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Monday 2:30- 5:20pm

AGR 1110- Final Report

Monday November 24, 2014

Low Cost Drip Irrigation Tubing from Irrigation Direct Canada

**Section 1:**

**The Product:**

The product I have chosen to export to Nepal is a low cost drip irrigation tubing from Irrigation Direct Canada. It can be ¼ “, ½ “ or ¾ “ high quality, low density tubing, made out of Union Carbide 7510 polyethylene resin, displayed in figure 1 (Irrigation Direct Canada 2009). The tubing can last for seven years in direct sunlight due to a carbon additive and even longer if it is covered (Irrigation Direct Canada 2009). The prices range from \$4.75 - \$145.00 depending on the type, size and amount of tubing being purchased. This product is manufactured and shipped out of Burlington Ontario, where Irrigation Direct has its main warehouse (Irrigation Direct Canada 2009). Contact them by phone at 905-465-9950 or email from their website [www.irrigationdirect.ca](http://www.irrigationdirect.ca), the product number varies depending on the size and quantity of tubing wanted.



Figure 1: (Irrigation Direct Canada 2009)

For a drip irrigation system to fully function there are many other parts that need to be included as well as the tubing. An example of such is one of the kits available through Irrigation Direct Canada, the parts are listed below for a system that will irrigate up to 100 feet of row crops or 5 rows, each 20 feet (Irrigation Direct Canada 2009).

**Qty Item**

**Part #**

1 Vacuum Breaker 3/4" Hose Thread Anti-Siphon Backflow Preventer

DD-HVB

1	Y Filter 3/4" Female Hose Swivel x Male Hose Thread 200 Mesh Stainless Steel Screen	DD-YS75HFM- 200
1	Pressure Regulator 10 PSI - Hose Threaded 3/4" FHT x 3/4" MHT for Drip Tape	DD-HPR10
1	Direct-Loc Swivel Adapter .600 ID DL x 3/4" FHT Swivel - 700 or 710 Tubing	DL-FHS600
1	1/2" x 50' .700 OD Poly Tubing - 50' Roll	DD-DH700-50
1	Direct-Loc Coupling .600" ID - 700 or 710 Tubing	DL-C600
1	Direct-Loc End Cap .600 ID DL x 3/4" MHT w/ Cap - 700 or 710 Tubing	DL-EC600
10	Goof Plug - Dual End 1/4" & 1/8"	DD-GP
10	Drip Tubing Hold Down 8" Wire Stake "J Style" fits 1/8" to 3/4" tubing - 10 Pack	DD-S8
1	Deluxe Hole Punch for 1/4" Barbed Fittings & Drippers	DD-HP250
5	Drip Tape 5/8" Loc x 1/4" Barb	DT-TO250
1	Drip Tape 5/8" (16mm) 15 Mil 8" Spacing .64 GPM/100' - 100' Roll	DT-1508HF-100
5	Drip Tape 5/8" Sleeve End	DT-TSE
1	Drip Tape 5/8" Loc x Male End with Cap	DT-EC58

### Similar products available in Canada

Other Canadian companies who sell drip irrigation tubing are Southern Irrigation, Aquadrip Inc., Power Equipment Ltd., Cole Distribution, Dubois Agrinovation, Vanden Bussche Irrigation, and more. All have locations in Canada but their offered products that resemble that of Irrigation Directs Low cost drip irrigation tubing are more high tech and expensive. They involve more equipment, expertise, time, and money or can only be bought in very large quantities and none of the above companies' ship to Nepal so they would not be a viable option for the Nepalese.

### Benefits to Canada

With Irrigation direct being located in Ontario Canada the production of these irrigation tubes is providing jobs for Canadians as well as more revenue for the company, which positively impacts Canada's economy. All of their products are manufactured in the warehouse but the company will not release details about where they purchase their raw products from (Evans 2014). However union carbide 7510 polyethylene can be produced in Canada, so if this is where the raw materials are being sourced from there is more job and business opportunity available for Canadians (DOW Canada 1995). A Canadian aid program that can help with the shipping and allocation of the product is USC Canada, whose goals are to contribute to improving food security by significantly increasing the production of food, stimulating sustainable economic growth, and increasing household income (Project Profile 2014). Drip irrigation tubing allows the USC to meet their goals and with government funding the USC could help make this project

a reality. This is also beneficial because Canada's economy relies heavily on our trade with other countries so with the exportation of this product Canada will be forming a new trading partner with Nepal.

## **Section 2:**

### **Brief Introduction to Nepal:**

Nepal is 147,181km<sup>2</sup> with a population of approximately 27 million. It is landlocked between China and India and is divided into three distinct regions, the Himalayas, valley/middle hills, and the terai region. Agriculture is the backbone of the economy and the basis of livelihood and sustenance for most of the population (Malla 2009). The average agricultural land holding is less than 1 ha and 43 of the 75 districts are food-deficient due to many living in isolated areas and there being a lack of transportation and distribution options (Malla 2009). With three different regions, there is a variation of different climates and each has different issues concerning agriculture. The terai region experiences the most drought and the middle hill areas rely on rain fed agriculture so with limited rain there are severe consequences (Ghimire, Shivakoti, & Perret 2010). This is where drip irrigation tubing will be most useful in Nepal to help with food security, increase incomes, and create a more sustainable agriculture.

### **Who will purchase the Product?**

The product would be most ideal for farmers in the terai region growing field crops as they have drought issues 8 months of the year but mainly April- early June (Adhikari, R. and Adhikari, K. 2005 & Kumar and Palanisamib 2010). It would however also be very ideal for any small villagers with any sort or size of garden as the use of drip irrigation will allow them to

grow vegetables that they hadn't been able to grow before. This product should be much sought after as agriculture is the main source of income for about 80% of the population in Nepal and a source of irrigation would really aid in increasing the income of any farmers or villagers who purchase it (Adhikari, R. and Adhikari, K. 2005 & Kumar and Palanisamib 2010). Another option is also for an agricultural store such as Nepal Nimbus Agri. Store to purchase large amounts of tubing to sell to the Nepalese, therefore providing the supply link between the manufacturers and the consumers.

Who will be hurt by the Product? :

Nepalese that might be hurt by this product are producers of high density polyethylene tubing that is produced in Nepal. This is because it is the exact same material that irrigation Direct's tubing is made out of and they could be getting the revenue from sales if they produced and sold the tubing themselves. Also small businesses that are trying to manufacture their own system of drip irrigation using the products and materials they have available to them will now have competition with sales. The system being referred to is the one by IDE who designed a drip irrigation system that could be fully manufactured within the country. However there have been issues with filtering systems, uniform hole punching, uncontrolled water flow and various other problems. Others who may be hurt by this product are farmers who cannot afford the product or who may not get it even through aid programs. These farmers won't be able to produce as much or as high a quality of products as those with drip irrigation so they will have a harder time making a profit off of their produce.

## Costs:

The outright cost for Irrigation Direct's drip irrigation tubing is \$4.75- \$145.00 = 291.7-8904.45 rupees (Irrigation Direct Canada 2009). These cost vary depending on the width and amount of tubing purchased. Considering the fact that most Nepalese farmers own less than one ha of land the maximum amount of tubing that would need to be purchased by a single farmer is 32000 feet. Looking at the cheapest option of the products available the ¼ inch micro tubing would need to be purchased in 1000 feet roles at \$57.50 per role equaling a total of \$1840.00 for a one ha field (Irrigation Direct Canada 2009). This is the most any one farmer would have to pay as most own less than one hectare of land and this is enough tubing to do a full hectare field, but purchasing less tubing and moving the tubing system throughout the rows provides a more affordable option. With an implemented drip irrigation system the farmer's profits will increase due to increased yields and they can then purchase more tubing as needed. There is also the option for a small community to purchase a large amount of the tubing and divide it amongst them if many of them have small gardens, this way the costs can be shared. This may even be a better market for the product than individual farmers as the irrigation tubing can be used in gardens of any size or type as well as in fields for crops (Irrigation Direct Canada 2009). The amount and size of tubing needed really depends on which region and the specific purpose for the product. In the terai region it is needed more for the field crops, but anywhere else in Nepal it is very useful tool in promoting vegetable garden growth and development.

When looking at the transportation logistics of getting the product to Nepal the most feasible option would be by plane and this needs to be organized apart from purchasing as Irrigation Direct Canada only ships within Canada (Evans 2014). One specific company that was quoted is A1 Freight Forwarding who took into account air freight fee, terminal and screening

fee as well as a processing fee, and the quote included 500 units at an estimated size of 24x24x10 inches and 20lbs per unit (a rough estimate) (A1 Freight Forwarding 2011). The final quote came out to \$26 077.00 CA which adds a shipping fee of \$52.15 per unit (A1 Freight Forwarding 2011). It could go by plane from Toronto, Canada to Kathmandu, Nepal, and then be shipped to different regions of the country by train, vehicle or small airplane. Once there it can be sold in any agriculture or hardware type store, such as Nepal Nimbus Agri. Store, which plans to have 200 stores throughout the country by 2016 (The Crop Site 2014). The stores sell an array of farm related products and provide a direct link between processors, manufacturers, and consumers (The Crop Site 2014). The USC Canada aid program as mentioned before could play a key role with the use of government funding to transport and market the product in Nepal as well as distribute and educate the Nepalese about the product.

#### Benefits to Nepal:

This irrigation tubing is a great product for Nepal as it has many advantages over other products. It is fairly cheap compared to other options for irrigation and as the Nepalese own very small areas of land (as individual farmers) they don't need to purchase massive amounts tubing for their small fields. Drip irrigation is also proven to increase yields with increased production and productivity, requires less workload, has fewer inputs, will both increase income and stabilize it and has lower water requirements (Upadhyay, Samad, and Giordano 2005 & Namara, Hanjra, Castillo, Ravnborg, Smith, and Van Koppen 2010). Another major benefit of drip irrigation tubing in Nepal is that it will allow for the growth of more vegetables which at the current time is minimal. This provides another source of income as well as a more complete diet for the Nepalese farmers (Upadhyay *et al.* 2005). With the increased income they can expand their farms by purchasing a dairy cow or goat to further improve their diet and provide yet

another source of income by selling the milk in their villages. This product also requires no machinery and promotes more involvement for women in the agriculture sector.

Drip irrigation is a big promoter of women's roles in agriculture in Nepal. Since it has been introduced in some areas of Nepal women are able to play a larger role as shown in Table 1, that is not as physically demanding as it had once been. Without the use of drip irrigation women could spend 1-2 hours a day just fetching water for both home uses and irrigation (Upadhyay *et al.* 2005). The irrigation process itself also takes 50% less time with the drip irrigation method (Upadhyay *et al.* 2005). With the extra time not spent fetching water or irrigating women will have more time to raise their children, livestock, focus on other tasks, spend time socializing, etc. (Upadhyay *et al.* 2005). It is thought of by many Nepalese that adopting drip irrigation systems will provide more income for Nepalese women than many other livelihood options (Upadhyay *et al.* 2005). With the increased produce that comes with the adoption of drip irrigation women have more nutritional food available to them, and if they are running their own the drip system they will achieve their own source of income which is uncommon in Nepal (Upadhyay *et al.* 2005).

#### Gender Division of Labor in vegetable farming per season

Activities Undertaken	Men(Hours)	Women (hours)
Seed bed preparation	10	4
Sowing seed	2	2
Transplanting	-	5
Irrigating	10	80
Fertilizer Application	-	22

Harvesting	-	5
Marketing	-	10
Weeding	-	36
Total Hours	22	164
Proportional mean %	12	88

Field survey: 2003 Table 1: (Upadhyay *et al.* 2005).

The table above shows the roles and hours divided by gender for vegetable farming with the use of drip irrigation, the women doing significantly more work than the men.

#### Environmental Benefits to Nepal:

Looking at the environmental benefits of drip irrigation in Nepal the benefits are numerous as drip irrigation is very environmentally friendly. Drip irrigation is about 70% efficient or more with losses at 30% or less (ICID: Resources 2012). Usual problems such as waterlogging and salinity are no longer a concern and it is more water efficient and produces higher yields with better quality products (Kumara and Palanisamib 2010). The drip irrigation also allows for the water to be absorbed right at the root zone, which maintains a good moisture level and aids in producing maximal root penetration (Kumara and Palanisamib 2010). This form of irrigation also uses less labour and produces fewer weeds which is just another benefit to Nepalese farmers (Kumara and Palanisamib 2010).

Competitive Products from other Countries:

Company/Product	Location	Minimum purchasable amount	Price
DAYU Irrigation - drip irrigation line/tubing for Sugarcane	Xingang, China	1000 meters	\$0.02-\$0.26 /meter
Neetrue Low Price Agriculture Drip Irrigation Tubing	Ningbo, Shanghai	200 rolls	\$0.05-\$0.35/meter
Su Zhou Wan Nian Tube Industry Co. Ltd	Shanghai	500 meters	\$0.10-\$50.00/meter
Irrigation System China Drip sells drip irrigation tubing	Xiamen, China	1 carton	\$0.06-\$0.07/piece

Looking at the table above it is relevant that a low cost drip irrigation tubing can be purchased and shipped much easier and cheaper from China then from Canada. There is a variety of competing products, only a sample of which are shown above.

Future Studies and Unknowns:

In the future what needs to be looked into is more Canadian-Nepalese aid programs besides USC Canada who wasn't reachable at the time. The aid programs will help offset costs of these systems and shipping as that is the main reason many farmers will not be able to adopt the drip irrigation tubing/systems (Upadhyay *et al.* 2005). The aid programs will also be able to help with educating the Nepalese about how to use and maintain the systems so that the aid programs will only be needed to start up the projects but it is unknown if aid programs will be a reliable option.

Some unknown costs that were not determined are taxes, import duties, and the cost of distribution throughout the region once the product is shipped to Nepal. Also the shipping cost that were determined were based on an estimated size and weight of one unit of the product. With these considerations the cost of the product could vary and would only increase from the given price in the costs section.

Some other unknowns are whether or not the Nepalese will be able to maintain their systems/tubing, most issues only occur with blocking of the emitters but that is easily fixed with something as simple as a safety pin to unblock the holes. The tubing lasts for up to 7 years but after the tubing wears out they will have to purchase more which would be much accessible if a store like Nepal Nimbus Agri. Store held a stock of them (Irrigation Direct Canada 2009). It is also questionable as to whether or not they are able to set up a new drip system on their own. These unknowns provide areas for further studies that can be done in small villages in Nepal to see if drip irrigation is maintainable without outside support.

#### Critical Summary and Recommendations:

Overall Low Cost drip irrigation tubing is a great idea for Nepal. However producing the product and shipping it from Canada is a very expensive option even when comparing the different companies in Canada that produce and manufacture the product. When comparing it to the costs of the products that can be produced and shipped from neighboring countries, i.e. China there is a lot of time and money that could be saved. All of the products examined that can be purchased from China are cheaper than the Canadian products and China is much closer for shipping. The tubing alone can also be produced in Nepal which is the cheapest of all the

options. The only concern with producing the tubing in Nepal is that they need to then turn the tubing into a drip irrigation system. They have had issues with this in the past as uniform hole punching was an issue as well as proper working emitters. Ideally if Nepalese are going to be able to upkeep the systems themselves they need good quality, reliable products which means a larger initial investment importing the product from another country such as China, but a better a more maintainable and reliable product will then provide them with all of the available benefits.

If Canada is to play a part in further introducing drip irrigation tubing to Nepal they would have to somehow find a way to decrease the price of the product through cheaper labour or raw materials. Their only other option would be to use government funding through a Canadian aid program to cover at least the shipping costs and to distribute the product to the different areas in Nepal. The aid program would also be responsible for educating the Nepalese on how to use the product. If such an aid program is not an option however the best option for Nepal would be to either manufacture the product in the country or purchase it from China, but with these options there still needs to be a way of distribution and personnel to teach the Nepalese how to use and care for the product.

This is overall a very beneficial product for Nepal and the implementation of drip irrigation throughout the country will provide the Nepalese with better, higher income lives, and open many doors for them.

## References:

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