

**EXPLORATION OF FIBER FROM
SANSEVIERIA PLANT FIBERS IN
UGANDA**

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**A GUIDE BOOK SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENT FOR THE AWARD DEGREE OF MASTER OF ART AND
INDUSTRIAL DESIGN IN WEAVING OF KYAMBOGO UNIVERSITY**

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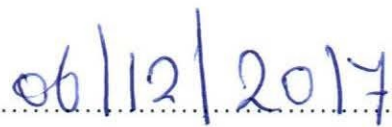
DECLARATION

This guide book is my original work and has not been presented for a degree in any other university.

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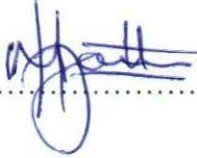
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DEDICATION

I dedicate this research report to all my friends who supported me and those who have interest in using natural fibers.

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I acknowledge my supervisors for the guidance throughout this study. I thank the staff at TEXFAD incubator who supported me in technical aspects of my study.

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ABSTRACT

The purpose of this study was to explore the possibilities of using sansevieria plant fibers as a material for the production of textile woven products. The researcher noted that communities in Masaka Bukomansimbi district have continued to use synthetic fibers in production of hand woven products. The objectives of the study were to examine the process of extracting fibers from the sansevieria plant, to explore possibilities of using sansevieria fibers as a material for weaving and to use sansevieria fibers to produce selected home interior décor products. The study was qualitative in nature and employed a cross sectional research design. Data was collected using interviews, observation, photography and studio experimentation. Findings revealed that sansevieria plant can produce fibers which are ideal for use in textile weaving. The study experimented with the fibers in production of items for home decor. The outcomes of the study were tapestry rugs; door and floor mat, plain woven table mats, pile wall hanging, macramé flower holders and twill chair cushions fabrics. The study concluded that sansevieria plant can support the weaving industry through the use of its fibers and highly recommended its use in Masaka Bukomansimbi District for production of natural fibers products for commercial purpose

CHAPTER ONE: INTRODUCTION

1.1 Overview

This chapter presents the background of the study, statement of the problem, purpose of the study, objectives, research questions, and scope of the study, the significance of the study and definition of operational terms.

1.2 Background of the study

Sansevieria is a genus of xerophytes, rhizomatous, evergreen perennial plant and its known variously as Bowstring Hemp, snake plant, zebra lily, mother-in-laws tongue, cow tongue (Chahinian, 1986). Sansevieria plant also known as *Akagwogwa akaganda* in Buganda or *Rutanga* in Ankole.

The genus sansevieria is important from the economic point of view for the numerous textile species. The medicinal uses vary from uses of leaf concoction for treatment of ear-aches, stomach-aches, tooth-aches, snake bites, wounds, skin diseases, ulcers and expulsion of intestinal worms (Kokwaro, 1993). Sansevieria was valued for their fibers which were used for making of folk items, tying, construction and washing of utensils. Sansevieria fibers are tender, smooth and have a long life span.

According to Mwansele, Sichona and Akarro. (2011), there is high pollution from textile industries; this calls attention for natural fibers because they are eco-friendly, inexpensive, abundant and renewable, lightweight, low density, high toughness, high specific properties, biodegradability and non-abrasive to

processing characteristics, and lack of residues upon incineration. Therefore, natural fibers can serve as reinforcements by improving the strength, stiffness and also by reducing the weight of the resulting bio-composite materials.

The extraction process of Sansevieria fiber is simple and results are of excellent quality, quantity and lengthy fiber useful for fabrication of large composite components. The tensile modulus of Sansevieria fiber composite is higher than those of jute and silk fiber composites and comparable to that of drumstick composite at highest volume fraction of fiber (Chahinian, 1994)

In Uganda, sansevieria plant grows wildly and is traditionally harvested for its medicinal use. In urban areas of Kampala the plant is used as an ornamental potted plant for landscape design, rationally sansevieria fibers were used to make traditional trapping net; despite the fact that the plant fibers were used to make traditional nets little is known about its fibers by local people in the community.

The species of sansevieria plant that grows naturally in tropical areas of Uganda is called Sansevieria trifasciata Uganda 20cm (Koller, 1988). It is also classified following the classification order that is the kingdom, species, family, sub-family, botanical name, common names, foliage type and finally the plant type (Kant, 2013).

Table 1: Classification of sansevieria plant; Sansevieria trifascita Uganda 20cm

Class	Name
Kingdom	Plantae
Species	Yucca
Family	Asparagaceae
Sub-family	Agavrodeae
Botanical name	Sansevieria trifascita Uganda 20cm
Common names	Snake plant, mother-in-law tongue
Foliage type	Ever green
Plant type	Cacti/ succulent, indoor plant, perennial, tropical Clumping Upright

The ever growing cost of foreign art materials is an encouraging factor for further explorations into various aids that will reduce the cost of art production (United Nations 2009). It was due to this reason coupled with the dwindling nature of fiber art that the researcher embarked on the exploration and experimentation of sansevieria plant fibers as a material for textile weaving.

According to Newton (1994), sansevieria fibers can be used to produce products for decorative purposes, gifts and souvenirs such as; tapestries wall hangings, macramé, ropes and codes. However, no effort has been taken to use sansevieria fibers in weaving. The study of sansevieria fibers and their

incorporation into art especially fiber art will encourage the development of small scale industries especially weaving industries.

Textile weaving has a number of techniques which are used to produce different woven articles; they include plain weave, twill and satin weave, macramé weave, and rug weaving. The common materials used in weaving are threads for example cotton threads, acrylic and other improvised yarns such as sisal, raffia, banana fibers among others. The above mentioned materials can be supplement by sansevieria fiber to reduce the cost of production because sansevieria plant grows naturally in the environment, and its fibers can be extracted easily. Woven products include clothes, wall hangings, bags, rugs, mat, hats, and belts among others. Kant, (2013).

The development of material resources: sansevieria fibers will enhance and advance indigenous creativity because sansevieria fibers can be applied in diversified areas of art, science and technology for production of car interior parts, papers, among others. Natural fibers have been generally considered to be more environmentally friendly than synthetics in production and disposal (United Nations 2009).

Natural fibers such as sansevieria fibers prove to be human and environmental friendly. The rise of the synthetic fibers usage has caused human, animal and environmental problems such as **pollution** through air, water and land, healthy problems such as acute **irritation of the skin**, eyes, and respiratory tracts, (United Nations 2009). A lot of **concerns** have been raised for long term

disease such as cancer and lung scarring. This study therefore intends to explore the possibilities of using sansevieria plant fibers as an alternative material for synthetic fibers for weaving. This will add a unit block on the sustainability of green environment.

1.3 Statement of the problem

Textile weaving involves use of either natural or synthetic fibers that are spun into yarns. In recent years, synthetic yarns have taken control of textile industry. Synthetic fibers are expensive leading to a stagnated textile cottage industry. These synthetic fibers are not biodegradable and pollute the environment; they can harm both human and animal life. Despite the fact that Uganda has vegetative textile matter fibers which can be extracted, textile weavers have not fully exploited the natural resources. They have continued to use synthetic fibers which have impacted negatively the environment. This study therefore explores the possibilities of using extracted sansevieria plant fibers for the production of hand woven products such as macramé, tapestry, pile and others to reduce the use of synthetic fibers which could be harmful to plants, animals and human life.

1.4 Purpose of the study

The purpose of the study was to explore the possibilities of using sansevieria plant fibers as a natural material for the production of hand woven textile products.

1.5 Specific objectives

The specific objectives of the study were to;

- (i) Examine the process of extracting fibers from sansevieria plant.
- (ii) Explore the possibilities of using sansevieria fibers as a weaving material.
- (iii) Use sansevieria fibers to produce selected home interior décor Products.

1.6 Research questions

The research questions were made basing on the objectives of study.

- (i) How can the fibers be extracted from sansevieria plant?
- (ii) How can the fibers be prepared for use in hand weaving?
- (iii) Can sansevieria fibers be used to produce interior décor products?

1.7 Scope of the study

The scope of the study consisted of the geographical scope, content and time aspects.

1.7.1 Geographical scope

The study was carried out in selected village of Bukomansimbi Kasenyi Kigangazi Masaka in Buganda region because sansevieria plants are in abundance and the researcher was well versed with the environment and the community. Studio exploration and experimentation were conducted at Kyambogo University because the results were hoped to help both undergraduate and graduate students offering weaving. More practical works

were conducted at TEXFAD incubators because it has machines for fiber extraction.

Bukomansimbi District is bordered by Gomba District to the north, Kalungu District to the east, Masaka District to the southeast, Lwengo District to the southwest and Sembabule District to the northwest Bukomansimbi, where the district headquarters are located, lies approximately 26 kilometers (16 miles), by road, northwest of Masaka. Bukomansimbi is approximately 152 kilometers (94 miles), by road, southwest of Kampala, the capital of Uganda. The coordinates of Bukomansimbi District are: 00 10S, 31 39E. (Mambule 2010)

1.7.2 Content scope

The content of the study was based on three specific objectives which were formulated from purpose of the study. The content for specific objective one included the process of extraction of fibers, identifying tools and materials used in extraction of fibers. The process was examined basing on the operation and functioning of the selected tools and materials during the process of extraction. The length of the fibers in relation to the original plant was looked at as well as the appearance of fibers for hand and machine extraction. The fibers in the waste after extraction were also examined.

To generate content for specific objective two, the extracted fibers using specific one, were dyed in natural and synthetic dyes. They were also carded, combed and spun to make yarn,

The content for specific objective three involved the exploration of fibers and yarns generated using specific objective one and two. The fibers and yarns were used to make selected interior décor products.

1.7.3 Time scope

The research was carried out in the academic year 2016-2017. The time was divided according to writing up a research proposal, data collection, studio experimentation, analysis and interpretation of findings, writing up a research report and its submission.

1.8 Significance of the study

Community: The findings will enable the public to know that sansevieria plant has fibers which can be used in the making of textile. This will help in the reduction on cost of importing yarns such as nylon yarns by the weavers of Bukomansimbi district.

Scholars: This study will be beneficial to other researchers who will use it as a reference for enriching their studies and research.

Policy makers: This study will help in preservation of the environment after knowing that some plants can be used to get fibers.

1.9 Definition of operational of terms

- Exploration:** The act or an instance of searching through or into or the activity of searching and finding out about something.
- Fiber:** Is a natural or synthetic substance that is significantly longer than it is wide. Wingate (1964)
- Natural fiber:** Is any hair like raw material directly obtainable from an animal, vegetable, or mineral source
- Sansevieria plant:** Is an evergreen, perennial plant that produces long narrow erect sword shaped leaves of about 75cm long from the rhizomatous rootstock
- Textile Weaving:** Textile weaving; is a process by which a fabric is formed by interlacing a set of vertical threads (warps) with a set of horizontal thread (weft) on a loom (Jenkins. 2003), or is a method of fabric production with distinct set of yarns that are interlaced at right angles.
- Material:** According to the study the materials are the fibers extracted from sansevieria plant leaves.

CHAPTER TWO: LITERATURE REVIEW

2.1 Overview

The literature focused on the specific objectives of the study. However the information used was related to other plant fibers especially sisal and banana fiber. The information collected was related to the extraction process of other fibers from different plants, dyeing process, spinning of yarns/yarn making and how products can be made out of other fibers.

2.2 Extraction of natural fibers

Fiber is extracted by a process known as decortications, where leaves are crushed, beaten, and brushed away by a rotating wheel set with blunt knives, so that only fibers remain, (Sudhakar, Venkatasubramanian, Singh, and Srinivas 2003).

According to Famfied (1975), fibers are of two types: natural fiber that consists of animal and plant fibers, and man-made fiber, which consists of synthetic fibers and regenerated fibers. Natural fibers are those that come from a plant, animal or mineral source (Cook, 1969). Cotton, sisal and linen are examples of plant fibers, (*see figure 1 for sisal and wool fibers*) while silk and wool come from animal sources. Asbestos is a natural mineral fiber. Figure 2.1b is illustrating wool fibers.



Fig a: Sisal natural fibers



Fig b: Wwool fibers.

Fig1: Different natural fibers

Source: bhtengda.com and laughin glambfibers.com

According to United Nations (2009), Fiber can be extracted from animals, plants and minerals. Animal fibers are wool, hair, etc. and secretions, such as silk. Plants fibers include cotton, coconut husks, sisal leaves, and linen bust.

Figure 2 is showing sources of natural fibers.



Fig a: Sisal plant



Fig b: Cotton plant



Fig c: Merin sheep

Fig 2: Sources of natural fibers

Source: ga-mineragrex.com/agronewsng.com

The leaves are hand-harvested, and their fiber is separated from the surrounding leaf tissue by decortications, a hand or machine scraping or peeling process, then cleaned and dried. The released fiber bundles, or strands, are not separated into individual fiber cells and are called fibers in the trade. See the figure 3 bellow of scraping a plant with a blunt plate to get fibers.



Fig 3: Hand extraction

Decortication of a plant leaf using hand materials

Source: common.wikimedia.com

East Africa, where production is typically on large estates the leaves are transported to a central decortication plant, where water is used to wash away the waste parts of the leaf. (Sudhakar, et al 2003)



Fig 4: Machine extractor

A machine extractor where the leaves are crushed, beaten and brushed by a rotating wheel.

Source: ecogreenunits.blogspot.com

After extraction, the fiber is then dried as seen figure 5 below, brushed for use and baled for export. Proper drying is important as fiber quality depends largely on moisture content. Artificial drying has been found to result into generally better grades of fiber than sun drying, but is not always feasible in the developing countries where sisal is produced (Msahli, Chaaboumi, Sakhi and Dream, 2007). In the drier climate of north-east Brazil, sisal fiber is extracted by teams using portable raspadores which do not use water and fiber is subsequently cleaned by brushing. Dry fibers are machine combed and sorted into various grades, basing on the previous in-field separation of leaves into size groups.



Fig 5: Drying fibers
Sisal fibers set for drying
Source: textileschool.com

2.3 Dyeing and yarn making

Apart from economic considerations, the usefulness of a fiber for commercial purposes is determined by such properties as length, strength, pliability, elasticity, abrasion resistance, absorbency, and various surface properties (Ziabicki, 1990). Most textile fibers are slender, flexible, and relatively strong. They are elastic in that they stretch when put under tension and then partially or completely return to their original length when the tension is removed.

Preparation of fibers into yarn goes into different processes which include carding, combing, drawing and finally spinning

Carding; According to Dehghani, A. et al (2000), it's the heart of spinning process. This is where the flock from bales will be open into individual fiber. Thus, it will ease to remove the excess impurities on the fiber surface. At this point, short fiber which not suitable for production in terms of length requirements will be eliminated

In a wider sense, carding can refer to the four processes of willowing, lapping, carding and drawing. In willowing the fibers are loosened. In lapping the dust is removed to create a flat sheet or lap of fibers; Carding itself is the combing of the tangled lap into a thick rope or sliver of 1/2 inch in diameter, it can then be optionally combed, is used to remove the shorter fibers, creating a stronger yarn, (Dehghani, et al 2000).

The simplest machine carder is the drum carder. Most drum carders are hand-cranked but some are powered by electric motor. These machines generally have two rollers, or drums, covered with card clothing. The licker-in or smaller roller meters fiber from the in feed tray onto the larger storage drum. The two rollers are connected to each other by a belt- or chain-drive so that their relative speeds cause the storage drum to gently pull fibers from the licker-in. This pulling straightens the fibers and lays them between the wire pins of the storage drum's card cloth. Fiber is added until the storage drum's card cloth is full. A gap in the card cloth facilitates removal of the batt when the card cloth is full. Some drum carders have a soft-bristled brush attachment that presses

the fiber into the storage drum. Figure 6 is showing different devices used in carding of fibers.



Fig a: Combs



Fig b: Drum carder



Fig c: Carolina carder

Fig 6: Carding devices

Source: [pinterest.com/pacificwoolandfiber.com](https://www.pinterest.com/pacificwoolandfiber.com)

Combing: This is a process where the yarn will be straightened again so that they are arranged in parallel manner. While at the same time, the remaining of short fiber will be eliminated completely from the longer staple fiber. By doing this, long-staple will produce stronger and smoother fabric which are highly demanded in the market.

Drawing: At this stage, it will be pulled the sliver lengthwise direction over each other. Thus, it will cause it to be stronger and thinner in production which is very important in evenness of the yarn. If there is any faults occur during process, it will still pass into the yarn. Most of manufacturer use blending process where two or more different types of fibers are blended to form a yarn. Common type of blend use is Cotton/Polyester combination, by doing this it will not only reduce the cost but also increase the performance.

A Combing machine: (See figure 2.7). In drawing, a drawing frame combines 4 slivers into one. Repeated drawing increases the quality of the sliver allowing for finer counts to be spun. Each sliver will have thin and thick spots, and by

combining several slivers together a more consistent size can be reached. Since combining several slivers produces a very thick rope of cotton fibers, directly after being combined the slivers are separated into roving. These roving are then what is used in the spinning process.

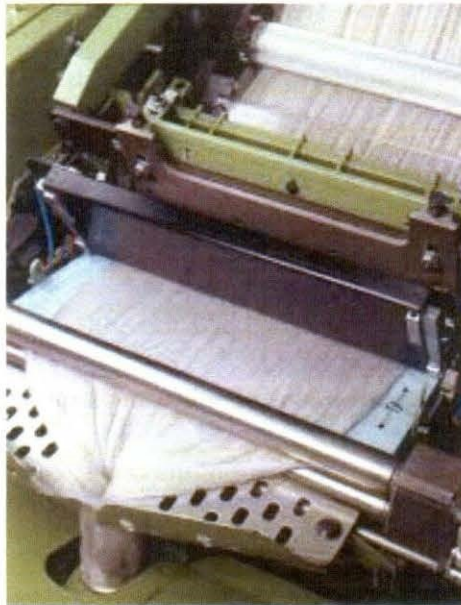


Fig 7: A combing machine
Combing cotton fibers with a machine
Source: qdyogjia textile.en.alibaba.com

For machine processing, a roving is about the width of a pencil. The rovings are collected in a drum and proceed to the slubbing frame which adds twist, and winds onto bobbins. Intermediate Frames are used to repeat the slubbing process to produce a finer yarn, and then the roving frames reduces it to a finer thread, gives more twist, makes more regular and even in thickness, and winds onto a smaller tube.

Roving: This is the final stage where the preparatory steps for insertion of the twist. Enough twist is given to hold the fibers together but still has no tensile

strength. The roving in bobbins is placed in spinning frame where it passes several sets of roller which running at high-speed to convert into yarn forms.

Twisting: The end of fiber is tied with the hook of the spindle, twist spindle in clockwise direction, if the twist too loose it may break the yarn during process.

Park: The yarn will be wrapped at the below section of the spindle

At spinning, fibers exist in continuous fibrous form, similar observations were made by Msahli et al. (2007) and International Year of Natural Fibers (2009). These continuous filaments are not used in their state, but are cut into short lengths called staple and spun in order to make them more strong by binding them together to produce a continuous yarn that is tough and durable (Nkenoye, 1993). The mechanical behavior of technical fiber is related to its fine structure and this is the basis for its utilization (Chaabouni et al. 2004). To spin, some of these short length fibers are drawn out and twisted into yarn or thread. The twist can be inserted in either clockwise or anticlockwise direction. Clockwise is referred to as “Z” twist while anticlockwise is S twist

Spinning is the twisting together of drawn out strands of fibers to form yarn, and is a major part of the textile industry. The yarn is then used to create textiles, which are then used to make

Hand Spinning: Before industrial revolution occurs, hand spinning method is widely used by people for making yarns. The principle is by using a tool such called carder or bare hand to align parallel the yarns before twisting. According to Cabman, (2005) spinning involves carding, Combing, Drawing,

Roving and Twisting. Figure 6a showing hand spinning with a drop spindle while figure 6b and c are illustrating a spinning wheel and how it's used.



Fig a: Spinning with hands



Fig b: Spinning with a spinning wheel

Source: www.paradisefibers.net



Fig c: A spinning wheel

Fig 8: Spinning with hand

Source: www.paradisefibers.net

Spinning machinery: Ring spinning is one of the most common spinning methods in the world. See figure 9 and b below. Other systems include air-jet and open-end spinning, a technique where the staple fiber is blown by air into a rotor and attaches to the tail of formed yarn that is continually being drawn out of the chamber. Other methods of break spinning use needles and electrostatic forces, (Richards, 1972).

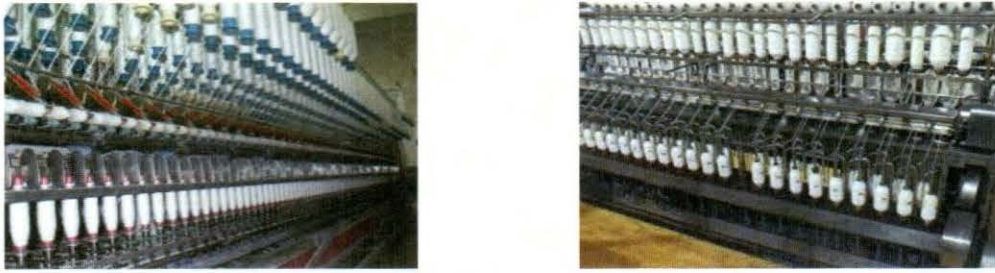


Fig 9: Ring spinning of cotton fibers

Source: qdyogjiatexile.en.alibaba.com

In a spinning mule, the roving is pulled off bobbins and sequentially fed through rollers operating at several different speeds, thinning the roving at a consistent rate. The yarn is twisted through the spinning of the bobbin as the carriage moves out, and is rolled onto a cop as the carriage returns. Mule spinning produces a finer thread than ring spinning. Spinning by the mule machine is an intermittent process as the frame advances and returns. It is the descendant of a device invented in 1779 by Samuel Crompton, and produces a softer, less twisted thread that is favored for fines and for weft (Rask and Madsen, 2011).

The ring was a descendant of the Arkwright water frame of 1769 and creates yarn in a continuous process. The yarn is coarser, has a greater twist, and is stronger, making it more suitable for warp. Ring spinning is slow due to the distance the thread must pass around the ring. Similar methods have improved on this including flyer and bobbin and cap spinning.

The pre-industrial techniques of hand spinning with spindle or spinning wheel continue to be practiced as a handicraft or hobby, and enable wool or unusual vegetable and animal staples to be used. (Nasmith, 1896).

Dyeing is the process of adding color to textile products like fibers, yarns, and fabrics. Dyeing is normally done in a special solution containing dyes and particular chemical material. After dyeing, dye molecules have uncut chemical bond with fiber molecules. Cutchon et al (2004).

Figure 10a is illustrating natural dyes while 10b is showing dyed fibers.



Fig a: Dyes



Fig b: Dyed fibers

Fig 10: Dyeing fibers

Source: artisansofmorocco.com

2.4 Use of vegetable fibers in production of home interior décor Product.

The extraction of natural fibers from plants and their uses for production of fabrics and other woven or constructed textile materials has played major role in textile development. Before this development, man had made fabrics or body covering with furs, animal skins and tree barks. The failure of these improvised materials to fulfill its purpose compelled man to further amplify their search for a suitable substance for clothing which are found in fibers. The positive impact of natural fiber in developing textile, book production and brick making industries cannot be underestimated.

The use of natural fibers for textile materials began before recorded history, Natural Resources (2016). According to Catling and Grayson (1982) bast fibers have higher tensile strength than other fibers. Therefore, these fibers are used for durable yarn, fabric, packaging, and paper. Some examples are flax, jute, industrial hemp, ramie, rattan, and vine fibers. Leaf fiber, hard, coarse fiber obtained from leaves of monocotyledonous plants or flowering plants that usually have parallel-veined leaves, such as grasses, lilies, orchids, and palms, used mainly for cordage. Such fibers, usually long and stiff, are also called hard fibers, distinguishing them from the generally softer and more flexible fibers of the bast, or soft, fiber group. Commercially useful leaf fibers include abaca, cantala, henequen, Mauritius hemp, phormium, and sisal.

Fibers are used in textile industries or used locally to produce items such as ropes, codes, macramé and wall hanging. Natural fibers have been generally considered to be more environmentally friendly than synthetics in production and disposal (United Nations, 2009). They can be used as a component of composite materials. They can also be matted into sheets to make product such as paper or felt.

Leaf fibers are chiefly employed for such cordage as rope and twine. They may also be used for woven fabrics, usually requiring no spinning for this purpose. Sisal, abaca, and henequen lead in world production (Kadolph, Sara, 2002). Many potentially useful leaf fibers remain unexploited because of the limitations of existing cultivation and processing methods and the increased use of synthetic fibers for cordage. Leaves provide the fibers for sisal, while

stems are the basis for hemp and linen cloth. The husks of coconuts provide short fibers that are often used as padding in upholstery, especially in automobiles. However, the very fine seed hairs of the cotton plant provide the most widely used of all natural fibers: cotton.

Fibers are used to produce products that can be used for decorative purposes which can be used for gifts and souvenirs for example tapestries macramé wall hangings, bags, jeweler's boxes etc. (Kadolph, 2002). See the figure 11 below for jeweler box and money purses.



Fig 11: Jeweler box made out of natural fibers

Source: www.textfad.co,ug

The use of natural fibers at the industrial level improves the environmental sustainability of the parts being constructed, especially within the automotive market. Within the building industry (Murali and Ratna, 2010), the interest in natural fibers is mostly economical and technical; natural fibers allow insulation properties higher than current materials.

Ropes Industry: This sector is the major field of sisal application. The expression 'Ropes Industry' used means here many sorts of products made of sisal such as threads, strings, yarns, twines and all types of ropes used of agriculture and cattle-raising, both on industry and commerce. (Msahli et al, 2007). See figure 12 for ropes.



Fig 12: Ropes made out of sisal fibers

Source: dir.indianmart.com

Paper Industry: According to Mural and Ratna (2010). Sisal fiber is rich in cellulose; it is widely used for the manufacturing of cellulose paste of superior quality, for the production of high quality paper. The type's bucha and refugo are mostly used for this since the length of the fiber is not important on its industrial process.

Construction Industry: Bucha is used in this sector for the polishing of ceramic coverings, and in the composition of 'pastes' for the production of linings and plasters. In the field of construction, sisal can also have other applications such as on residential houses, offering more resistance to composites, as well as replacing asbestos in the composition of roofing tiles for the covering of industrial and residential properties. The reason for the use of sisal in the construction industry is that the adding of the fiber to the base of cement (paste, mortar, concrete) significantly increases the tenacity and post-cracking behavior of the cement. (Mural and Ratna, 2010).

Carpets: (See Figure 13 for sisal carpets) Article that has considerable demand, especially after the green politics developed in Europe, Australia and in the United States, sisal carpets and rugs are no longer used only on rustic

architecture; nowadays, it decorates big offices and modern companies worldwide, (Talicuad, et al. 2008).

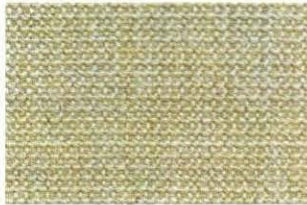


Fig a: A Plain weave carpet made out sisal **Fig b: Twill weaves carpet made out sisal**

Fig 13: Sisal fibers carpet

Source: morforug.com Kenya

Car Industry: Vegetal fibers have been largely used in the past as a composite of latex - natural rubber - reinforced with coconut fibers, for example, for the production of automobile padding, (Saravana and Kumar, 2010).

According Puglia, Biagiotti, and Kenny, (2004), Vegetal fibers have high capacity to absorb humidity which offers more comfort indispensable to professional taxi, bus and truck drivers, who spend a long time seated at their vehicles. The creation of rural and industrial jobs is another important aspect of the use of vegetal fibers. A car seat composed of vegetal fiber uses at least four times more labor than the one composed of foam, (Kumar, 2008). Still today, first-class vehicles from companies such as Mercedes-Benz use vegetal fibers for padding. Another advantage of the use of vegetal fiber is that it is not toxic. Another important aspect is the fact that the decorticated / brushed residues of the fibers, such as bucha, may also be used in the composition of plastic, (Scheruebl and Wulf, 2009).

Handicraft: Sisal fiber, threads, strings, yarns, twines, etc., may be used for the production of various types of handicrafts such as bags, rocking chairs, brushes, general decoration and so forth. Figure 14a and 14b are illustrating bags made out of natural fibers and figure 14c is illustrating a chair made out of sisal fibers. (Talicuad, et al, 2008).



Fig a: Banana fiber bags

Fig b: Sisal bags

Fig c: A sisal fibers chair

Fig14: Crafts made out natural fibers

Source; morforug.com Kenya

Tows: The Sisal Tow can be used in packing segment, generally protecting many types of products inside boxes and bags. Its discard, unlike plastic, polystyrene or other used synthetic materials, is totally harmless to the environment.

Sisal Pads: According to Hangad, (2003), the sisal pad is a product of multiple applicability, its consistency is firm, but at the same time is extremely softness, allowing good air ventilation on its inside. It is quite tough, has a strong texture and abrasive properties. It's a natural filter product, hygroscopic, thermal and acoustic. Its main usage purpose is in the manufacture of mattresses, upholstered and padded in general. Its application in the manufacture of upholstered and composite in the automotive industry is already a reality

among key brands on the market, not forgetting the policies for conservation of the environment, (Venkateshwaran and Elayaperumal, 2010). Great opportunities arise for new applications, especially for being a 100% biodegradable, (Cheung, 2009).

The rise of these synthetic fibers usage has been causing environmental problems i.e. dumping and recycling. In addition, glass fiber can cause acute irritation of the skin, eyes, and respiratory tract. Many concerns have been raised for long term disease such as cancer and lung scarring for example pulmonary fibrosis. Glass fiber does not decompose hence resulting in environmental pollutions, as well as, threatening animal life and nature along. Therefore, one of the solutions is using natural fibers instead of synthetic fibers in developing composites materials as they are renewable. Also the consumption of renewable resources would provide positive image for sustainability of green environment. (Yu, 2005).

CHAPTER THREE: METHODOLOGY

3.1 Overview

This chapter presents the research design, target population, sample size and sampling technique, research instruments and methods, reliability and validity, data collection procedures, processing and analysis, limitations of the study as well as ethical values.

3.2 Research design

The study was qualitative and it employed cross sectional design. This design was selected because the study wanted to capture the use of sansevieria as one setting and later subject it to studio exploration.

3.3 Study population

The target population was weavers of Masaka-Bukomansimbi Kasenyi Kigangazi and weavers at Kyambogo University and TEXTFAD Incubator. Bukomansimbi weavers were selected because sansevieria plant grows wildly in the area. Kyambogo University and TEXTFAD Incubator were selected because they have weaver have got authority in weaving textiles.

3.4 Sample size and sampling technique

The sample size that participated in the study included eight (8) people and (5) men from Masaka-Bukomansimbi Kasenyi Kigangazi who took part in the collection of sansevieria plant leaves. Three (3) weavers at TEXTFAD Incubator participated in fiber extraction, checking the quality of the fibers as well as the

quality of the woven products. In addition, the researcher applied purposive sampling technique to select the sample size.

3.5 Data collection techniques

The study used participant observation, photography, studio experimentation, documents and records. These were appropriate to generate data for the study. The total population was eight (8) people.

3.5.1 Participant observation

The researcher observed five people as they were collecting sansevieria plant leaves, and observed one person as he was extracting fibers from sansevieria plant leaves. In addition the researcher observed three weavers at TEXFAD Incubator as they were checking extracted sansevieria fibers and the products made out of the sansevieria fibers.

3.5.2 Photography

The researcher took picture of the sansevieria plant before it was harvested in Masaka-Bukomansimbi Kasenyi Kigangazi. The researcher continued to take pictures during studio experimentation and in production processes of hand woven products.

3.5.3 Documents and records

The researcher consulted different sources of information which included the library books, research reports, journals and the internet. These helped to back up the study in back ground, related literature and in the discussion of the findings of the study.

3.5.4 Data processing and studio experimentation

Data for this study was collected during fiber extraction, dyeing of fibers in natural and synthetic dyes, carding, combing, spinning and plying of fibers in the process of yarn making. More findings were got when samples were made test the possibilities of sansevieria fibers. All the findings were first organized, edited so as to detect any possible error and coded. The findings were classified for suitable interpretation and efficient examination.

Sketches were developed for hand woven products and they inspired by the sansevieria plant. Hand woven products like wall hangings, chair cushions, table, floor and door mats, were done using weaving looms which included a frame, table and a floor loom in the studio.

3.6 Reliability and validity

The questionnaires and interview guide questions as research instruments were given to different people with authority in weaving and fiber extraction but outside the sample size. This was done to test the effectiveness of the research instrument and they were proved effective.

3.7 Ethical considerations

The researcher acquired an introductory letter from the Dean of graduate school of Kyambogo University, which introduced the researcher to relevant authorities in the field. The researcher introduced himself to the LC1 chairperson who later introduced the researcher to the owner the land where sansevieria plants were in plenty.

CHAPTER FOUR

PRESENTATION OF THE FINDINGS

4.1 Overview

This chapter presents findings of the study. The findings were based on the specific objectives of the study, characteristics and behaviours of sansevieria plant, fiber extraction, dyeing, yarn making as well as products out the sansevieria fibers. The findings were presented, analysed and interpreted at the same time because the research is more experimental and product oriented.

4.2 Findings

The findings were noted when sansevieria plant was studied in its natural form, during studio experimentation of its fibers and at the production processes of hand woven products.

4.2.1 Sansevieria plant

Sansevieria plant grows wild in Uganda is called Sansevieria trifasciata. In Uganda it is 20cm and it has different English names which include Snake plant, mother-in-law tongue, and zebra lily. It's also known as *Akagwogwa akaganda* in Buganda or *Rutanga* in Ankole. See figure 15a for the Sansevieria plant. It has a sword shaped leaf and a mature leaf can be around 75cm height. Sansevieria is ever green; the leaves are variegated with light green and dark green bands. Sansevieria propagates by use of its rhizomes. See figure 15b for the green bands and rhizomatous roots of sansevieria plant. It was found that Sansevieria plant grows under shades of other trees and does not grow in open plain given that it needs little/less light for its growth.



a



b

Fig a: Sansevieria plant under shades Fig b: Green bands and rhizomatous roots of sansevieria plant

Fig 15: Sansevieria plant

Source: photo by the researcher (2017)

Sansevieria plant bears flowers and seeds however it's very rare to find one with seeds and flowers. Figure 16 is illustrating sansevieria plant with flowers.



Fig 16: Sansevieria plant with flowers

Source; photo by the researcher (2017)

Harvesting sansevieria leaves

Sansevieria plant were harvested by up-rooting its leaves. The leaves were harvested from Kasenyi-Kigangazi Masaka Bukomansimbi district. They were packed in sacks and transported to TEXTFAD incubator Kampala for extraction.



Fig a: collected sansevieria leaves Fig b: collected sansevieria leaves

Fig 17: Harvested sansevieria leaves

Source: photo by the researcher (2017)

4.2.2 Studio experimentations

There are a number of activities involved under studio experimentation which included the following: fiber extraction, fiber dyeing, felting, board making, yarn making; carding, combing, spinning, plying and testing yarns on a weaving loom.

Extraction of fibers from sansevieria plant

The collected sansevieria plant leaves were extracted using two mechanical techniques; one which is by the use of the hands and the other is by the use of a machine, in a process known as decortications.

Use of the hands: The leaves were scraped with a blunt knife or flat piece of wood on a large flat piece of wood. See the figure 18a and b below for hand extraction, and figure 18c is illustrating extracted fibers by use of hands.



Fig a: Hand extraction with a knife

Fig b: Hand extraction with a knife

Source: photo by the researcher (2017)



Fig c: Dried hand extracted sansevieria fibers

Fig 18: Hand extraction

Source: photo by the researcher (2017)

The use of the machine: Fibers were extracted using a power machine fiber extractor. It runs its shafts by the help of a motor. The leaves were pushed into a small space on the machine. The leaves were pulled and pushed several times until the fibers were generated. See figure 19a, c and d below are showing machine extraction process. And figure 19d is illustrating machine extracted fibers.



*Fig a: The researcher extracting sansevieria fibers with a machine
Source: photo by the researcher (2017)*



*Fig b: Inserting sansevieria leaves into a machine. Fig c: leaves scraped into
fibers by the machine*

Source: photo by the researcher (2017)



Fig d: Machine extracted sansevieria fibers

Fig 19: Machine extraction

Source: photo by the researcher (2017)

The sansevieria plant fibers were extracted using both hand and machine, however there is no clear distinction between hand extracted fibers and machine extracted fibers in terms of colour, length and strength. Hand extraction consumes a lot of time to produce a good amount of fibers and machine extraction produces a lot of fibers at a short time because its electronic supported. See figure 20 below to compare machine and hand extracted Sansevieria fibers. Sansevieria fibers are off white in color, soft, smooth, strong, some how elastic in nature and long in length, about 65cm a long ones and 45cm a short ones.



Fig a: Hand extraction sansevieria fibers

Fig b: Machine extraction sansevieria fibers

Fig 20: Extracted fibers

Source: photo by the researcher (2017)

During extraction of sansevieria plant leaves for both hand and machine extraction, by-product wastes were produced. See figure 21 for the extraction by-product waste. Hand extraction is an ineffective and a lot of fibers move with waste because sansevieria plant leaves are soft and can easily be broken by the blunt knife and tools used for extraction. Compared to machine extraction, in machine extraction less fibers moves with waste because the blunt blades move at a high speed.



Fig a: Machine extraction waste

Fig b: Hand extraction waste

Fig 21: Extraction By- products

Source: photo by the researche (2017)

Dyeing of fibers

Sansevieria fibers were dyed in natural dye; see Figure 22 for the results of dyeing with natural dyes. Dyeing is the process of imparting colors to a textile material through a dye. Dyes are obtained from flowers, nuts, barriers and other from vegetables and plants as well as from animal and mineral sources. A dye is a colored substance that has an affinity to the substrate to which it is being applied. Dye is generally applied in an aqueous solution and may require a mordant to improve the fastness of the dyes on the fibers.



Fig 22: Effect of natural dyes on sansevieria fibers

Source: photo by the researcher (2017)

Some fibers were dyed in synthetic dyes (direct/substantive dye). This was carried out in a neutral or slightly alkaline dye bath at a near boiling point with the addition of sodium chloride (NaCl) or sodium sulfate (Na₂SO₄) or sodium carbonate (Na₂CO₃). The result of dyeing of sansevieria fibers is as illustrated in Figure 23.



Fig 23: Effect of synthetic dyes on sansevieria fibers

Source: photo by the researcher (2017)

Sansevieria fibers were dyed in both natural dyes and synthetic dyes. Natural dyes reacted positively with sansevieria fibers. The naturally colored fibers were clear, bright and straight after dyeing compared to fibers dyed with synthetic dyes, the fibers looked faded after dyeing (they look salty) and folded themselves. See Figure 22 and Figure 23 for natural and synthetic dyed fibers respectively.

Yarn making

Yarn making involved a number of processes which include carding, combing, spinning and plying of fibers. Carding and combing were preliminary processes which prepared fibers for spinning. Carding was done using a drum carder however it was ineffective with sansevieria fibers because they are long in length but carding worked better on the residue of combing because they were short. Combing proved to be good because it separated and made the fibers straight.

Carding of sansevieria fibers

Sansevieria fibers were carded using a drum carder. Plain color was carded separately, then colored/ dyed fiber with a single color and finally mixed colors with plain. Figure 24 is showing carded sansevieria fiber. Carding of fiber is a mechanical process that disentangles, cleans and inter-mixes fibers to produce a continuous web or silver suitable for subsequent processing. This is achieved by passing the fibers between differentially moving surfaces covered with card clothing. It breaks up locks and unorganized clumps of fibers and then aligns the individual's fibers to be parallel with each other. Carding is done to loosen fibers for spinning.



Fig a: Plain carded fibers



Fig b: Colored carded fibers

Source: photo by the researcher (2017)



Fig c: Mixed colored carded fibers

Fig 24: Carded sansevieria fibers

Source: photo by the researcher (2017)

Combing fibers

The fibers were combed with a comb and hands, during combing the fibers were separated into small sizable bundles with the use of hands, preparing them for spinning. Combing makes fiber strands straight compared to drum carding. See figure 25 for combed fibers.



Fig a: Before combing



Fig b: After combing

Fig 25: Combing of fibers

Source: photo by the researcher (2017)

Spinning fibers into a textile yarns

The carded and combed fibers were spun into yarns using a spinning wheel. The combed fibers were separated into small units, with the help of the hands

the fibers were joined onto one another by a moving spinning wheel as spun fibers roll up on the bobbin. The fibers were removed from the bobbin and rolled up into balls. A spinning wheel is the best tool to spin sansevieria fibers. Spinning is the action or process of converting fibers into threads or yarns. See figure 26 below for spinning of sansevieria fibers on a spinning wheel.



Fig 26: Fiber spinning with a spinning wheel

Source: photo by the researcher (2017)

Ball winding

The spun fibers were rolled into balls by use a hand rolling machine. See figure 28 for rolling machine and single color rolled spun sansevieria fibers, plain and mixed colors.



Fig a: A rolling machine

Source: photo by the researcher (2017)



Fig b: showing rolled fibers



Fig c: Rolled up fibers single color



Fig d: Rolled up fibers plain color

Source: photo by the researcher (2017)



Fig e: Mixed spun fibers rolled up into ball

Fig 27: Rolled up yarns

Source: photo by the researcher (2017)

Other fibers were spun using a drop spindle. See the figures 28 below. The fibers were tied on the hook of the dropping spindle and then rotated.



Fig 28: Spinning with a drop spindle
Source: photo by the researcher (2017)

Plying yarns

Sansevieria was plied using two ply and three ply. The result of plying is the making of ropes. See the figure 29 for plied yarns. Plying is the process used to create a strong, balanced yarn. It's done by taking two or more strands of a yarn that each time has a twist to them and putting them together. The strands are twisted together in the direction opposite that in which they were spun.



Fig a: Plain two ply sansevieria fibers
Source: photo by the researcher (2017)



Fig b: Coloured two ply yarn sansevieria fibers *Fig c: Mixed colored two ply yarn sansevieria fibers*

Source: photo by the researcher (2017)



Fig d: Two plied cord sansevieria fibers

Fig 29: Plied yarns

Source: photo by the researcher (2017)



Fig e: Three ply cord sansevieria fibers

Fig 29: Plied yarns

Source: photo by the researcher (2017)

Testing yarns on weaving looms

The fibers were tested with different weaving techniques which include plain weave; pile weave and tapestry weave on a frame loom. Wheel spun sansevieria fiber, was tested on table loom and floor loom for a twill and satin weave.

Sample One: The plain weave sample one was done using two plied sansevieria fibers on the frame loom. Acrylic yarns were used as warps



Fig 30: plain weave on a frame loom with plied fibers

Source: photo by the researcher (2017)

Sample Two: This was also done on flame loom, using two plied sansevieria fibers as warps and wefts as well spun fibers

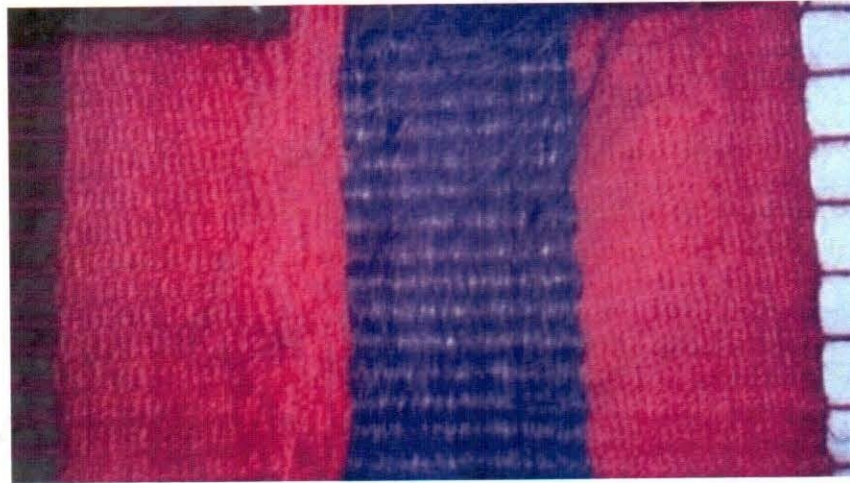


Fig 31: plain weave on a frame with wheel spun fibers as wefts and plied fibers as warps

Source: photo by the researcher (2017)

Sample Three: These samples were made on frame loom using a plain weave and a pile technique. Sansevieria fibers were used as wefts and acrylic yarns were used as warps.

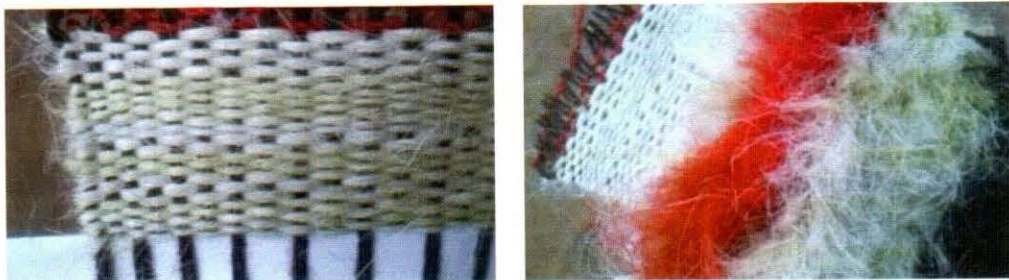


Fig a: A plain weave with spun fibers on a frame Fig b: pile weave on frame

Fig 32: plain weave and pile weave techniques

Source: photo by the researcher (2017)

Sample Three: Twill and satin weave technique was used. Cotton yarns were used as warps and wheel spun fibers as wefts on the floor and table



Fig 33: A twill and a satin weave on a table loom

Source: photo by the researcher (2017)

Felting of fibers

Sansevieria fibers were felted using a wet method of felting; where hot water mixed with soap rubbed onto the fibers and left to cool down and dry. Felting is a simple process of separating, tangling and re-locking fibers; it begins with through agitation of the fibers

Wet felting was tried, carded sansevieria fibers were wet felted. However felting was ineffective because sansevieria plant fibers contains very low fats and felting works better on fibers with a lot of fats. The product of felting cant

be used because the fiber did not stick onto each other very well. See figure 34 for the product of felting



Fig 34: Felting of sansevieria fibers

Source: photo by the researcher (2017)

Board making

The fibers were chopped/cut into very small pieces and dropped in glue which was prepared in a plastic container. The board were made by mix wood glue with the fibers. The fibers that were in touch with the surface of the container created smooth surface whereas untouched ones created a hairy surface. See figure 35 for the boards.



Fig a: Back side of the board



Fig b: The front side of the board

Fig 35: Boards

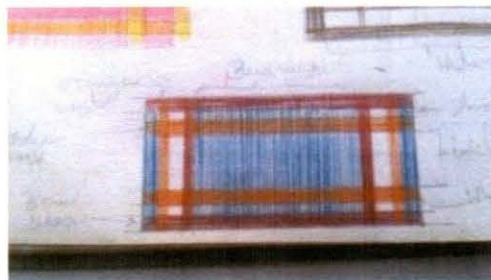
Source: photo by the researcher (2017)

4.2.3 Projects

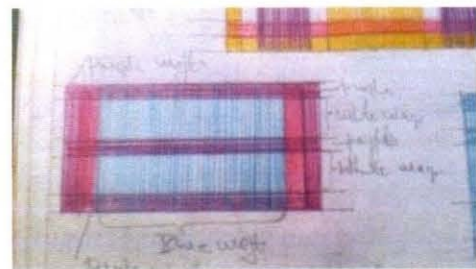
The projects were done using sansevieri fibers. The products produced included a set of table mats, one door mat, one floor mat, two wall hangings, chair cushions and four flower holders.

Project One: Table Mats

Several sketches of the table-mats were made inspired by the existing table mats. See Figure 36 for preliminary sketches of table mats



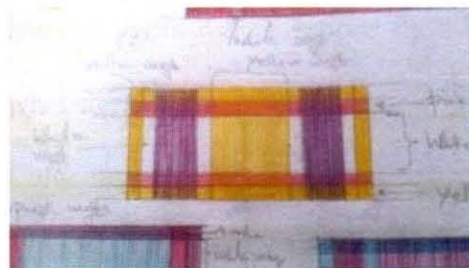
a



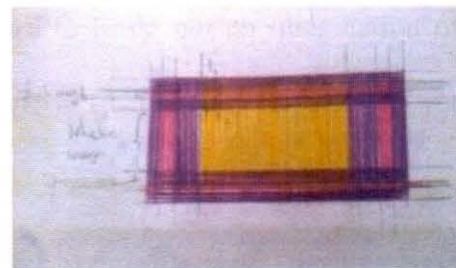
b

Fig a and b: Table mats in blue color with little brown bands and purple

Source: photo by the researcher (2017)



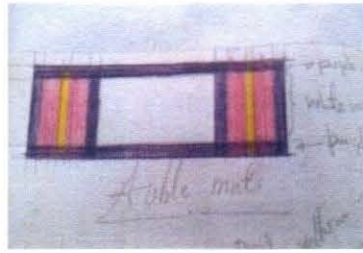
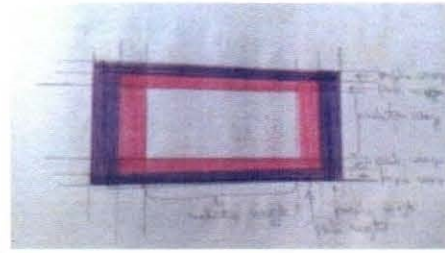
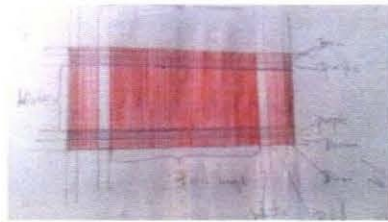
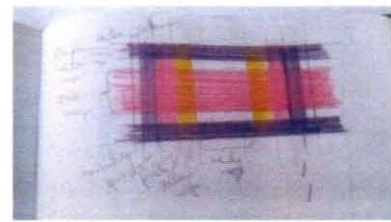
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d

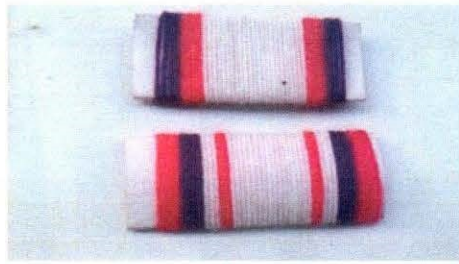
Fig c and d: Yellow table mats with purple and pink bands

Source: photo by the researcher (2017)

*e**f**Fig e and f: White table mats with pink and purple bands**Source: photo by the researcher (2017)**g**Fig g: Red table mat with white bands**i**Fig i: A pink table mat with pink and yellow bands**Fig 36: Preliminary sketches of table mats**Source: photo by the researcher (2017)***Color suggestions using acrylic yarns**

Acrylic yarns were wrapped on a card board to bring out an imagination of what the table mat will appear when sansevieria fiber used. See figure 37 for Color suggestions using acrylic yarns.

*a**Fig a: Yellow mixed with purple and pink yarns**b**Fig b: White with purple, pink and yellow yarns**Source: photo by the researcher (2017)*



c



d

Fig c and d: White with purple and pink yarns

Source: photo by the researcher (2017)

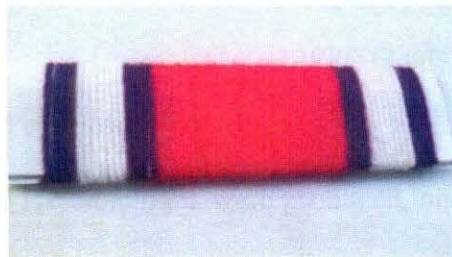


Fig e: Pink wrapped with white and purple



Fig f: White wrapped with purple, yellow and pink

Fig 37: Acrylic yarns wrapped on a card board

Source: photo by the researcher (2017)

Production process of table mats

Table mats were woven on a floor loom using sansevieria fibers and cotton yarns as warps. A set of four small mats with one runner were produced. See figure 38 for the making of table mats and finished table mats.



Fig a: Warps cotton on a loom



Fig b: Process of weaving with the fibers

Source: photo by the researcher (2017)



Fig c: A woven piece still on the loom

Fig 38: processing table mats

Source: photo by the researcher (2017)

Products

Five table mats were produced, one runner and four small ones. See figure 39c for the finished table mats.



Fig a: A small table mats

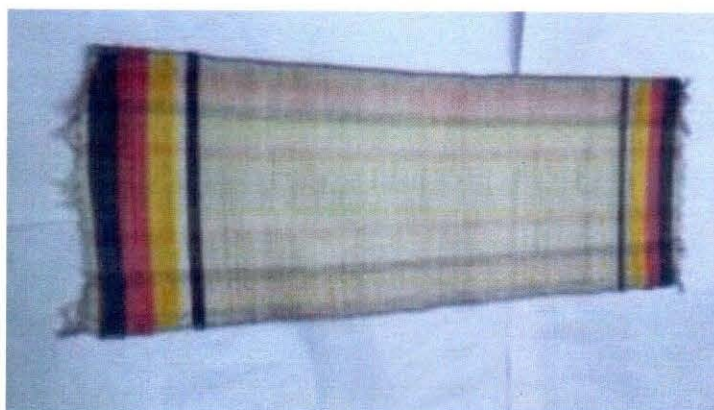


Fig b: The runner of a table mat

Source: photo by the researcher (2017)



Fig c: A Set of table mats

Fig 39: Finished table mats

Source: photo by the researcher (2017)

Suggested functions of table mats

The function of table mat is to protect the dinner table from water marks, food stains or heat damage as well as decorations.

Project Two: Macrame Flower Holders

Macramé; is a form of textile-making using knots rather than weaving or knitting. Its primary knots are the square knot (a variant of the reef knot) and forms of "hitching": full hitch and double half hitches. Two ply sansevieria cords were knotted using square knots, half hitches among others knots to make potted flower holders

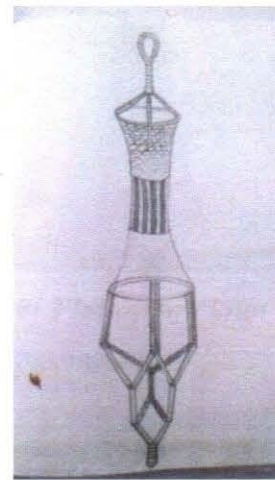
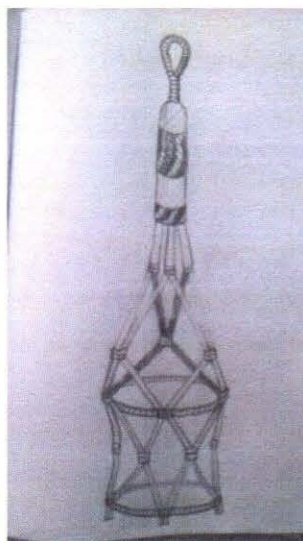
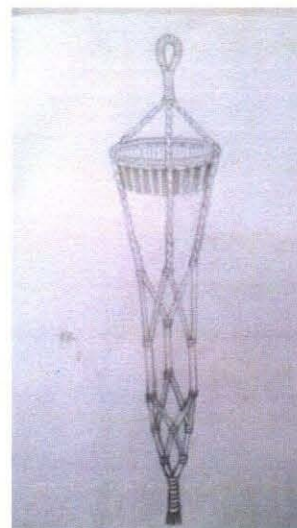
*a**b**c**d*

Fig 40: Preliminary sketches for flower holder

Source: photo by the researcher (2017)

Macrame products: four macrame flower holders were made using different macrame techniques which included flat square knots, reverse square knot and half hitches. See figure 41 for the sansevieria macramé products.

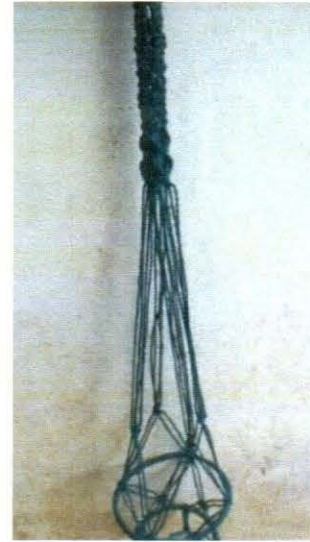


Fig a: Flat square and reverse square knots used. Fig b: Flat square knot used

Source: photo by the researcher



Fig c: Reversed square knot used

Fig d: Flat square knot used

Fig 41: Macrame products

Source: photo by the researcher (2017)

Macrame products with flowers



a



b

Fig a and b: macrame products with flowers

Source: photo by the researcher



c



d

Fig c and d: macrame products with flowers

Fig 42: Sansevieria flowers holders

Source: photo by the researcher (2017)

Suggested functions of macrame products

Macrame products can be used as flower holders, curtains as well as serving as decoration in houses.

Project Three: Table cushions

The wheel spun sansevieria yarns were used as wefts to make a twill weave on a floor loom. The twill weave was inspired by already made woven twill weaves. Figure 43a and b are illustrating a twill weave woven on a floor loom and figure 43 is showing a finished sansevieria twill woven fabric which later used to make chair cushions.

Production process of cushions



Fig a: Twill weave on a floor loom using purple and pink spun dyed fibers

Source: photo by the researcher (2017)



Fig b: The details of the twill weave

Source: photo by the researcher (2017)

*d**e*

Fig d and e: Finished woven twill sansevieria fabric

Fig 43: twill woven sansevieria fabric

Source: photo by the researcher (2017)

Products: Table cushions were cut out of a twill sansevieria fabric and a dinning of four seats was produced as a functinal product from sansevieria fibers. See the Figure 44 a and b for different chiars, and cushions figure 44c for the dinning table.

*a**b*

Fig a and b: sansevieria fiber chair cushions

Source: photo by the researcher (2017)



Fig c: A dining table with four seats

Fig 44: chair and dining table

Source: photo by the researcher (2017)

Suggested function of chair cushions

The chairs are for sitting on and decoration in houses

Project Four: Door mat

The images in the door mats are inspired by the sansevieria plant and traditional mats. Figure 45 is illustrating sansevieria plant as a source of inspiration, figure 46 is showing drawings of sansevieria plant in pencil and preliminary sketches of the door mat. Figure 47 is showing colour suggestion of the door mat and the final product. The door mat was produced using tapestry weaving techniques, cotton yarns were used as warps while sansevieria fibers were combed and used as wefts on frame loom.

Source of inspiration

The pile weave wall hanging was inspired by the green bands and sword shaped leaves sansevieria plant.



a



b

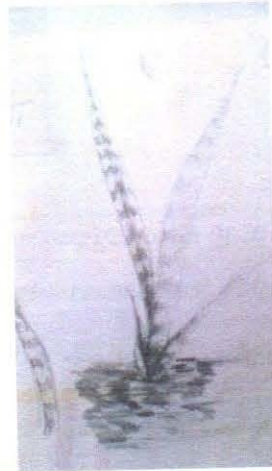
Fig 45: Sansevieria plant

Source: photo by the researcher (2017)

Preliminary sketches of door mat: the sketches were developed from the sansevieria plant. See figure 4.42 for the sketches of the door mat.



a



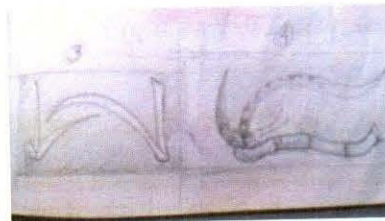
b



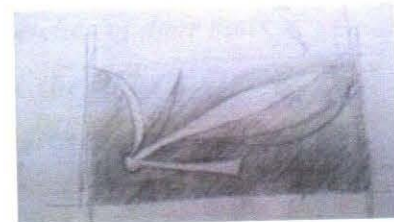
c

Fig a, b and c: Drawing of sansevieria plant

Source: photo by the researcher (2017)



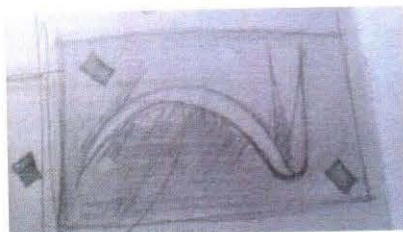
d



e

Fig d and e: Sketches of door mats

Source: photo by the researcher (2017)



f



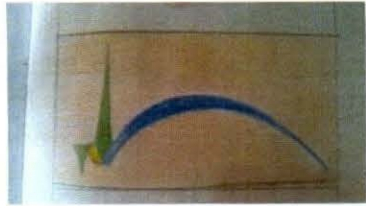
g

Fig f and g: Sketches of door mats

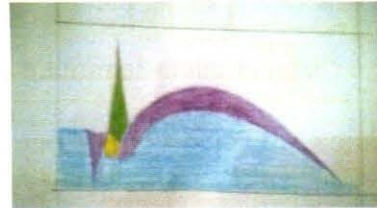
Fig 46: Preliminary sketches of door mat

Source: photo by the researcher (2017)

Color suggestions for the door mat



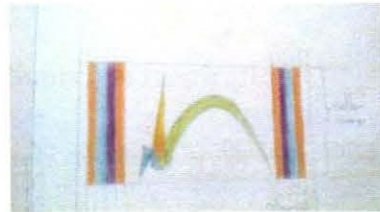
a



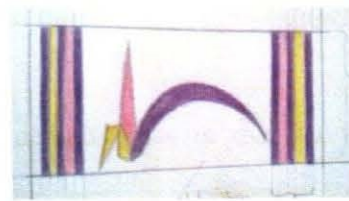
b

Fig a, and d: Color suggestions of the sketches of door mats

Source: photo by the researcher (2017)



d



e

Fig d and e: Color suggestions of the sketches of door mats

Fig 47: Color suggestions for the door mat

Source: photo by the researcher (2017)

Product: the door mat was made using sansevieria fibers as wefts and cotton yarns as warps on a frame loom. Tapestry weaving techniques were applied



Fig 48: A finished door mat

Source: photo by the researcher (2017)

Suggested function of door mat

It will be stepped on as you enter into the house

Project Five: Wall Hangings

The image in the wall hanging are inspired by the designs and patterns in the traditional mats (*omukeka*). See figure 49 for the traditional mats. Figure 50 is showing preliminary sketches of wall hanging and figure 46 for the colour suggestions. Figure 51 is illustrating the progress of making a wall hanging using sansevieria fibers as weft and cotton yarns as warps as well as a final wall hanging product. Tapestry weaving technique were employed on a frame loom.

Source of inspiration

The pliated mats has interesting patterns and designs this is due to the arrangement of the colours. The researcher used a mat because mats are made out of natural materials which are biodegradable when dumped in environment after being used. See figure 4.44 for traditional mats as a source of inspiration for wall hanging, Figure 4.45 for preliminary sketches of Wall hanging and Figure 4.46 for Colour suggestions of the wall hanging.



Fig 49: Source of inspiration for wall hanging

Source: photo by the researcher (2017)

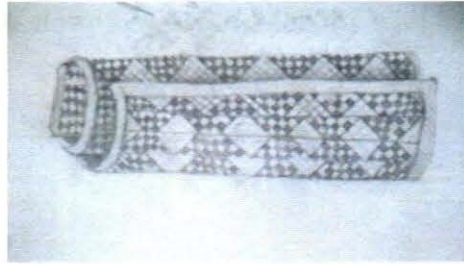


Fig a: A drawing of a mat in a pencil

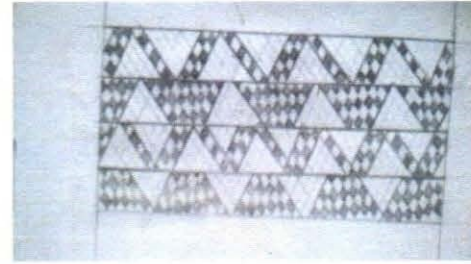


Fig b: Drawing of mat designs

Source: photo by the researcher (2017)



Fig c: Developing of designs

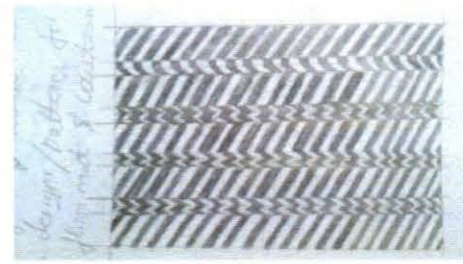


Fig d: Creation of patterns



Fig e: Colored patterns

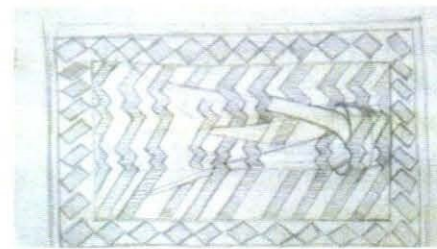
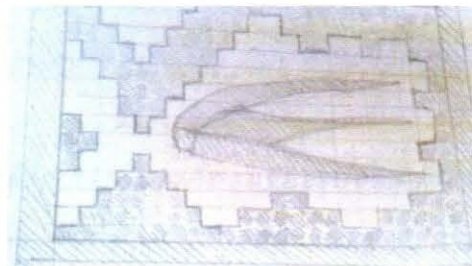
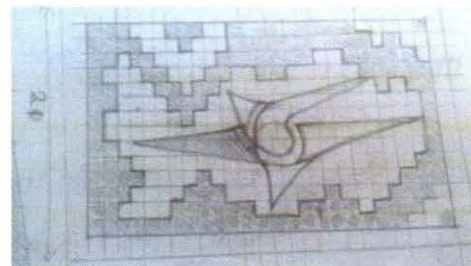


Fig f: Combining the mat patterns with sansevieria plant



h



i

Fig h and i: More sketches for the wall hanging

Fig 50: Preliminary sketches of Wall hanging

Source: photo by the researcher (2017)

Colour suggestions for the wall hanging

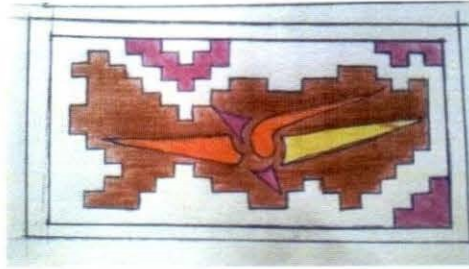


Fig a: Color suggestion, brown used as a major color n



Fig b: Red and green were used

Source: photo by the researcher (2017)

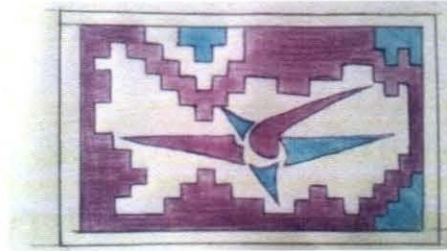


Fig c: Purple blue wall hanging

Source: photo by the researcher

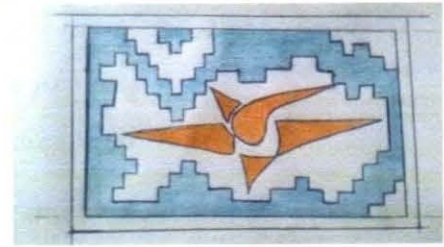


Fig d: Blue orange wall hanging

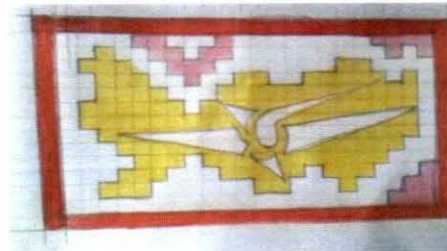


Fig e: Yellowred pink wall hanging



Fig f: Green purple orange wall hanging

Fig 51: Colour suggestions for the wall hanging

Source: photo by the researcher (2017)

Production process: Wall hanging was produced using sansevieria fibers as the wefts and cotton yarns as the warps on the frame loom. Tapestry weaving

techniques were employed. Green, red and plain colors were of sansevieria fibers were used. See figure 52 below for the production process.

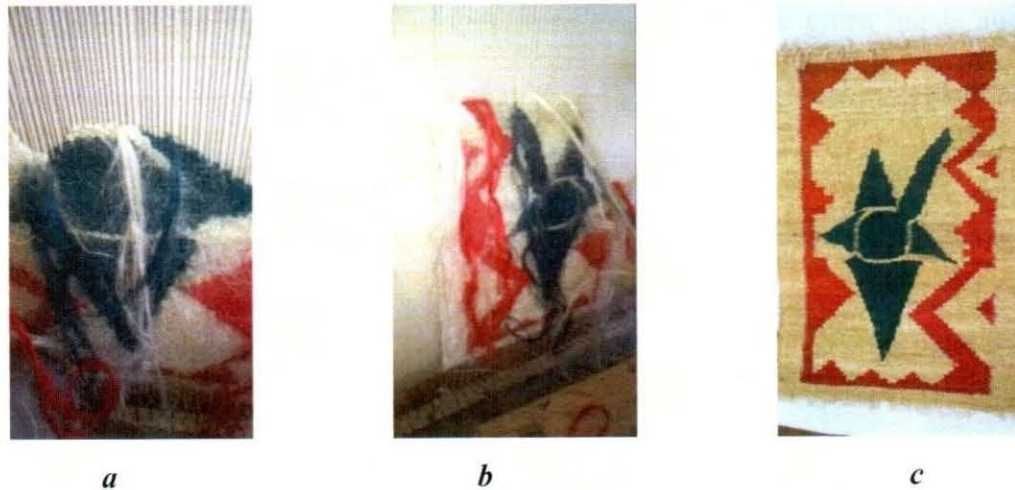


Fig 52: Production process

Source: photo by the researcher (2017)

Product: After weaving the wall hanging on the frame loom, the product was streamed with a scissor to remove the excess fibers. See Figure 53 for the finished wall hanging.



Fig 53: Finished wall hanging

Source: photo by the researcher (2017)

Suggested function of wall hangings

They are used as wall hangings to decorate rooms, they are placed against the walls especially in dinning rooms and sitting rooms.

4.2.4.6 Project Six: Pile Weaving

Source of inspiration

The pile weave wall hanging images were inspired by the green bands and sword shaped leaves of sansevieria plant. See figure 54 for sansevieria plant as Source of inspiration for pile weaves wall hanging.



*Fig 54: Source of for pile weaves wall hanging
Source: photo by the researcher (2017)*

Preliminary sketches: preliminary sketches and drawings for the images of wall hanging were developed basing on nature of sansevierian plant. See figure 56 for preliminary sketches and figure 57 for color suggestions in the images of a pile weave wall hanging.



a



b

*Fig a and b: Images for the wall hanging
Source: photo by the researcher (2017)*

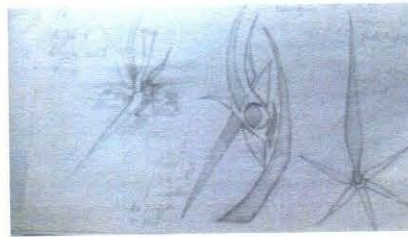


Fig c: Images for the wall hanging

Fig 56: Preliminary sketches for the wall hanging

Source: photo by the researcher (2017)



a



b



c

Fig a, b and c: Color suggestions in the image



d



e



f

Fig d, e and f: Color suggestions in the image

Source: photo by the researcher (2017)



g

i

j

Fig g, I and j: More colored images of wall hanging

Source: photo by the researcher (2017)



Fig k: The selected images for the wall hanging

Fig 57: Ccolor suggestions

Source: photo by the researcher (2017)

Production process: A pile weave wall hanging was produced on a frame loom using Ghiorde's knots. Cotton yarns were used as warps and sansevieria fibers were used to tie the Ghiorde's knots onto the warps. See figure 58 and b for the production process of a pile weaving on a frame loom



a



b

Fig 58: Production process of a pile weaving on a frame loom

Source: photo by the researcher (2017)

Products: A after the production of pile weave on frame, the product was treated off to a certain level all most 2cm height. See 59 for the finished pile weave wall hanging.



Fig 59: Finished pile woven wall hangings

Source: photo by the researcher (2017)

Suggested function of wall hangings

They are used as wall hangings to decorate rooms, they are placed against the walls especially in dinning rooms and sitting rooms.

Project Seven: Floor Mat

The floor mat was woven on frame loom using tapestry weaving techniques. Cotton yarns were used as warps and sansevieria fibers as wefts. The designs were inspired by existing floor carpets. See figure 60a, b and c for sketches of a floor mat and figure 4.52d for the production process.

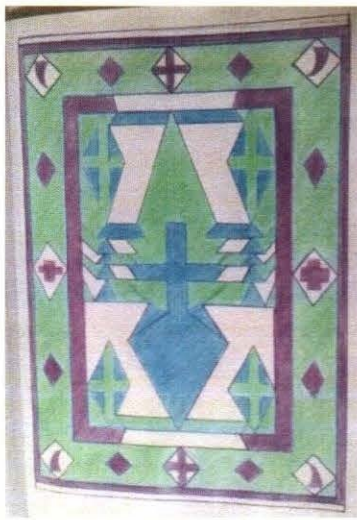


Fig a: A sketch of a floor mat in green Fig b: A sketch in black and orange

Source: photo by the researcher (2017)

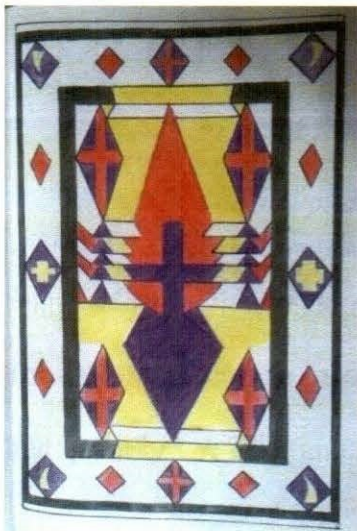


Fig c: A sketch in yellow purple an red

Fig d: Weaving a tapestry floor mat on a frame loom

Source: photo by the researcher (2017)

Product: A floor mat was made on a frame loom using tapestry weaving techniques. Sansevieria fibers were used as wefts and cotton yarns were used as warps. The product was treated off with a scissor to remove excess fibers on both surfaces of the mat. See figure 60 for the finished floor mat.



Fig 60: Floor mat

Fig c: A finished tapestry floor mat

Source: photo by the researcher (2017)

Suggested function of floor mats

The floor mats can be used to decorated the floor of the rooms. They can be lied down on the floor and stepped on or tables and chairs can be placed on top of it.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Overview

This chapter presents the summary of findings, conclusion and recommendations. They are based on the result generated during studio experiments and production processes which also guided by the specific objectives of the study

5.2 Summary

The fibers were extracted from sansevieria plant; they were off white in colour, soft, strong and long in length. The fibers were extracted by use of the machine and hands. Machine extraction was more effective compared to hand extraction.

Sansevieria fibers absorbed natural dyes than synthetic dyes which contain salts and chlorides that burnt the fibers and they looked salty and folded. Sansevieria fibers were carded, combed, separated, Spun and plied into yarns and ropes. Woven samples were made using different weaving looms and the results were positive. The fibers were tested for felting and did not work out because the fiber contains fewer fats which is a major factor felting of felting fibers.

Mats for table, door and floor, wall hangings and boards were made out of non plied sansevieria fibers. Flower holders were made out plied fibers where as chair cushions were made out of spun sansevieria fibers.

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Mats for table, door and floor, wall hangings and boards were made out of non plied sansevieria fibers. Flower holders were made out plied fibers where as chair cushions were made out of spun sansevieria fibers.

5.3 Conclusion

Sansevieria plants grows under shades shades of other plant and therefore they can be used as indoor plant. Machine extraction is most effective compared to hand extraction, so It is better to extract fibers with machine in order to save time. The fibers are strong, smoth, off white in color and a length of 40 to 60 centmeters.

Natural dyes reacted positively with sansevieria fiber. There fore natural dyes are reccommended for natural fibers.

Yarns were made using a spinning wheel, drop spindle and by plying. The spinning proved effective, therefore a spinning wheel was regarded as the best tool be used to spin sansevieria fibers.

Table mats, door mat, floor mat, wall hangings, flower holders and chair cushions were produced using sansevieria fibers. Therefore sansevieria fibers can be used to produce woven products instead of using synthetic yarns, so that the cost of buying and importing weaving materials is reduced as well as reducing environment pollution by synthetic woven products after being used.

5.4 Recommendations

The researcher did not make thorough research and test on felting of sansevieria plant fibres. More research is needed on the felting of sansenseria fibers. Fibers are used in the making of braids since sansevieria fibers are soft, thin, smooth and dyes easily the researcher suggests more reseach on the possibilities of using sansevieria fibers in scientific laboratories.

The community where sansevieria plant grows naturally, particularly in tropical should stop using synthetic yarns for weaving. They should start using sansevieria fiber because they are locally available and don't pollute the environment after being used.

The government should fund and support further research on natural fibers as one way of achieving sustainable development goals.

Art institutes schools, clubs and individual should start using sansevieria as a material for weaving because it can easily be spun into yarns which can be used on wide frames like table loom, jark loom, floor looms etc.

There is a lot of fibers which goes with the waste during extraction, so more research is needed to reduce on fiber wastage during extraction. The waste can be dried and carbonised for production of briquets for cooking.

The researcher recommended machine extraction for fiber extraction, natural dyes for dyeing and spinning wheel for spinning of sansevieria fibers.

The community should come up and grow sanasevieria plants. This will give and create job opportunities.

REFERENCES

- Alfani A Ligrone R. Fioretto A. and Virzo de Santo A (1989).Histochemistry, ultrastructure and possible significance of dead parenchyma cells with specialized walls in the leaf and rhizome of Sansevieria. *Plant Cell and Environment*. <http://dx.doi.org/10.1111/j.1365-3040.1989.tb01939>.
- Catling, D. and J. Grayson (1982).*Identification of Vegetable Fibers*. London UK.Chapman and Hall Ltd.
- Chahinian, B.J. (1986). *Sansevieria from Kenya. A basic Review* Brit. Nairobi, Cac Succ. Publishers
- Chahinian, B.J. (1994-1996). *Sansevieria from Kenya.A basic review*. Brit. Nairobi, CacSucc. Publishers
- Cheung, H. Y. Ho, M.P. Lau, K.T. Cardona, F. Hui, D. (2009). *Natural Fiber-Reinforced Composites for Bioengineering and Environmental Engineering* <http://dx.doi.org/10.1016/j.compositesb.2009.04.014>
- Cook, J. (1969). *Hand Book of Textile Fibers*. Metuchen, NJ. Textile Book Service.
- Corbman, Bernard P. (2005) *Textile: Fiber to Fabric*. New York: McGraw-Hill Book Company
- Cunningham, A. B (1993). *African medicinal plants. Setting priorities at the interface between conservation and primary healthcare. People and plants making paper* UNESCO, Paris, France.
- Cutchon et al (2004). *Handbook on Pre-treatment and Dying of Indigenous*

Plant Materials for World Class Product. PTRI, Bicutan, Taguig,
Metro Manila.Commerce.

Dehghani A., Lawrence C.A., Mahmoudi M., Greenwood B.and C. Iype
(2000). An assessment of changes in the state of fiber mass during the
early stages of the carding process. *J. Textile Inst.*

Md. Mazedul, Khan, Adnan Maroof, Islam, Md. Monirul (2013). Textile
Industries in Bangladesh and Challenges of Growth, Department of
Textile Engineering, Daffodil International University, Bangladesh,
Research Journal of Engineering Sciences, Vol.2(2), 31-37.University
of Mysore, Hassan, India.

Dr. Devaraja T.S, (2011). Indian Textile and Garment Industry.Department of
fibers.

Dr Rita Kant, PreetiAlagh (2013). International Journal of Science and
Research (IJSR) ISSN (Online): 2319-7064

E. Fortunati, D. Puglia, M. Monti, C. Santulli, M. Maniruzzaman, J. M. Kenny,
(2012).‘‘Cellulose Nanocrystals Extracted From Okra Fibers in
PvaNanocomposites’’, Journal of Applied Polymer Science,

Famfield, CA. (1975). Identification of Textile Materials. Manchester, UK.
The Textile Institute.

Gangstad E.O. Joyner J.F. Seale C.C. (1951). Agronomic characteristics of
Sansevieria species. Tropical Agriculture Journal 28: 204 – 214.

Gelfand M., Mavi S., Drummond R.B and Ndemera B (1985). The Traditional Medical Practitioner in Zimbabwe: His Principles of Practice and Pharmacopoeia. Mambo Press, Gweru.

Hangad, Stela Marie C.(2003). Textile Value of “yucca’ Draceana sp. Fiber- Part II Samay Bulletin Vo. 3 No. 1

Hans J. Koslowski. (2009). Man-Made fiber dictionary. Deutscher Fachverlag

Hedberg I., and Staugard F (1989). Traditional medicinal plants: Traditional medicine in Botswana. Ipeleng publishers, Broadhurst, Gaborone.
http://library.sut.ac.th:8080/astm/cd07012005/PDF/D157_7.pdf

James Edward Gordon and Philip Ball. (2006). The new science of strong materials, or, Why you don't fall through the floor. Princeton University Press.

Jenkins, J. Geraint. The wool textile industry in Great Britain (1 ed.), London Routledge & Kegan.

K.Murali Mohan Rao A.V.Ratna Prasad (2010). Fabrication and Testing of natural fiber composites: Vakka, sisal, bamboo and banana, Mater.

Kadolph, Sara (2002). Textiles. Prentice Hall. ISBN 0-13-025443-6.

Kauffman, George B. (1993). "Rayon: the first semi-synthetic fiber product".
Journal of Chemical Education.

Koller A.L., and Rost T.L., 1988. Leaf anatomy in Sansevieria (Agavaceae).

- American Journal of botany 75 (5): 615-633.
- Kanimozhi, M. (2011). "Investigating the Physical Characteristics of Sansevieria Trifasciata Fiber", International Journal of Science and Research Publications, Volume 1, Issue 1,
- Kokwaro, J.O. (1993). Medicinal Plants of East Africa. Edn 2. Kenya Literature Bureau, Nairobi, Kenya.
- Man-made fiber". Encyclopædia Britannica. Encyclopædia Britannica, Inc. 2013.
- Mauerberger, H.R. (1954). Mathew's Textile Fibers. 6thed New York City N.Y: John Wiley and Sons, Inc.
- Mambule, Ali (2010). Bukomansimbi Gets Free Treatment. New vision, Uganda.
- Mbugua, P.K. (1995). Systematic studies of the Genus Sansevieria thunb (Dracaenaceae Salisb). University of Reading, England. Unpublshied PhD. Thesis.
- Mohan Kumar, D. (2008). A Study of Short *Areca* Fiber Reinforced PF Composites. *Proceedings of the World Congress on Engineering, WCE* 2008, London,
- Msahli, S., Y. Chaaboumi, F. Sakhi and J.Y Dream, (2007) Mechanical Behavior of Agave Americana l. Fibers. Correlation Between Fine

- Structures and Mechanical Properties. *J. applied sci.* 7 3951-3957
- Mwamsele, HA, Sichona, FJ, Akarro, RRJ (2011). Determination of Inventory Control Policies at Urafiki Textile Mills Co Ltd ,Dar-Es-Salaam, Tanzania, *Business and Economics Journal*, Volume: BEJ-23.
- Nasmith, Joseph (1896). *The Students Cotton Spinning* (Third ed.), Deansgate, and Manchester: John Heywood Ltd, p. 637
- Natural Resources Published Online March 2016 in SciRes.
<http://www.scirp.org/journal/nr>, <http://dx.doi.org/10.4236/nr.2016.73011>
- Nazeer M.A. and Khoshoo T.N (1984). Cytology of some species of *Sansevieria*. *Thunb.Cytologia*
- Newton, L.E (1994). Observations Flowering of *Sansevieria robustain* Kenya *E. Africa Nat. Hist. Soc Bull.* **24**, 8-11
- Nkonoye P.O (1993). *Introductory Textile for Home Economists, Students of Arts and Beginners Generally*. S. Asekome and Co. Publishers. Samara , Zaria, Nigeria
- Ondiek, Gerald Ochieng. (2012). *Assessment of Materials Management in Kenyan Manufacturing Firms*, University of Nairobi,
- Pfennig, H. (1979). *Grass-like to tree-like: Sansevieria*. *Cactus. J.* (Gr. Britain)
- Puglia, D., Biagiotti, J. and Kenny, J.M. (2004). A Review on Natural Fiber-Based Composites—Part II: Application of Natural Reinforcements in Composite Materials for Automotive Industry. *Journal of Natural Fibers*.

- Rask, M. Madsen, B. (2011). Twisting of fibers in yarns for natural fiber composites. Abstract from 18th International Conference on Composite Materials, Jeju Island, Republic of Korea.
- Richards, R.T.D. (1972). "The development of the modern woolen carding machine", in
- SaravanaBavan. D. and Mohan Kumar, D. (2010). Potential Use of Natural Fiber Composite Materials in India. *Journal of Reinforced Plastics and Composites*, <http://dx.doi.org/10.1177/0731684410381151>
- Scheruebl, B.R. Wulf, B.U (2009). The use of different natural fibres in the compression moulding process: A highly competitive approach. *Int. J. Mater. Prod. Technol.*
- Sudhakar, R. Venkatasubramanian, V. Deo Singh, V. Srinivas, I (2003).

Banana fiber extractor a need based user friendly invention

(krishiVigyan Kendra, Central Tobacco Research Institute,

Rajamundry, Andhra Pradesh).
- Takawira R. (2000). Biosystematic studies of the genus *Sansevieria* (Dracaenaceae) in Zimbabwe. Master of Philosophy (Mphil) unpublished Thesis, Dept. of Biological Sciences, and University of Zimbabwe.
- Taliquad, et al. (2008). "Potential Fiber Sources For Textile Materials,"

Unpublished Undergraduate Thesis.
- Taplip, Ian M, (2006). Restructuring and Reconfiguration: The EU Textile &

Clothing Industry Adapts a Change, *Business Review*, volume 18, pp. 172-186.

Turril W.B (1959). *Sansevieria*. National Botanic Garden. Lucknow-India
Bulletin 46: 1-29.

United Nation (2009). International Year of Natural Fibers United Nation
General Assembly, Session 61 Resolutio 189.

Venkateshwaran, N. and Elayaperumal, A. (2010). Banana Fiber Reinforced
Polymer Composites—A Review. *Journal of Reinforced Plastics and
Composites*, <http://dx.doi.org/10.1177/0731684409360578>

Yu, C. (2005). Sisal. In *Bast and Other Plant Fibers*, 1st ed.; Franck, R.R., Ed.;
Woodhead Publishing Limited: Cambridge, UK, pp. 228–273.

Ziabick, A. (1990). *Fundamentals of fibers formation*. New York City N.Y:
John Wiley and Sons, Inc.

APPENDIX
INTERVIEW GUIDE

Questions for Respondents of Masaka Kasenyi-Kigangazi Bukomansimbi district

Dear Respondent.

This is an academic research; it will help in the scholarly studies on the topic **“exploration of sansevieria plant fibers as a material for textile weaving in Uganda”** Kindly respond to the following questions by giving sincere and reliable information.

Your response shall be confidentially handled; your help will be highly appreciated.

Qn.1 Do you know sansevieria plant (akagwogwa akaganda)?

Qn.2 How does it look like?

Qn.3 Where can it be found at this village?

Qn.4 How can you extract fibers from its leaves locally?

Qn.5 How can you prepare the fibers extracted before using them to produce functional items?

Qn.6 Which products do you make out of the extracted fibers?

Questions for Respondents at TEXFAD Incubators

Qn.1 Do you know sansevieria plant (akagwogw aakaganda)?

Qn.2 How can you extract fibers out of it?

Qn.3 How can you prepare the fibers extracted before using them to produce functional items?

Qn.4 Which products can you make out of the extracted fibers?

Qn.5 How do you check the quality of the fibers and the quality of the hand woven products?


KYAMBOGO UNIVERSITY

GRADUATE SCHOOL

CERTIFICATE OF CORRECTION OF THESIS

Department ART AND DESIGN Faculty VOCATIONAL STUDIES

Degree MASTER OF ART AND INDUSTRIAL DESIGN

Candidate's No: 151021014537 Signature 


Registration No. 15/1/14537/GMID/PE

Title of Thesis/Dissertation.....

EXPLORATION OF FIBER FROM
SANSEVIERIA PLANT FIBERS IN UGANDA

DECLARATION BY SUPERVISOR OF CORRECTIONS

I have received the required four bound copies of the above named thesis (including the original). I have examined these copies and I certify that the corrections have been made as instructed by the Board of Examiners of this Faculty.

NAME: Kimani Muriu SIGNATURE 

(SUPERVISOR OF CORRECTION)

DATE 06/12/2017

NAME: Mubiga E SIGNATURE 

(HEAD OF DEPARTMENT)

DATE 07/12/2017

NAME:.....SIGNATURE.....

(DEAN OF FACULTY/SCHOOL)

DATE.....

NAME:.....SIGNATURE.....

(DEAN OF GRADUATE SCHOOL)

DATE.....

N.B. this dully filled certificate (6 copies and a soft copy (CD) should be forwarded the Dean Graduate School through the Dean of the faculty