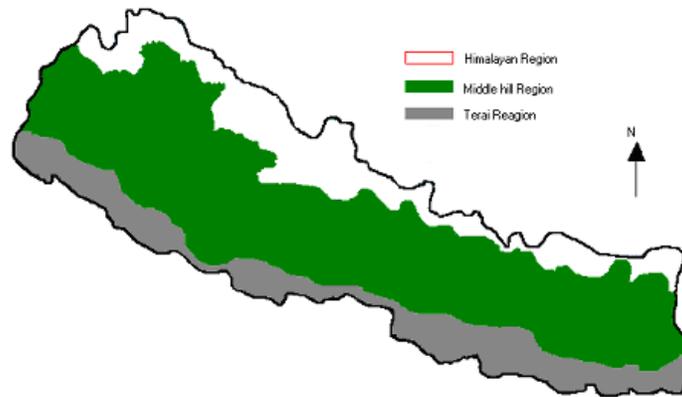


Using Hydromulch from International Erosion Control Systems to Control Soil Erosion in Nepal

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Introduction

Nepal is located in South-East Asia and is bordered by China, to the north and India, to the south. The country has various levels of terrain ranging from; mountains in the northern section, to plains in the more southern region, and hilly regions in between. Weather in Nepal also is a large difference in ranges (“Climate,” (n.d.). The seasons are classified into different categories: spring summer, monsoon, autumn, and winter (“Climate,” (n.d.). 80% of the rain Nepal receives in a year happens during the Monsoon season this averages about 1600mm per year but can increase to 3345mm in some locations (“Climate,” (n.d.). The terrains and weather within Nepal dictate the type of Agriculture that predominantly takes place. From rice and different crops in the more southern regions, to terraced crops in the hilly region, to more animal based agriculture in the mountainous region, one can see how diverse Nepal’s agricultural systems are. These systems are also expanding to the point that forest must be logged to make way for: expanding land use, timber sales and development of towns and villages (Shrestha, 1997, p. 1). These factors of the climate and terrain are major factors in the development of minor and major erosion issues within Nepal. Erosion decimates land quality and destroys the amount of useable land a country or region owns. It affects not only farmers, who with reduced land or lowered land quality may see significant return losses on the land, but people in villages, towns and cities affected by the multiple landslides Nepal experiences each year (Shrestha, 1997, p. 2). Developing systems to combat these losses is key to cementing sustainable land for farmers and creating a safe stable environment for the population of Nepal to grow.



[Nepal Regions]. Retrieved from URL (<http://pridenepal.wordpress.com/geography>)

Hydromulch

Product Description

One of these various systems used to combat erosion is Hydromulch. Hydromulch is a cellulose based product, developed from recycled newspapers, that when combined with water, grass seed, and fertilizer creates a very productive growing medium for quickly and efficiently growing grass (“Hydromulch”, n.d.). This product is, as aforementioned, mixed in any sort of large mixing device or by hand to produce a slurry that can then be sprayed by the use of pumps up to a distance of 200 feet away (“Hydromulch”, n.d.). Hydromulch adheres to the environment it is sprayed on a creates a microclimate for the seed to germinate and grow at a much faster rate than that of regularly planted grass seed, as it more readily delivers a water, fertilizer, and heat cocktail to the seed (“Hydromulch”, n.d.). As Hydromulch sticks to the ground on which it is sprayed it is perfectly suited to steep environments and can be sprayed from a significant distance to reach areas that cannot be reached with large machinery (“Hydromulch”, n.d.). This slurry also helps to fend off animals and birds that would traditionally try to eat the seed as it is planted (“Hydromulch”, n.d.). The quick germination and plant growth that occurs with the Hydromulch allows root systems to be developed more quickly in the top soil (“Hydromulch”, n.d.). This development of root systems in soil is well known to prevent erosion (“Hydromulch”,

n.d.). The anchoring of top soil to low layers of soil helps to prevent the run off of the soil and thus prevent minor and major erosion depending on the size of the plants roots (“Hydromulch”, n.d.).



[Hydromulch]. Retrieved form URL (<http://www.klsupplies.com/products/lawns>)

Product Development and Application

Hydromulch is a product produced by the International Erosion Control Systems (IECS) company. IECS is a Rodney, Ontario based company owned and operated by Louis Arvai (Louis Arvai, personal communication, September 02,2014). Hydromulch is made at this location in a factory run by currently 12 people but is still expanding to meet demands (“Industry Canada,” n.d.). The Hydromulch is developed by grinding and chemically extruding newspapers and other paper based products to create a straw like medium that can be packaged into bales and shipped in 25 kg bags or in bulk shipments for larger areas (Louis Arvai, personal communication, September 02,2014). This ground product is the Hydromulch and when mixed with the seed, fertilizer, and water produces the growing medium. The process is relatively simple and cost effective as much of the product is developed using recycled paper products (Louis Arvai, personal communication, September 02,2014). As Hydromulch is predominantly recycled

newspaper it is a very environmentally sustainable growing medium as recycled materials are produced in mass amounts every day in Canada. Hydromulch is not patented in North America and as such is produced by many companies. However in research one is unable to find this product currently offered or produces in any large applications in Nepal. IECS is unique to other domestic companies in that they have currently patented other useful and pioneering erosion control systems that could potentially also help Nepal. Such products include Cable Concrete®, a IECS patented product for controlling erosion that involves the use of large concrete articulating mats that are anchored in the soil of erosion prone areas creating a protective barrier against erosion (Louis Arvai, personal communication, September 02,2014). This product however would be difficult to sell to the Nepalese population as the use of large heavy machinery and advanced knowledge of the product is required (Louis Arvai, personal communication, September 02,2014). The potential still exists for the future sale of this product in Nepal however if other more easy to apply solutions from IECS are well integrated into Nepal's soil erosion plan.



[International Erosion Control Systems]. Retrieved from URL (<http://iecs.com/>)

Prices

The cost of the Hydromulch is \$9 CAD per 25kg bag but for large scale erosion control buying in bulk can reduce the price by about \$1 CAD per 25 kg. To adequately seed an area 30 bags or 600-750 kg of the Hydromulch is required per acre. With that price formulation the cost of Hydromulch for an acre of land is between \$240 - \$270 CAD for the Hydromulch alone.

When Hydromulch is applied to the affected area it requires that it is mixed with water, the seed, and fertilizer for effective results. All of these products are readily available for sale in every country. The prices for fertilizer and seed vary heavily in various countries. Not only does the fertilizer price vary but the type of fertilizer and different levels of required mineral and inorganic chemical content changes between regions. This can have a drastic effect on the price of the fertilizer. The seed in question can be of any variety of fast growing plant and does not have to be tradition grasses but can be customized to seed for any type of native grass species (Louis Arvai, personal communication, September 02,2014). As such I was unable to find specific prices on bulk fertilizer and seed in Nepal. Comparatively to Canada however one could expect to spend approximately \$2000-\$3000 CAD including the cost of Hydromulch to seed an acre of land (Louis Arvai, personal communication, September 02,2014). This price factors in the seed, fertilizer, water, and gasoline costs (Louis Arvai, personal communication, September 02,2014).

Application of the Hydromulch can be done by the use of professional Hydromulching equipment like the T-120 made by Finn equipment but can also be spread using easily fabricated custom systems to meet the needs of the individual or group. The T-120 Hydroseeder is an all in one system for mixing and distributing the Hydromulch for approximately 1/3 of an acre per tank ("T-120 Hydroseeder," n.d.). It contains the required tank for mixing the mulch, pump, hosing for spraying ("T-120 Hydroseeder," n.d.). The unit is mounted on a truck for easily transporting

the unit to sites and back (“T-120 Hydroseeder,” n.d.). The cost however in total is approximately \$22000 USD for a used unit which is quite expensive in total (“T-120 Hydroseeder,” n.d.). However Louis Arvai suggested that for curbing cost of applying the Hydromulch a less extravagant system can be developed by using a large 1000 gallon polypropylene tank that can be purchase for under \$1000 on many online sites or taken from other applications such as water storage or chemical storage (Louis Arvai, personal communication, September 02,2014). For example a suitable tank could be bought from a online plastic manufacturer for \$720 (“1000 Gallon Plastic Tank,” n.d.). This size tank would be able to cover about 1/3 of an acre of land (Louis Arvai, personal communication, September 02,2014). A sufficient pump for the Hydromulch can be purchased or alternatively used from other applications such as pumping water or other high flow pumping tasks (Louis Arvai, personal communication, September 02,2014). These pumps can be run with propane or gasoline to suit the needs of the person and cost under \$500 with the proper hosing and applicators for Hydromulch (Louis Arvai, personal communication, September 02,2014). For example a pump sufficient for this application could be bought online for \$497 (“Koshin Water Pump 3 inch Robin,” n.d.). Thus the more cost effective option would be to make and develop the applicator than to buy a professional applicator. Simple modifications would allow these materials to be fashioned into a functional sprayer (Louis Arvai, personal communication, September 02,2014).

Shipping

As the product is a cellulose based fiber made of recycled newspapers no health or nutritional information is provided or required for the product. As this is the case the product is also able to be shipped around the world without restriction as seen with many foods or chemical products (Louis Arvai, personal communication, September 02,2014). From the home plant in Rodney,

Ontario transport trucks owned and operated by the IECS can transport the Hydromulch in bulk container (1000kg) or on a pallet of 1000kg (40 bags) to Pearson International Airport in Toronto, Ontario (Louis Arvai, personal communication, September 02,2014). As Nepal is a landlocked country it would be most effective to transport the product by air transport. The Canadian air freight company A1 Freight Forwarding would be able to ship the product to Katmandu, Nepal for \$2.50 / kg thus a 1000kg product would be \$2500 to ship to Nepal (“A1 Freight Forwarding,” (n.d.). From Katmandu the product can be distributed by Starlight Express, a Nepal based truck shipping company (“Starlight Express,” n.d.). Starlight express would be able to distribute the mulch to the required customers as the product would be shipped on a demand basis.

Total Cost (approx.)*

Item	Cost/unit	Total Cost
Hydromulch (25kg bulk)	\$9 / 25kg \$8 / 25kg	\$270/acre \$240/acre
Ready to Spray Hydromulch Mix**		\$2000-3000 / acre
Polypropylene Tank (1000 gal.)	\$720	\$720
Pump with Hosing for Spraying	\$497	\$497
A1 Freight Costs	\$2.50/kg	\$2500/40 units
Starlight Express	unknown	unknown

* In CAD

**The Hydromulch + Grass Seed + Fertilizer + Water Slurry

Nepal Market



[SCWM]. Retrieved from URL (<http://www.icimod.org/?q=10254>)

Hydromulch as a product is not overly expensive to the Canadian consumer. At about \$9/bag in Canada this is not a very large investment for the majority of people. However in Nepal this is a significant amount of money. Not only is the product not cost effective for most Nepalese people but the additional costs that are associated with actually applying the Hydromulch are far too high for many them to apply it on an individual basis. However the potential still exist on a governmental and cooperative level to control erosion. The Soil Conservation and Watershed Management (SCWM) is a Nepalese governmental agency that exists to help preserve the soil integrity and sustainability in Nepal ("Unasyuva - No. 164 - Watershed management - Bio-engineering erosion control in Nepal," n.d.). The SCWM controls 18 district offices which all attempt to combat erosion, educate the population, and repair areas already effected with minor and major erosion ("Unasyuva - No. 164 - Watershed management - Bio-engineering erosion control in Nepal," n.d.). By marketing Hydromulch to governmental agencies such as the SCWM the product could be used to combat and repair erosion on a national level compared to just a small regional level or even just individual. The government would be able to afford to Hydromulch and would have the resources to either manufacture or develop the appropriate

applicator for applying the Hydromulch. This is seen in Canada by the Ministry of Transportation of Ontario's use of Hydromulch to preemptively stop erosion from newly built and under construction roads ("Hydromulch", n.d.). There also exists the possibility of selling the Hydromulch to individuals through the cooperative buying and using of the equipment needed. If towns and villages come together to buy the proper equipment it would be quite possible to share the costs of the equipment. The Hydromulch then could be used to stabilize farm fields, terrace walls, animal pastures and more, all helping to fortify soil integrity on this farm land. Both of these potential markets would be able to largely solve the issues of erosion in Nepal however the governmental level would be the most lucrative to the IECS and should be the main focus of marketing.

Canadian Benefits

The benefits to Canada's economy, while not vast on a monetary sense initially, would grow greatly overtime. The IECS is currently a Canadian owned and operated company, which is where the majority of all sales of Hydromulch and other products come from for this company. The income from the sale of Hydromulch to Nepal would help to create and fortify Canadian jobs in the products: manufacturing, sale, and research. They have recently expanded into Nigeria where they have been working with major construction companies, located in Nigeria's larger cities, to put in erosion control products they develop. The potential for future expansion to a South East Asia could be possible if potential market is seen. While Nepal alone would not be a sufficient market to this company to finance such a large undertaking, the countries that border it, China and India, would be. There exists the possibility for future expansion into these countries if the products are effective in controlling erosion in Nepal. Erosion is a significant issue in this area of the world and the need for new and creative erosion control systems is of

utmost importance. As such the capital generated from the sale of these products from the IECS can help the company to invest more time and effort into the research and engineering of new potential products. All the research, manufacturing, and sale would simply help to furthermore cement a burgeoning Canadian company. The transport of the Hydromulch to Nepal would also help to supply a Canadian air freight company, A1 Freight Forwarding, with a steady supply of product to move.

Nepalese Benefits



[Nepal Landslide]. Retrieved from URL

(http://www.thestar.com/news/world/2014/08/03/no_chance_of_finding_nepal_landslide_survivors_official.html)

Nepalese people in general would benefit from many factors with the import of Hydromulch into the country. The benefits to the country can be divided into two main categories: the Nepalese townspeople and the Nepalese farmers. The Nepalese townspeople in the hilly and mountainous region of Nepal receive a large amount of rainfall each year during the monsoon season (Shrestha, 1997, p. 2). This rainfall causes soil that is not vegetated with trees, grasses, and other plants due to deforestation or other various reasons to wash away. These landslides can also be caused by poorly designed infrastructure such as incorrectly built roads, irrigation canals and other manmade earth based structures (“Risk Profile Nepal,” n.d.). These, because of the

mountain nature of Nepal, can lead to fatal landslides (Shrestha, 1997, p. 2). Landslides in Nepal lead to thousands of deaths each year (“Risk Profile Nepal,” n.d.). The landslides can also disrupt water supplies like rivers and streams. The increased amounts of sediment and soil can cause these streams to have decreased or non-existent flow. Both can have serious consequences for the population if they rely on the water source for drinking water or irrigation for crops. Using Hydromulch helps develop root systems in the soil, anchoring topsoil to the ground preventing water and rain from causing soil runoff (“Hydromulch”, n.d.). This increased soil integrity can help to provide a safer environment for these people to live and prevent future deaths due to landslides. The Nepalese farmers can also benefit from the sale of Hydromulch in Nepal due to the prevention of farmable land loss. The large amounts of terraced, hill, and mountainous farming that take place in Nepal all have erosion associated with them (Shrestha, 1997, p. 2). Losing this land due to erosion means increased losses to the farmer in food for family or sale. Thus maintaining this land is important to the sustainability of farming in Nepal. Not only is land loss particularly devastating to the farmers but the reduced soil quality by disrupting soil nutrient balance (“Risk Profile Nepal,” n.d.).

Product Potential

I believe this product has a great potential in Nepal. While perhaps not to the Nepalese farmers due simply to costs the governmental use of the product could open many exciting doors for this Canadian company. By having a partnership with the governmental agency SCWM the IECS could significantly help to reduce the amounts of erosion in Nepal. If enough market is seen while doing so the potential for expansion into Nepal or other South East Asian countries is quite possible. By manufacturing and selling the product in country to costs to the consumer would be drastically reduced. Hydromulch costs could drop significantly and the Nepalese farmers who

once could not afford this product would then be able to buy and use the product. The other IECS products could also be marketed to Nepal if the company expands. Products more effective at controlling erosion but more intensive to implement would be more easily installed if properly trained personnel were present (ie. Cable concrete®). As well this expansion into Nepal would give the company the required size to allot more time and resources into developing new erosion control systems. The potential for sales of Hydromulch in Nepal is massive and should not be ignored.

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