

Canadian Apples' Future in Nepal
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Part I

Product description

Various varieties of uncertified organic apple trees that are selected and grafted in Sainte Julienne, Quebec for their taste, bug and disease immunity, and ability to stand up to Canada's seasons and worst temperatures (all 200 varieties of apple trees grown at the nursery have been tested to survive winter temperatures as low as -47°C) (Hardy Fruit Trees, 2014). Grafting is the process where a shoot or a twig of a favourable plant is inserted into a slit in the trunk or stem of another plant, and the other plant's root system now provides nutrients to the favourable plant's tissues because its tissues are within their own (Dictionary of Plant Science 2012). At the Hardy Fruit Tree nursery, the apple trees they sell are all grafted varieties; this is to make the desirable characteristics consistent in every tree they sell, like they advertise. This is how they give every tree the "hardy" characteristic (weather tolerant), by grafting the favourable tree parts, which are only slightly less hardy than their rootstock, each onto a full-sized rootstock that is tested to be tolerate to temperatures as low as -50°C . Rootstock also influences the what size the tree will grow to, such as dwarf, semi-dwarf or full sized, as well as the tree's lifespan. Since these trees are grafted onto full sized tree's rootstock, they can be expected to live over a hundred years, where as a dwarf tree only has the lifespan of 30 years at best.

The Hardy Fruit tree Nursery currently sells 14 different varieties of apple trees, I believe ideally a mix of the different would help prevent issues that are common when there are many grafted clones in the same area (such as disease), but if the trees are to be grown on the hill side of Nepal, the best varieties for high-altitude, slanted growth will only be decided when the varieties are tested in that situation. These apple trees are not

like the everyday, mass produced apple species' that are usually seen in supermarkets (i.e. Macintosh, Honey Crisp, etc.), but local varieties that the nursery has accumulated over the time. Their trees are relatively shorter than fruit trees found in the common garden center, and this is due to the lack of chemical fertilizer they give the tree. The nursery explains that fruit trees often sold at garden centers are tall because they are "over weight", meaning their branches and trunk are too large for their small root system to support. The trees that they sell are said to have the correct ratio of trunk/branches to root system, therefore allowing for exceptional growth. Though the nursery has hundreds of rare fruit tree varieties on its land, only the select few are available for purchase. This is because from the varieties they have, only the few that pass all of their criteria of what makes a good "hardy" tree will be sold to the public. These nine sections of criteria include: the plant's hardiness (will withstand at least -40°C without frost damage), resistance to diseases, good taste, the size of its fruit, good storage properties, if it is a heritage variety, if it bears fruit at an early age, the appearance of the fruit and the tree itself, and if it is an exclusive variety discovered in the nursery's area. So, because local varieties are used, it makes the tree fairly low maintenance in comparison to commercial apple varieties due to the amount of pesticide and fungicide spraying the tree requires to remain healthy. Most apple trees are also self-fertile, which also makes the tree to be low maintenance; though it is said that their trees will produce a larger quantity of fruit if it is planted beside another apple tree variety.

Currently there are 14 different varieties of apple trees available for sale from the Hardy Fruit Tree nursery, and I believe buying a mix of these varieties will be best for the farmers in Nepal. Therefore to minimize diseases attacks on genetically identical plants

that can occur when a species is widely grafted (Hardy Fruit Trees, 2014).

Where the product is grown/raised

The Hardy Fruit Tree Nursery is located just outside of Montreal in Sainte-Julienne, Quebec, where they operate a garden/nursery home to hundreds of rare (majority local varieties) of fruits and vegetables (Hardy Fruit Trees, 2014). Being located in Quebec, they face the annual risk of losing fruit and even their trees to the cold weather.

Therefore because of this they have tailored their nursery to produce trees that will be able to survive these temperatures and market to Canadian customers who experience the same problems. This is why they are named “Hardy” Fruit Tree nursery, because they categorize their trees’ ability to survive cold temperatures according to the hardiness zones created by Agriculture Canada (which categorizes the Guelph area as a “5b Zone”). Therefore hardiness zone classified trees = “Hardy Fruit Trees”.

The Hardy Fruit Tree nursery is not a certified organic orchard, but follows the same principles an organic operation would follow. Such as not using pesticides, fungicides, or chemical fertilizers, and exclusively using compost and manure to enrich the tree’s available nutrients. This nursery also prides itself on being a small operation that is in close touch with their customers. All of the breeding, raising and care required for their plants are done by the hands of their employees, giving each tree the attention that they advertise on their website. Also because they pride themselves on being a small operation, they currently only market their trees to people in Canada and do not advertise shipping across any borders (Hardy Fruit Trees, 2014).

Labour required and costs

As mentioned, all of the care taking for the trees is done by hand, which minimizes fuel emissions created by the machinery that could be alternatively used (Hardy Fruit Trees, 2014). Though, this means that more paid labour is required and the amount of employees needed is amplified.

The Hardy Fruit Tree nursery also grows and sells multiple varieties of forest trees. When these are bought in large sizes, 10 or more of the same species, the buyer is given a 50% discount because the minimal work it takes to raise a forest tree allows them to still make a profit. Though, this does not apply to their fruit trees. Since every tree is advertised to have specific specialty traits, a large amount of labour must go into making the tree worthy of the nursery's name. For example, the most labour intensive characteristic is every fruit tree is grafted onto a full-sized rootstock for it to be weather tolerant. This means until the root stock is ready for grafting, the rootstock trees must also be raised, even when grafting to an apple tree shoot ends up being unsuccessful. The nursery has therefore made a reasonable rate to charge to compensate for the work that goes into every tree: \$35 Canadian for each 1-2ft tall tree.

Also a inconvenience to transportation, since every tree is a living organism, and is prone to shock when it is dig up, transported, and finally transplanted into a new place with different soil, the nursery only sold when they are in their dormancy period (April or October). That way they can also be sold bare-root (shipped with as little soil possible) to minimize shipping costs (Hardy Fruit Trees, 2014).

Inputs required to start program

There will be very minimal cost needed to begin shipping Hardy Apple Trees to Nepal, because their operation is large enough to support the first few orders of trees without having to build any larger facilities (Hardy Fruit Trees, 2014). The only immediate cost will be the cost of each tree (\$35 Canadian dollars per 1-2ft tree) and the shipping and handling required. Shipping, if the company is convinced to ship outside the country, will also be minimal because the trees are shipped in large quantities and bare-rooted, meaning with as little soil as possible. (Shipping and handling to Ontario and Quebec is currently \$25 dollars plus 10% of the total purchase price of the order) (Hardy Fruit Trees, 2014).

Nutritional information associated with the product

Food Name	Measure	Weight	Energy	Energy	Protein	Carbohydrate	Total Sugar	Total Dietary Fibre	Total Fat	Calcium	Iron	Sodium	Potassium	Magnesium	Phosphorus	Vitamin A	Beta-carotene	Lycopene	Folate	Vitamin C	Vitamin B12
		g	kcal	kJ	g	g	g	g	g	mg	mg	mg	mg	mg	mg	RAE	mcg	mcg	DFE	mg	mcg
Fruit and Fruit Juices																					
Fruit																					
Apple with skin (7cm.diam)	1	138	72	300	tr	19	14	2.6	tr	8	0.2	1	148	7	15	4	37	0	4	6	0

Apples are a good fruit to export to Nepal because of its amount of dietary fibre just from one apple (2.6g), the energy it provides (300kJ per apple), as well as the other nutrients it provides the consumer all from one apple (that is 7cm in diameter) (Health Canada 2008). Making apples a more common fruit consumed will improve the Nepalese population's health by more diversifying its nutrient sources (Health Canada 2008).

Any patent/intellectual property constraints

Like mentioned earlier, Hardy Fruit Tree nursery prides itself on being a small operating business that because of being so small, is very close to the customers it has. I

believe this nursery's values it uses to raise its trees are ideal for creating a perfect export to Nepal's Hilly Region, but their resistance to expand their facilities may become a problem if this export gains popularity (Hardy Fruit Trees, 2014).

As stated on their website, an apple tree is an investment; because their trees are grafted onto full sized tree rootstock, they can live to be over one hundred years old (Hardy Fruit Trees, 2014). I believe because of this the popularity of exporting these trees to Nepal will not be constant, but instead in multiple smaller rushes because a family will only need to buy one or two trees to support the entire family's need for apples, therefore the Nepalese people will buy however many trees they would like, and then will not have to buy anymore unless their tree has a disease or they want to expand their orchard by purchasing from Hardy Fruit Trees.

Because these trees are so easy to replicate, ownership of the species' actual genes will have to be discussed, for the possibility of two reasons: the nursery is not able to accommodate for the demand of apples the Nepalese people are ordering and the facility must be expanded, or because of the risk of Nepalese people grafting the trees themselves instead of purchasing another tree created in Canada.

Market opportunity (niche product, or required by a large population?)

I believe hardy fruit tree's varieties should be marketed to the families that farm on the field terraces in Nepal's Hilly Region. I believe this because even though the price of each 1-2ft apple tree is significant, but obtainable for a Nepalese family to pay for, it is adapted to the country's seasons (similar to Canada's) and can survive through the worst of Nepalese temperatures (Hardy Fruit Trees, 2014). Having an apple tree will also give

the family an extra source of nutrition, and another product to sell at market and produce annual extra income. The trees grown at Hardy Fruit Trees are extremely low maintenance in comparison to commercial varieties of apples, so it is ideal for families who hardly know anything about apples, because they do not require much tending-to. Also, the money spent on the initial purchase is said to be made back in the second year of harvest. Making the many harvests after the second purely profit (Hardy Fruit Trees, 2014).

Benefits to Canada

Some advantages that can come from this export could benefit Canada by: when/if the Hardy Fruit Tree nursery can no longer support the demand for apple trees in Nepal, rights to the patents for some of the nursery's most favourable varieties could be bought and a new apple tree orchard could be established in Canada. This would create a new Canadian business, and provide multiple new labourer jobs to Canadian workers because all of the work done raising the trees must be done by hand, to maintain Hardy Fruit Trees' key values. Also because all work is done by hand, gas emissions are minimal, only trucks and tractors for transportation are still used, therefore using the Hardy Fruit Tree nursery or recreating a nursery with similar values helps cut Canada's ecological footprint (Hardy Fruit Trees, 2014).

At the Hardy Fruit Tree Nursery they regularly take on groups of 5 or larger for a "one-day nursery experience", where the group works on the orchard for the entire day and gains lasting memories while doing it. This idea I believe could be tailored to troubled

teens or criminals to teach them values of working hard and as a team to achieve a common goal, therefore creating a program with the nursery (either existing or with the newly established nursery) to rehabilitate Canadians who have lost their way.

Part II

Transportation logistics:

Transportation outside the country is uncertain because this nursery is very adamant about remaining a small operation, meaning they only want to market to Canadians, and they would have to be negotiated with to agree to sending their trees directly to Nepal (Hardy Fruit Trees, 2014). Though, these trees are relatively simple to ship. Apple trees are sold in two sizes: 1-2ft and 2-3ft tall, the nursery recommends purchasing the 1-2ft tall trees if you plan to have the tree mailed and I therefore believe this will be best for export because they take up the least amount of space when shipped, and will have the smallest shipping and handling cost. Trees are also shipped bare-root, which means they have as little amount of soil packaged with them as possible, therefore reducing weight and bulk. Also because they are shipped bare-root they can be shipped in large quantities, sometimes more than 100 trees per order. As mentioned earlier, I predict that the demand for the trees will come in waves, because purchasing the tree requires the family to save up money for one, and once they have a tree they can harvest from said tree for potentially up to 100 years, so the family would not want to purchase more trees because they already have a healthy amount of harvest.

Again, because these trees are distributed bare-rooted, when they are packaged the Hardy Fruit Tree nursery uses regular postage such as Canada Post to ship their trees across the country (only sending them on a Monday or Tuesday, that way the tree will not have to spend the weekend in the post office). If you are located somewhere in Canada, you can expect your tree within 1-4 days with regular postage, but if they were ever to be exported from Quebec, Canada to the Hilly Regions of Nepal, express postage would have to be discussed in order to ensure the tree makes it to its destination alive (Hardy Fruit Trees, 2014).

Storage/refrigeration issues from post-harvest

Every species of apple is slightly different in the way it ripens, but if you are planning to store your apples post harvest, it is recommended that they are picked when mature, but still firm (Burford 2014). When an apple is mature, it will be firm, crisp, will have developed good flavor and colour (Burford 2004) and can be stored as long as six months in a refrigerated temperature of -1 to 0 degrees Celsius (Ehsani-Moghaddam 2013).

Though because Nepalese farming families do not commonly have refrigerating units, they will most likely not be able to preserve their apples for nearly as long as six months. However this does not turn out to be much of a problem, because the Nepalese will not be producing their apples commercially like the producers who have refrigerating units do, therefore they do not have any need to preserve their apples because there is only enough apples to be immediately consumed by the family when the apple ripens (Ehsani-Moghaddam 2013).

Of course if there does so happen to be excess apples produced from the harvest, the family can either sell the apples for some extra income, or they can make the apples into jams, pies or can be dried to fend off the fruit spoiling (Burford 2004).

Benefits to the importing nation

Nepal's climate has large variations over its three different geographical regions, The Valley Region, Hilly Region and the Himalayan Region (World Encyclopedia 2014). I believe the hilly region would be the best place for Hardy Fruit Trees' apple trees because it will maximize the tree's benefits of the trees' large root systems by reducing the amount of erosion on farm terraces and the trees will also improve agriculture within the region (Viles, 2001), agriculture occupies 80% of Nepal's working citizens (World Encyclopedia 2014). Multiple apple varieties can now grow at higher elevations, such as the ones in Nepal's hilly region, so with some minimal researching, at a reasonable cost, it can be determined which of the nursery's trees will survive best at higher altitudes (Ferree 2003). Nepal also has seasons similar to Canada's, though they are named differently; therefore the Hardy Fruit Trees' ability to withstand Canadian hardiness zone temperatures will reassure that no trees will be lost due to cold weather (World Encyclopedia 2014).

The apples will also encourage more diverse nutrition among Nepalese people and will create a new source of reliable income for the locals, if they choose to sell their family's

apples (World Encyclopedia 2014). This is because Nepal's agriculture is not significantly diverse, or are its citizens wealthy enough accommodate a balanced diet (World Encyclopedia 2014), therefore increasing apple tree populations would make a good addition.

Since the Hardy Fruit Tree nursery does not want to expand into a large operation and if the demand for these trees continues to grow in Nepal, a new nursery, licensed to use Hardy Fruit Trees' varieties, could be established in Nepal. This would be possible because all of the work done on the trees is done by hand. Therefore this makes it possible for Nepalese people with little equipment able to establish their own humble nursery (World Encyclopedia 2014). From having this nursery in Nepal, it will provide them with a new source of employment and income, as well as the large amount of trees will help with the country's deforestation and erosion.

Future studies required to properly evaluate the export potential of your product (unknowns)

More research and negotiation is required to determine if the nursery will be willing under certain circumstances to directly export to Nepal, and if not, what negotiations would have to be done to gain patent rights to the apple tree varieties if a new orchard must be eventually establish.

What the demand for this product actually is among Nepalese families, will the nursery have to be expanded to accommodate or will the demand be spread out in waves?

If the demand comes in waves will the current nursery be able to accommodate the order sizes without expanding?

As well as which of the fourteen varieties of apple trees that the nursery sells will be idea for growing in the Hilly Region of Nepal? How will they grow at a higher altitude? Or with the region's different type of soil? Is there some varieties that do better in these conditions?

Therefore I would recommend exporting apple trees to the hilly region of Nepal because it will benefit Canada by supporting a Canadian business and its potential for expansion, that can help with our deforestation, and possible create programs for misguided teens or criminals that will teach them the good values of hard work. As well as also benefitting Nepal's hilly region by reducing the amount of erosion, improving the locals' daily nutrition, and providing Nepalese families with an extra source of income.

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