

Recycling and Reuse Technology Transfer Center
Recycling and Reuse Technology Transfer Center



<http://www.rrttc.uni.edu>

Alternative Fibers for Paper
Student Intern report for the RRTTC

Publication # 1998 – 119

Student authors: B. Shetty, Biology Department, University of Northern
Iowa

93-119

ALTERNATIVE FIBERS FOR PAPER

Brinda Shetty

5/11/98

Forests are a critical part of our lives. They provide the air we breathe, stabilize the world's climate, and provide a home to more than three-fourths of all species on earth. Also, forests provide humans with a vast array of timber and non-timber products. However, in today's world, the consumer demand and waste of timber products is overburdening the forests. Deforestation is becoming a prevalent problem.

In the Pacific Northwest alone almost two million acres of ancient forest has been lost to extensive logging. This has left fragmented forests with limited ecological value. The loss of biological diversity may deprive society of opportunities to advance its knowledge in fields such as medicine, ecology, and forestry. Deforestation also accelerates the amount of CO₂ in the atmosphere which contributes to the greenhouse effect and global warming. Soil erosion and sedimentation are other environmental dilemmas facing areas of forest mismanagement.

Unfortunately, one of the biggest demands placed on forests is timber for paper. Half of all trees harvested are chipped up for pulp mills. However, there are plenty of alternative fibers that may be used to make paper. The challenge lies in putting together the right combination of available alternative pulp sources to produce high quality paper that can be profitably marketed at prices competitive with the established industry.

One promising alternative to virgin wood paper is hemp (*Cannabis sativa*). Hemp has long been known as a cheap and good source for high quality cellulose for paper making. The

Declaration of Independence was, in fact, printed on paper made from hemp.

Until the present century, hemp was a staple crop of the paper making industry for nearly two thousand years. Today, there is a great resurgence in the industrial potential of hemp because of the quality, length, and strength of its fiber, and also because of the favorable economics of cultivation. There is twice as much cellulose, ton for ton, as there is in wood chips, and the hemp plant can produce large crops of both seed and fiber with no pesticides and easy cultivation. Another benefit of hemp is that it produces less waste. Its bast fibers, hurds, and seeds provide raw materials for a variety of products, from textiles to food and cosmetics.

The Marijuana Tax Act of 1937 criminalized hemp farming, even though industrial hemp generally has less than 0.03 percent THC, the psychoactive component of marijuana (compared to 3 to 11 percent in plants cultivated for getting high). This is one reason hemp has been overlooked in research for alternative pulp sources. However, cultivated fiber hemp has practically no THC. Low THC fiber hemp varieties have been cultivated for thousands of years in China, Bulgaria, Hungary, Russia, and more recently in France, Spain, Australia, Holland, Great Britain, Germany, and Canada.

Another potential source for pulp is kenaf (*Hibiscus cannabinus* L.). It is a plant indigenous to Africa with many of the same qualities as hemp but without the narcotic top. It grows well in many parts of the United States and offers

another source of paper without cutting down trees.

Kenaf grows very quickly to heights of 12-14 feet in only 4-5 months. The U.S. Department of Agriculture has done studies that show kenaf yields of 6 to 10 tons of dry fiber per acre per year are generally 3 to 5 times greater than the yield for Southern pine trees, which can take from 7 to 40 years to reach harvestable size. The bast of the kenaf plant has fibers that are comparable in length to the best softwood fibers used to make paper. The core of the plant contain fibers comparable to hardwood tree fibers which are also used in a wide range of paper products.

Another benefit of kenaf is that it is naturally white and does not need to be bleached. Bleaching is a major source of pollution in the virgin wood paper making industry. Kenaf's effluent has actually been approved by the EPA as safe for recycling in irrigation. That means less chemicals are used, and kenaf paper mills require less energy than conventional mills, which significantly reduces production costs. Kenaf pulp may also be added to virgin wood pulp to increase its strength. Also, kenaf can be recycled 4-5 times as much as tree pulp.

Both kenaf and hemp are viable alternative sources of fiber for paper. Market considerations are looking up, but it will take time, effort, and education of the general public for real change to occur. There are many companies in the United States now producing kenaf including the Kenaf Paper Manufacturing Company and Vision Paper. In the case of hemp, however, legal

standings of the plant have held back industrial production and even research. The establishment of workable THC standards and cost effective enforcement mechanisms must be worked out.

It is not realistic to think that the paper making industry will change its practices overnight. Instead, it will be a slow and gradual process, as with most environmental change. New crops and new processing techniques will integrate themselves step by step over time as they increase in the market share. Therefore, it truly is up to the consumer.

A growing population in turn creates a growing demand for paper. Recycling alone cannot satisfy the demand. If alternatives are not used deforestation will become more and more of a problem that will eventually effect every individuals life. Sustainability is something the country needs to embrace. Granted, there are many barriers to the widespread adoption of sustainable practices. These include high costs for making the transition to sustainable agriculture, including tree farms, insufficient markets and services, lack of public awareness of the importance of, and support for these systems, and an absence of effective strategies for sustainable practices in teh face of rapid urbanization.

As more and more people become aware of environmental problems perhaps an overall environmental conscience and respect for the natural world will develop. We must recognize the values and benefits the forests provide us in order not to destroy them. We should be able to use the resources given and still maintain the forest's ecological integrity, minimizing the impact

of harvesting on biological diversity, respecting the rights of forest dependant communities, and conserving the forest's economic value.

REFERENCES

- Killinger, G. B. 1964. Kenaf, a potential paper-pulp crop. Second Int. Kenaf Conference. Palm Beach, FL.
- New Scientist (issn:0262-4079) v. 125 p.35 February 10 '90
- Barry, John Byrne. Is Grass Really Greener? Sierra Magazine December 1995.
- Vision Paper, a division of KP Products Inc. Albuquerque, NM, 1997.

- Follow-up on a tough sentence
- Construction Concept (Good)
- Discharged from Original Project Plans
- References not cited in text.

(B)