



**BUSITEMA  
UNIVERSITY**  
*Pursuing Excellence*

**FACULTY OF ENGINEERING  
DEPARTMENT OF GINNING AND TEXTILE ENGINEERING.**

**PRODUCTION OF HANDMADE PAPER FROM MANGO ENDOCARPS.**

**BY**

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***A Final Year Project Report Submitted in Partial Fulfillment of the Requirements for The Award of  
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## **ABSTRACT**

The most source of materials for paper are hard woods, followed by softwoods but due to environmental factors and high rates of deforestation in search for raw materials to make paper, there has been need for alternative non-wood sources which include on purpose crops grown for paper like hemp, agricultural residues like maize stalks, industrial residues like cotton linters, mango endocarps, and, naturally occurring un cultivated crops like papyrus bamboo. (*Boston, 1769*)

There has been high usage of plastic bags for packaging but they have often lead to adverse effects like non biodegradable and many others (*Chris Woodford., 2007*)and thus there has been need to look for alternative packaging materials and these can be produced from industrial residues like mango endocarps.

The purpose of this project has been conversion of wastes that is mango endocarps into useful products like handmade paper which would help in phasing out these plastic bags that have been used for packaging.

In order to achieve these various methodologies have been used including collection of raw materials, crushing of raw materials, fibre cooking, beating, pressing, calendering, sizing, drying, cutting and many others.

Various materials have been used including Sodium hydroxide (to delignify the mango endocarps), Alum (to raise the pH to slightly acidic for the work of rosin), Starch (Binder), Rosin (for creating bonds and crosslinks of fibres, promoting cohesion in the pulp/paper, AKD – Alkyl Ketene Dimer (sizing agent), Anthraquinone as an additive for protecting cellulose content, nylon mesh and clip, mixer/beater, handmade vat. And many others. (*Atuheire 2012*)

Once all these methodologies are met an ecofriendly handmade paper will be produced which will serve as a perfect replacement of PP and PE plastic bags and the project has been aimed at majorly improving incomes to mango producing countries which will be as a result of value added to mangoes and thus increasing the price. The project will help in improving the environmental situation by reducing various problems like global warming.

**DECLARATION**

I KATO PETER Reg no BU/UG/2014/95 hereby declare that this project research is my original work and that the information contained in this project is out of my hard work and research, except where explicit citation has been made and it has not been presented to any Institution of higher learning for any academic award.

Signature ..... Kato Peter .....  
Date..... 28/05/2018 .....



**APPROVAL**

This is to certify that the project under the title production of handmade paper from mango endocarps has been made under supervision and is now ready for examination.

**Supervisor: Name:** Dr. NIBIKORA Ildephonse

**Signature:** .....

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I also acknowledge the love and care of my family and loved ones, for all the financial, moral, Spiritual, and physical support.

Lastly, to all my course mates with whom I studied with at Busitema University, thank you for your team cooperation.

## **DEDICATION**

I dedicate this project research to my family members who have been there for me in the times when I needed them most.

I also dedicate it to my friends for your support morally, materially and academically and all my classmates especially Oshaba Jonan who has always been there for me and many others for the unity and togetherness in this period we have spent together here at campus not forgetting some lecturers like Dr. Nibikora, Mr. Vincent and many others who have always encouraged me.

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## **CHAPTER ONE**

### **1.1 BACK GROUND**

#### **1.1.1 History of Hand Papermaking**

According to Vickerman (1995), those who write about the history of papermaking agree that the craft was invented about 105 A.D in China. The early Chinese paper appeared to have been made from hemp waste through a process of washing, soaking and beating into pulp with a wooden mallet. A paper-mould made of a sieve of coarsely woven silk stretched on a four-sided bamboo frame was used to dip up the fiber slurry from the vat and hold it for drying. The sheets were dried in an oven. Later a smooth material, often a fine woven silk was used to cover the mould which allowed the papermakers to free the newly formed sheet to dry on a flat surface, usually the walls of their houses. The Chinese brought the art of papermaking to a high degree of perfection but after the middle of the 8th century, the quality of their paper rapidly deteriorated. Vickerman (1995) says that the oldest paper known dates to about 151 A.D. It was very thin, transparent, and of a very white color. In the 5th century, the papers were all thick and of a dull buff color while those of the latter half of the 6th and the 7th centuries were golden yellow and thin. By the beginning of the 8th century, Vickerman says the Chinese paper was thick, flabby and of a dull buff color with an uneven texture that gave a poor resistance to ink. Although papermaking was a closely guarded secret in China for 500 years, the process migrated to Korea sometime around the 6th century A.D. In Korea, paper was prepared from fibres of hemp, rattan, mulberry, bamboo, rice straw and sea weed. Eventually it is believed a Buddhist monk from Korea introduced papermaking to the Japanese. As papermaking moved to Japan, three plants were discovered that produced thin translucent papers of exceptional quality. The most common paper was made from the inner bark of the mulberry tree.

Vickerman (1995) adds that in 751 A.D, the papermaking skill had spread via war to the Arabs. Hand papermaking in India is believed to have employed many thousands of people in mills located in various parts of that country. Most of the paper made in India was used for account books by merchants and money lenders. It took nearly 500 years after the invention of papermaking in China for papermaking to reach Europe because the early paper was disfavored by the Christian world as a manifestation of Moslem culture. Spain was therefore the first European country to manufacture handmade paper during the middle of the 12th century

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