sold it would cost approximately \$1000 CAN to send 20L of syrup back to Toronto, Canada (FedEx, 2016). Based on this data, it has the potential to very profitable to sell the finished syrup in Nepal at lower prices or in North America where it would be sold at higher prices. These values are based off of north American sap yields and are therefore only

estimates. Further research needs to be done to determine yields that are truly reflective of the climate and environment in Nepal.

Fee	Dollar Value (CAN)
Cost of Spile from CDL	\$0.75
FedEx Shipping from St. Lazare, Quebec to Katmandu, Nepal	\$3.13
Fixed Tax on Agricultural Imports (10%)	\$0.39
Total Cost of 1 spile	\$4.26

Table 1 – Total Cost of Spile

	Walnut	Birch
Sap to Syrup Ratio	67:1	100:1
Average sap yield per tree per season (liters)	16 L	72 L
Average syrup ratio per tree per season (liters)	0.24 L	0.72 L
Value of syrup per liter	\$168 CAN	\$255 CAN
Value of syrup produced by one tree per season \$ CAN	\$40.32 CAN	\$183.60 CAN
Value of syrup produced by one tree per season Nepalese Rupees	3308.04 Nepalese Rupees	15063.41 Nepalese Rupees
One time Cost of Spile (CAN \$ / Nepalese Rupees)	\$4.26 CAN / 349.51 Rupees	\$4.26 CAN / 349.51 Rupees
Profit * (CAN \$ / Nepalese Rupees)	\$36.06 / 2958.53 Rupees	\$179.34 / 14713.90 Rupees

*Profit not including cost of additional equipment, bottling etc.

Table 2 – Total average profits* of one tree

	25 Walnut Trees Tapped	25 Birch Trees Tapped
1 st Season's Approximate Profits* (CAN \$)	\$901.50	\$4483.50
2 nd Season's Approximate Profits* (CAN \$)	\$1008.00	\$4590.00

*Profit not including cost of additional equipment, bottling etc.

Table 3 – Profits* of 25 trees worth of Syrup per season

CDL is experienced with shipping overseas, as the company regularly exports their products to nations such as Estonia, Sweden, Switzerland and Japan (Holmes J, 2016). Because of their history with international trade, CDL Inc. is familiar with issues of international exports including taxes, tariffs and documentation. Transportation between Canada and Nepal can be carried out in multiple ways. The quote provided from FedEx included transportation by ground from St. Lazare Quebec to Toronto International Airport, where the spiles would be flown by cargo airplane to Katmandu Nepal, with multiple stops in between (FedEx, 2016). In a phone conversation, Josh Holmes, a sales advisor for CDL Inc. explained that CDL will often also send their products by truck or by rail to a Canadian port and then by cargo ship to the desired destination (Holmes J, 2016). In this case, the spiles would need to be shipped to India, because Nepal is a landlocked country, and then again by truck into Nepal. The method of transportation may differ depending on the size and weight of the shipment, and what option is makes more sense economically and logistically (Holmes J, 2016).

Part V – Benefits to Nepal

Nepal can benefit from using Canadian-made spiles from CDL Inc. in multiple ways. The first and arguably most important reason is that they have the means to provide farmers with a low input, high value crop. As demonstrated above, birch and walnut sugaring have the



capacity to bring a new and cost-effective product to Nepal. Sap sugaring is simple and inexpensive as farmers can use pre-existing birch groves and forests as well as walnut orchards that are also already present in the country. Farmers will not have to change their ways, but can add sap as another crop to in the off season during the winter to harvest and make a profit off of.

Figure 10 – An existing Nepalese Walnut Orchard

Farmers can choose to export the syrup produced from the sap to North America or other regions as explained above. They also have the option to keep it and consume it themselves. Nepal imports large amounts of sugar products each year (comtrade.un.org, 2014) and producing alternative sources of sugar is a way for Nepalese people to save money and be more self-sufficient. This alternative source of sugar may have negative impacts on the Nepalese sugar industry. Many people rely on local cane sugar farmers and the significance of this impact needs to be further evaluated.

Tree sap has been found to be high in minerals such as Calcium, Potassium, Iron, Zinc and Manganese as well as many antioxidants that can improve the health of the immune system (Gunnars, K, 2012). Consuming birch and Walnut syrup can be a more beneficial alternative to cane sugar in terms of mineral and antioxidant content, but is not a suitable means of obtaining sufficient amounts of these nutrients, because the sugar content is far too high. The added sugar

outweighs any benefit of the other nutrients in the syrup when consumed in large quantities (Gunnars, K, 2012).

In Nepal there is a law prohibiting the felling (cutting down) of seven tree species including the *Juglans regia* (Acharyda, K, 2004). Because of this law, farmers are reluctant to plant more trees of this species (Acharyda, K, 2004). This law may cause one of two different outcomes for the potential walnut sugaring industry in Nepal. It may promote farmers to plant more trees of the *Juglans regia* species because of the new market and the new-found usefulness of the species. The law may also cause the walnut sugaring industry to shrink and eventually become non-existent, if farmers refuse to plant trees in fear that they will become permanent on their land.

Part VI – Marketing Strategy

The marketing strategy in Nepal for maple sugaring equipment, specifically spiles, would be much different than in Canada. Maple syrup has been produced in Canada for hundreds of years, but sap sugaring is an unfamiliar practice to Nepalese farmers. There is an information gap between Canadian producers of maple sugaring equipment, such as CDL Inc., and the farmers in Nepal. For Nepal to be successful in the production of walnut and birch syrup, there needs to be effective communication between CDL and the farmer. The best way to ensure that this communication is made is by selling the spile directly to the farmer. Ideally, an employee of CDL would act as an international salesperson, and would provide information and training on the products being sold, such as the spiles, as well as the sap sugaring industry as a whole. This is a large assumption that the company would employ such a salesperson and is unlikely. An alternate approach would be to offer written instruction with visual aids on how to use the

products and how to harvest sap and process it into syrup. Some form of communication must be made between CDL and farmers in Nepal because there is no legitimate competition for sap sugaring equipment for the Nepal and the surrounding region. Online retailer's prices are approximately nine times more expensive than CDL (amazon.ca, 2016), and there are no physical store locations that sell the required equipment.

The sale of spiles would also be targeted to a certain demographic of people in Nepal. The farmer would need to have a sufficient amount of trees in order to make the process of sap sugaring worthwhile in terms of time and revenue. The target consumers would be those with pre-existing walnut orchards, and those residing in rural areas with access to a sufficient amount of either birch or walnut trees.

Part VII – Recommendations and Conclusion

The export of spiles to Nepal has high potential to be beneficial to both Canada and Nepal. The expanded market into Nepal would provide more jobs for Canadians at CDL Inc., IPL Plastics, and in the transportation and marketing industries. Nepalese farmers would benefit from the high value syrup that they would be able to produce using the spiles. The syrup could be consumed as a substitute to conventional cane sugar, or could be shipped back to North America where it could be sold for a high cost. Based on the high profits of birch and walnut syrup, the low unit cost of spiles and the confidence of CDL Inc. in regards to international trade, it is very plausible that exporting Canadian spiles to Nepal will be beneficial to both parties.

There are some unknowns that must be researched and some recommendations to be made to this export idea. First of all, the volume of sap that can actually be extracted from the tree is still in question. There is North American and European data that have similar values for

sap volumes extracted in a season for birch and walnut sap, but there is no data from Nepal. These values are critical in evaluating the true profit that an average farmer in Nepal would be accumulating in a season. The second recommendation is that a more in depth evaluation of potential sap farmers be conducted. There are no values on the number of farmers that would have access to sufficient amount of birch or walnut trees to make their investment in spiles and other equipment worthwhile. A final recommendation would be to acquire a more accurate quote on full shipping costs and all required documentation for exports of spiles to Nepal. Once a more accurate number of farmers willing to take up sap sugaring is obtained, a more detailed plan on shipping specifics can be made. The same is also true for exports of finished syrup from Nepal back to North America.

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