

# **A Canadian Export to Nepal: Improving the Livelihood of Subsistence Fruit Farmers, While Increasing Yields**

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## **Product Information**

### **Introduction**

To help strengthen the yields of fruit trees and stop weeds before they get a chance to mature, 'Wee Mats' and protection 'Blue-X' tubes should be introduced to Nepal. (Agrinovation, 2016) Within Nepal, trees have a number of multi-purpose uses, which include integration with their farming systems, subsistence farming and placement around fields for erosion protection (Frozen and Oberholzer, 1984). These trees provide valuable foods such as apples, pears, plums, cherries and apricots making them a perfect source of agriculture. Since climate variability, growth time and weed control are a large problem when growing these trees in Nepal, this agricultural sector has not reached its maximum potential (Sharrow, 2001). This paper will explore the potential of exporting weed mats and tree tubes from Canada to Nepal, in an attempt to bring economic growth to both countries.

### **Part 1: Product Information**

#### **Weed Mats**

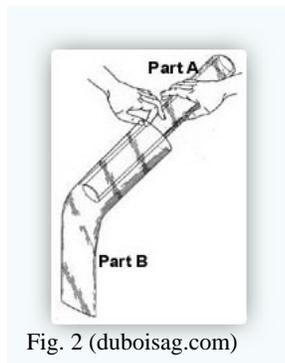
Used to control the growth of unwanted weeds under and around plants, weed mats made from a plastic which resembles that of mulch, are used by being placed at the base of a tree, on top of the soil (Kulp, 2016). These mats



Fig.1 (duboisag.com)

come in a variety of colours and sizes, the most common being black, which helps with heat absorption, and a 48-foot by 400-inch roll that makes for easy transportation (fig. 1)

(Agrinovation, 2016). When black biodegradable mats are introduced, there will be an increase in soil temperature for the roots, protection from water erosion, along with protection from competition, all while making sure there are no toxic residues left on the ground. Having a biodegradable mat means no clean up, or no unnecessary buildups in landfills (Agrinovation, 2016).



### **Tree Tubes**

For protection from animals, weather, and harmful ultraviolet rays, tree tubes can be placed around a tree from the time it emerges from the ground (Agrinovation, 2016). One of the most efficient tree tubes sold in north America is the “Blue-X”. These tubes are made from a blue plastic which allows for nature’s natural blue light to penetrate through and is 8.9cm round by 76.2cm tall. In addition to the blue shell, a blue plastic sleeve is provided, which can be easily slid over the top of the tube to add an extra layer of protection (figure. 2 shows the easy assembly process). In addition to protection, there will be an increase in humidity for the tree, higher carbon dioxide levels, reduction of harmful ultraviolet rays and an increase in the tree’s stem diameter (Agrinovation, 2016).

## Experiment Using Both Tree Tubes and Weed Mats

An experiment in the Hong Kong

hillside lasting 3.5 years, measured the height, crown diameter and basal diameter of newly planted trees after tree tubes and weed mats were applied, resulted in a larger survival rate and improved growth times (Lai and Wong, 2005).

During their growth period, the trees could not grow

outwards, which resulted in an acceleration in upward growth. This upward growth reduced tree diameter for a short time while the tree was surrounded by the tree tube, but when the tubes were removed, tree diameter, stem thickness and outward growth exploded. Accelerated growth from the tree tubes along with weed protection from the weed mats, resulted in a larger height, basal diameter and crown diameter in all trees tested, as shown in the graphs from Fig.3 (Lai and Wong, 2005).

## Alternative Products

Tree tubes and weed mats are not a new invention of the 21<sup>st</sup> century, meaning that many variations of these products have been created, improved upon and technologically advanced. With its first patent being submitted in 1876, the tree guard was created with the purpose of preserving root health and providing protection the tree trunk (Cottman, 1876). Tree guards are similar to that of tree tubes as they provide protection, but guards are added to the tree after a

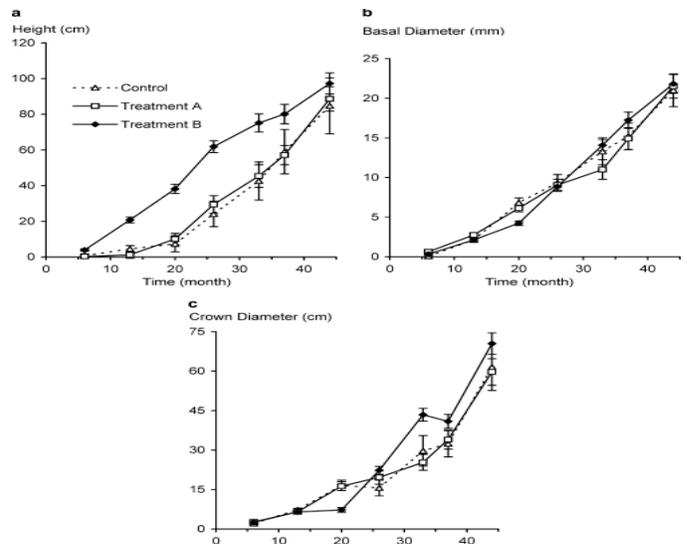


Fig. 3 (Lai and Wong, 2005)  
Control- Without protection  
Treatment A- Only weed mats  
Treatment B- Tubes and mats

strong root system and tree base has been developed. These guards tend to be made from a plastic mesh, or steel bars, which results in them being less cost efficient (Cottman, 1867).

Since weed mats are used to resemble mulch, mulch itself could be used alternatively. Mulch is a cellulosic fibrous biodegradable product, consisting of many layers which are compressed together, forming a product that prevents weed growth (Kulp, 1987). There are two main reasons why the plastic mulch is preferred over traditional mulch. Mulch releases phytotoxic substances which can be harmful to plants in the surrounding ecosystem and mulch is expensive to ship, as it has a high weight content (Sheehan, 2003).

### **The Company for the Job:**

Located in both Saint-Remi Quebec and Simcoe Ontario, Dubois Agrinovation has been providing Canadians with irrigation and agriculture protection solutions since 1945 (Agrinovation, 2016). In 2004 the company acquired Dubois and Sons Limited, which opened up their sales channels allowing the company to specialize in irrigation systems, floating row covers, plastic mulch film, greenhouse and nursery equipment, harvest containers, harvest bins, and vineyard equipment. With the company's long-time expertise and community connections they have created, Dubois Agrinovation plays a large part in many local Canadian farming operations. Local farmers can create larger yield sizes using their mulch weed mats, "Blue-X" tree tubes, drip irrigation systems and provide frost protection for their blueberries, strawberries, and vineyards with their 'Agryl' floating row covers (Agrinovation, 2016).

### **Economic Benefits of Exportation**

Dubois Agrinovation is a Canadian company supplying Canadian worker's jobs in the agriculture sector and as of now the company has over 40 Canadian employees (Cooper, 2016).

Along with distributing their weed mats and tree tubes in both Ontario and Quebec, Dubois has all their products manufactured in North America, including their weed mats which are made in Ontario and Quebec (Cooper, 2016). An increase in sales to Nepal will result in more job positions at both the sales channels and the manufacturer level, along with a distributor who will work directly with Nepal. Since weed mats and tree tubes from Dubois only ship to north and south America, a transportation link will need to be created between the two countries, adding economic growth to Canadian transportation companies (Agrinovation, 2016).

### **Social Benefits of Exportations**

Along with economic growth, the exportation of these products will result in social benefits for Canadians. The company works closely with local farmers, gathering feedback and researching the benefits that new technologies would have on crops in the nearby areas (Agrinovation, 2016). By partnering with a new country, Dubois Agrinovation will have a new source to gather research from, resulting in new low-cost technologies that will be more affordable to Canadians. Dubois also supports many local charities and participates in community events year round, which include providing skills on strawberry planting, frost protection and greenhouse building (Cooper, 2016). So with a new revenue stream, the company will be able to invest the excess profits back into the well-being of Canadian farmers.

#### *Dubois Agrinovation Contact Information*

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**Part 2: Benefits to Nepal**

**Introduction to Nepal**

Landlocked between China and India, Nepal extends 800km east to west, filled with picturesque mountainsides and spicy cultural cuisine (Acharya, 2006). Due to the country's large elevation change, Nepal is broken into three different farming systems (Fonzen, 1984). Mountain farming, which consists of rocky to sandy loam, very little access through the use of roads, and a warm temperature climate. The mountains contain very little plant agriculture, but are a great region for cattle grazing (Chapagain, 2016). The second being hillside farming, which consists of forest land, cattle grazing land, and sandy soil. The hills have a warm to sub-tropic climate, making it a

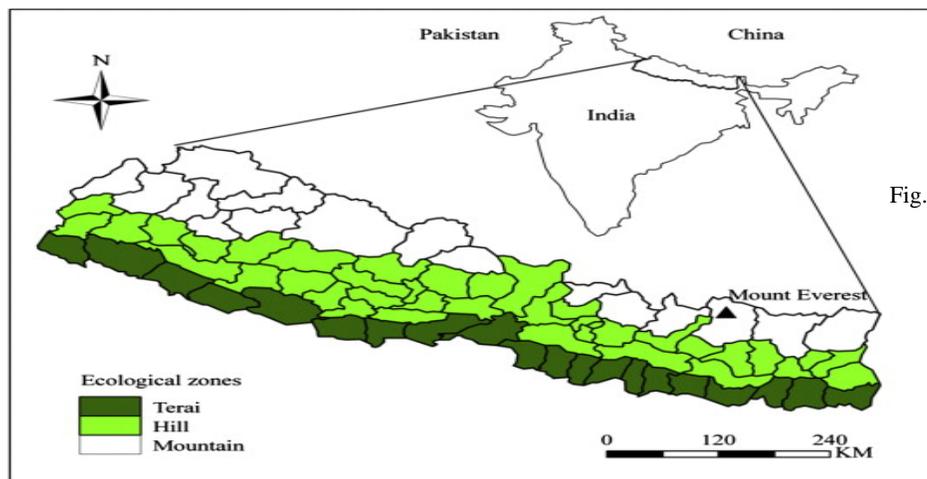


Fig.4 Americain.edu

suitable place for the growth of fruit such as apples, pears, citrus fruit and common vegetables like corn and millet. Moving to the south of Nepal, one will find the most highly fertile flat soil, which is suitable for crop growth such as rice, corn, and wheat (Chapagain, 2016).

Due to the fact that only 18.6% of the Nepalese population has urbanized and the unemployment rate is just over 40%, Nepal is known as among some of the poorest countries in the world (Central Intelligence Agency, 2014). With a GDP of only 70.09 billion, compared to the 98 billion which is considered to be the average, Nepal's purchasing power is very little in comparison to first world countries, such as the United States, Canada, Australia, England and

China (Central Intelligence Agency, 2014). This lack of buying power means the country cannot afford luxury items like oil, electricity or even herbicides for crops.

### **Nepal's Need for Canada's Export**

Tree growth in Nepal can be found in the mountains region, with the largest amount of fruit growth being grown on trees in the hillside region (Chapagain, 2016). Fruit growth in Nepal is considered subsistence farming, as farmers base their decision to plant trees on specific household needs and only sell the fruit at the market if there is an abundance of leftover (Malla, 2000). Growing on their own land means there will be limitations when it comes to precipitation levels, labor for picking weeds and most importantly, the time in which it takes a fruit tree to mature. When these trees are in their early stages of growth, the largest limiting factor Nepalese face is weeds. Invasive weeds such as the parthenium hysterophorus (fig. 5), will drown out tree saplings when not picked by hand on a daily basis (Shrestha and Shabbir and Adkins, 2015). Introducing weed mats will limit weeds like the parthenium hysterophorus, allowing Nepalese women to spend more labor hours caring for their other crops.

Fig. 5 Parthenium hysterophorus  
(plants.usda.gov)



The speed at which fruit trees grow really depends on the climate and soil they are planted in. When there is high elevation point in the land, as for example the Himalia's in Nepal, the tree becomes very limited to the temperature and requires larger amounts of humidity and water as opposed to trees grown in perfect conditions (Shrestha and Hofgaard and Vandvik, 2015). Each year Nepal is gifted with a monsoon occurring in July, but with global warming effects, this monsoon is providing less and less water to the minuteness regions each year, creating patches of drought (Sharma, 1979). With the introduction of tree tubes, rainfall is

captured and stored for the trees later use, along with providing a humid climate within the confines of the tube.

### **Who Will Purchase the Weed Mats and Tree Tubes?**

Since the growth of fruit trees is primarily found in the mountains and hillsides, production is scattered and makes for a small commercial market (Devkota, 2016). The farmers growing these fruit trees are subsistence farmers providing food for their families. These farmers will be producing fruit such as apples, pears, peaches, plums, apricots and persimmon, usually using only one or two trees for each. Aside from private tree growers, the government of Nepal has their own nurseries which they hire local Nepalese to grow, then sell them at a minimal price. But like any other agricultural product, these fruits only grow for a short window of time, this being January and February for most fruits, so it is very important that the trees mature as fast as possible (Devkota, 2016).

### *Production of Fruit in Nepal*

<b>Fruit</b>	<b>Total Area in Hectors</b>	<b>Production (Mt/ha)</b>
<b>Apple</b>	4652	28595
<b>Pear</b>	3049	27339
<b>Peach</b>	2143	12819
<b>Plum</b>	1441	8294
<b>Apricot</b>	97	431
<b>Persimmon</b>	71	328
<b>Total</b>	11392	77806

Fig. 6 (fao.org)

## Total Costs

Since both weed mats and tree tubes are agricultural products, this means there will be a 10% import tax which will be applied to the total shipment price, along with a 13% development tax (International Trade Administration, 2016). The tables below show the costs for both weed mats and tree tubes in Canadian dollars from Dubois Agrinovation, before taxes and shipping fees.

Weed Mats Sizes	Prices
48" x 200'	\$54.00
36" x 500'	\$75.00
48" x 500'	\$95.00

Fig. 7 (duboisag.com)

### *Tree Tube Pricing*

<b>"Blue-X" Tree Tubes</b>	<b>Price</b>
100 units	\$155.00

Dubois Agrinovation also has an agreement with UPS (United Postal Service), which lets them ship internationally straight from one of their three locations to anywhere in the world. Using UPS's air freight service, shipping of 100 tree tubes and a 48" x 400' weed mat is approximately \$200 Canadian, with next day shipping (UPS, 2016).

## Environmental Benefits

Herbicides such as 'Roundup' or 'Glyphosate AKB' tend to be criticized for their toxic formulas in America, but in countries such as Nepal, these herbicides can be pricey and not cost effective (Rodrigues and Oliveira and Abe, 2016). By using biodegradable weed mats, there will not be harmful chemicals spread onto the weeds, along with organic fertilizer for the plants after

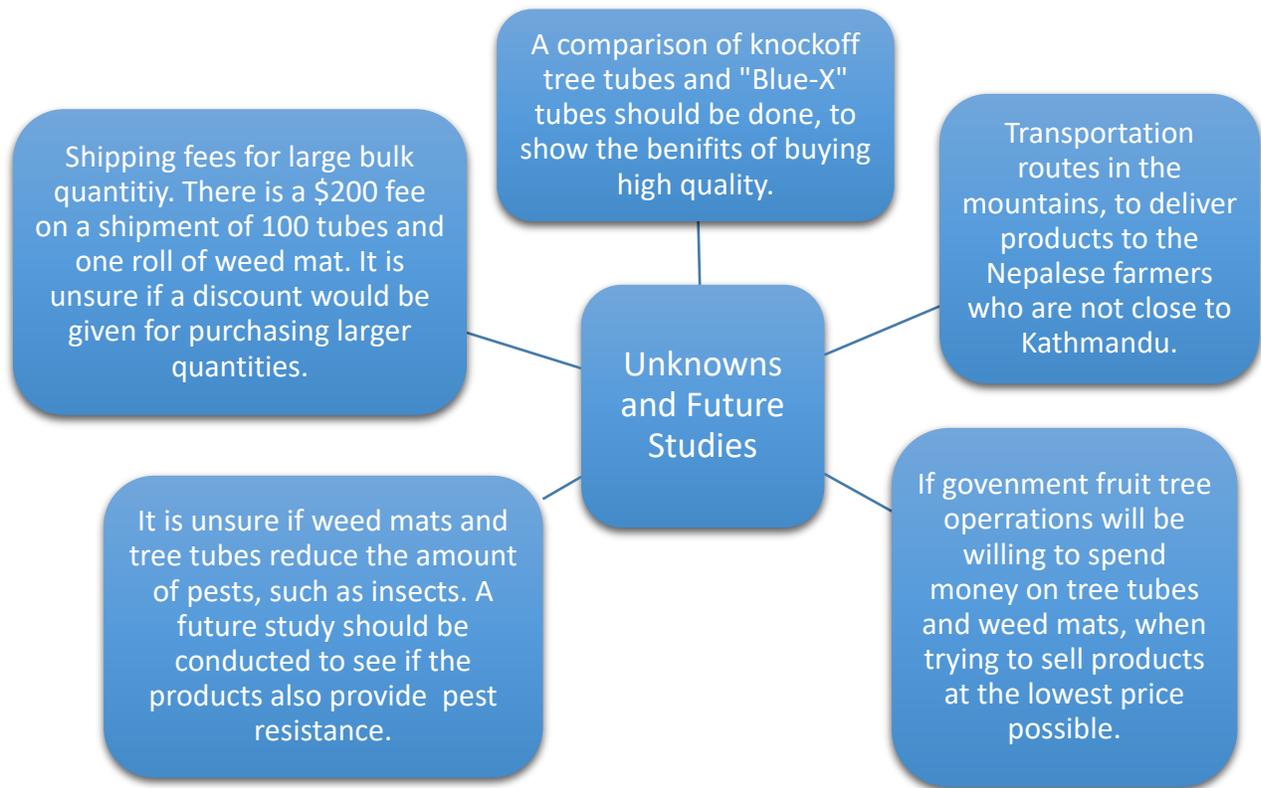
the mats decompose (Morgan, 2001). These mats are made from an assortment of organic fibers, using everything from straw to corn stalks, to hair and gelatin (Morgan, 2001). Not only will the mats allow for a clean environment and act as a fertilizer, they are energy efficient as they do not require the use of large equipment.

### **Competing Products**

With online sales becoming an ever larger marketplace for buyers looking for cheap deals, the quality of products continues to decrease. One competing tree tube one may come across is the recyclable 'corflute' tree guard. This product is manufactured in Shandong, China and retails for about, five guards for \$0.10 US dollars (Alibaba.com). These imitation tubes allow for protection from UV rays and are shaped like a triangle to allow for easy removal after the tree has outgrown them and stability from harsh winds, but need to be held up using a small wooden stick. The material used is a cheap plastic making them very flimsy, but able to be folded as they have bendable edges.

As China is one of the largest plastic producers worldwide, it comes as no shock that they produce a cheap plastic version of the weed mat. A company by the name of Guangzhou Yu Tai Plastic Co. specializes in plastic film, which is then made into plastic weed matting. These mats retail for \$1500 US dollars for a one-ton roll and contain 100% Polypropylene (Alibaba.com). This makes the product non-biodegradable, meaning it is both an issue for removal and the environment, as after use it needs to be disposed into a landfill. Both the 'corflute' tree guard and plastic weed mats are cheap in comparison to the Canadian exports and are located within close proximity, but with these products, the environment is compromised and cheap materials may result in product failure, ultimately leading to inefficient crop growth.

## Future Studies Needed and Unknowns



## Marketing Technique

In order to get the weed mats and tree tubes to the subsistence farmers who will be using them, marketing channels will need to be developed in Nepal, as most Nepalese do not have access to the internet. Since both weed mats and tree tubes are agricultural products, the best strategy to selling them would be through already established retailers, that sell fruit seeds, agricultural tools, or greenhouse equipment. Some of these sales channel may include nurseries such as 'Everything Organic Nursery', which is located just three hours east of Kathmandu and sells everything from organic tree nuts to cherry seed (Everything Organic Nursery, 2016). Or

through the company 'Crop Protech', a small business located in the heart of Nepal, which specializes in the sales of handheld garden tools and non-toxic pesticide sprays (CropProtech, 2016). By creating sales intermediaries, Nepalese can buy the weed mats and tree tubes conveniently through local sellers, eliminating the need to buy in large bulk, or over the internet.

## **Conclusion**

Even though there may be cheaper alternatives and large sellers of knockoff products in China, the proposed export of high-quality weed mats and tree tubes from Canada will still be more beneficial to both Canada and Nepal. These two products will provide faster growth time, protection from the elements, an environmentally friendly alternative to herbicides, and above all, products that can be depended on to increase the yield of fruit trees (Kulp,2016). These weed mats and tree tubes will improve the livelihood of Nepalese farmers, while increasing the yield sizes at a quicker rate, ultimately making them a much needed import for Nepal.

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