Exporting the Thomson Laurentian Rutabaga to Nepal

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Nepal is a small country, located in southern Asia between India and China with a population of 29 million (CIA, 2016). Agriculture is an important part of the Nepalese economy and society with 80% of the population involved in the industry and contributes one third of the GDP (Joshi, 2000; National Seed Board, 2013). In all three geological regions (terai, hills, and mountain), farmers commonly grow corn, wheat, rice, and a variety of vegetables (Conroy, Joshi, & Witcombe, 2012). However, they are limited when it comes to different varieties of cultivars (Joshi, 2000). As a result, exporting rutabaga seeds to Nepal has a lot of potential.

Product Information of Thomson Laurentian Rutabaga Seeds

Description of Rutabagas

Rutabagas, *Brassica napus var. napobrassica,* are a root vegetable that is a cross between a turnip and cabbage (Agriculture and Agri-Food Canada, 2014). There are many varieties of rutabagas, but the most vigorous is the Thomson Laurentian variety (Agriculture and Agri-Food Canada). Rutabagas are a cool season crop meaning it grows best at lower temperatures usually between 15°C and 20°C (Agriculture and Agri-Food Canada, 2014). However, rutabagas are frost tolerant and can survive temperatures as low as -3°C (Agriculture and Agri-Food Canada, 2014). Due to this temperature range, rutabagas would be best suited for the hills region in Nepal as the average temperature during the growing season can range between 13°C to 27°C (Pariyar, 1999). While growing, weed management is critical to eliminate competition. Also, application of fertilizers and pesticides can greatly benefit the crop's overall yield (FAA, 2016). Brown Heart is a common problem in growing rutabagas and is caused by boron deficiency which results in brown spots on the root (Agriculture and Agri-Food Canada, 2014). These brown spots turn into rot overtime, reducing storage length, and can be prevented by adding boron fertilizers to the soil (Agriculture and Agri-Food Canada, 2014). After approximately 85 days, the Thomson Laurentian variety reaches maturity (NORSECO, 2016). The rutabagas can then be harvested either by hand or with a mechanical harvester (Agriculture and Agri-Food Canada, 2014). Many Nepalese farmers do not have access to mechanical harvesters, therefore they would be harvesting the rutabagas by hand. Once harvested the rutabagas can store up to nine

months if stored in an environment that is high in humidity (95%), and is set at a low temperature (0°C) (Agriculture and Agri-Food Canada, 2014; FAA, 2016).

Nutritional Value of Rutabagas

Like many other vegetables, rutabagas are an excellent source of many essential nutrients. To prevent malnutrition, it is important to consume as many nutrients as possible (Cain et al, 2014). Below is a chart describing the important nutrients found in rutabagas including minerals and vitamins.

Table 1: Nutrients found in rutabagas and common deficiencies associated with the nutrients

Nutrients	**Amount found in a medium sized rutabaga**	**What it is used for in the human body**	**Deficiencies caused by lack of the nutrients**
Energy	143 kCal	n/a	n/a
Protein	4.17 g	-Amino acids	-Muscle mass decrease
Fat	0.62 g	-Making phospholipid bilayer in cells	-Body begins to break down proteins for energy
Carbohydrates	33.55 g	-Energy	-Body begins to break down proteins for energy
Fiber	8.9 g	-See carbohydrates	-See carbohydrates
Sugar	17.22 g	-Energy	-Body begins to break down proteins for energy
Minerals			
Calcium	166 mg	-Tooth and bone strength -Muscle function	-Stunted growth -Weak bones
Iron	1.70 mg	-Helps blood carry	-Anemia

		oxygen	
Magnesium	77 mg	-Enzymes	-Improper functioning of nervous system
Phosphorous	205 mg	-Bone/tooth strength, -pH balance -Nucleotide formation	-Calcium loss -Bone weakness
Potassium	1177 mg	-pH balance -Function of nerves	-Paralysis -Heart failure -Nausea -Weakness
Sodium	46 mg	-pH balance -Function of nerves	-Cramps in muscle -Loss of appetite
Zinc	0.83 mg	-Enzyme function	-n/a
Vitamins			
Vitamin C	96.5 mg	-Absorption of iron	-Scurvy
Vitamin B (Folate)	81 ug	-Coenzyme in amino acid reactions	-Birth defects -Anemia
Vitamin A	8 IU	-Vision (pigments in retina)	-Blindness
Vitamin E	1.16 mg	-Antioxidant	-Neurological dysfunction
Vitamin K	1.2 ug	-Blood clotting	-Problems clotting blood

(Cain et al., 2014; Dunea, Last, Lock, 2006; USDA, 2016)

Uses of Rutabaga

Rutabagas are used as food source for both humans and animals (Agriculture and Agri-Food Canada, 2014). For human consumption, rutabagas can be cooked in casseroles, cut as fries, mashed, and put in soups and stews (Agriculture and Agri-Food Canada, 2014). Overall,

rutabagas are considered by many to be a delicious vegetable that can be a healthy food option as seen above (Table 1.). Along with human consumption, rutabagas are also used for animals (Benedict, Miles & Johnson, 2013). Domesticated animals can graze on the leaves and stems of rutabagas providing them with a healthy food source that is high in protein and other nutrients (Benedict et al., 2013). When rutabagas are used as animal feed, it must be gradually introduced into the animal's diet since it is so high in protein (Benedict et al., 2013). The animal will not be able digest it fully and therefore could get sick (Benedict et al., 2013). If introduced gradually, and consumed along with other feeds to receive other important nutrients, rutabagas are an excellent alternate food source for animals. Since both humans and animals consume this vegetable, there are opportunities for the rutabagas to be sold in markets to earn profit.

Companies Involved with the Export

There are many different companies across Canada that supply rutabagas including NORSECO, W.H. Perron, Stokes, and Veseys. However, the company that will be focused on is NORSECO. This company is headquartered in Montreal, Quebec and is one of the most popular seed distributer in Canada (NORSECO, 2013). It currently sells its Laurentian Thomson rutabagas for $2.22 per thousand seeds (NORSECO, 2013). However, if bought in bulk, the price goes down. For example, if 500 000 seeds are purchased the price of seeds goes down to $1.179 CAN per thousand seeds for a total of $589.5 CAN (NORSECO, 2016). The company distributes its seeds from its warehouse in Laval, Quebec across Canada (NORSECO, 2013). It is currently working with horticultural companies from different parts of the worlds to increase its commercial agreements and therefore could be a great potential company to work with to export seeds to Nepal (NORSECO, 2013)

Benefits to Canada

Exporting rutabagas seeds to Nepal would benefit Canadians in many different ways. The creation of new job opportunities would be an important economic benefit to Canada. To provide the seeds, farmers need to cultivate rutabagas to produce them, and because rutabagas are a biennial plant, it takes two years for the plant to produce seeds (Agriculture and Agri-Food Canada, 2014). Farmers would need to be given incentive to let their rutabagas grow for two years to produce the seeds instead of the one year to produce the root. Since the Nepalese would be using this primarily as a food source, farmers can profit from companies providing them with

contracts to produce seed. In NORSECO's warehouse in Laval, Quebec, jobs would be created for the locals in helping the company process large amounts of seeds (NORSECO, 2013). Also, shipping the seeds across Canada, and across the Pacific Ocean to Nepal, would create job opportunities within trucking and air companies.

Export Potential to Nepal

Benefits to Nepal

Exporting rutabagas can greatly benefit the Nepalese in many ways. Currently, the demand for new varieties is high and if they are introduced it can greatly benefit farmers in Nepal (Joshi, 2000). Yields can increase by 20-30% when high quality seeds are used which would be provided by Canada (Shrestha, 2012). Many Nepalese live below the poverty line, 55%, and are threatened by food insecurity (Regmi. Singh H., Singh O., & Singh N., 2013). A study performed by Bishal et al. (2013) showed that the adoption of vegetable production in the mid-mountain region in Nepal increased farmers' income by selling their produce in markets which improved food security. The net income of vegetable production compared to cereal production was 50% higher (Bishal et al., 2013). Rutabagas would be an excellent vegetable to introduce into production as it matures quickly and stores very well (Agriculture and Agri-Food Canada, 2014) Also, introducing rutabagas into the diet of the Nepalese would help combat malnutrition, which is predominant in that country, as it is full of important vitamins and minerals that are essential for proper bodily functions as highlighted previously (FAA, 2016; USAID, 2016)). Vitamin A is particularly important as 19.6% of women and 32.2% of children suffer from vitamin A deficiency (World Health Organization, 2016). Another small but significant benefit of exporting rutabagas is it provides diversity to the crops grown in Nepal, helping prevent the spread of disease and pests (Joshi, 2000).

Challenges

In general, the Nepalese have very limited access to new varieties of seeds due to problems in distribution and production (Devkota, Joshi, Witcombe, 2010). Seeds from commercial companies and the public sector account for a maximum of 10% the seeds distributed in Nepal (Devkota et al., 2010). Seeds are usually saved by farmers and then exchanged between farmers within their communities (Shrestha, 2012). As a result, it poses a

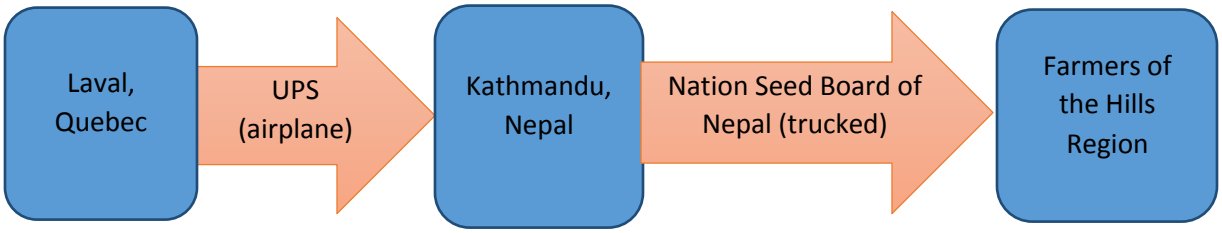
problem for the export of rutabagas seeds. If farmers save seeds, exporting them would not create a continuous cycle of trade. However, the Nepalese would be primarily using rutabagas as a food source and since they are a biennial plant, it means that they would not be able to save seeds as well as other crops (Agriculture and Agri-Food Canada, 2014). Additionally, if they set aside plants for seeds, the root of those plants would become inedible (Agriculture and Agri-Food Canada, 2014). To still have the stable food source rutabagas offer, the Nepalese would still need to get some seeds from other sources other than their own supply of seeds. Even if farmers do not save the rutabaga seeds, supplying the farmers with seeds is still a challenge. The seed system in Nepal is very weak (Joshi, 2000). According to Deepa Singh Shrestha (2012), a scientist with the Horticulture Research Division in Nepal, the three major weaknesses of the seed system are insufficient breeders, limited access to modern breeding techniques, and not enough marketing knowledge. These weaknesses provide opportunities for Canada seed exports but also poses a lot of problems. Due to the lack of marketing, farmers often do not know of new varieties of seeds being released (Joshi, 2000). If rutabagas seeds are exported to Nepal, farmers may not know that they have the opportunity to grow a new variety of crop. Another weakness of the seed system is role of the public sector in seed distribution (Devkota et al., 2010). The main distributor of seed in the public sector is the National Seed Board (Shrestha, 2012). As highlighted above, this sector distributes very little of the seed found in Nepal, and is the board that would regulate the release of the rutabaga seeds (Devkota et al.,2010). All of these challenges pose problems in exporting rutabaga seeds to Nepal.

Required Documentation

Like any other product being exported to another country, seeds require documentation called a phytosanitary certificate (FAO, 2016). Since seeds can carry pathogens and pests, they must be certified in order to ensure diseases are not carried into other countries (FAO, 2016). Some of the information that must be put on the certificate are the plant protection agencies of Nepal and Canada, name of product, scientific name, place of origin, type of passage, and many more (FAO, 2016). In order to export rutabagas to Nepal this certificate must by obtained.

Transportation

Figure 1: Transportation to Nepal



To get the rutabaga seeds to Nepal, there are many methods that can be used. Since seeds are not a huge product it does not make sense to ship by boat. Instead, air freight is a more efficient method. As illustrated in Figure 1. Transportation to Nepal requires various steps. Using the shipping company UPS to ship the product from NORSECO's warehouse in Laval, Quebec to Kathmandu, Nepal it would cost $249.40 CAN (UPS, 2016). In the Nepalese currency, this would equal 20 191.69 rupees. Once in Nepal the seeds would be delivered to the National Seed Board where they would be trucked to the hill region. However, transportation to this region often comes at a high cost. If rutabaga seeds can make it to the hills region in Nepal, farmers throughout the region would benefit greatly.

Competition

When exporting a product to a foreign country, there is always competition with other countries. Since Canada and Nepal are separated by an ocean, there are closer countries that could export the product at a cheaper cost that would make it more affordable to the Nepalese. One of these countries is India. As the second largest vegetable producer in the world, India also produces a lot of seed (Kumari, Singh, & Vanitha, 2014). India could be a potential competitor for seed supply, however, they were not discovered to grow rutabagas. However, India could still pose a problem as they can offer new seeds that are cheaper, that offer the same benefits as rutabagas.

Total Costs

One of the major crisis ailing Nepal is poverty, with 55% of the population living in poverty (Regmi et al., 2013). Many farmers in Nepal cannot afford to buy new technologies, including seeds, that could greatly improve their farming practices (Conroy et al., 2012). Therefore, one important question must be asked: Can farmers in Nepal afford to purchase rutabaga seeds? If a 33.15 lbs. bucket, containing 500 000 seeds, is purchased the price would be $589.5 CAN (NORSECO, 2016). With shipping, the total price would be $838.90 CAN which is equivalent to 67 999.19 rupees. For a Nepalese farmer, this would be very expensive as they earn

an average of $1.25 per day (Regmi et al., 2013). One way to combat this expensive price tag would to be to go through an organization like the National Seed Board (Shrestha, 2012). This public-sector organization's purpose is to organize seed programs and control the release of new seeds (Shrestha, 2012). If the National Seed Board were to purchase the seeds, they could distribute the seeds to farmers in the hills region. With this strategy, exporting rutabaga seeds would be more affordable for the average Nepalese farmer.

Marketing

Most farmers in Nepal do not know when a new variety of seed is released (Johsi, 2000). In order for farmers to learn of the release of rutabaga seeds, advertising must be done which could be in the form of pamphlets. This form of advertising would be particularly effective as it can tell farmers the seed variety available, how they should be grow, harvesting, and storing techniques, and the benefits of rutabagas. One challenge with this method is many Nepalese are illiterate (Conroy, 2012). To combat this the pamphlet would have to be in pictures so the Nepalese can understand fully why they should grow rutabagas.

Projected Success of Export

In Nepal, this export would have great success. Rutabagas would provide the Nepalese with a food source that stores well and is very nutritious to help prevent food insecurity and malnutrition (Agriculture and Agri-Food Canada, 2014). To help alleviate poverty, rutabagas can help increase yields and provide an income for farmers (Bishal et al., 2008; Shrestha, 2012). Along with these successes, there are many challenges facing the exportation of rutabagas, as highlighted previously. One of the biggest challenges that will be faced is that farmers save their seeds for the next year (Devkota et al., 2010). Once rutabaga seeds are introduced, the Nepalese would not rely on Canada to continue to export seeds for them to plant. Even though rutabaga seeds are biennial and take two years to produce the seeds, farmers in Nepal would still set aside plant to go to seed simply because it is more cost productive. However, some farmers will take the option of buying seeds as the roots of plants that have gone to seed are inedible, and it is more profitable to harvest all the plants each year. This challenge significantly decreases the success of exporting rutabaga seeds as only a small percentage of farmers will continue to the purchase seeds.

Recommendations

Since rutabaga seeds can only be exported in one large bulk shipment, realistically, Canadians would not benefit as much as the Nepalese. However, in Canada there are many seed companies that are creating new seed varieties every year. Comparatively, there is no effective plant breeders for many different types of crops in Nepal (Shrestha, 2012). Even though rutabaga seeds would only be exported in bulk once, Canada can continue to export other varieties of seed. There are many different varieties of vegetables, forages, and grains that can be developed and sent to Nepal. If companies develop a partnership with countries like Nepal, both countries can benefit. With improved crop varieties, yields can increase by 20-30% (Shrestha, 2012). Even though rutabagas may only be exported once, Canada can continue to support Nepal's seed system by exporting other varieties as well.

Conclusion

If exported to Nepal, rutabagas could greatly benefit Canadians and Nepalese alike. It would create jobs for many Canadians including in the shipping company involved and in the company's warehouse in Laval, Quebec. It would also provide Canadian farmers with contracts to produce the seeds for exportation. Rutabagas would benefit the Nepalese by adding a nutritious food source that stores extremely well to help combat food insecurity and malnutrition. Introducing new improved varieties can increase yields and income, and help provide genetic diversity (Bishal et al., 2013; Joshi, 2000). The company that would be involved with this export would be NORSECO. From their warehouse in Laval, Quebec the seeds would be shipped to Nepal using the shipping company, UPS. If a 33.15 lbs. bucket containing 500 000 seeds is shipped to Nepal the total cost would equal $838.90 CAN, equivalent to 67 999.19 rupees. To the average Nepalese, this price is expensive. In order to combat this, the seeds would be purchased by National Seed Board and distributed to farmers in the hills region, where they would grow best. Due to the fact that farmers usually save seeds each year, the export of rutabaga seeds would only be able to, realistically, occur once (Shrestha, 2012). However, farmers in Nepal would greatly benefit from a new type of seed being introduced. Even if the exportation only occurs once, companies and organizations should consider rutabaga seeds for exportation to Nepal.

References

Agriculture and Agri-Food Canada. (2014) *Crop Profile for Rutabaga in Canada, 2012. (Catalogue No.:A118-10/23-2014E-PDF).* Ottawa, ON: Agriculture and Agri-Food Canada.

Agriculture and Agri-Food Canada. (2016). *Canada's Seed Industry.* Retrieved from http://www.agr.gc.ca/eng/canada-s-seed-industry/?id=1174596024742

Benedict, C, Miles, C., Johnson, S. (2013). *Vegetable fodder and forage crops for livestock production: Rutabagas; Washington State University extension fact sheet*. Retrieved from https://research.libraries.wsu.edu:8443/xmlui/bitstream/handle/2376/4356/FS054E.pdf?sequence=2&isAllowed=y

Bishal, K., Nyborg, I.L.P., Paudel, G.S., Sitaula, B.K., Tiwari, K.R. (2008). Analysis of the sustainability of upland farming systems in the Middle Mountain region of Nepal. *International Journal of Agricultural Sustainability, 6(4),* 289-306.

Cain, M.L., Durnford, D., Jackson, R.B., Minorsky, P.V., Moyes, C., Rawle, F., …Wilson, K. 2014. *Campbell Biology*. New Jersey: Pearson Education, Inc.

Canadian Food Inspection Agency [CFIA]. (2015). *Multiplication of Seed Abroad-Questions and Answers*. Retrieved from http://www.inspection.gc.ca/plants/seeds/exports/multiplication-of-seed-abroad/eng/1382971629670/1382971780221

Central Intelligence Agency [CIA]. (2016). *The World Fact Book: South Asia: Nepal*. Retrieved from https://www.cia.gov/library/publications/the-world-factbook/geos/np.html

Conroy, C., Joshi, K.D., Witcombe, J.R. (2012). Agriculture, seed, and innovation in Nepal: Industry and policy issues for the future. *International Food Policy Research Institute. 1-60.*

Department of Fisheries, Forestry and Agrifoods [FAA]. (2016). *Rutabaga and turnip: vegetable crops production guide for the Atlantic provinces*. Retrieved from http://www.faa.gov.nl.ca/agrifoods/plants/pdf/turnip.pdf

Devkota, K.P., Joshi, K.D., Witcombe, J.R. (2010). Linking community-based seed producers to markets for a sustainable seed supply system. *Cambridge University Press, 46(13),* 425-437.

Dunea, G., Last, J.M., Lock, S. (2006) *The Oxford Companion to Medicine (3 ed.).* Oxford University Press.

Food and Agriculture Organization of the United Nations [FAO]. (2010). *Assessment of Food Security and Nutrition Situation in Nepal.* Retrieved from ftp://ftp.fao.org/TC/CPF/Country%20NMTPF/Nepal/thematic%20studies/Food%20Security%20_Final_.pdf

Food and Agriculture Organization of the United Nations [FAO]. (2016). *Requirements for phytosanitary certificates*. Retrieved from http://www.fao.org/docrep/004/y3241e/y3241e06.htm

Joshi, K.D. (2000). Strengthening the Farmers' Seed System in Nepal. *Biotechnology and Development Monitor, 42, 15-17.*

Kumari, G., Singh, R., Vanitha, S.M. (2014). Export Competitiveness of Fresh Vegetables in India. *International Journal of Vegetable Science, 20* (3), 227-234.

National Seed Board. (2013) *National Seed Vision 2013-2025*. Hariharbhawan, Lalitpur Nepal: Ministry of Agricultural Development. Retrieved from http://faolex.fao.org/docs/pdf/nep147056.pdf

NORSECO. (2013) *Laurentian Thomson*. Retrieved from http://www.norseco.com/en/24630-laurentian-thomson.html

Pariyar, D. (1999). *Country pasture/ forage resource profiles: Nepal*. Retrieved form http://www.fao.org/ag/agp/agpc/doc/counprof/nepal.htm

Regmi, K.R., Singh, H.P. Singh, O.P., Singh P.K. (2013). A value chain analysis of vegetables: a case study of Palpa District, Nepal. *Economic Affairs, 58(2),* 135-146.

Shrestha, D.S. (2012). *Country integrated seed sector status paper of Nepal.* Retrieved from http://q.datakultur.se/~svalofco/wp-content/uploads/2012/12/Nepal-Seed-Sector-Status-Paper.pdf

Shrestha, R.K. (2016). *Agroecosystem of Mid-Hills*. Retrieved from http://www.fao.org/docrep/004/t0706e/T0706E02.htm

Spaner, D. (2001). *Agronomic and horticultural characters of rutabaga in eastern Canada*. Canadian Journal of Plant Science, 2002, 82(1): 221-224, 10.4141/P01-086. Retrieved from http://www.nrcresearchpress.com.subzero.lib.uoguelph.ca/doi/abs/10.4141/P01-086#.WAUrrUlTHIX

United States Department of Agriculture [USDA]. (2016). *Basic report: 11435, Rutabagas, raw*. Retrieved from https://ndb.nal.usda.gov/ndb/foods/show/3151?fgcd=&manu=&lfacet=&format=&count=&max=50&offset=&sort=default&order=asc&qlookup=rutabaga&ds

UPS. (2016). *Calculate time and cost.* Retrieved from https://wwwapps.ups.com/fctc/timeandcost?loc=en_US

USAID (2016) *Agriculture and food security*. Retrieved from https://www.usaid.gov/nepal/agricultureand-food-security

World Health Organization. (2016) *Nutrition landscape information system country profile: Nepal*. Retrieved from http://apps.who.int/nutrition/landscape/report.aspx?iso=npl