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Nepalese Junar

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Nepal is a country located geographically within the sub-tropical zone, which maintains a vast variety of climates and altitudes. This allows Nepal to support the growth of a wide assortment of horticultural crops, especially citrus fruits (Gurung). Within the country of Nepal, the hill regions tend to be well suited for fruit crops such as citrus, which represents one of the most important types of fruit growth in Nepal. Citrus fruits are produced extensively in the mid-hills of Nepal; they cover an area of approximately 9495.5 hectares with a projected production of roughly 64,132 metric tons of fruit yearly (Gurung). Among the citrus fruits produced is the indigenous Junar, a sweet orange, which is grown in the Ramechhap, Dhankuta, Sindhuli and Bhojpur districts (Gurung). Because Junar is indigenous to Nepal, it poses as a product with great export potential to North American countries, particularly Canada.

Junar has only been produced for approximately two hundred and fifty years in Nepal. However, the importance of this fruit has grown quickly due to the economic opportunities for poor hillside farmers and the introduction of proper production techniques. Junar trees used to only be planted near farmer's homes for their own consumption, until the 1970s when the economic importance of this fruit began to be understood (Junar Cooperative). In 1972, a National Citrus Development Programme was initiated in order to develop citrus fruits like Junar (Gurung). In 1986, came the introduction of the Horticultural Development Project, which was another big breakthrough in the development of the Junar fruit (Junar Cooperative). The project brought financial and technical aid from the Government of Japan. This gave Nepalese farmers a chance to kick start their production of Junar, as the project's main purpose was to advance the fruit production methods for Junar through the training of fruit farmers and extension workers, in addition to technical development (Gurung).

Junar could be considered an excellent cash crop for poor Nepalese hillside farmers. Not only is it a great source of income already amongst some Nepalese farmers, but it would be even more beneficial if they were to export to other nations. According to the Government of Nepal and the Ministry of Agriculture and Co-operatives, the middle-hill regions of Nepal have a comparative advantage in the agronomy of citrus fruits such as Junar, compared to the conventional grain crops, which include things like maize, rice, and wheat. Citrus farming in Nepal has been found to be of the utmost quality. Thus, it is essential to explore Nepal's potential for citrus cultivation for export marketing (Maharjan, 2011).

Exporting this fruit to other nations would result in many positive outcomes for the Nepalese. It would generate more of an income for the farmers in the mid-hill regions, which consequently would increase the livelihoods of themselves and their families. With increases to a farmer's income, they would then have the opportunity to invest in more advanced technology and machinery to help with their growing and harvesting, or to invest in more hired labour. This would inevitably produce more job opportunities for other Nepalese citizens.

Growing conditions of Junar include a precise climate, an ideal temperature of between 13 and 27 degrees Celsius, and soil temperature close to 25 degrees Celsius to allow for optimal root growth. High humidity is undesirable as it increases the spread of many diseases across crops. However, frost is also very harmful. Hot wind throughout the summer results in dehydration and drop of flowers and of the developing fruits (Maharjan, 2011). It is these very particular growing conditions that make Nepal's sub-tropical climate ideal for growing citrus. Additionally, Junar orchards do best in light soils, which have good drainage properties. Soils with a depth of about 2-3 meters, and a pH value of 5.5 to 7.5 are seen to be ideal. It is best to avoid extreme soils; for example, soils that have a high concentration of calcium carbonate

throughout the feeder root zone might unfavorably affect the development (Maharjan, 2011, 9). Land preparation tends to be equally as important. The land requires careful plowing and leveling. Planting in hilly areas is often done on terraces alongside the slopes. Another possibility for lands like this is to use high density planting because of the availability of aerial space in comparison to flat lands (Maharjan, 2011, 10). Sweet orange trees are extremely sensitive to water stagnation and water logging whilst in the rainy seasons; therefore it is of great importance to provide draining channels (of approximately 3-4 feet in depth) along the slopes throughout the orchard (Maharjan 2011, 10).

Citrus fruits like Junar are susceptible to many pests and diseases so it is essential that there be proper management. Insect-pests that tend to target citrus include fruit fly, leaf miner, citrus thrips, psylla, fruit sucking moths, bark eating caterpillar or trunk borer, scale insects and mites (Maharjan 2011, 12). As per a study conducted by Roseleen Maharjan (2011) on Junar, sweet orange cultivation in Nepal, the ways to manage these pests include using foliar sprays with either quinalphos, fenvalerate, monocrotophos, acephate, dimethoate etc. mixed with water (Maharjan, 2011, 12). Along with pests, there are many diseases of the citrus fruit, which include, powdery mildew, *Phytophthora gummosis*, citrus canker, anthracnose, citrus tristeza virus, citrus greening, etc. (Maharjan, 2011, 12). Disease management tends to consist of removing the infected branches or unproductive areas and applying different treatments. Nonetheless, citrus greening seems to be one of the most damaging diseases of citrus within Nepal. It is triggered by bacteria, called greening organisms (GOs), that are transmitted by a psyllid vector, *Diaphorina citri* (Yoshihiro, O., Nakashima, K., Prommintara, M., & Tomiyasu, Y, 1998).

These sweet oranges bud during March and April and during this time they produce an abundance of pollen and nectar, allowing for honeybees to collect portions of honey from the citrus flower (Partap). Bee farming can resemble that of an intercrop option, as it offers double the benefits: honey production and plant pollination (Maharjan, 2011, 11). Within Uma Partap's study, it was observed that *Apis Cerana*, or honeybees, have the ability to reduce the fruit drop by 45.9% and enhance the fruit set by 24.2% (Partap, 175). Bee pollination also seems to improve the quality of the fruit by increasing the fruit's weight, size, amount of fruit juice and amount of sugars created within the juice (Partap, 175).

Junar has many benefits to consumers, such as its rich taste and nutritious qualities. Not only is the fruit a great export on its own, but it can be sold to Canadian companies in numerous forms: as fresh fruit, jams, marmalades, desserts, juices, smoothie extracts, herbal teas, and more. Some of these products are already being produced in Nepal, such as sweet-orange squash and sweet-orange jam (Maharjan, 2011, 18). Another selling point is the potential health benefits of this citrus Junar fruit. Junar are rich in sources of minerals and vitamins (Junar Cooperative), which can help prevent possible diseases like cancer, heart disease and stroke. These health benefits really speak to those that are health-conscious.

As far as exportation opportunities go, there are numerous Canadian importers that would be willing to import the Junar fruit, including, Dominion Citrus Limited, Bamford Produce, F.G. Lister & CO., Limited and Fresh Taste Produce Limited. Dominion Citrus allocates produce to food service operators and retailers in the major cities within Ontario and Quebec (Dominion Citrus). Bamford Produce is a provider of fresh produce and is located in Toronto, Ontario. 'Fresh Advancements' is the company that works with Bamford, they are the importers and wholesalers at the Ontario Food Terminal (Bamford Produce). Next, F.G. Lister & CO., Limited

has been importing and distributing fresh produce since 1931. It is a family business, proud to continue supplying fresh produce from around the globe (F.G. Lister & CO.-Fresh Produce). Furthermore, Fresh Taste Produce is a key importer and distributor of offshore products, their team travels the globe constantly pursuing new quality growers to present to Canadian consumers (Fresh Taste). Contact information is provided for each Canadian importer at the end of the paper.

Proper post-harvest handling of citrus crops is crucial to the survival of the fruits. From the time they are harvested until the time they reach the market, the process must be well understood in order to cutback the losses, which result due to biological and environmental factors (Maharjan, 2011, 14). Citrus fruits tend to be stored in cool, dry, darker places; however, more information is needed on the specific post-harvest needs of Junar. It can be assumed that there might be some refrigeration requirements throughout transport in order to keep the fruit as fresh as possible. Transportation throughout Nepal is currently done with pick up vans, tractors and buses. It is likely that while exporting to Canada, a lot more transportation would be required, such as ships and planes. It is important for Junar to be properly packaged during transportation because while transferring Junar within Nepal farmers experienced 5-10% damage to occur (Maharjan, 2011, 14).

In conclusion, Junar is an indigenous fruit with great potential for export, however there is still a lot of missing information that would be needed in order to do so. Simply put, there has not been enough research done on this fruit. Nevertheless, it is a good prospect for Nepal since the Junar fruit is indigenous to Nepal and it requires such meticulous growing conditions and harvesting practices, more research should be done in order to take full advantage of this prosperous economic opportunity for Nepal.

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