

TRAINING MANUAL

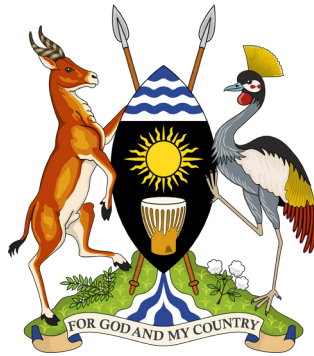
**ON POST-HARVEST HANDLING, STANDARDIZATION AND
DIVERSIFICATION OF SHEA BUTTER TREE PRODUCTS**



*empowered lives
resilient nations*

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JULY 2017



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This publication was produced by the National Environment Management Authority with funding from the Global Environment Facility through the United Nations Development Programme Uganda Country office.



FOREWORD

The national Environment Management Authority (NEMA) contracted Advanced Afrika to put in place measures for increasing income generation among rural women producers and processors of shea butter tree products in Abim, Agago and Kitgum district in northern Uganda. One of the task in accomplishing the assignment was production of a training manual.

The training manual has been designed to equip women producers and processors of shea butter tree products with skills in post-harvest handling, standardization and diversification of shea butter products. The use of improved techniques in handling and storing harvested shea nuts by farmers will help protect the nuts from damage with a goal to improve quality of products produced and processed from shea nuts and enhances value addition.

The training manual provides tools and basic business skills related to how to make and generate income from shea butter products. This manual will, therefore, provide guidance in the post-harvest management training sessions effectively to the women producers and processors of shea butter tree products in general and those in Abim, Otuke, Agago and Kitgum districts in particular.

The manual is based on a participatory learning approach. This will require active engagement of the women producers and processors during the training sessions regardless of the participants' level of formal education. Each participant will be welcome to express his/her own ideas. This will also allow for experience-sharing, group discussions and role-play, among others. The trainer will be responsible for creating the conditions and the environment in which participants can discover and practice the imparted knowledge and skills. This training manual has purposely been written for the women producers and processors of shea butter tree products to acquire additional knowledge and experience during the participatory training in post-harvest handling, standardization and diversification of shea butter tree products.



Dr. Tom O. Okurut
Executive Director, NEMA

ACKNOWLEDGEMENTS

The preparation of the training manual on post-harvest, diversification and standardization of shea butter tree products has been made possible with input from various stakeholders at local, district and national levels. In particular, NEMA would like to appreciate the contribution of the district local governments of Abim, Agago, Kitgum and Otuke districts together with selected representatives of the women groups from some sub-counties that participated in the training undertaken by Advance Afrika.

NEMA's gratitude also goes to the various partners, including though not limited to United Nations Development Programme (UNDP), District Local Governments of the participating districts, Non-Governmental Organizations (NGOs), Community Based Organizations (CBOs) and more specifically women groups involved in production and processing of shea butter tree products.

Last but not least, NEMA would like to thank the Project Coordinator (Mr. Sabino Francis Ogwal), the Project Manager (Mr. James Okiria-Ateker) and his team for the good work done.

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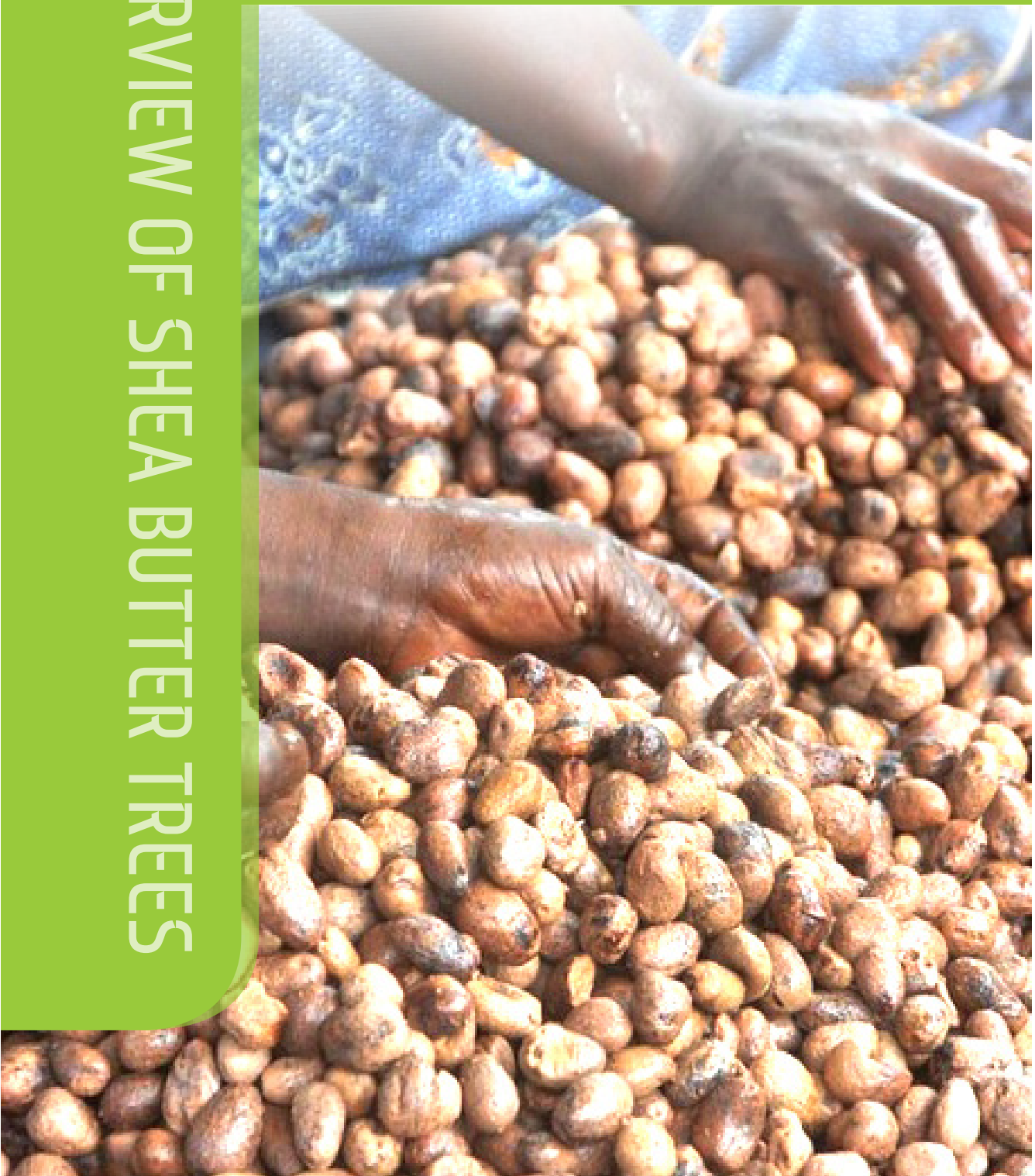
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OVERVIEW OF SHEA BUTTER TREES



Unit 1

OVERVIEW OF SHEA BUTTER TREES AND THEIR PROTECTION

UNIT AIM

The aim of the unit is to provide trainees with background information about the shea butter tree and its protection.

Unit objectives

By the end of this unit, the trainees should be able to;

- Understand the origin of the shea trees, as well as the values and importance of their products.
- Identify practices that lead to the extinction of the tree and basic protection methods.
- Determine how to obtain good quality fruits and.
- Know how to harvest shea nuts and the precautions to take during harvest.

Session 1.0: Overview of Shea Butter Trees

1.1.1: INTRODUCTION

The shea tree is an indigenous and exclusive asset in West, Central and East Africa. The shea tree, formerly named *Butryospermum paradoxum* and now called *Vitellaria paradoxa*, grows naturally in the wild in the dry savannah belt of West Africa, from Senegal in the west to Sudan in the east, and on to the foothills of the Ethiopian highlands. The shea tree thrives in 19 countries across the African continent, namely Benin, Ghana, Chad, Burkina Faso, Cameroon, the Central African Republic, Ethiopia, Guinea Bissau, Côte d'Ivoire, Mali, Niger, Nigeria, Senegal, Sierra Leone, Sudan, Togo, Uganda, Congo and Guinea.

In Uganda, the tree is mainly found in the eastern and northern regions. Scientifically called *Vitellaria paradoxa*, the shea tree is known by several local names in Uganda: ekungur (Ateso), komure (Kakwa), kinakongole (Lugwere), awa (Madi), yao (Luo) and komoro (Lugbara). It is a tree species that grows in the following districts of Uganda: Abim, Adjumani, Amolatar, Amuria, Amuru, Apac, Arua, Budaka, Bukedea, Bulisa,

Dokolo, Gulu, Kaabong, Kaberamaido, Katakwi, Kitgum, Koboko, Kotido, Kumi, Lira, Maracha-Terego, Masindi, Moyo, Nakasongola, Nebbi, Oyam, Pader, Pallisa, Soroti and Yumbe.

1.1.2: IMPORTANCE OF THE SHEA BUTTER TREES TO COMMUNITIES IN AREAS WHERE THEY GROW

The shea tree has long had a significant positive impact on the human populations living in these areas, providing a staple edible oil, fuel wood, building material, soil protection and honey from the bee pollinators. The tree produces shea nuts from which shea butter is extracted. The butter contains countless therapeutic virtues. Both the shea nut and shea butter are international commodities today, and they constitute a primary source of monetary income for rural women in the regions in which they are found. The commodity is now attractive for markets across Europe, America and Asia.

SESSION 1.2: PROTECTION OF SHEA BUTTER TREES

1.2.1: UNDERSTANDING OF SHEA TREES

What is a shea tree? (Participants should share their understanding about the tree)

The shea tree is a traditionally protected indigenous tree in many of the areas where it grows. The tree is not traditionally planted in a domesticated manner but rather selectively managed through agroforestry systems.

In 1865, the West African shea tree was re-classified as *Butyrospermum parkii* and the East African sub-species was classified as *Butyrospermum nilotica* by Theodore Kotschy.

The shea tree, though slow in its initial growth, has a useful fruit bearing life span of 15–20 years and can live for more than a hundred years.



1.2.2: THE VALUES AND IMPORTANCE OF SHEA TREE PRODUCTS

(Below is a guide for facilitators on the values and importance of the shea butter trees. However, the facilitators should first ask participants to share their knowledge on the values and importance of shea tree and its products)

To ensure sustainable management of shea trees, communities need to consider ways to add value to the shea tree products. This will most likely provide practical, market-based incentives for the sustainable management and conservation of shea trees and their resources. It is important to note that one of the key shea tree products helps rural women immensely to engage themselves in fair trade. This allows the women to make a decent living and fight poverty.

All parts of the shea butter tree are of immense value. The tree is rich in vitamins and minerals and is not lacking in protein. Below is a summary of the values and importance of shea tree products from its leaves, branches, fruit, seeds, stem and roots, nuts and butter.

Values And Importance Of Shea Tree Products

SHEA TREE PRODUCTS	VALUES AND IMPORTANCE'S
Leaves	<ul style="list-style-type: none"> • Shea tree leaves are used as medicine to treat stomachache in children. • The young leaves can be used as a vapour bath for the treatment of headaches and also as an eye bath. When the leaves are put in water, it forms a frothy opalescent liquid, which is used to bathe the head of the patient. • The leaves of the shea butter tree are believed to offer spiritual protection.
Branches	<ul style="list-style-type: none"> • The branches of the shea tree are believed to offer spiritual protection too. In some communities when a woman goes into labour, the branches are hung in the doorway of her hut to protect the newborn baby from evil. • In addition, its branches are used to cover the dead prior to their burial.
Fruits and seeds	<p>The fruit has a seed which is rich in the mixture of edible oils and fats known as shea butter. This is the essential nutritional resource for increasing income generation for rural households, mainly for women.</p>
Roots and the bark	<ul style="list-style-type: none"> • The roots and the root bark are ground into a paste and taken orally as a cure for jaundice as well as for treating diarrhoea and stomachache. • The bark of the shea tree can be boiled and taken as a beverage. Studies have revealed that the beverage can treat diabetes. • The root bark is also boiled and pounded and used for the treatment of chronic sores in animals such as horses. • The bark mixed with other species is used in baths; this can be used in a foot bath to help extract jiggers and it can also ease child delivery in women in labour. • A bark mixture has the capacity to neutralize the venom of the spitting cobra when used as an eyewash.

Wood	The best charcoal comes from the shea tree. However, farmers are encouraged to burn charcoal from other tree species.
Tree sap	<ul style="list-style-type: none"> • When the sap from the tree is heated and mixed with palm oil, glue is produced. • The gum formed from the tree can be used to fill up cracks or punctures in drums.
Shells /husks from nuts	<ul style="list-style-type: none"> • The husks that are separated from the nut to release the kernel purify water and can remove substantial amounts of heavy metal from aqueous solutions. • The husks are also pounded and used for plastering traditional mud houses to beautify them and promote their lifespan by making them impervious, thus reducing their absorption of moisture. • The husks can also be used as manure once decomposed.
Residues from shea butter production	<ul style="list-style-type: none"> • Once mixed with clay, the thick, brownish residue hardens and makes it stronger before it is moulded. Therefore, this mends cracks in the exterior walls of mud huts, windows, doors and traditional beehives. • The residues can be used to decorate traditional mud houses. • The residues can also be used as animal feeds.

Shea Butter	<ul style="list-style-type: none"> • One of the significant values of shea butter is that it has been used for centuries in treatment of the skin, particularly for newborn infants. • The butter is also applied to the umbilical cord of newborn babies to hasten its healing. This is a preferred body cream for newborn babies among mothers. • Shea butter is considered pure since it contains natural moisturizers and vitamins that give babies a smooth skin. • The butter also has effects on skin aging by preventing enzymes that degrade skin proteins. It is also used as an anti-microbial agent for the promotion of rapid healing of wounds. • The butter is an anti-inflammatory unguent for treating arthritis; it is used in the treatment of eczema and other skin conditions, including herpes lesions. • Shea butter also has been clinically proven to lower human cholesterol. • It is an important part of the diet of people living in the areas where it grows and it is used for frying and making stews.
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Other studies indicate several benefits that one can obtain from a shea tree and its products.

Various uses of the shea (from: Nafan, 2001)

USAGE	PHARMACEUTICAL AND MEDICAL	OTHER USES
Leaves	<ul style="list-style-type: none"> • Analgesic (head, stomach, eyes) • Care of oedemas, decline of sight, stomach ulcers • Restores menstruation 	<ul style="list-style-type: none"> • Occult practices ('disenchantment' of houses, cleansing ceremonies) • Increases the yield of shea oil
Roots	<ul style="list-style-type: none"> • Treatment of jaundice, rheumatism, stomach problems • Restores menstruation 	

<p>Mistletoe (<i>Tapinanthus</i> sp.)</p>	<ul style="list-style-type: none"> • Fight against breast cancer • Antibiotic (dysentery) • Antipyretic • Analgesic • Used to facilitate childbirth (psychoprophylactic) • Treatment of jaundice, rheumatism 	<ul style="list-style-type: none"> • Used in the training of dogs • Seed to bring good fortune • ncreases the productivity of crops • Eduction • Increase in fertility (humans and animals)
<p>Bark and latex</p>	<ul style="list-style-type: none"> • Treats problems of the heart and of the teeth • Cough suppressant • Treats jaundice, bleeding gums, stomach ulcers... • Disinfects wounds and treats scorpion stings 	
<p>Wood</p>		<ul style="list-style-type: none"> • Biomass (fuel wood, charcoal) • Woodworking • Bark used in dyeing
<p>Press cake and nut residues</p>		<ul style="list-style-type: none"> • Source of potassium hydroxide for soap factories • Cooking fuel • Fight against termites

Shea butter	<ul style="list-style-type: none"> • Care of sprains • Massage • Healing skin • Revitalizing (fatigue) • Adjuvant-eye drops (care of eyes) 	<ul style="list-style-type: none"> • Culinary (food oil, preservation of food (meat in particular)) • Cosmetics (skin cream, hair treatment) • (Traditional) soap-making • Fuel for lamps • Anointing oil (in traditional ceremonies) • Waterproofing (houses)
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1.2.3: MAINTAINING GOOD YIELDS OF SHEA BUTTER TREE PRODUCTS

DISCUSSION POINTS (15 MINUTES)

- (a). What are some of the factors that have significantly influenced the low yields of the shea nut products?
- (b). Bad practices that have resulted in loss of shea trees and low yields
 - Cutting down of shea trees mainly for charcoal burning.
 - Lighting bush fires during hunts for wild animals for bush meat.
 - The presence of insects and parasites.
 - Droughts lead to wrinkling of the seeds or even abortion of shea fruit growth.
 - Strong winds or heavy rain can make the flowers drop off.
 - Caterpillar species are also common and affect the foliage and fruits of the shea tree. One insect that is important for the shea tree, like for many trees, is the bee, which is responsible for the pollination of the fruits.
- (c) How to grow shea trees and ensure that they bear good quality nuts

Shea trees are preserved and their exclusive plantations are restricted to avoid shading of other crops. However, the operations of weeding and the management of soil fertility adopted for other crops also facilitate shea tree growth.

Steps taken to grow and protect shea trees:

- i. Choose a large area with well drained soils so that the roots do not get damaged.
- ii. The soils should be clay or sandy.
- iii. 5-6 metre spacing to grow shea trees.
- iv. Use an organic fertilizer or humus.
- v. Use a weed trimmer or a comparable tool to remove the weeds around the tree.
- vi. To protect the tree from bugs and insects, smoke the tree but take extra caution so that the tree is not burnt.

1.2.4: HARVESTING SHEA NUTS

- (a) Discussion points (30 minutes)
 - i. Preparation before harvesting and tools used for harvesting.
 - ii. Timing of harvesting.
 - iii. Precautions during harvesting.
 - iv. Process of harvesting in your community.

The shea trees bear fruit which will take 4-6 months to ripen. Each tree gives an average yield of 15-20 kg of fresh fruits with an optimum yield of 45 kg. A kilogram of the fruit produces around 400 grams of dry seeds. The fruit, which is green in colour, has a fleshy edible pulp rich in vitamins and minerals and not lacking in protein either.

- (b) How shea nuts are harvested

Shea nut harvest is a straightforward affair, involving the simple collection of ripe fruits from the ground.

When the shea fruits ripen, they fall to the ground by the action of wind, rain or birds or simply as a result of their own weight, and they are gathered by hand. The tools used during the harvest or collection of shea fruit include baskets or basins.



- (c) Timing for harvesting
 - It is very important to harvest shea fruits at the correct time.
 - The fruit of the shea tree ripens during the annual hunger season when food supplies are at their lowest ebb and agricultural labour requirements

are at their peak.

- The fruits are harvested between April and August each year.

If harvested too early, the seeds will shrink when drying, which lowers their oil content and quality. Delays in harvesting will result in poor quality seeds due to mould infections and subsequent contamination of the nuts.

(d) Precautions during harvesting

- You should avoid early picking when there is little light and visibility is low. You run the risk to get bitten by scorpions or snakes, since snakes are also attracted to the shea fruit.
- During harvesting, care should be taken to make sure that produce is not affected in quality or quantity.
- The fruit should be harvested at the right stage, depending on the intended use.
- The timing should also be correct and weather conditions should be dry because wet weather enhances the rotting of produce.
- Delayed harvesting is not encouraged as many crops can get spoilt, thus reducing the quality and quantity available for consumption and sale.

Unit 2

POST-HARVEST HANDLING OF SHEA NUTS

UNIT AIM

The aim of the unit is to enhance the skills of women producers and processors of shea butter tree products on post-harvest handling of shea nuts.

Unit objectives

At the end of this training session, the participants will be able to:

- Identify ways and techniques of improving post-harvest handling of shea butter tree products and,
- Use techniques of improving shea butter production.

SESSION 2.0: POST-HARVEST HANDLING OF SHEA NUTS

2.1: INTRODUCTION

Post-harvest handling or management is the stage immediately following harvest. It determines the final quality of a product.

2.2.0: ACTIVITIES UNDERTAKEN DURING POST-HARVEST HANDLING OF SHEA NUTS

The quality of shea nuts and butter, both of which are also exported in large quantities, is basically dependent upon post-harvest processing. The steps listed below contribute to the improvement of quality in production. After the shea nuts are collected, they go through five processing steps before they are placed in storage and put out for sale or before butter can be extracted from them. The steps are numbered in the figure below;

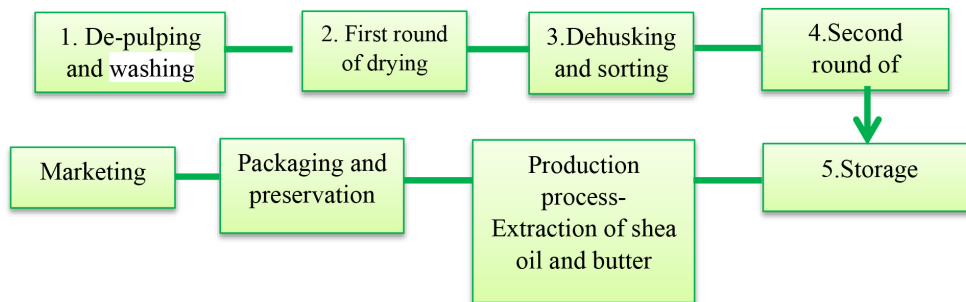


Figure 1: Steps in post-harvest handling of Shea tree products

This training manual provides information useful for the women producer groups training in post-harvest handling practices of the shea tree. Adopting such practices would help improve on the quality and value addition to the product.

2.2.1: DE-PULPING

Following harvest, the pulp of the shea fruit is removed. The pulp contains high amounts of sugar that encourages the growth of fungi, which decreases the oil content of the kernel. So the purpose of the removal of pulp is to prevent further growth of fungi.

The traditional methods of pulp removal included a fermentation process in an earthen pit. The fruit is buried in the ground for several weeks to ferment and putrefy. In other cases, the fruits are simply allowed to decay and then removed using hands or fed to farm animals and the remains are then collected to recover the nuts. For example, birds and other animals eat the fruit pulp and once satisfied, drop the nuts. This is a cause of concern to the shea nut collector.

What to take note of: Whereas the high temperatures of fermentation may help to denature growth enzymes, killing the seed and minimizing enzymatic oxidation, *the fermentation process may also taint the kernels with an unpleasant odour. Fermentation is therefore discouraged owing to this risk of contamination.*

2.2.2: WASHING

After depulping, the nuts are boiled to terminate the germination process. This is, however, done in West Africa. This step is also referred to as washing. The boiling is done in big pots containing some water and put on a traditional hearth. Parboiling requires a great deal of fuel wood, with corresponding impacts on the environment.

This has not been the practice in eastern Africa. Instead, the nuts are washed to remove all the dirt, stains and small insects attached. The seeds are dried in the sun for about two weeks and thereafter, the shells are removed.

2.2.3 DRYING

The boiled nuts are then dried in the sun for a couple of days. At the end of this drying step, the moisture content of the nuts will be approximately 8% of their weight (JICA, 2007).

HOW TO OBTAIN GOOD YIELDS DURING THIS STEP

The boiled nuts are sun-dried on drying racks, cemented ground or a mat. This will ensure proper drying and that no moisture is formed. If drying by machine is required, a hot air-drying oven or a microwave drying machine can be used.

Shea nuts will turn black if they are not well dried, for example if they are wetted by rain or when direct sunlight is not available. Poorly dried or black nuts will fetch lower prices on the market than well-dried kernels.

Well-dried nuts will produce a rattling noise when shaken.

2.2.4: REMOVAL OF SHELLS

At this point, the shell is removed to free the kernel. The shell can be easily removed by hand after the nut is cracked. Cracking of the shell is done by gently pounding the nuts with a mortar, pestle or stone. There are shellers/separators suitable for processing shea nuts.



At this stage the kernels are ready for transformation into shea butter. As a form of value addition the shells can be used as a source of energy once burnt or decomposed into a fertilizer.

2.2.5: DRYING THE KERNELS

The kernels are washed with clean water. The kernels are then sun-dried for another 3 to 5 days to remove the moisture. After this the moisture content in the kernels should be about 1% of their weight (JICA, 2007). This is done to prevent fungi from growing in the nut.

2.2.6: SORTING AND STORAGE

The kernels will then be sorted to remove bad seeds and impurities. Afterwards, they are stored in big baskets or in sacks to be used after the harvest. Extension training curricula used by shea development projects in eastern Africa recommend the use of traditional storage methods, such as home granaries or baskets stored off the floor. In West Africa, in addition to traditional granaries and baskets, jute bags from the cocoa industry are more widely available; jute fibres allow air flow to regulate moisture levels, but must be stored at least 25 cm off the floor.



Methods of storage of shea kernels in villages include storage of the dried nuts in granaries, inside ovens, on shelves and in jute bags. Experience shows that properly dried nuts can be stored for a year or even longer.

2.3: WHAT TO CONSIDER DURING STORAGE

- A tightly woven plastic mesh does not allow free circulation of air, and the condensation of kernel moisture over a diurnal temperature gradient stimulates the development of fungal spores, leading to rapid contamination of the stored shea nut. The situation is made worse by the fact that the bags are often stored directly on the earthen floor of a house.
- Never bag shea nuts for storage when the pods are still damp.
- Before storage, remove broken, damaged, poor and fungus-infected nuts.
- Store in a well-ventilated and cool place.
- The longer the storage time, the greater the risk of degradation of the kernels. Humidity, which favours the development of fungi on the kernels, is the most significant factor in this degradation. Kernels so infected have a very poor yield and give poor quality butter. The process of transformation from the kernel to shea butter is long.

Unit 3

GRADING / QUALITY ASSURANCE (STANDARDIZATION OF SHEA NUTS AND BUTTER)

UNIT AIM

The aim of the unit is to enhance the skills of women producers and processors of shea butter tree products on standardization of shea nuts and butter.

Unit objective

At the end of this training session, the participants will be able to:

- Identify and apply ways and means of ensuring the quality of shea nuts and butter.

SESSION 3.0: STANDARDIZATION OF SHEA NUTS AND BUTTER

3.1: INTRODUCTION

The quality of butter is a function of the quality of nuts, which also relies on the collection from the field, and the process of depulping, washing and drying.

Several individual companies specify their own quality standard for purchase of the shea nuts. However, the benchmark for the composition of the shea nut required for import is: free fatty acids (FFA) $\leq 6\%$, moisture content $\leq 7\%$, oil content $\geq 45\%$, latex = 4-10%.

Specific quality requirements for shea kernel parameters

Parameters	Grade 1	Grade 2	Grade 3
	Max.	Min. Max.	Min. Max.
Moisture content (%)	0.5	>5-7	>7-8
Free fatty acid (%)	2	>2-4	>4-5
Peroxide Value (meq/kg)	5	>5-7	>9-15
Insoluble impurities (%)	0.5	>0.5.08	>0.8-1

Source: ARS SHEA-K (2011)

3.2: FACTORS AFFECTING THE QUALITY OF SHEA NUTS AND BUTTER

The quality of shea fats and oils is dictated by several physical and chemical parameters that are dependent on the source of oil – geographical, climatic and agronomic practices as well as processing and storage conditions.

The quality of shea nuts and the butter are basically dependent upon proper post-harvest processing by ensuring the following.

- v. The shea nuts are collected from under the tree as soon as possible after they have dropped. They should not remain on the ground for more than three days.
- vi. The shea nuts are sun-dried. Better quality is obtained by sun-drying of the shea nuts and the avoidance of smoking. Smoking the nuts over a fire contaminates them with hydrocarbons.
- vii. In particular, the kernels/nuts should be protected from rain at all times.
- viii. The nuts should not be dried on bare ground. They should be protected from absorbing more moisture. The nuts should be dried on a pavement or tarpaulin. The lower the level of free fatty acids, the better the quality of the butter produced.
- ix. The nuts should be cracked gently to avoid breakages.
- x. The nuts should be stored in clean jute/gunny bags.
- xi. The nuts should not be placed on the floor but on pallets above the ground in a well-ventilated room. Inadequate storage is the primary reason for the loss of kernel quality.

It is, therefore, important to consider various factors that lead to poor quality shea nut products in order to promote the commercialization of shea products locally and internationally.

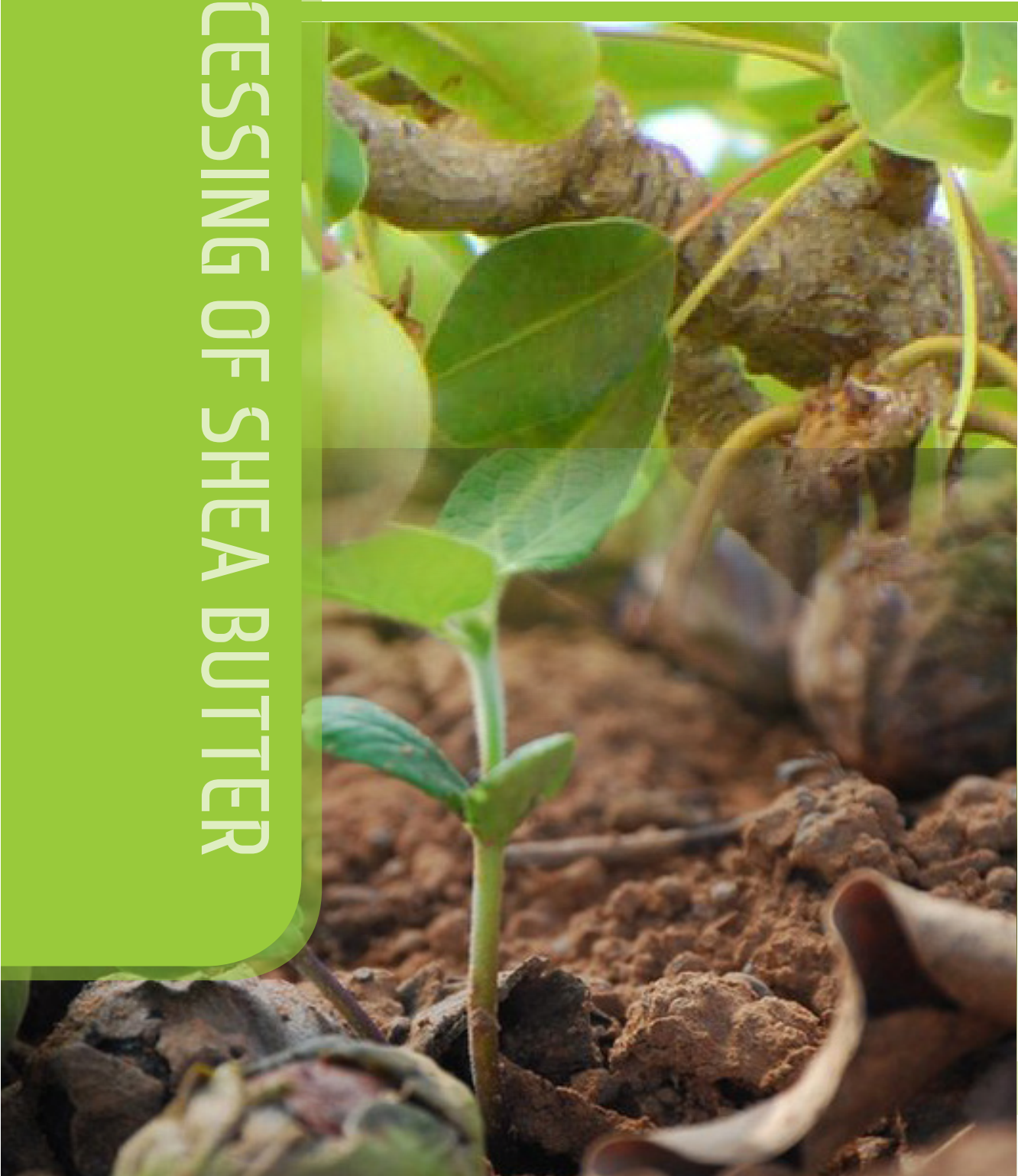
3.3: PACKAGING

Shea nuts should be packed in jute sacks/gunny bags that are clean, sound, free of insects and sufficiently strong. These bags are then properly sewn. Each bag of shea nuts/kernels should be marked with paint or non-toxic ink indicating the following information:

- The name of the product;
- The registered group name;
- The number of the seller;
- The net weight;
- The country of origin;
- The year and month of harvest; and
- The packaging date, and the batch code for traceability and certification (if required).



PROCESSING OF SHEA BUTTER



Unit 4

PROCESSING OF SHEA BUTTER

UNIT AIM

The aim of the unit is to equip the women producers and processors of shea butter tree products with skills on shea butter processing.

Unit objective

At the end of this training session, the participants will be able to:

- Identify the techniques and efficient tools for shea butter processing.
- Understand the different methods of processing shea oil, their advantages and disadvantages.
- Know how to store shea butter.
- Know the different products that can be obtained from shea butter.

SESSION 4.0: PROCESSING OF SHEA BUTTER

4.1: INTRODUCTION

Processing shea nuts into shea butter is a highly labour-intensive process. It is estimated that the production of 1 kg of shea butter takes one person 20-30 hours, from collection to the final product. It is also estimated that 8.5-10.0 kg of fuel wood is needed to produce 1 kg of shea butter. Extraction rates are also low at about 25-60% (Hall et al., 1996).

4.2: METHODS OF EXTRACTION OF SHEA BUTTER

A. The traditional method

The traditional method of processing shea consists mainly of cracking of the seeds to obtain the nuts, roasting the nuts/seeds, milling, kneading with excess water and scraping the oil to get crude butter

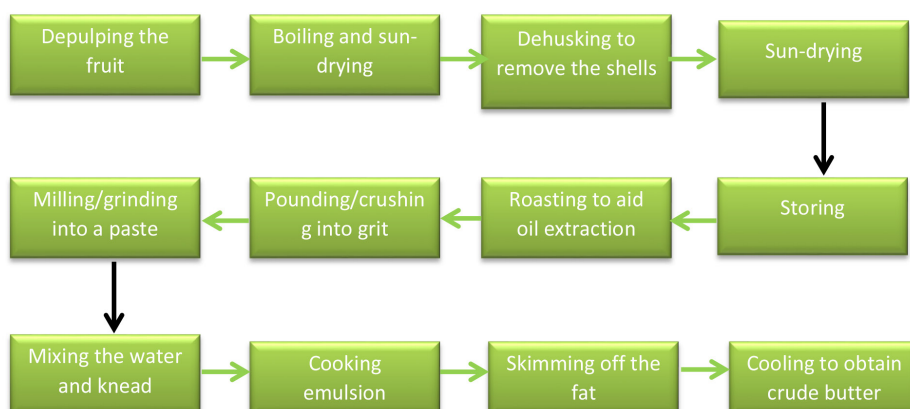


Figure 2: Flow diagram: Showing traditional butter production process (Addaquay, 2004)

Pounding/crushing into grit: The dried kernels are pounded in a mortar with a pestle or crushed in a crusher into small pieces for easy roasting. This can also be done using a kernel chopping machine.

Roasting of the kernels: The crushed kernels are sent to the roaster and roasted to aid in oil extraction.

Milling/grinding into paste: The roasted kernels are then ground in the grinding machine into a paste.



Kneading. Traditionally the butter is extracted by kneading by hand. However, kneading can also be done by using a kneader. Pressing by hydraulic/screw press or solvent extraction can also be utilized, followed by refining with refining equipment.

In kneading manually, women churn the paste by hand, adding cold water gradually. The mixing breaks the emulsion, causing the fat to break away from the cake. Hot water is then added to melt the fat and set it free from the cake, which facilitates separation. Then large amounts of cold water are poured on the mixture. As stirring continues, the fat floats while the cake settles to the bottom. Women collect the fat from the top of the water layer.

Boiling: The fat is boiled on fire to dehydrate it. The actual butter is skimmed off the top. This boiling process can be done by using a jacketed kettle.

This paste is mixed with an equal amount of water and boiled. The oil is then skimmed off and held in a separate container. The oil is often rewashed and boiled to remove particles and mucilage from the first-stage boiling. The oil is then left to cool. It can take 4-6 women a full day to produce 4-5 litres of oil, from 20 litres of nuts. This quantity can last a family 1-3 weeks, depending on usage. The shelf life of the oil is from 1 to 3 weeks, depending on the moisture content of the oil after processing.

The oil is extracted locally by a process involving the heating and kneading of the crushed kernels and straining the resultant crush to release the oil. Alternatively, the oil is separated from the mash by heating the mash in hot water.

Filtration and solidification: The butter is then filtered through a filter cloth, and then allowed to cool and solidify. Gradual stirring is done to facilitate cooling.

Packaging: The butter is then packed in airtight containers. This can be done by using a filling machine. The cake is also packed in bags ready for sale to feed the millers.



B. The semi-mechanized system

The semi-mechanized system of extraction utilizes appropriate technology to mechanize some of the unit operations of the manual traditional system. The production stages remain the same, but improved machines are used to enhance the efficiency of production. Instead of pounding, sun-drying, roasting with fuel wood and manually kneading, a dryer, nut crusher, roaster and kneader are used to increase production efficiency and product quality.

Advantages and disadvantages of shea butter extraction methods

The traditional processing method maintains the natural nutrients of the products.

This, however, is laborious, time-consuming and uses large quantities of water and firewood and the product is of low quality and fetches low income for processors. An average yield of butter obtained by using traditional method of extraction is estimated at about 30%. This method may not be suitable for export and, therefore, the shea butter is sold and consumed locally.

The semi-mechanized system is a more efficient method of extracting the oil. Through using this method a higher oil percentage is obtained.

However, with the increased interest in naturally derived products, organic shea butter production is preferred and, thus, efforts have been made to industrially produce shea butter by following the traditional extraction methods.

The equipment required for the semi-mechanized system is expensive and scarce and most individual groups cannot afford it. Under this method, the nuts are exposed to high temperatures during roasting, which can reduce the yield of oil. There is also the presence of dirt, such as stones, which can cause wear and tear of the internal parts of the crushing equipment.

4.3: PACKAGING AND PRESERVATION OF SHEA OIL

PACKAGING

- xii. To maintain its physio-chemical qualities, shea butter should be stored and packaged in plastic or aluminum containers previously washed and dried.
- xiii. The packaging should be a dark colour and opaque.
- xiv. Labelling and packaging should be attractive to consumers and should indicate:
 - the composition/ingredients;
 - the production date; and
 - the shelf-life.

PRESERVATION (STORAGE)

Shea butter, perfectly conditioned and packaged, has a shelf-life of at least one year. The storage conditions are:

- Avoid exposure to air and moisture (moisture content of product should be < 1%).
- Condition in an opaque plastic package to avoid exposure to light and oxidation.
- Avoid packaging components containing iron.

4.4: QUALITY MECHANISMS AND GRADES

In eastern Africa, a shea nut grading system has been developed and adopted by producers, consisting of four quality grades

GRADE CHARACTERISTICS:

(a). Clean and dry light-coloured shea nuts of first quality, suitable for cold-pressing for food oil and cosmetic and export applications. Obtaining grade A shea nuts has been a challenge owing to:

- Delays in picking the shea nuts from the ground leading to decay and their becoming stained.
- Smoking the nuts over a fire leading to their becoming contaminated.
- The nuts in most cases being exposed to rain and not properly dried, hence having a high moisture content, which results in moulding.
- The nuts not being well stored or packaged.
- The nuts being damaged during the removal of shells.

(b). No evidence of contamination, but some darkening of nuts, cracking, limited insect and/or rodent damage. Bad nuts can be sorted out, the remainder suitable for roasting and (hot-pressed) extraction of food oil.

(c). Nuts dark and many cracked, insect and/or rodent damage evident. Bad nuts can still be sorted out, and the remainder used to extract shea butter for soap-stock.

(d). Nuts dark and cracked, with extensive insect and/or rodent damage and fungal contamination evident. Bad nuts cannot be sorted; nuts must be discarded, or sold to less discriminating buyers at a greatly reduced price.



GRADING / QUALITY ASSURANCE
(STANDARDIZATION OF SHEA NUTS AND BUTTER)

Unit 5

SHEA BUTTER PRODUCTS

UNIT AIM

The aim of the unit is to enhance the knowledge of women producers and processors of shea butter on the different products that can be got from shea butter including skills to produce some of those products.

Unit objective

At the end of this training session, the participants will be able to:

- Understand the different products got from shea butter.
- Practically produce handmade soap using shea butter.

SESSION 5.0: PROCESSING OF SHEA BUTTER

5.1: INTRODUCTION

Several products are derived from shea butter. Today the shea butter is mainly used in:

- Skin- and hair-related products such as creams, body lotions and hair treatments.
- Medicinal ointments.
- Candle-making and waterproofing wax.
- Butter as cooking oil.
- The making of chocolate and,
- Soap-making.

5.2: SHEA BUTTER HANDMADE SOAP

5.2.1: INTRODUCTION:

Soap is a salt of an alkali, such as sodium and potassium, with a mixture of fatty acids. It is a result of a chemical reaction, called saponification between triglycerides and a base such as sodium hydroxide. During this reaction, the triglycerides are broken down into their component fatty acids, and neutralized into salts by the base. In addition to soap, this chemical reaction produces glycerin. Shea butter is a perfect raw material for making

bathing soap. Shea butter has both saponifiable (ingredients which can be transformed into soap) and non saponifiable (ingredients which cannot be transformed into soap) and these confer unique and superior properties to it as a raw material for use in toilet soap formulation. Those unsaponifiables are the ones which condition and moisturize skin instead of stripping away your natural skin oils while cleansing. Because shea butter doesn't contribute very much to lather or hardness, as opposed to other oils, it should be used at 15% or less during toilet soap formulation.

During the formulation of shea butter based bathing soap, attention should be paid to the availability and cost of the raw materials. The final shea soap product should be of high quality but not expensive to the final consumer and this is determined by the ingredients selected.

5.2.2: SOAP MAKING PROCEDURE: COLD PROCESS

NO. STAGE IN PROCESS NOTES

1. STEP 1

DETERMINE YOUR FORMULATION/RECIPE

To formulate a recipe, start by designing your base oils or foundational recipe. You can use each oil between 20 – 30%. For the remaining portion of your oils, consider what you'd like the outcome of the final bar to be. Do you want it to be super moisturizing, have a nice thick lather, or be hard and long lasting?

Coconut, Palm and Olive are the three most common soap making oils. These three oils have become the de facto foundation of many soap recipes because they have qualities that complement each other to form a robust bar of soap. Many recipes revolve around these three oils. Palm oil contributes firmness, coconut oil provides cleansing properties and produces big bubbles, olive oil gives the bar softness and a silky feel. The combination of these three oils creates a bar that is firm, cleansing and moisturizing. A very common starter recipe is the 30/30/30/10. That's 30% Olive Oil, 30% Coconut Oil, 30% Palm Oil and 10% of something special e.g. — Shea Butter. Some general rules of thumb that can make formulating recipes easier. In general:

Liquid oils (those that do not solidify at room temperature) tend to trace more slowly. They also take longer to harden in the mold and can be sticky before a full 6 week curing and drying time. Soft oils contribute skin-loving properties to soap, and ensure it is not brittle. Soft oils also help prevent the soap from cracking.

- Conversely, solid oils (those that are solid at room temperature) trace more quickly. Recipes with a large percentage of solid oils tend to harden up faster in the mold and need to be cut more quickly to prevent shearing.
- Though any soap can technically be made with single oil, the only oil recommended to use up to 100% is olive oil. The best recipes are generally some combination of hard and soft oils.
- The measuring of oils and fats (and all other ingredients) must always be done by weight, never by volume. This is because the measurements need to be exact for the best soap making results.

3. STEP 2

MEASURING CAUSTIC SODA (LYE)

Measure your dry lye in a container with a lid. Your lye measurement needs to be exact.

The amount of lye necessary for the recipe depends on the saponification value of each oil. The saponification value (aka: SAP value) refers to the amount of lye it takes to turn 1 gram of oil into 1 gram of soap. The SAP value for each oil and butter may vary slightly depending on where it comes from. Because SAP values can vary, one saponification chart may give slightly different values than another.

Become familiar with Saponification charts. This is key for determining how much lye is necessary to turn the oils in your recipe into soap.

Multiply the number of grams of oils or fats by the figure stated and this will give you the exact amount of sodium hydroxide to saponify it.

Example: Say Shea butter has a saponification value of 0.128 on the chart: (Note which hydroxide you are using. Saponification charts usually give values for Sodium hydroxide and Potassium hydroxide)

Number of grams of oils/fats * 0.128 = Lye or sodium hydroxide to be added

Example : 150 gm of shea butter * 0.128 = 19.2 grams of Lye /Sodium hydroxide.

That total is the amount of lye (sodium hydroxide) needed. If using a combination of oils, multiply for each and add all the sums for a total of all the fats. Make sure you have on googles, gloves and a mask.

With too little fats or oils, the soap will be too caustic as there is left-over lye that could not take part in the reaction. This will make your soap hard and crumbly, and also it might burn the skin.

With too much fats or oils, the soap will become extremely soft and the soap will be too super-fatted.

4. STEP 3

MIXING LYE INTO WATER

Mix the lye- water combination continuously until all lye is dissolved. Be careful not to inhale. Continue to mix. Do not break in mixing until your lye-water solution is clear. This solution will heat up very quickly. Make

sure you are in a well-ventilated place or outside.

HOW MUCH WATER DO YOU USE?

A general rule of thumb is to use approximately 1:2.7 Lye to water. That is 2.7grams of water for every 1gram of lye.

Remember to always pour lye into water, not water into the lye! Keep in mind the reaction alone will cause the solution to heat to more than 93 degrees Celsius; make sure your container is heat safe. So be careful and only use a container that can withstand that kind of heat!

Aluminum reacts with lye, creating a toxic fume, and is not appropriate for soap making.

Heat-safe tempered glass, stainless steel, or Polypropylene plastics are what we've found to work best.

5. STEP 4

Melt all your solid oils and liquid oils at room temperature over a heat source. Pour the appropriate weights of all the oils as determined by your formula into a larger soap making pot. Use a pot/pan made of stainless steel material.

As your lye solution is cooling, allow your oils to cool at the same time. Many soapers have different degrees at which they mix and lye at a temperature of 35 – 40 degrees Celcius.

Cooling your lye and oils to the same temperature is best for soap making.

6. STEP 5

After the desired temperatures are met, slowly pour the lye into the oils, while

stirring vigorously.

You are mixing your soap to get to trace. The best way to determine when soap has saponified is trace. As you begin to mix your soap you will notice that it begins to emulsify. The soap will no longer separate into two mixtures. Once you feel that the soap has begun to trace, test the mixture by lifting out the stirrer to see if the soap leaves a trail on top of the soap mixture. If the soap stays on top of the solution for a brief period before sinking back into the rest of the solution, you are at trace.

This is the most important step in the soap making procedure. You must stir the solution constantly and rather briskly in order for all necessary molecules to interact in order to get to TRACE. It is best to stir the liquid in a clockwise motion if blending by hand. Trace may take 10-15 minutes.

For even faster results, use a powered stick blender. This cuts the process down to 2-5 minutes.

7. STEP 6

After trace is reached, add whatever desired ingredients including essential oils, fragrances, colorants, extracts, powders etc. Here is where you can be creative. You can make your soap more medicinal by adding a range of additives or herbals.

As your soap hardens, make sure you have included all your ingredients. Do this quickly!

What you will have to learn is what fragrances, essential oils and colorants work with your formula. This will require trial and error. Some fragrances do not soap well and despite the amount of fragrance you use, it will not fragrance the soap. Some colorants will speed up trace and cause the soap to seize almost

immediately. Use oil-soluble fragrances and colours

Soap making is a learning process. Test and re-test your formulas.

8. STEP 7

POUR THE SOAP INTO A MOULD.

You can be creative with your soap. Silicone moulds, wooden moulds, pvc pipes, used canisters, the list is endless. The most common molds for soap making are made of wood, plastic, or silicone. If you use wood molds, they must be lined (fresh soap eats wood). You cannot use glass for a soap mold. While it is safe, it is difficult to release the soap from a glass mold.

Wood: Wood molds cannot be used unlined, as the wood is porous and will absorb the oils in soap batters.

Lining wood molds can be done with freezer paper, or done quickly with a silicone liner or even transparent polythene material. Wood molds are sturdy and durable, and some can be used for alternate soap making processes like Hot Process.

Plastic: Plastic is an excellent medium for soap molds. In addition to plastic molds intended for soap making, one can also find household items made of plastic that can also double as soap molds. Even plastic yogurt containers will work! If you are re-using household finds, be sure that they are clean, free of food debris, and dry before using them to make soap.

Silicone: Silicone is a flexible material that is especially conducive as a soap mold material. Flexibility allows for extreme ease in unmolding, which some soap makers hold high above any other mold attribute. However, silicone molds also tend to want to “cling” to soap for a bit longer, so soap

may have to sit for a few extra days. This doesn't have any effect on the soap itself, but may be a test of your patience.

You can also mix different colours, make spirals, or any other artistic designs to give your soap a little more appeal. This can add value to your soap and set it apart from others.

9. STEP 8

INSULATE THE SOAP.

Cover the mold with its lid (or a piece of cardboard) and the wrap it with towels. You can also use Saran wrap. The more insulated the better. This is to ensure that no heat can escape, as this is essential for the initial curing process. Wrap the soap well so that it can continue to saponify. During this time, your soap will go through a gel phase.

Leave the soap for about 18-36hrs, depending on the ingredients used. Once again, the formula will determine how long to let the soap initially cure before cutting.

24hrs is usually sufficient for most soaps to gel.

Gel phase is beneficial to soap because it can intensify colors in the soap and give soap a shinier, slightly translucent look. However, not going through gel phase does not detract from the soap in any way. In fact, some soapers prefer the matte look of soap that has NOT gelled, or gone through gel phase

Insulating soap after molding will promote gel phase. Cooling the soap as quickly as possible will deter gel phase from happening, which is why some soapers put their soap into the fridge or freezer directly after molding. To gel or not to gel is a matter of personal preference.

Do not wait too long to unmould and cut the soap, or it will harden, and be difficult to cut.

10. STEP 9

Once the soap is ready to be unmolded, carefully measure and cut it into equal bars. If you used individual moulds, remove the already formed soap bars.

Lay the soap on a rack so that air can circulate around it. Flip them over about once every 6-8 days

The soap will now cure for 3-6weeks depending on the formula. Patience is essential for cold process soap making.

The process of curing cold process soap allows the excess moisture in the bars to evaporate, leaving a harder and longer-lasting bar. The 4 to 6 week curing and drying time helps to produce the most gentle bar of soap possible. You will notice a difference in your skin when showering with a new bar of soap versus a fully cured and dried bar.

It's the final bit of pH lowering that happens in the rest of the 4-6 weeks of curing, and the main benefit of the cure time is the evaporation of excess water, which makes for a harder bar and a more true net weight for labeling purposes if you're selling your soap. So if you'd like a harder bar, allow your soap to go through the standard 4-6 week cure.

During this time, the soap pH levels will remarkably drop, and your finished product will be a wonderful, mild and natural home-made soap.

10

TESTING SOAP

Before you use the soap, you can test it. Purchase pH paper to see what the pH is. It is sometimes a struggle among soapers to achieve good quality soap below 9 on the pH scale. If your soap produces a white powder on the surface, this is soda ash. It is a chemical reaction that occurred during saponification, where the lye reacted with oxygen. Simply scrape or cut that from your soap.

MARKETING



Unit 6

MARKETING

UNIT AIM

The aim of the unit is to equip the women producers and processors of shea butter with marketing skills for shea butter tree products.

Unit objectives

At the end of this training session, the participants will be able to:

- Understand marketing.
- Understand the importance of marketing
- Identify shea butter properties to consider in marketing
- Identify challenges associated with marketing.
- Identify available opportunities for marketing shea products.
- Identify key players in the trade of shea butter tree products.

SESSION 6.0: MARKETING

Discussion/brainstorming/experience-sharing (1hr 30 minutes)

To succeed in the shea butter business, one must attract and retain a growing base of satisfied customers.



6.1: WHAT IS MARKETING?

Marketing is a process which aims at increasing sales and profits by concentrating on giving customers what they need/want. This involves:

1. Understanding what customers need/want.
2. Developing a product which gives customers what they need/want.
3. Promoting the product among customers.
4. Keeping on improving the product (keeping up with the customers).

6.2: IMPORTANT COMPONENTS OF MARKETING

1. **Product:** The item you are selling.
2. **Distribution:** Finding the best way to get your product to the selling point.
3. **Price:** Setting your price to make a profit.
4. **Promotion:** Creating ways to persuade customers to buy your product.

6.3: PROPERTIES OF SHEA BUTTER TO CONSIDER FOR MARKETING

- It heals
- It is used to treat body aches
- It is used in massage
- It is a moisturizer
- It is an anti-aging agent
- It protects against sun damage
- It is used to treat stretch-marks
- It is used to treat hair dryness and damage

6.4: CHALLENGES TO IMPROVING MARKETING OF SHEA PRODUCTS IN UGANDA

DISCUSSION (15 MINUTES)

What are some of the challenges faced in marketing shea products today?

- Lack of a reliable market.
- Low/unstable/fluctuating prices.
- Competitive uses of shea tree (fuel wood, poles, bark extracts etc.)
- High levels of consumption of the shea oil in the shea belt.
- Lack of proper transport.
- Lack of market information.
- Poor storage facilities.
- Crude processing techniques/skills.
- No planting culture – it runs counter to tradition.

- No consistent methods/quality control.
- Long juvenility period.
- Variability in terms of germplasm source (non-uniformity in fruiting and ripening and the harvest season).
- Genetic influence on the chemical profile.

What marketing opportunities are presented to you today in selling shea butter products?

- Processing of organic certification with assistance from Export Promotions of Organic Produce from Africa (EPOPA).
- Improving on the standards and grades of the shea products.
- International buyers of edible products demand: reliable supplies of large quantities of kernels or butter; consistent high-quality shea that has low moisture content; no smell; and no foreign matter.
- Selling by women's groups as associations or cooperatives with strong bargaining power.

6.5: KEY PLAYERS IN THE TRADE OF SHEA AND RELATED PRODUCTS IN UGANDA

The markets for shea nuts are dominated by a few organizations that buy nuts from the gatherers. They monopolize the markets because they offered the only reliable market for shea nuts. These organizations include:

- KFP/KM International Trade (markets: USA, Germany, Poland, Kenya)
- NOGAMU – National Organic Agricultural Movement of Uganda (local – Uganda) works with farmers who produce organic farm outputs, they buy in large quantity organic farm outputs especially oil, however shea is a priority area for them
- The Shea Project – COVOL – Lira (markets: local/international)
- CREAM – Community Organization for Rural Enterprise Activity Management (local – Uganda)
- Guru Nanak Oil Mil – GNOM Inc. (markets: East Africa, Europe, India, USA) is managed for Indians and operates in Lira, started their operation in 2011 with making sunflower and soy bean oil but have now incorporated shea butter as well
- Agency for Local Community Development (ALCOD) has worked with ZOA to support farmers on shea butter business
- CAIO, this is a Dutch organization operating in the districts of Alebtong, Otuke buying shea products but are potential customers in case they expand to Acholi sub region.
- Community Organization for Rural Enterprise Activity (CREAM), operate in Arua
- PINSAR Group started operation over 20 years ago and currently also builds capacities of producer and processor groups in producing different products

- Africa Growth Opportunity Act (AGOA), has new contract to send products to the USA which is not limited to shea butter products.

Through their lead organization, NOGAMU, these organizations mainly export shea nuts and unprocessed shea oil to USA, Germany, Poland and China, amongst other countries. There are limited sales to the local communities as most of the organizations are located in Kampala, where there is limited knowledge amongst consumers about various shea products and their uses.

Unit 7

ECONOMIC AND SOCIAL CONSIDERATIONS

UNIT AIM

The aim of the unit is to enhance the knowledge of women producers and processors of shea butter tree products on sustainable production of shea butter tree products for livelihood improvement.

Unit objectives

At the end of this training session, the participants will be able to:

- Understand opportunities associated with shea butter tree products in livelihood improvement.
- Understand the challenges in utilizing opportunities associated with shea butter tree products for livelihood improvement
- Understand what needs to be put in place to address the challenges.

SESSION 7.0: ECONOMIC AND SOCIAL CONSIDERATIONS

Shea tree producers provide not only important support for sustainable rural development but also livelihood support and maintenance of livelihood security for the rural people. It is clear that livelihood diversification, food security, household asset accumulation, employment generation and financial savings are some of the opportunities that rural producers and sellers gain from being involved in the shea butter enterprise.

Nevertheless, a lot of challenges were identified as working against these potential opportunities. These are mainly the lack of processing equipment, capital, technical skills and government support. It is, therefore, important to ensure the following:

- Maintenance of a deliberate policy that will provide public awareness. Farmers should be encouraged to protect and plant shea trees on their farms.
- The provision of economic incentives and technical assistance to facilitate and boost the shea enterprise.
- Provision by the government of support to the shea butter enterprise

through skills enhancement programmes.

- Establishment of market information centres where shea communities can easily access market information.
- Improvements in market infrastructure within the shea zone, which would encourage market participation.
- Conducting of more research on shea processing techniques and technology, which is needed for improved processing and post-harvest handling in Uganda.
- Development of uniform and shorter maturing shea trees (shortening of juvenile phase –
- grafting for promoting on-farm domestication both in situ and ex situ).
- Enhancing naturally regenerating young shea or coppices (in situ conservation).
- Sensitization and provision of appropriate training in techniques of shea gathering, processing and marketing.
- Making certification premiums available.
- Involvement in carbon trade.
- Making grants accessible (market development place, GEF etc.)

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APPENDIX 1:

DISTRICT COMMITMENT TOWARDS USE OF THE MANUAL

ABIM DISTRICT LOCAL GOVERNMENT,
AGAGO DISTRICT LOCAL GOVERNMENT,
KITGUM DISTRICT LOCAL GOVERNMENT,
AND
OTUKE DISTRICT LOCAL GOVERNMENT,


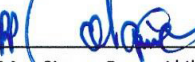




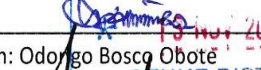

RECOGNIZING THAT they are statutory bodies established by an Act of Parliament and responsible among others, for the sustainable management of environment and natural resources outside protected areas in partnership with the local communities and other stakeholders for the benefit of their people;

NOTING the mutual interest they have in strengthening the conservation and management of the shea butter tree for the purpose of conserving the shared shea belt for preserving and conserving the shea tree for the use and enjoyment of present and future generations;

RECOGNIZING that proper management and conservation of the shea butter tree requires knowledge and understanding of the values and importance of the shea butter tree products to communities; and that proper management and conservation of the shea tree can best be achieved through training of the community groups;

WHEREAS they wish to undertake training of community groups; AND hereby warrant and represent that they ALL have capacity to undertake training of community groups on standardization and diversification of shea butter tree products;

NOW THEREFORE, in witness whereof, their duly empowered representatives, append signatures consenting to undertake training of community groups in post-harvest handling, diversification and standardization of shea butter tree products:

<p>Abim District Local Government P. O. BOX 1, ABIM, UGANDA</p>	<p>Signed: <u></u> Hon: Ocheo Jimmy Chairman LCV</p> <p>Witness: <u></u> Mr.: Simon Peter Akileng Chief Administrative Officer</p>
<p>Agago District Local Government P. O. BOX 1, AGAGO, UGANDA</p>	<p>Signed: <u></u> Hon: Opio Leonard Ojok Chairman LCV</p> <p>Witness: <u></u> Mr.: Mulondo Robert Chief Administrative Officer</p>
<p>Kitgum District Local Government P.O. BOX 28, KITGUM, UGANDA</p>	<p>Signed: <u></u> Hon: Jackson Omona Chairman LCV</p> <p>Witness: <u></u> Mr. Joseph Lomongin Chief Administrative Officer</p>
<p>Otuke District Local Government P. O. BOX 617, LIRA, UGANDA</p>	<p>Signed: <u></u> Hon: Odongo Bosco Obote Chairman LCV</p> <p>Witness: <u></u> Mr.: Mabiya Joshua Chief Administrative Officer</p>



