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Monday/2:30pm

AGR1110

Due Date: Tuesday, December 1, 2015

## Nutrient Seed Balls: Promoting Canadian Agrifood Exports in Nepal

This report examines the potential export of a product made in Canada used overseas in countries such as Nepal. There are many advantages and disadvantages to producing a product in Canada and distributing the product in other countries such as production costs, transportation costs, amount of product needed, and etcetera. This paper will help highlight all these benefits and costs, and further explain the requirements to foreseeing the process of producing and distributing the product. The potential export product is compact nutrient seed balls.

### **Product/Technology Description**

The potential export product, the nutrient seed ball, consists of a combination of seeds, clay and compost (Shreiber 2014). The packed compost which contains a diversity of nutrients and a seed inside is enclosed by red volcanic iron-rich clay (Shreiber 2014). There will be extra additives combined with the nutrient seed ball such as pest-deterring products, native forest soils and legume inoculant (Shreiber 2014). All these diverse items contribute a different trait to the overall product such as the compost will provide the extra nutrients to the seed, the seed will provide the nutritious plant and the clay will provide the protection of the nutrient seed ball from drying out in the sun, getting eaten by mammals and blowing away in the wind. The additives will also provide beneficial traits, such as the pest-deterring product, which will ensure that insects are under control and not attempting to damage or attack the seed ball. The native forest soils allow different fungi to be present, (Shreiber 2014) which is essential because fungi is important for plant growth as it provides mycorrhizal associations with the root of the plant and help with water uptake in the roots and also increases the resistance of pathogens in

the roots (Rainforest Conservation Fund 2015). The legume inoculant is beneficial for avoiding a lack of necessary bacteria in the seed ball, increasing plant growth (Shreiber 2014).

### **Where/how the product is grown, raised, processed**

The overall product contains different components, and therefore needs different companies to process the nutrient seed balls. One of the companies required is the Bayer CropScience Canada Company, offering Canadian farmers a variety of crop protection products and employs over 300 people, one of their five processing plants is located in Guelph, Ontario (Bayer CropScience 2015). The BrettYoung Company employs a staff of approximately 170 people and offers legume inoculants, as well, the company's one of five processing plants is located in Harriston, Ontario (BrettYoung 2015). As there is no large company specifically designed to produce seed balls made with specifically with clay in Canada, Canada will import the seed balls from Central Pennsylvania from a large provider, Seed-Balls.com. Seed-Balls.com provide top quality seed balls at a low ecological footprint, their seed balls are individually created in their Pennsylvania greenhouse and are packaged in a recyclable brown paper bag (Ketchum 2015). Their seed balls include rich compost, vermicompost, post-ferment bokashi, which helps break down the compost more easily, and a mixture of natural clay along with a seed (Ketchum 2015). The seed balls will be taken to the two other companies, Bayer CropScience and BrettYoung Company, where they will apply their separate components of pest-deterring products and legume inoculants in order to enhance the seed ball's growth and protection (Ketchum 2015).

### **Machinery Required and Cost**

There are no machinery required to make the nutrient seed balls. Seed balls are made by hand by placing clay and compost together and mixing it together with a little bit of water (Ketchum 2015). Before the seed and clay combination dries, there are 1-2 considerably good seeds placed inside the middle of the clay (Ketchum 2015). Afterwards, the whole product is rolled into a ball and is dried until hard (Ketchum 2015). Later, the seed balls will be transported to Canada to the other two companies where Bayer CropScience will spray their pest-detering product and BrettYoung will apply their legume inoculants. Both of these products that will be added do not require any machinery as well, therefore there is no additional costs for machinery.

### **Labour Required**

There is labour required in order to make the seed balls because there is some work needed with compacting the seed ball together with clay and compost (Ketchum 2015). Afterwards, there is additional labour required when the seed ball shipment arrives in Canada as the legume inoculants and pest-detering products have to be applied for each seed ball. There will be costs to all labour as multiple workers will be needed.

### **Inputs Required**

Inputs required other than the seed balls, pest-detering products and legume inoculants is a large amount of fuel. Fuel is needed to transport the product from Central Pennsylvania to Ontario, Canada. An average shipping truck uses approximately thirty-five litres

per hundred kilometres (Government of Canada 2015) and the average distance between Central Pennsylvania and Guelph, Ontario is about 530 kilometres. This averages that the fuel that will be used is about 185 litres in total for the whole trip. The average distance between Guelph, Ontario and Harriston, Ontario is about 66 km. Therefore, the fuel being used is approximately 23 litres in total. Altogether, to travel the seed balls to Canada, 208 litres of gas is required. The average price of gas in Toronto, Canada in October 2015 is approximately 100.8 cents per litre (Statistics Canada 2015). Therefore, about \$210 will be the gas expense of one trip to transfer the seed balls to the Bayer CropScience Company and BrettYoung Company to apply their products.

### **Health/ Nutritional information**

The seed ball contain natural fertilizers and are associated with a series of nutrients as the seed balls contains compost and additional products. Compost is essentially made with animal manures, food, and other organic materials. Conventional compost includes nutrients such as nitrogen, phosphorus, and potassium (Day 2011). Micronutrients that are found in compost are sulphur, carbon, magnesium, calcium, boron, copper, iron, iodine, zinc and manganese (Day 2011). Compost has many benefits such as being able to regulate the soil pH for it to be suitable enough for the plant to grow, it improves soil texture and is able to regulate the moisture (Day 2011). Vermicompost contains 2-3% of nitrogen, 1.85-2.25% of potassium and 1.55-2.25% of phosphorus, and also rich in micronutrients, beneficial soil microbes, enzymes and hormones that assist with plant growth (Am-Euras 2009). In scientific studies, it has been proven that vermicompost promotes plant growth while also providing protection for

the plant from pests and diseases (Am-Euras 2009). If just the conventional compost is added to the seed ball, it would fail to give the amount of macronutrients and micronutrients required, therefore the addition of vermicompost helps provide the correct amount while providing the nutrients nitrogen, phosphorus and potassium in a shorter time (Am-Euras 2009). Bokashi is made with a series of ingredients from fermenting protein, rich organic raw materials. It is essentially a combination of animal manure, oil residue, fish refuses and fishmeal (Leong 2011). Bokashi is beneficial because of its raw organic materials that contain saccharides, fat, and other low molecular organic materials that decompose more easily and therefore faster (Leong 2011). Bokashi allows nutrients to also become more readily available at an earlier growth stage for the plant compared to if there was only the addition of compost, which has a slower process at decomposing and providing nutrients (Leong 2011). Bokashi contains animal organic matters which is where it gets its nitrogen content (Leong 2011). The other components that are in Bokashi are nucleic acid, the vitamin B group, a factor unknown that assists in plant growth, hormones and others are produced by the product's natural yeast which helps in the maintaining and growth of the plant (Leong 2011). There are many additional factors that help in plant growth such as the plant's intake of the amino acids, asparagine, creatinine, and glucose that are produced when the organic materials are decomposed (Leong 2011). Organic salt, choline, betaine, trimethylamine and others that are produced also assist in healthy growth for the plant (Leong 2011).

### **Patent/intellectual property constraints**

A patent is when the inventor of an object are able to have exclusive rights for the invention as it provides a new way of doing something (World Intellectual Property Organization). Therefore, there are no patent/intellectual property constraints as seed balls are an item that has been used for centuries and because it is such an ancient technique, a patent is not enforceable for this product.

### **Evaluate the market opportunity (niche product, or required by a large population)**

The product will be sold to the National Seed Company Limited in Nepal that have close relations with the Nepalese farmers (Adhikari 2015). The National Seed Company Limited will be able to distribute the product nationwide and sell it to a diverse selection of farmers. Nepal is in need of improved seeds as they have very limited ways of receiving them (USAID 2015). The niche product is designed specifically for Nepalese farmers and can be used on any type of soil. Nepal consists of three different regions, mountains, hills and terai (Maps of World 2015), therefore this product is suitable for any farming grounds in the hills and terai as the seed ball is able to take care of itself and able to handle diverse soils (Shreiber 2014). Over 70% of Nepal's population works in agriculture which also accounts for their Gross Domestic Product at 38% (USAID 2015). Therefore, the seed ball product will be used widely by a large population in Nepal.

### **Benefits to Canada**

The benefits to Canada will include companies such as BrettYoung and Bayer CropScience that will be able to expand their processing plants to make their products of

legume inoculants and pest-deterring products. As seed balls for farmers come in large packages as forty thousand seed balls are needed for just one acre of farming land (Ketchum 2015), the companies' production will increase for their products. This will increase the amount of workers needed in the companies, Bayer CropScience and BrettYoung to produce more of the products and to apply the company's products to the nutrient seed balls while also increasing Canada's economy greatly.

### **Environmental Sustainability**

The actual seed balls may not have a growing and manufacturing environmental sustainability in Canada but will in Central Pennsylvania where they are produced. The seed balls at the Seed-balls.com Company require three types of compost, reducing the country's footprint (Ketchum 2015). It provides an alternate route to waste by converting animals' and humans' waste into compost and using it in the seed balls to provide nutrients (Ketchum 2015). Also, the seed balls are placed in a recyclable brown paper bag to reduce the ecological footprint by making the packaging not as wasteful (Ketchum 2015).

### **Export Potential to Nepal**

Nepal is a small country that is located between India and China and is a part of the continent, Asia (Maps of World 2015). Nepal consists of three different regions, mountains, hills and terai (Maps of World 2015). It is home to one of the most well-known mountain in the world, Mount Everest and has a population of approximately 29 million people (Maps of World 2015). The currency in Nepal is known as the Nepalese Rupee (Maps of World 2015) and one

Canadian dollar is equal to 79 Nepalese Rupees (The Money Converter 2015). Over 70 percent of the population in Nepal work in the agriculture business which accounts for 38 percent of the total Gross Domestic Product in Canada (USAID 2015). In Nepal, they are requiring a need for improved seeds resulting in the potential export product, compact nutrient seed balls.

### **Transportation Logistics**

Ground transportation is the first step where a truck will transport the seed ball product from Central Pennsylvania to Guelph, Ontario then to Harriston, Ontario. This trip requires a total of 208 litres and because truckers spend approximately thirty-five litres per hundred kilometres (Government of Canada 2015) and the average gas price in Toronto, Canada in October 2015 is 100.8 cents per litre (Statistics Canada 2015), the expense of gas will be \$210 to transport the seed ball product to Canada and its processing plants. The product will be final in Harriston, Ontario and will be transported to Toronto, Ontario. This is approximately 150 kilometre trip requiring about 53 litres of gas and costing the total transportation to be \$53. Once the truck arrives in Toronto, Ontario, it will be placed aboard the A1 Freight Forwarding, an airfreight transporter and be flown 11,920 kilometres to Nepal (A1 Freight Forwarding 2015). A typical package consists of three thousand seed balls weighing about eight kilograms, taking up a height, length and width of one foot (Ketchum 2015). This will cost approximately \$250 to fly to Nepal using the A1 Freight Forwarding Company (A1 Freight Forwarding 2015). After landing in Nepal's capital city, Kathmandu, the seed ball packages must travel approximately nine kilometres to the distributing warehouse in Kuleshwor, Kathmandu (Adhikari 2015) where the National Seed Company Limited is located. From there, the National

Seed Company Limited have close relationships with the Nepalese farmers where they will be able to sell and distribute the seed balls across the country (Adhikari 2015).

### **Storage/Refrigeration Issues**

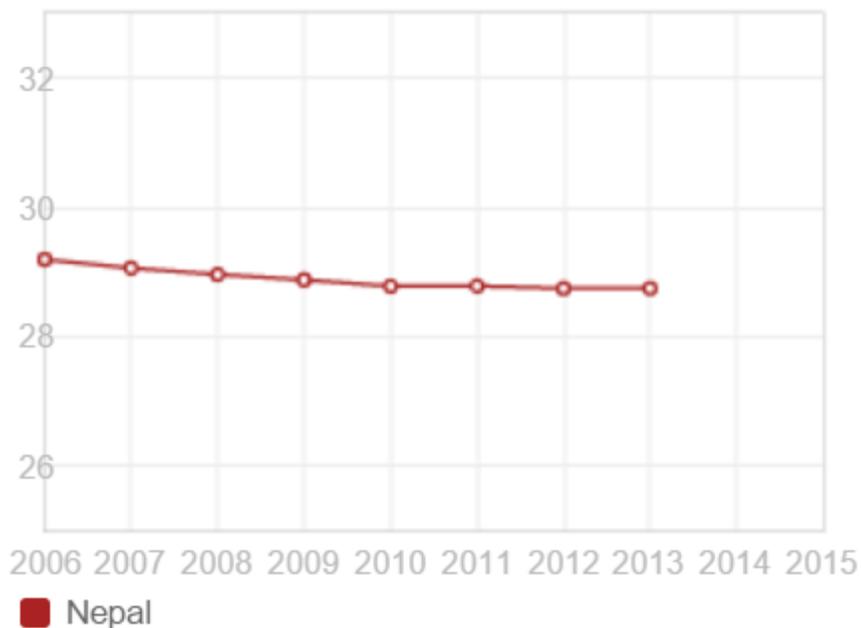
The storage and refrigeration for the seed balls from post-harvest to market require little to no maintenance (Ketchum 2015). No refrigeration is required for this product and storage for this product can be placed inside anywhere (Ketchum 2015). These nutrient seed balls are made of hard, dry clay, therefore their chances of breaking are slim to none (Ketchum 2015). They can be packed altogether, preferably in a dry area as any moist, wet area could stimulate the seeds to grow and break the hard, clay shelling (Ketchum 2015).

### **Cost Analysis**

The seed balls are sold from Seed-balls.com at \$0.12 US per seed ball (Ketchum 2015). It is difficult to analyze the products from BrettYoung and Bayer CropScience as there is no definite cost of their sales, therefore the cost analysis will be a rough price point. Generally, most seed ball products are sold between 20 cents to 24 cents (Ketchum 2015), this allows Canada to achieve an 8 to 12 cent profit from the product. Typically, 40,000 seed balls are used per one acre of land in North America (Ketchum 2015), although less may be used in Nepal, this report will focus on this fact to roughly calculate Canada's profitability. If Canada purchases one acre of seed balls from Seed-balls.com, it will cost Canada \$4800. Per one acre of land, the total cost of seed balls are \$8000 to \$9600, therefore because Canada will obtain an 8 to 12 cent profit, they will achieve an income of \$3200 to \$4800. Referring to Figure 1, it details the

percent of agricultural land used in Nepal which is 28.7% of the total land in 2013. The total land area of Nepal is 147,181 square kilometres (Pariyar 2008), this equals over 36 million acres, concluding that if only 28.7% of the total land is used for agriculture, the total agricultural land equals to over 10 million acres. Therefore if Canada purchases enough seed balls to cover Nepal's entire agricultural land of about 10 million acres, it will cost Canada \$48,000,000,000 to purchase the seed ball product from Seed-balls.com. To assume best case scenario that each acre of agricultural land uses 40,000 nutrient seed balls, this will create the maximum total revenue of \$80,000,000,000 to \$96,000,000,000 and profiting Canada roughly \$32,000,000,000 to \$48,000,000,000. Therefore this price point is not realistic as Canada will obtain the same amount of revenue that they output to Seed-balls.com or less, leaving Canada with either no profit or a large loss of money if they obtain less than 48 billion dollars.

## Agricultural land (% of land area)



Data from World Bank

**Figure 1: The percent of Agricultural land area in Nepal from 2006 to 2013**

In 2013, Nepal's percentage of agricultural land was roughly 28.7%. There has been a very constant, but slight decrease over the years (World Bank 2013).

### **Needs and benefits to Nepal**

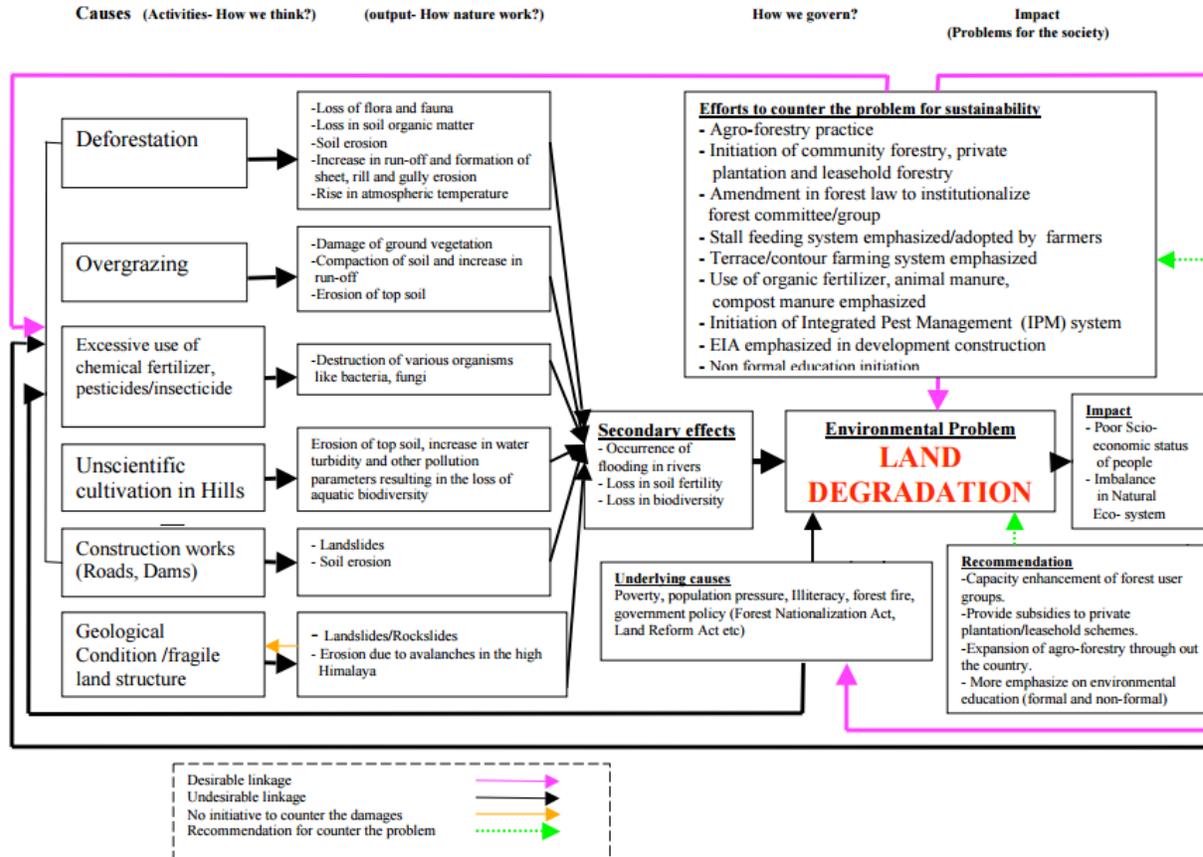
Needs that will be met in Nepal after the development of this product are improved seeds and the requirement of tools and machinery will decrease as seed balls do not need the soil to be opened in order to plant the product. Challenges that most Nepalese people face are the difficulty to operate machinery due to Nepal's landscape, soil loss and degradation, poverty because of the high cost of seeds, fertilizers, tools and equipment and labour shortage. This product, the nutrient seed ball, helps eliminate these problems by providing no machinery

necessary to plant the product because farmers no longer need to open up the soil as the seed balls are just scattered on top of the ground. This is a solution to another of Nepal's challenges of soil loss and degradation because of the lack of machinery and tools to open up the soil, less soil will be disturbed, leaving it healthier and not as damaged. Although the cost of nutrient seed balls are fairly high at twenty cents per ball, the nutrient seed ball is supplied with seeds, fertilizers, pesticides, protection and lack of needing tools and equipment and therefore because the product contains all these components, it can be cheaper for the Nepalese farmers to purchase overall compared to purchasing each item individually. Lastly, the labour shortage in Nepal will be solved due to the seed ball's low labour requirement, there will be a decreasing need for labour work and the shortage will not affect future farming as the only labour required for the seed balls is to scatter them on top of the ground.

### **Environmental benefits to Nepal**

Compact nutrient seed balls prevent soil loss and degradation, improving Nepal's environment as the seed balls do not require cultivation tools that damage the soil by opening it up. Land degradation is when an amount of land is lost to various erosion causes, not allowing for the growth of plants (Karkee 2004). Referring to Figure 2, it describes how land degradation is caused, how nature works, how it is governed and the impact land degradation has on society. Nepal is affected by all three types of land degradation which are physical, biological and chemical degradation. Physical degradation identifies the structure of the soil and its properties such as compaction and hard setting that is caused when there is a reduction in the soil's structural pores (Karkee 2004). As a Hindu country, Nepal rears cattle to worship them,

mainly in large festivals (Karkee 2004). By allowing the cattle to free graze, it causes an increase in the erosion in soil, as well as a compaction of the soil leads to increased run-off (Karkee 2004). Biological degradation is when there is a decline in soil organic matter, biomass carbon, and the productivity and diversity of soil fauna that are used as soil quality indicators (Karkee 2004). In Nepal, biological degradation is found highly in excessive chemical use such as pesticides as cheaper farming methods that are not as advanced are used (Karkee 2004). Chemical degradation refers to the loss of nutrients, an increasing accumulation of toxic chemicals or an imbalance of elements dangerous to the growth of the plant (Karkee 2004). Due to Nepal's use of fertilizers, chemicals, and pesticides, the soil loses fertility, and micro-organisms such as bacteria and fungi (Karkee 2004). As well, fertilizers contribute to soil loss and degradation in Nepal (Karkee 2004). Therefore, with these aspects of soil erosion in mind, the compact nutrient seed balls helps to eliminate mostly chemical degradation and biological degradation in Nepal's soil by reducing the use of additional chemicals, fertilizers and pesticides as the seed ball already contains most of these products inside the clay shell. Physical degradation of the soil will also be deducted as seed balls will not disturb the soil further with cultivation tools as they are scattered on top of the ground.



**Figure 2: The causes, output, government, and impact of land degradation in Nepal**

Describes the linkage between the causes of land degradation, how nature works, how it is governed and the impact for society and the problems society will face (Karkee 2004).

### Canadian companies, potential Nepalese buyers

Canadian companies that may be involved in the production of the Seed Balls is the Bayer CropScience Canada at 1-(888) 283-6847 (Bayer CropScience 2015), and BrettYoung at 1-(800) 655-5015 (BrettYoung 2015). These companies will combine their products together in order to protect and improve the health of the seed ball (Bayer CropScience, BrettYoung 2015). It will be sold to potential Nepalese buyers such as large seed companies that have close

relationships with Nepalese farmers such as the National Seed Company Limited in Nepal, where the seed ball can be distributed throughout the country (Adhikari 2015).

### **Marketing strategy to sell in Nepal**

The National Seed Company Limited in Nepal is the marketing strategy that will be sought after in Nepal to create sales to the country. The National Seed Company's primary purpose is to meet the needs of the Nepalese farmers by providing improved seeds (Adhikari 2015). Some of the main objectives that the company has that meet the seed ball's requirements include the import and export of seeds that are improved, selling the improved seeds in bulk to other seed companies that are more private and to begin producing and distributing products whilst conducting additional promotion sales (Adhikari 2015). Overall, because of the company's close ties to the country's people, it is the most beneficial way of selling Canada's export product.

### **Trade/Subsidy barriers**

Common trade barriers are tariffs, where there is a tax on imports, or embargoes, where there is a barricade or political agreement that tampers with a country's exports and imports and limits the whole process of trade (Liberty Fund 2010). Subsidy barriers are caused by a specific domestic industry that make goods cheaper to produce than buy in other foreign markets, resulting in a smaller price (Liberty Fund 2010). All these barriers cause foreign goods to become more expensive than goods found inside one's country, causing a decrease in imports (Liberty Fund 2010). A fault with nutrient seed balls is if you acquire all the common

ingredients necessary to make the product such as clay, seeds, and compost, it can be easily made and produced in any country. Seed balls have been an ancient technique used for centuries, therefore does not require machinery or advanced technology (Schreiber 2014). This can cause an increase in seed ball facilities in Nepal or closer to Nepal in order to import the product for cheaper prices, stopping the potential export product in Canada.

### **Regional and global competition**

Seed balls are not a big industry with many competitors, overall there are only a few companies around the world that specifically sell seed balls. One of these companies is located in Cincinnati, Ohio named “Seed Bombs”, the business began by a couple who are both graphic designers (CNNMoney 2014). Their business began to expand and the demand for their product grew suddenly when they began to sell to local stores and through an Etsy shop (CNNMoney 2014). There are also other companies not just in North America but in Europe such as the “Seedbom” company in Scotland (Kabloom 2015) and the “Seed Ball” company in England (Maya Project 2015).

### **Future studies required to evaluate the export potential**

Future studies required to properly evaluate the export potential of this product should be a figure comparing the amount of seed balls versus the amount of seed balls that break apart and stimulate plant growth, as well as the quality of the plant grown from the seed ball compared to a plant grown from a regular seed. The last future study that should be evaluated

for this product is the quality of growth between the different regions in Nepal and see if the different types of land have an effect on the growth rate or quality of plant.

Word Count: 3990

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