UBC Social Ecological Economic Development Studies (SEEDS) Student Report

An Investigation into Sugar Cane and Wood Fiber Paper at UBC

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An Investigation into Sugar Cane and Wood Fiber Paper at UBC

- FINAL REPORT -

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ABSTRACT

The University of British Columbia (UBC) is a front-runner and showcase of sustainable living. Currently, the university is using 30% post-consumer recycled, wood fiber paper, purchased from OfficeMax Grand and Toy, in all faculty and department offices. As an attempt to further UBC sustainable image, Supply Management is considering a shift to paper made from sugar canes utilizing TreeFrog as a sole supplier. A triple bottom line assessment is presented in this report showing that sugar cane paper is more sustainable, environmentally friendly and socially accepted compared to the current wood fiber paper. The main downfall of sugar cane paper is that it will cost UBC approximately $1.75 more, per 500 sheet package, for a similar performing paper compared to wood fiber paper.

Social, environmental and economic aspects were all taken into consideration and analyzed in detail. Social indicators used include labor conditions, a social "license" of shifting to sugar cane paper, and the sustainable image of UBC. Raw materials, energy consumption/emissions of all aspects of production and transportation and recycling feasibility were used as environmental indicators. The economic assessment was heavily based on the purchasing prince of the paper and the effect on both domestic and international economies involved in each paper producing/distributing method (sugar cane and wood fiber) This report recommends that UBC Supply Management should alter its paper provider and begin to use sugar cane paper despite of the small increase in cost. The importance of cost may outweigh the social and environmental benefits, however, that is to be deemed by UBC Supply Management and beyond the scope of this investigation.

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1.0 SOCIAL ASPECTS

This section is concerned with analyzing the social aspects of introducing sugar cane waste paper into the UBC campus. Specifically, an investigation into the labour conditions in either of the three major producers will be done to see if they meet UBC's Supplier's Code of Conduct; and the overall performance of the paper will be analyzed, by comparing relevant properties, and also by drawing reference to a simple study conducted by our group.

1.1 Labor Conditions in Brazil

Brazil is by far the largest producer of sugar cane in the world, producing approximately 30,691,000 metric tons of cane in the year 2010 (Prem, 2011). India comes second, at a lower amount of 20,450,000 metric tons (also in 2010). Brazil has continually been increasing its total production of sugar cane since 2008 (Prem, 2011), showing that there has been an increasing demand for sugar cane, and thus more employees are required to grow and produce it.

Brazil's sugarcane sector is strongly opposed to substandard working conditions (BSIA, 2010). They have government-appointed officials who regularly inspect the working site for signs of safety and sanitary issues; and employ hundreds of thousands of trained workers earning fair wages. The sugarcane cutters are the second highest paid workers in the Brazilian agricultural industry, making nearly three times the current minimum wage in 2010 (BSIA, 2010).

The fair working conditions are likely because of Brazil's pioneering into the field of clean energy alternatives for automobile applications. Brazilians have been able to reduce their oil imports to zero as a result of the vast amounts of sugarcane they produce – which is used to make Flex Fuel; an automotive fuel consisting of a mixture of gasoline and ethanol (made from sugarcane). Thus, Brazil is very much aware that one of their most valuable resources is sugarcane, and the people who work to produce/process it.

Since sugarcane cannot be produced in Canada or the United States, our source for the material is required to be from a foreign country. Because of this, UBC strives to ensure that human and civil rights are in compliance with the International Labour Organization (ILO) standards, for those who supply goods, services or equipment – known as the UBC Supplier's Code of Conduct (SCC)

Knowing that the Brazilian sugarcane farms are fair working places – with workers earning up to three times the country's minimum wage (perhaps not exceptional to our standards, but definitely a

good wage for Brazilians), routine workplace inspections for safety and hygiene – UBC can be confident that they are indeed helping support the locals, by supplying the demand for sugarcane, and thus promoting the fair work over in Brazil.

The main concern with making the switch to sugarcane-based paper is that our forestry industry – which accounts for many jobs in Canada (BC especially) – will suffer, as a large portion of the industry (paper making) will be lost to another country. As a result, our local economy would suffer. This is discussed more in the economics section (section 3.0).

1.2 Overall Paper Performance and Consensus

One problem that may arise if sugarcane-based paper were introduced into the UBC community is its overall performance. That is, how heavy paper handlers (students, faculty staff members, etc..) will rate the paper in terms of feel/texture, thickness, brightness or bleeding.

Before beginning this project, our group had acquired a couple sheets of sugarcane paper. This was used to perform a few surveys.

Firstly, each group member handled the paper and felt its thickness and texture. This, along with its brightness, was hardly any different from the standard wood fibre-based paper currently used. There was a slight texture difference that all three of our group members could feel, however we concluded that this would, if anything, benefit the user by facilitating handling – especially if handling many pieces of paper at once. The paper was used with a variety of ink and ball-point pens, as well as pencil, and no difference in bleeding was observed from the wood-based paper.

The first survey was performed at a small office in UBC, where we invited the staff to feel and write on both pieces of paper (one sugarcane, one wood fibre). The consensus was that both papers performed equally. When the sugarcane paper was revealed, and the question of whether they could see themselves replacing the wood-based paper with the sugarcane-based paper, they all agreed that they foresaw no problems in making the switch.

After having completed the survey, the paper was run through an ink-jet printer to see if there were any noticeable differences in printing quality – as this is the main purpose of copy paper. As expected, both types of paper were equal in printing capabilities.

Lastly, according to the manufacturer of the paper, TreeZero, the TreeFrog paper can be recycled with traditional papers made from wood fibre (TreeZero, 2010).

From the results of the more technical analysis, our group concluded that this paper is just as able as the wood fibre paper to be used as the standard copy paper at UBC.

1.3 UBC's Sustainable Image

Sustainability, and the idea of being environmentally friendly has been increasing in popularity; more and more communities strive for a more "green" look. Should UBC adopt this new paper, it would only add to the reinforce UBC's commitment to sustainability and further show that it is a leader in the switch to being a more green community.

A second survey was performed online via Facebook, in order to assess whether UBC's sustainable image had any effect on students' contentment of being a UBC student. From the responses gathered, the majority of participants voted that it UBC's sustainable image did have some effect on their contentment of being a student of UBC.

From our results, our group predicted that, in general, people are likely to appreciate the green movement that UBC is working for. We already see many sustainable initiatives at UBC in a variety of sectors, including: climate & energy, recycling waste, water, green buildings, purchasing, food and transportation (UBC Sustainability, 2013), and thus switching our wood-based paper to a more environmentally friendly product will only add to the sustainable future UBC is striving for.

2.0 ENVIRONMENTAL ASSESSMENT OF SUGARCANE PAPER

In this section, an investigation of the environmental impacts of sugar cane papers and wood fiber papers is conducted. In particular, sugar cane paper and wood fiber paper are compared in terms of: material resources, energy consumption, pollutions and disposal.

2.1 Material Resources

Wood has been the main source of papers for thousands of years. In the last 40 years, the percentage of consuming papers around the world has increased to %400 (Martin, 2011). The demand of papers is increasing and depending mainly on wood fiber to produce papers would require more trees to be harvested. According to Paula Goldspink, UBC consumes 280 tones of papers every year. For every one-ton of paper, 3 tons of trees are cut. The trees might take more than 10 years to mature while the sugar cane takes only 6 months (Treefrog, 2012). The duration of growing the sources of fibers used in producing paper is an important factor and fast growing plants could save time and effort.

The processes of making papers are different from one place to another and from one company to another. The material resources and papermaking production for wood fiber and sugar cane papers are as follows:

2.1.1 Wood Fiber Paper:

Most papers around the world are made of wood fibers. More than 95% of the fibers needed in the production of paper come from wood fiber (Carlsson et al, 2006). After the trees are cut, the wood goes into several processes to produce paper. The main stages of making papers are: pulping, bleaching and papermaking (See figure 1). Pulping is the process of separating the cellulose fibers, which are desired material to make paper, from lignin while bleaching is the process of removing the remaining lignin and whitening the pulp (Paper task force report, 1996).

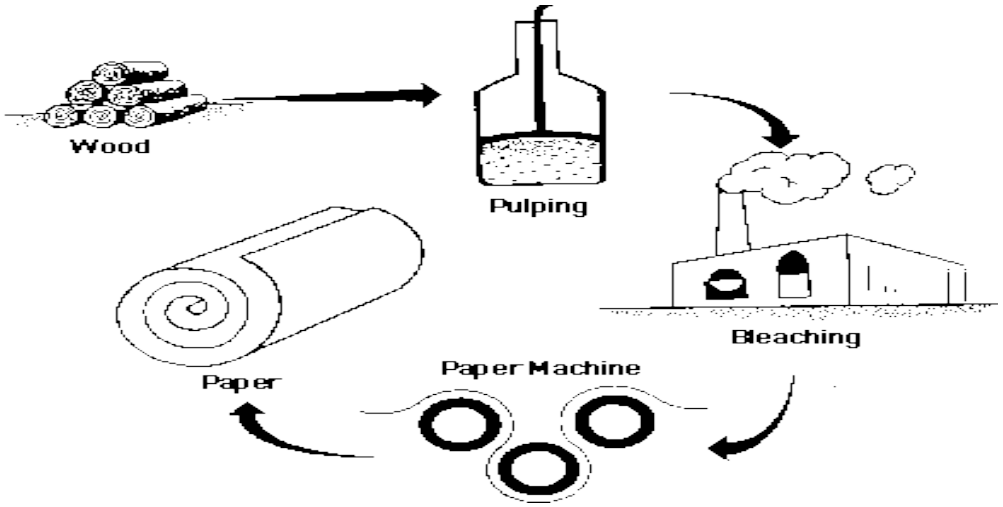

Figure 1 - The main stages of papermaking process (Reach for Unbleached Foundation, 1996)

2.1.2 Sugarcane Paper:

Fibers needed to produce paper out of sugarcane plants are called bagasse. Bagasse is the fibrous residue left after extraction of juice from sugarcane (Ganapathy, 1997).

According to Treefrog, the sugarcane is not harvested for the purpose of making papers and the company only uses the by-products of sugar cane. The bagasse fibers go through similar processes as the wood fibers but they are stored and treated with different chemicals.

2.2 Energy consumption

The amount of energy consumed in the production of paper is crucial in the evaluation of deciding the better fiber source. Forests cover more than %65 of British Columbia's land (Council of Forest Industries, 2013). This tremendous source of wood fiber would save traffic and energy because of its close location from the pulp and paper industry in BC. On the other hand, sugarcane usually grows in tropical areas and bagasse fibers need to be shipped to the sites of the pulp and paper industries, which would require more energy consumption (see table 1).

Table 1 - The world's top 5 sugarcane producing countries (Canada Statistics, 2006)

Rank	Country	Production (1 000 tonnes)
1	Brazil	455,291
2	India	281,170
3	China	100,684
4	Mexico	50,597
5	Thailand	47,658

The pulp and paper industry consumes a huge amount of energy in the production of paper. For example, the pulp and paper mills in the US consume about 31 million Btu's of energy to produce a ton of paper as mush as a US suburban home would consume in two months. The source of this energy depends on the process of pulping; wood waste from pulping can be converted to electricity and used in the chemical pulping process. In the mechanical pulping process, less wood waste is burned and the mills meet the remaining energy requirements from burning fossil fuels or purchasing electricity (Paper task force report, 1996). Bagasse can also be transformed to electricity and used as source of energy. For instance, burning bagasse can provide the sufficient amount of energy for the sugar cane factories (Ramjeawon, 2008).

2.3 Pollutions from Sugarcane and Wood Fiber Paper Production

During chemical reactions, some derived by-products can be toxic and have harmful impacts on the environment. Carbon dioxide, which is one of the larges contributors to air pollution, and water are two examples of those by-products. The paper and pulp mills are considered one of the largest sources of pollution in the world, and third largest in North America (Broten et al, 1999). The papermaking processes produce three different kinds of waste: air emissions, solid waste and water waste. Some examples of the air emissions as a result of the chemical reactions during the production of paper are: carbon dioxide, chloroform, Sulfur dioxide and nitrogen oxides. Solid waste consists of wood waste, non-recyclable paper and the resulted waste during chemical recovery processes. Water

effluent is the largest portion of waste from the pulp and paper industry; it contains some organic compounds, which can indirectly contaminate the environment and food products (Paper task force report, 1996). According to Treefrog, the carbon footprint from producing sugar cane paper is 12-16% less than the amount from producing wood fiber paper. This might be due to the less bleaching required on the bagasse fibers (Treefrog, 2012).

2.4 Recyclability

One important factor that must be taken into consideration when comparing sugar cane paper with wood fiber paper is the recyclability of the product. Papers after use are either recycled or incinerated to produce electricity or heat (Ekvall, 1999). In Canada, 6 millions tons of papers are used annually; only 1.5 million of used papers is recycled (Deltareprographics, 2008). UBC requires a minimum of 30% post-consumer recycled paper from the wood fiber paper company to save more trees from harvesting. The paper made from sugarcane bagasse is recyclable and can be used to make papers or other products (Treefrog, 2012).

3.0 Economics

The forest industry is a large contributor to the Canadian economy. The industry directly employs over 360,000 people and generates 3% of the GDP. Pulp production accounts for a large part of this activity and makes Canada the 2nd largest pulp producer in the world. Given the environmental damage caused by the forest industry through deforestation, and greenhouse gas emissions, there has been growing interest in the use of sugar cane as an alternative or supplementary fibre source for pulp production.

3.1 Impact on B.C. Economy

UBC currently uses around 50 million sheets of 30% recycled paper every year. This paper costs on average $4.75 per ream. Sugar cane paper made by Treefrog is shipped to Atlanta for distribution. These reams of paper cost around $6.50 each.

If the switch to sugar cane paper was made, we would see an immediate impact on the provincial economy. The British Columbia economy is very reliant on the production of wood pulp paper through the forestry industry. Forest exports exceed $3000 for each person in the province. Currently, the forestry sector boasts 15% of B.C.'s labour force, providing 1.2 million jobs. A 10%

decrease in production of wood pulp would cause a loss of 30,000 jobs and a 2 billion dollar loss in provincial GDP (Binkley et al. 1994).

Many communities in British Columbia depend on the forest industry. If harvest levels are reduced significantly, these communities run the risk of becoming destabilized. More than a quarter million people in B.C. live in communities where the forest sector is accountable for 40% or more of the income that is generated. Nearly half a million people in B.C. live in communities where more than 25% of the income is derived from the forest industry (Binkley et al. 1994).

3.2 Local vs. Global Economy

The 50 million sheets of 30% recycled paper that UBC uses on campus costs over one million dollars every year. The 30% recycled paper is manufactured locally, and as stated before, the sugar cane paper is shipped to Atlanta for distribution. If our interest was to support the local economy, then there would be no question in which paper that we would be recommending. However, we should think beyond our economy, and perform a proper triple bottom line assessment.

Purchasing the paper from Treefrog would strengthen economy of the sugar cane producing country. For example, the minimum wage in India is around $1/5^{th}$ of Canadian minimum wage, and that of Brazil is approximately $1/3^{rd}$; by purchasing the sugar cane paper from a foreign country, we are strengthening its economy, thus providing a chance for the minimum wage to rise. Continuing to purchase 30% recycled paper locally, we will continue to strengthen the Canadian economy, as well as provide jobs for British Columbians.

4.0 Conclusions and Recommendations

Research and studies performed for this investigation (shown in appendix 1) suggest that the community of UBC, including all offices will support a shift to sugar cane paper. A study of over 60 current students showed that 62% of students believed that UBC emphasis on sustainability either directly or indirectly influenced their decision to attend UBC. A separate study of a faculty office at UBC suggests that in normal day-to-day activities, paper users will not be affected by a change to sugar cane paper.

Wood fiber paper is manufactures using pine trees as a primary raw material, which have a maturity time* of more than 10 years. Sugar cane paper is considered more renewable

partially because the sugar cane plant has a much shorter maturity time of approximately 6 months. In addition, sugar cane paper is produced from a byproduct of the plant which is normally disposed of. Recycling of both wood fiber and sugar cane paper is similar and there is no significant advantage in terms of the sustainable effects of recycling. For these reasons, and others investigated in this report, sugar cane paper is deemed more environmentally friendly, renewable and sustainable compared to wood fiber paper.

Quotes from both OfficeMax and Treefrog were obtained with the bottom line being that sugar cane paper will cost UBC Supply Management approximately $1.75 CAD more per ream than the currently used 30% post-consumer wood fiber paper. The communities involved in the paper production will not have a substantial economic effect from UBC purchasing decision. However, it can be concluded that purchasing sugar cane paper more economic benefit for international countries than domestic. Due to the large forestry industry in British Columbia, purchasing wood fiber paper would provide more local economic benefits.

As a result of this triple bottom line assessment, the following recommendations are offered to UBC Supply Management:

- UBC Supply Management should alter its current paper supplier to Treefrog and utilize the advantages of sugar cane paper.
- If/when sugar cane paper is purchased and used, UBC should consider advertising in order to make prospective students and investors more aware of sustainable paper choice of the UBC community.
- Consider hoisting a meeting with Treefrog and other sugar cane paper suppliers in attempt to negotiate a lower purchasing price.

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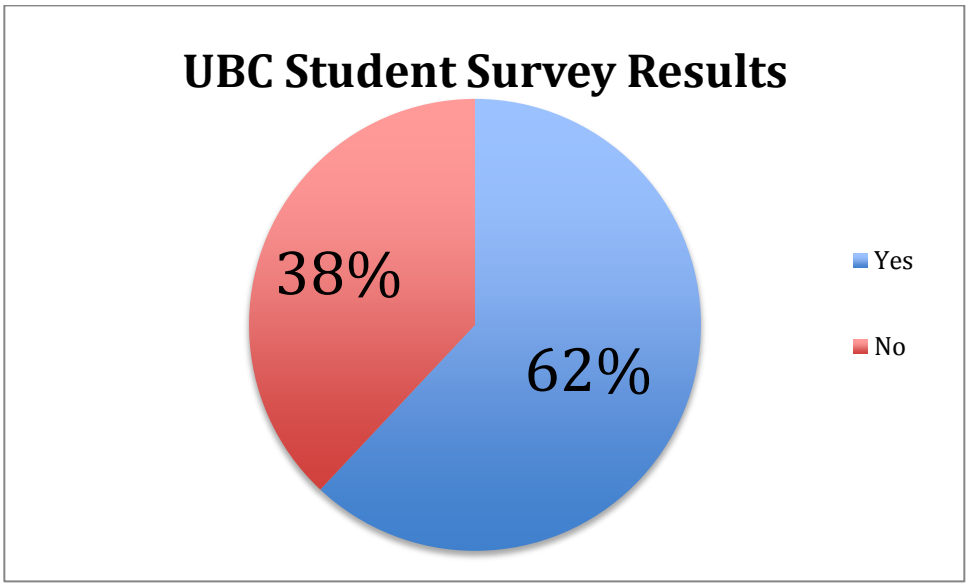
Appendix 1 – Studies Preformed from this Investigation

External studies preformed for the purposes of this investigation include:

Facebook Study of Current UBC Students

A survey of over 400 current UBC students was preformed as part of this investigation. The question of weather or not UBC's sustainable image either directly of indirectly affected each person's decision to attend. This survey was hosted online using Facebook with 72 students out of the 400 responding. From this, 45 students voted that UBC sustainable image did have some effect on them attending and 27 students voted that there decision was not affected. The results of the survey can be found in Graph 1.



Graph 1 - Facebook Survey Results

The objective of this survey was to quantify the impact UBC's sustainable image has on the student body. Our investigation shows that sugar can paper would be a sustainable option for UBC that would improve their sustainable image. In the event that UBC Supply Management shift to sugar cane paper, this study helps show that the majority of the student body will have a positive outlook on this.

UBC Office Staff Study

Office staff are the main users of the paper supplied by UBC Supply Management. Therefore a key social indicator used to determine the social effects of a change in paper type, is the moral of the people using the paper on a day to basis.

For this investigation a study was preformed at the UBC Materials Engineering department office. Although this particular office is a small sample out of all of the offices in the UBC community, the results can be extrapolated to encompass all offices. At the Materials Engineering office, paper is used in nearly all ways that would be used by any other office at UBC including photocopying, printing and handwriting. A total of four office staff were asked to write on, print and preform other various tasks with both the wood fiber and sugar cane paper. They were also asked if there would be any effect in their day to day activities if a new paper source such as sugar cane was used. It was found that there is no substantial effect on the office staff if sugar cane paper was introduced. Also, all of the participates mentioned that they would be happy to use sugar cane paper if it were in fact a more sustainable option; which was proved throughout this investigation.