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An Investigation into the Economic Influence of Sugar Cane and Wheat Waste Paper on Canadian Economy

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ABSTRACT

The issue of environment and sustainability has been one of the most debated topics within the last fifty years. Governments and companies around the world have been looking into numerous sustainable solutions in which environmental footprints can be minimized without jeopardizing the living standards. A major environmental concern today deals with paper and how environmentally unsustainable it is to produce paper from wood fibre. Therefore, manufacturers and scientists have developed a more sustainable paper solution: the sugar cane and wheat waste paper. The papers are made from the remains of sugar cane and wheat straw that is traditionally plowed back into the soil. Thus, by making use of such waste materials, the use of resources is maximized.

While both the sugar cane and wheat waste paper can be a sustainable paper solution, a suitable alternative must be chosen as the substitute for wood fibre paper. In order to differentiate which alternative is the best, this report looks into the impact of selecting both sugar cane and wheat waste paper on the Canadian economy. Note that this report only focuses on the economic impacts of the alternatives; therefore the environmental and social factors are ignored. This report compares the advantages and disadvantages of both sugar cane and wheat waste fibre paper on the Canadian economy in order to recommend the best alternatives for replacing wood fibre paper. Furthermore, these advantages and disadvantages is determined by analyzing the origin of raw materials and products, manufacturing costs, labour and long run effect once chosen as an alternative. Once these data is obtained, a prediction of the impact on the Canadian economy when a suitable alternative is chosen is made. This prediction is based on previous similar occurrences that have occurred within the pulp and paper industry.

After thorough analysis on both the sugar cane and wheat waste paper, it is found that sugar cane papers do not benefit the Canadian economy. Instead, this alternative causes money to flow out of Canada and into foreign countries. The reason is that sugar canes are not produced domestically and can be only purchased elsewhere. On the other hand, wheat waste paper can benefit the Canadian economy because Canada is ranked as the world's seventh producer of wheat straws. By selling the wheat waste to Canadian paper manufacturers, farmers can have an additional source of income; therefore, increasing GDP. However, the disadvantage of making this switch is that the Canadian pulp and paper industry can be displaced since wheat is only grown in prairie provinces. Therefore, wheat waste paper can be concluded as a sustainable paper alternative that can benefit the Canadian economy.

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1.0 INTRODUCTION

As world demand for paper continues to rise, more and more consumers are looking for products that leave a smaller environmental footprint. In Canada, paper consumption levels increased more than double between 1983 and 2003. Furthermore, an annual growth rate of consumption of 139.3% exceeded that of a 23.6% population growth rate by a wide margin in 2003 (Statistics Canada, 2009). Society's consumption of paper is projected to grow, especially in emerging Asian economies, which utilize a large amount of exported Canadian paper. It is clear that the demand of paper is growing at a rapid pace and that the supply of traditional wood pulp paper will struggle to keep up with the increasing demand. In recent years, many companies have looked for alternative ways to produce paper without permanently damaging the environment. The two solutions that have gained significant traction in this discussion are sugar cane paper and wheat waste paper. Both sugar cane and wheat are plants that are regarded as fairly renewable resources, causing the least damage to our surrounding environment. Sugar cane and wheat waste make good candidates for an alternative because of their use of agricultural waste, both of which are residual materials left over after their respective extraction process. Also, sugar cane and wheat are major crops that yield very high volumes annually. This makes for an attractive characteristic to point out the rapid growth and regeneration of these resources to keep up with a growing demand in paper. Therefore, this report will provide an economic analysis on both the sugar cane and wheat waste paper to determine which alternative is a suitable substitute for traditional wood fiber paper. Furthermore, this report will focus on the potential impact on the Canadian economy once these alternatives are chosen. Lastly, a recommendation will be provided on which is the best alternative.

2.0 THE CANADIAN PULP AND PAPER INDUSTRY

The Canadian pulp and paper products industry play a vital role in the Canadian economy. It is the largest manufacturing industry in terms of employment, value added and net exports (Hailu & Veeman, 2000). Currently, the industry employs an estimated amount of 85 000 workers with mills located across Canada with the exception of Prince Edward Island (Industry Canada, 2012). Therefore, it is a national industry since it is a geographically dispersed employer. Apart from the United States, Canada ranks second in pulp and paper manufacture and first in pulp and paper export (Tang, Kant, Laaksonen-Craig & Asinas, 2008). In quantity, Canada exports 79% of its pulp and paper products; 21% is used in Canada. The largest export market has always been for many years the United States followed by China and the United Kingdom (Industry Canada, 2012). Of these exports, about 40% is newsprint which Canada has been world's largest producer for over 50 years; about 37% is wood pulp for further processing into paperboards; 23% is a wide variety of packaging papers and boards, writing papers, tissues and sanitary papers; all of which totals to about 23 million tons each year (Industry Canada, 2012). As a result, not only does this industry play a large role in Canada but it makes important contributions in a global scale as well.

On a global scale, pulp and paper products are a big business that concerns the welfare of many people in different parts of the world. Some key factors that allow Canada to play an important role in the highly competitive international pulp and paper industry are due to the facts that Canada has high productivity and quality and large supply of natural resources (Tang, Kant, Laaksonen-Craig & Asinas, 2008).

2.1 Vulnerability of the Canadian Pulp and Paper Industry

One of the fundamental concepts of economics is the law of supply and demand. In the last

ten years, the Canadian pulp and paper industry has suffered a reduction in demand mainly due to the fact that papers are being substituted by computers, and newsprint by competition from broadcasting and the internet (Tang, Kant, Laaksonen-Craig & Asinas, 2008). Furthermore, the rising Canadian dollar within the last few years has also decreased export (Tang, Kant, Laaksonen-Craig & Asinas, 2008). For example, from 2000 to 2005, the pulp and paper sector suffered a total reduction in its production capacity of 12% (Tang, Kant, Laaksonen-Craig & Asinas, 2008). During this recession, several Canadian pulp and newsprint mills were closed (Tang, Kant, Laaksonen-Craig & Asinas, 2008). Furthermore, Figure 2-1 shows the decreasing manufacturing revenue for the pulp and paper industry from $26 billion in 2001 to $17.8 billion in 2010, or at an average compound annual rate of 4.1% per year but increasing 8.7% between 2009 and 2010 (Industry Canada, 2012). Apart from the falling manufacturing revenues, employees of the pulp and paper industry were also heavily affected by a decline in the demand of pulp and paper products. Figure 2-2 shows the reduction of the total number of employees in the pulp, paper and paperboard mills industry group from 56, 040 workers in 2001 to 29, 579 workers in 2010, an average annual decrease of 6.9% over this time span (Industry Canada, 2012). Note that these numbers are only the employees working at the pulp and paper mills and is different from the total number of people employed given in section 2.0. The number given above reflects the entire industry including loggers, truck drivers and management positions in the offices. Now a first thought that would come to mind when looking at these data would be that production productivity has gone up resulting in fewer workers needed. However, a look at figure 2-3 would tell that an increase of production performance of 3.1% annually would not be suffice to decrease workers by almost a half within 10 years. Therefore, a reduction in export and the demand of pulp and paper products are the reason for a decrease in manufacturing revenue and workers.

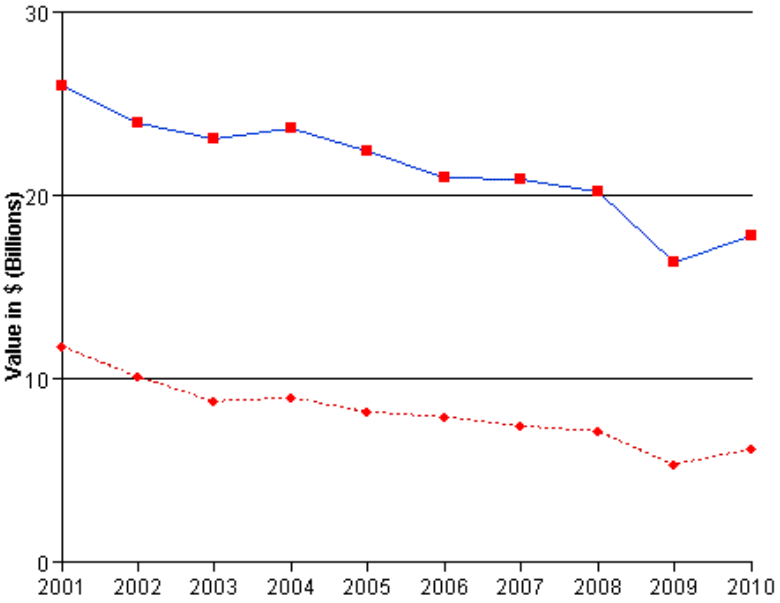

Figure 2- 1 – Manufacturing revenue of Canadian pulp and paper mills between 2001 - 2010(Industry Canada, 2012).

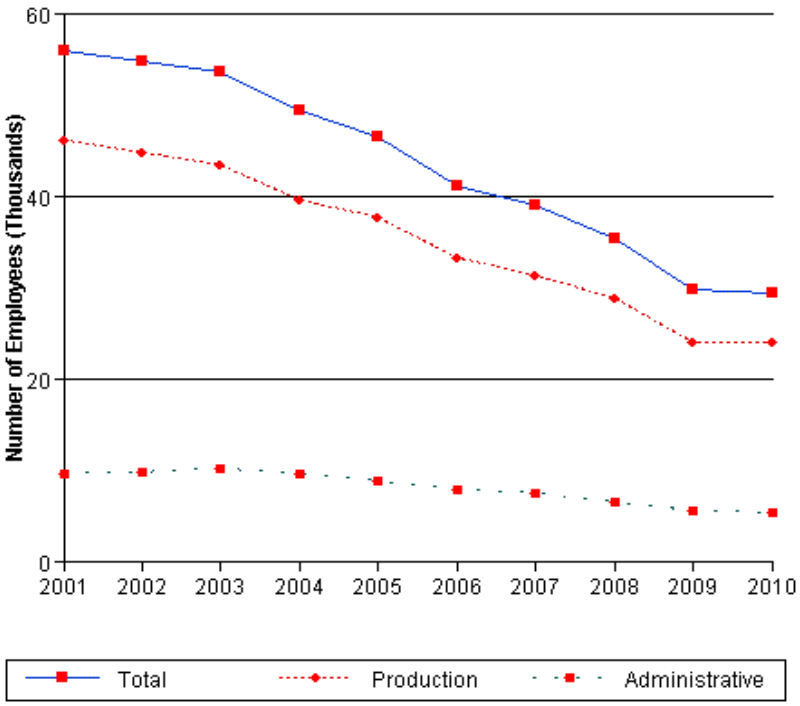

Figure 2- 2 – Number of employees in the Canadian pulp, paper, paperboard mills industry between 2001 – 2010 (Indsutry Canada, 2012).

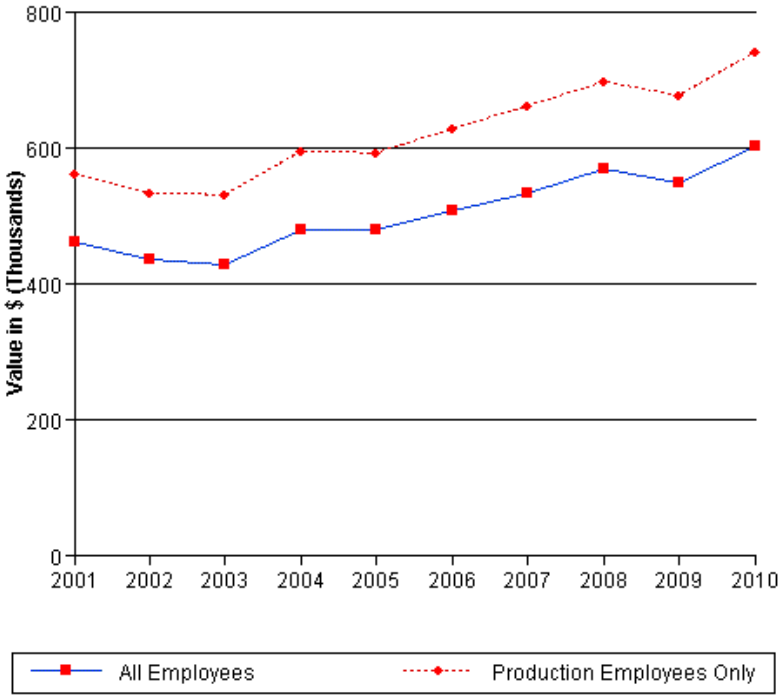

Figure 2- 3 – Production performance per employee between 2001 – 2010 (Industry Canada, 2012).

3.0 SUGAR CANE PAPER

Sugar cane paper, compared with traditional recycled paper, has superior performance, similar purchase price, and can even be recycled with the same process (Ricoh Canada Inc., 2011). The main raw material used for manufacturing sugar cane paper is called bagasse (Fenta, 2010). It is a fibrous by-product from the extraction of juice from sugar canes (Fenta, 2010). Since sugar cane paper contains zero wood fibers and seems to be an attractive alternative for being more environmentally sustainable, this section looks into the impact of which the increased use of sugar cane paper can have on the Canadian economy.

3.1 Origins of Bagasse

Current sources of sugar canes comes from mostly developing and third world countries such as Brazil, India and China with a few developed countries such as Australia and the United States where tropical areas are present (See figure 3-1 and Appendix A table A-1). The quantity of bagasse produced is directly proportional to sugar cane production, meaning that these countries are also bagasse producers. Since Canada do not produce any bagasse, Canadian sugar cane paper companies can only rely on acquiring this raw material from other foreign countries. Due to this reason, increase use of sugar cane paper can pose a potential risk to the Canadian pulp and paper industry.

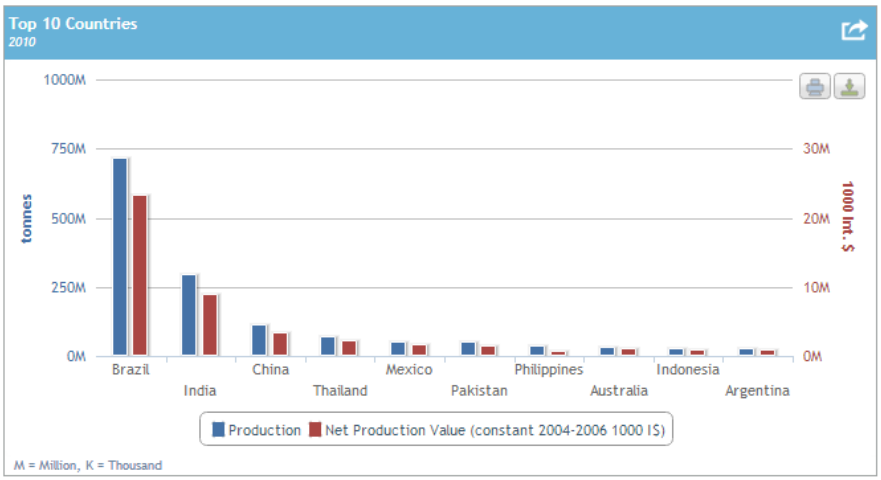

Figure 3 - 1. Top 10 Countries of Sugar Cane Production in 2010 (FAOSTAT, 2010)

3.2 Manufacturing of Sugar Cane Paper

Unlike traditional paper that is manufactured by Canadian companies, manufacturing sugar cane paper requires the manufacturers to acquire bagasse from the listed countries in figure 3-1. This suggests that when consumers purchase a unit of sugar cane paper, a portion of the papers unit price flows out of Canada and benefits the agricultural development of other countries. Moreover, some Canadian pulp and paper companies might even move their manufacturing plants close to sugar cane fields that are located in developing countries due to factors such as lower wages; therefore, this can further impact the Canadian economy. For example, instead of transporting the purchased bagasse to Canada for paper manufacturing, Tree Frog delivers the raw materials to a nearby factory (Tree Frog, 2013). On the other hand, although the main manufacturing process of sugar cane paper is the same as the wood fiber paper, replacing wood fiber with bagasse pulp can reduce the machines' production rate up to 30%. This is because sugar cane residue contains short fiber that increases the drainage process time in paper making (Rainey, 2009).

3.3 Labour

Since most of the bagasse produced is from developing countries, companies often find it attractive to place their manufacturing plants in these countries for the reason of lower wages. The minimum wage in Canada is currently $9.50 to $11.00 Canadian dollar per hour depending on the province (Munroe, 2013). Assuming workers work 20 8-hour shifts per month, the minimum monthly salary is calculated to be from CAD$1520 to CAD$1760. On the other hand, for a top bagasse producing country like China, the minimum monthly wage varies between CAD$110 to CAD$210 depending on the province (U.S. Department of State, 2011). Therefore, when sugar cane paper is purchased, consumer money flows out of Canada. Furthermore, purchasing paper that is manufactured in a foreign country will only enhance this effect and can therefore further impact Canada's economy.

3.4 Paper Consumption in Other Countries

While the worlds overall demand for paper is increasing, there is a rapid growing paper consumption in developing countries. Take China for example; in just 2005 alone, 59.3 million tons of paper was consumed. In addition, when compared with the United States paper consumption per capita of over 300kg, China's paper consumption per capita amounts to about 45kg. This means that there is a huge potential growth in the Chinese pulp and paper market (Ding, 2013). Promoting the use of sugar cane paper could cause the unit price of sugar cane paper in Canada to increase dramatically because of the limited availability of resources as well as the growing demand. As the demand for paper in developing countries is increasing, governments from these countries could likely restrict the export of bagasse to ensure a stable supply of paper products for their domestic markets. Ultimately, the price of sugar cane paper will remain high in Canada; therefore people will reduce their paper consumption, causing the Canadian pulp and paper industry to shrink.

4.0 WHEAT WASTE PAPER

Wheat waste paper is constructed using the stem and stalk of the wheat plant. This part of the plant would be classified as waste product. Therefore, by chemically reducing this waste product to pulp, it can then be used to produce paper. Canada, being one of the world's great wheat growers, can potentially use this technology as a more environmentally sustainable alternative to traditional wood pulp paper. In this section, an economic analysis on the wheat waste paper will be conducted with respect to the impact it can potentially make to the Canadian economy.

4.1 Origins of Wheat Pulp

Wheat pulp is a byproduct of wheat waste. The world's top five producers in wheat by volume are China, India, Russia, USA and France, respectively (see figure 4-1).

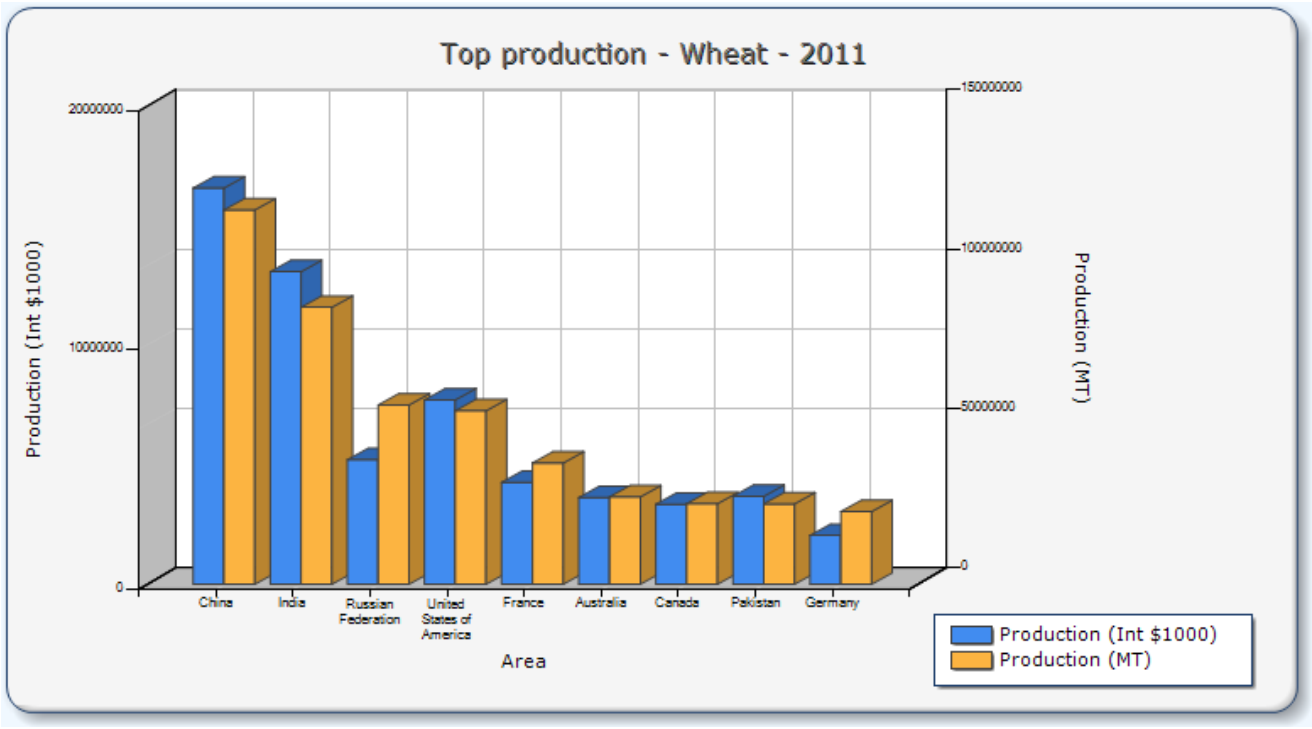

Figure 4- 1 Top Nine Wheat Producing Countries in the World (FAOSTAT, 2011)

As seen above, Canada ranks seventh among the world's top wheat producing countries with a yield of 25.26 megatons in 2011. Wheat straw is also a continually renewable resource; therefore, there will be wheat straw as long as farmers produce wheat. Wheat straw, unlike other major cereal grains, is not used for animal feed. Residual wheat straw is often used by farmers as bedding for livestock or decomposed back into the soil. Canada's wheat harvest leaves behind an estimated 21 million tons of wheat straw annually. This large amount of wheat straw could be used to produce up to 8 million tons of pulp. This is enough pulp to produce enough paper for 20 million magazines (The Wheat Sheet, 2008). With such high annual yields of raw material, Canada has the resources required to potentially sustain a wheat waste paper industry without having to import any wheat straw. By selling their wheat straw, local farmers will be given an opportunity to generate extra revenues from an agricultural waste that would have otherwise been underutilized. In addition to using Canadian wheat straw to produce wheat waste paper, the wheat straw pulping technology could also promote wheat straw pulp as a tradable commodity. Canada has the access to the resources required to export wheat straw pulp and thus bringing more money into the Canadian economy.

4.2 Manufacturing Process of Wheat Waste Paper

As of now, the wheat straw pulp used to manufacture wheat waste paper in Canada is processed in China and in turn imported into Canada. This situation is not desirable because the resources used to outsource this work leaves the Canadian economy, and does not benefit Canada in the future. The need to import is not because of a lack of wheat straw in Canada, but rather due to a lack of pulping mills to produce the straws within Canada. According to Prairie Pulp and Paper president Jeff Golfman, installing these paper mills could cost up to $500 million. At first glance, this may seem like a large initial cost to pay just to manufacture our own wheat straw pulp in Canada, but this technology also brings with it many benefits to

the Canadian economy.

When analyzing an investment of such a large scale, various economic repercussions must be considered. By installing its very own wheat straw pulping mill, Canada will be able to use its own domestic goods in producing wheat waste paper as opposed to outsourcing the work to pulping mills in China. If Canada pursues the plan of producing its own pulping mill as mentioned above, Jeff Golfman said the project could employ 300 people (The Canadian Press, 2012). Furthermore, by allocating the manufacturing process within Canada, the money used to buy and process wheat straw pulp will remain in Canada, promoting our own businesses. If Canadian wheat waste paper manufacturers continue to use imported wheat straw pulp from China, their manufacturing cost could become victim of fluctuating prices due to global demand as well as annual climate uncertainties. As mentioned above, Canada has an abundance of wheat straw pulp that is not being used to its full potential, there should not be a shortage of resources should Canada decide to pulp its own wheat straw. Through pulping our own wheat straw, wheat waste paper manufacturers could also save money in purchasing from local pulping mills, as opposed to purchasing pulp off of a pulping mill in China. By outsourcing this work to pulping mills in China, wheat waste paper manufacturers could become obliged to pay more for their pulp due to various duties and costs associated with transportation of goods.

4.3 Labour

The production of wheat waste paper is an industry that is already prominent in parts of Asia like India and China, however is also growing rapidly here in Canada (Boychuck, 2008). As an already prominent producer of wheat, the production of wheat paper locally has the potential to bring many new jobs to the country. According to Prairie Pulp and Paper president, Jeff Golfman, a single new wheat paper plant will involve the purchasing of waste wheat straw from up to 500 farmers. Furthermore, this new paper plant could employ up to

300 people. (McNeill, 2012)

According to current estimates, there is enough customer demand to have up to five of these wheat waste paper mills/plants running year round ("Canopy's straw paper,"). This means the potential of up to 1500 new jobs locally in Canada. Retrofitting current wood pulp and paper plants into wheat compatible ones are also much cheaper than building a new plant; however this seems unlikely to happen in Canada to the overall number of wheat paper plants (Lenz, 2010).

4.4 Paper Consumption in Other countries

With the growing demand of paper in developing countries around the world, it is becoming more essential for Canada to become more self-reliant. Based on Canada's wheat harvest, Canada could produce enough wheat paper to fill the demands of the North American newspaper industry every year ("The wheat sheet," 2009). Furthermore, Canadian wheat paper can be exported alongside regular wood fiber papers. The self-reliant nature of wheat waste paper makes it more robust in an economic setting; it is not dependent on another country to obtain its raw materials.

5.0 DISCUSSION

As discussed in the second section of this report, the pulp and paper industry is a cornerstone of the Canadian economy and one of the major contributors to Canadian exports. It is a national employer and many people depend on this industry. Therefore, any deterioration in the industry can adversely affect the economy as well as the well-being of Canada and its people. As a result, there needs to be much consideration when it comes to choosing a sustainable paper alternative. This section will discuss the pros and cons of selecting either sugar cane or wheat waste fibre paper as a viable alternative. It would then finish off by providing a recommendation on which alternative is the most beneficial for the Canadian economy.

5.1 Pros and Cons of Sugar Cane Paper on the Canadian Economy

Sugar cane paper can benefit the environment and can be a sustainable paper solution for the future. However, switching to this type of paper alternative does not add any economic benefits to the Canadian economy. By selecting sugar cane paper, the Canadian economy would be affected by having money leave the country. Furthermore, the job market in the pulp and paper industry could be heavily impacted as well.

If the sugar cane paper alternative is chosen, the Canadian pulp and paper industry can be heavily affected. As mentioned in section 3.1, Canada does not produce and grow any sugar cane; therefore if this alternative is chosen to substitute the current paper in the market, these papers will need to be imported from foreign countries such as Brazil and India. As a result, money will flow out of the Canadian economy and into foreign countries which would result in a lower GDP. While manufacturers can produce sugar cane paper domestically, bagasse still needs to be imported from other countries. Thus, part of the company's earnings will flow to the bagasse producing countries, benefiting their economy rather than Canada's.

In addition, since the demand for paper in countries that produces sugar cane and bagasse is increasing, the demand for this type of paper would also rise. This phenomenon will cause both the price of the raw material needed for paper, and the paper itself to increase as well. Moreover, these countries could possibly impose taxes in order to protect their pulp and paper market to prevent shortages in supply. The increase cost of bagasse will ultimately be reflected on the price on sugar cane paper, eventually causing consumers to rely on other paper alternatives.

Furthermore, switching to sugar cane paper causes a decrease in demand on wood fiber paper, impacting the forestry industry in Canada since 95% of the fiber used in the Canadian pulp and paper industry is from Canadian forests (Minnes, 2013). From the data presented in section 2.1, a decrease in the demand of pulp and paper products would result in a reduction in manufacturing revenue. Consequently, this would drive down the Canadian GDP as well as cause companies to go out of business. Apart from the decrease in manufacturing revenue, the workers employed in this industry will also decline since loggers and truck drivers are no longer needed as bagasse is shipped in from another country.

Last but not least, given that sugar cane is grown outside of Canada, Canadian manufacturers that produce sugar cane paper could shut down their mills and move to locations closer to where bagasse is found. Seeing as this is more economical towards manufacturers it only makes sense to have cheap labour since most of the bagasse producing countries have lower wages. As a result, Canadian jobs will also be moved to foreign countries; thus impacting the job market.

5.2 Pros and Cons of Wheat Waste Paper on Canadian Economy

Making the switch to a more sustainable paper solution can bring benefits to the Canadian pulp and paper industry. After thorough research on the economic implications of introducing

wheat waste paper, it has been found that wheat waste paper has the potential to become a very large industry in Canada. One large hurdle Canada must overcome is the ability to process the raw material (wheat straw) into usable resources (wheat straw pulp) that are required in manufacturing wheat waste paper.

As of now, Canada's wheat waste paper manufacturers do not use locally processed wheat straw pulp as mentioned above in section 4.2. Instead, the wheat straw pulp Canada uses is processed in China, and then imported such that it can be processed into paper. This proposes a few concerns, the first of which is cost. When importing goods from another country, the cost of goods may be inflated due to trading and importing duties as well as necessary costs in transportation. Moreover, importing these goods may put our wheat waste paper industry in jeopardy since there is a heavy reliance on raw material from foreign countries. This allows suppliers to have a price control of the resource depending on unpredictable factors such as annual climate patterns and global demand.

Should Canada choose to stop importing wheat straw pulp from China, it has proven more than capable of supplying enough wheat straw to sustain a wheat waste paper industry as presented in section 4.1. Canada remains one of the world's largest wheat producing countries, making it a potential candidate to boast its own wheat waste paper market. The reluctance to do so is likely a result of the colossal initial cost to implement a wheat straw pulping facility. Hidden in the intimidating price tag of Canada's very own wheat straw pulping facility are many potential economic benefits. First of all, the pulping facility would make use of the otherwise underutilized agricultural waste, wheat straw. Canadian farmers will then be able to generate extra revenues from this waste that is traditionally plowed back into the soil. Also, the opening of a pulping mill could open up new job opportunities in rural communities, thus improving Canada's economic situation. Another important benefit is the fact that the Canadian wheat waste paper industry would no longer need to outsource this work to another country. This will inhibit money from trickling out of the Canadian economy.

Switching to wheat waste paper will effectively decrease demand for wood fiber paper, negatively impacting the forestry industry in Canada. With wheat waste paper, this means displacing work from the wood fiber paper mills to work elsewhere within Canada. By keeping the labour and raw materials from within Canada, there is less of an impact on the Canadian economy by using wheat paper. In spite of this, the forestry industry in Canada will still be impacted in a negative way by the switch to wheat waste paper.

5.3 Recommendations

As one can see from the advantages and disadvantages listed above, it is clear which alternative can benefit the Canadian economy the most. Since the sugar cane paper alternative do not add any economic value to the Canadian economy, choosing the wheat waste paper would be more beneficial. While sugar cane paper can be more sustainable towards the environment, this alternative leads to money leaving the country and into foreign economies. However, if the wheat waste paper is chosen, not only is it beneficial to the environment but it also allows Canadian money to stay domestically with the local wheat farmers. This would allow wheat farmers to have an additional source of income since this type of paper is produced by wheat waste. Even though selecting wheat waste paper as a viable alternative can affect the current Canadian pulp and paper industry, it would not impact the industry as heavily if sugar cane paper was chosen. Furthermore, if wheat waste paper was taken as an alternative, it would only displace the current pulp and paper industry in which more mills and workers would be located in the prairie provinces as that is where most of where Canadian wheat come from. In all, selecting wheat waste paper as an alternative would create less of an impact to the Canadian economy compared that of sugar cane paper.

6.0 CONCLUSION

After performing a thorough economic analysis of sugar cane and wheat waste fiber paper, it is determined that the use of wheat fiber paper is a more economically beneficial option with regards to the Canadian economy. The Canadian pulp & paper industry is a vital part of the Canadian economy with a large focus on exports of paper and paper products. By analyzing the anticipated effect of each of these alternative paper types, we have come to the conclusion that paper made from sugar cane bagasse, while environmentally friendly does not have any direct positive impacts for the Canadian economy and the current wood based paper industry. Wheat waste based paper has less of a negative impact on the current pulp & paper industry and also encourages a sense of self-reliance for the Canadian economic situation.

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APPENDIX A

Top 25 Commodities
2010

Area	Production (tonnes)	Flag	Production (1000$ Int)	Flag
Brazil	717464000		23342641	*
India	292302000		8926439	*
China	111501483		3422025	*
Thailand	68807800		2259442	*
Mexico	50421600		1655694	*
Pakistan	49372900		1459132	*
Philippines	34000000	F	635043	*
Australia	31457000		1032954	*
Indonesia	26600000	*	873464	*
Argentina	25000000	F	820925	*
United States of America	24820600		760853	*
Guatemala	22216700		728545	*
Colombia	20272600		665691	*
Viet Nam	16161700		524864	*
South Africa	16015600		525904	*
Egypt	15708900		469180	*
Cuba	11500000		377626	*
Peru	9660900		317235	*
Myanmar	9397880		295874	*
Venezuela (Bolivarian Republic of)	8907670	F	292501	*
Ecuador	8347180		270156	*
Honduras	7818920		164766	*
Sudan (former)	6728000		220927	*
Bolivia (Plurinational State of)	5826230		191316	*
Kenya	5709590		187486	*

Table A- 1 Top 25 Countries in Sugar Cane Production in 2010 (FAOSTAT, 2010)