AGRICULTURE AND FOOD AUTHORITY

NUTS AND OIL CROPS DIRECTORATE

THE COCONUT VALUE CHAIN STATUS

2020 SURVEY REPORT

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Abbreviations

AFA	Agriculture and Food Authority
CBO	Community Based Organization
FAO	Food and Agriculture Organization
FBO	Faith Based Organization
FGD	Focus Group Discussions
GDP	Gross Domestic Product
ICC	International Coconut Community
ISO	International Standards Organization
ITC	International Trade Centre
KALRO	Kenya Agricultural and Livestock Research Organization
KEPHIS	Kenya Plant Health Inspectorate Services
KES	Kenya Shillings
KRA	Kenya Revenue Authority
MESPT	Micro Enterprises Support Programme Trust
MOALF	Ministry of Agriculture, Livestock and Fisheries
NGO	Non-governmental Organization
NOCD	Nuts and Oil Crops Directorate
ROSCA	Rotating Savings and Credit Association
SACCO	Savings and Credit Cooperative Society
USD	United States Dollar
VC	Value Chai

EXUCUTIVE SUMMARY

A Value chain study is a key component in the creation of data banks of facts and figures necessary to inform decision making processes. In chapter one, contains the reason for the survey, this was important since it was used to update the information for stakeholders. Objectives of the study main being to carry out an end to end study and compilation of a comprehensive report on coconut value chain in Kenya. Herein, there is the study methodology which describes how the data was collected analyzed and compiled. The second chapter of the report discusses the background of the coconut industry; whereby the global, Kenyan, and area of study's perspective have been outlined. Chapter three, describes the coconut value chain analysis from research, input supply, production, value addition, aggregation and marketing and consumption. Three value chain analysis models has been used to describe value chain of the coconut industry. Value chain upgrading programs such as increasing coconut production, facilitating of product development and technology transfer, improving the regulatory framework, strengthening marketing systems and facilitation of market access, business opportunity along coconut value chain and funding needs for coconut value chain were discussed in chapter four. The SWOT analysis is also included. Towards the end of the report challenges and mitigation; the main challenge being processors supply chain inefficiencies such as raw material supply chain challenges, fluctuations of coconut prices. Other challenges are poor infrastructure, inadequate funding, inadequate personnel, inadequate research, pest and diseases and inadequate value addition. Some of the mitigation include; enhance resource mobilization, lobby for improved infrastructure, enhance budget allocation, enhance collaboration/resource mobilization, enhance market access for coconut products, enhance collaboration with research institutions/Universities, sensitization of the players, enhance quality seedlings production, enhance investment/technology transfer, organize players into cooperatives.

CHAPTER ONE:

INTRODUCTION

1.1 Why update the coconut Data?

Agriculture and Food Authority (AFA) was established by AFA Act 2013 and operationalized by the Crops Act 2013 to develop, regulate and promote scheduled crops. AFA offers a wide range of advisory services from pre-production, production, value addition and marketing through its various directorates including Nuts and Oil Crops Directorate (NOCD). The Directorate is tasked with the responsibility of developing, regulating and promoting all nuts and oil crops in the country. The nuts and oil crops include cashew nuts, coconut, macadamia, groundnuts, oil palm, sunflower, safflower, sesame, and jojoba, among others**.** To effectively execute this mandate NOCD has to collect and collate data on all the various nuts and oil crops and this is done through surveying, documenting and constantly reviewing the various crops' value chains.

A Value chain study is a key component in the creation of data banks of facts and figures necessary to inform decision making processes. It involves the collection and collation of data, compiling the facts and figures in booklets which will be reviewed from time to time, so as to be a source of the needed knowledge in the work of advising stakeholders. Data is stored in the repository and accessed whenever there is need to offer guidance on policy formulation to the Government through the parent Ministry of Agriculture, Livestock and Fisheries (MOALF), whenever giving investment advisory services to potential investors and when conducting general sensitization to stakeholders about any of the crops.

1.2 Rationale of the Survey

Despite its enormous contribution to the economy the coconut sub-sector suffers challenges when it comes to availability of reliable and current data that can be used by stakeholders for policy, planning and decision making. To overcome these challenges NOCD found it necessary to carry out a survey and update the information available to provide stakeholders with the necessary information.

1.3 The Value Chain Study Approach

To be able to efficiently undertake the task of advising stakeholders, responsible staff need to be continuously armed with the right information. This is where value chain studies become crucial. Unlike the traditional sectoral analysis which tends to be static and suffers from the weakness of its own bounded parameters, the Value chain approach (VCA) overcomes these weaknesses. The value chain approach is therefore preferred because of its thoroughness. At each stage of the value chain, the analysis involves: identification of chain players; their function; role and relationships; determination of chain governance or leadership; and identification of value activities in the chain. VCA therefore assesses the competitiveness of markets, identifies actions by the public and private sector to overcome production, processing and marketing problems.

A value chain is a chain of activities that a firm operating in a specific industry undergoes in order to deliver a valuable product or service to the market (Porter, 1985).

Value chain describes the categories of activities within and around an organization, which together create a product or service (Johnson, Scholes, Whittington, 2008). According to Miller and Jones (2010), the concept of agricultural value chain includes the full range of activities and participants involved in moving agricultural products from input suppliers to farmer's fields and ultimately to consumers.

1.4.1 General Objective

To carry out an end to end study and compile a comprehensive report on the coconut value chain in Kenya.

1.4.2 Specific Objectives

1. To identify and document all the activities in the coconut sub-sector
2. To identify all value chain players, their roles/functions in the coconut value chain
3. Identify and document challenges faced by actors in the value chain
4. Identify and document the profiles of all business opportunities in the coconut industry.

1.5 The study Methodology

This study used descriptive cross-sectional survey design aimed at assessing the value chain of the coconut subsector in Kenya focusing more on value chain actors who are farmers, product dealers, service providers and processors involved in coconut value addition. Descriptive cross-sectional survey was preferred in this study because it provides more accurate information from a larger group and would be the best to explore value chain analysis in the coconut subsector in Kenya.

1.6 Sample size

The study population was comprised of coconut value chain actors who are nursery operators, farmers, product dealers, small micro enterprises (SMEs)/processors, enablers and service providers engaged in the coconut value addition.

Table 1: Sample size Distribution

Actor	Sample size
Farmers	300
Nursery operator	58
Processors	38
Traders/Product dealers	30
Total	**426**

Source: Nuts and Oil crops

1.7 Data Collection

Both primary and secondary data was used in the study. The primary data was collected through a mix of Focus Group Discussions (FGD), administered structured questionnaires, telephone interviews as well as personal interview using a semi- structured interview guide/questionnaire that had both closed and open ended questions. A structured questionnaire was used to gather secondary data. Before the interviews were conducted, the respondents were introduced about the purpose of research and were assured that utmost confidentiality was guaranteed. Thereafter, the interviewer proceeded with the interview carefully following the interview guide and where possible recording views and other issues raised by respondents touching on the research problem not captured in the questionnaire. The study respondents were comprised of representatives of the thirty-eight (38) engaged in coconut value addition, farmers, product dealers and service providers that were identified from a data base obtained from Nuts and Oil Crops Directorate. The interview guide was deliberately structured in a way that would enable the obtaining of information that identifies the component of coconut value chain, identifies the instructional framework necessary for coconut value chain and finally another part which explored the determinants of value chain in the coconut sub-sector in Kenya. Secondary data was obtained from journals, books, articles on coconut, magazines, newsletters, website and various documents available at Nuts and Oil Crops Directorate, county governments, government manuals, sub-sector players and relevant research institutions.

CHAPTER TWO:

THE COCONUT INDUSTRY BACKGROUND

2.1 Global Perspective of the industry

Coconut (*Cocos nucifera)* is justifiably called the tree of life. It is grown in over 90 countries on about 12.1 million hectares producing an estimated 69 billion nuts per year. The global exported value of coconut products in 2019 reached USD 11.6 billion. The major products exported are coconut meat-based products, followed by water, shell, and husk-based products. The twenty (20) International Coconut Community (ICC) member countries account for over 90% of the world's production and exports of coconut products. The products and by-products have reached consumers in over 110 importing countries excluding domestic utilization of the coconut. India, Indonesia and Philipines are on average ranked as the world's leading coconut producers. In 2018, Indonesia produced about 18.55 million metric tons of coconuts while India was the third largest coconut producer in the world, accounting for around 11.71 million metric tons of global production volume. However, the scenario changed in 2019 with India becoming the largest producer and Indonesia taking second position as shown in table 2 below.

Global market demand for coconut products is increasing. Further synergies between coconut stakeholders are needed to increase production and meet these growing demands. Such collaboration is also needed to support value addition, processing, and marketing of high-value coconut products, as well as to counter any adverse publicity against coconut and its products.

Table 2: Leading Coconut Producing Countries

	Country	Quantity of Whole nuts (Millions)
1.	India	21,991
2.	Indonesia	16,821
3.	Philippines	14,967

4.	Brazil	3,112
5.	Mexico	1,518

Leading African Producing Countries

	Country	Quantity of Whole nuts (Millions)
1.	Tanzania	587
2.	Ghana	394
3.	Kenya	301
4.	Nigeria	281
5.	Mozambique	270

Source: International Coconut Community (ICC)

2.2 Kenyan Perspective Coconut Industry

The coconut subsector is one of the key economic drivers in Kenya and supports over 150,000 households who directly rely on it for income, employment and food. Coconut trees have a wide adaptation range across the world especially in countries with tropical climatic conditions and particularly in the coastal regions, which have considerably saline soil conditions. In Kenya, the coconut tree is one of the most significant crops grown in the coastal lowland, particularly in Lamu, Kilifi and Kwale counties. It is mainly grown in the vast stretch of the coastal lowland, classified as the coconut-cassava zone under the agro-ecological classification of Jätzold et al (1982), but stretches further to other medium potential zones with favorable soil conditions. Locally, coconuts take 4 -5years after planting to first fruit bearing. They can grow to about 100 feet and have a life time of about 75 to 100 years.

While the tree has been known to be exclusively found in the coastal Kenya, recent studies have shown that there is potential for coconut farming in other parts of the country. Piloting trials are indicating encouraging results in Tharaka Nithi, Makueni and Machakos counties. According to Danda (2020), the potential of coconut in Kenya is estimated to be Kenya shillings Twenty-Five (25) billion annually but only 53% has been utilized. This clearly implies that 47% of the coconut potential is untapped thus denying the country the much needed agro based revenue which is critical to achieve sustainable development goals. Though the coconut plant has many economic uses, very little interventions have been put in place to optimize its huge economic potential and maximize its returns for socio-economic reasons. Indeed, there is inadequate value addition linkages aimed at commercializing the coconut subsector through technological innovation, infrastructural development, distribution, marketing financing and leveraging

on existing structural & institutional framework that are prerequisite in harnessing the untapped coconut multibillion agro sub sector.

The untapped potential justifies the need to promote the production and utilization of coconut-based products by ensuring a sustained flow and adoption of technologies, and research and development, which meet the challenges of this sub-sector. Its contribution to the Gross Domestic Product (GDP) from agriculture is estimated at to 1.5% while its contribution to the National GDP stands at 0.4%. Despite the proven subsector's great potential, stakeholders in the sub-sector have faced challenges, key among them being old and senile trees, traditional crop varieties, limited value addition, highly fragmented, small in scale and highly informal. These, among other constraints, have made the coconut industry rank very low amongst other agricultural and enterprise subsectors in the country. The sub-sector remains a sleeping giant to itself, the County and National economies.

Table 3: Distribution of Coconut Trees by Type

	Tall Type		***Dwarf Type***		***Total***
Name of County	**Number**	**Percentage**	**Number**	**Percentage**	
Kwale	4839677	87%	667875	13%	4839677
Kilifi	4313625	86%	603907	14%	4313625
Lamu	988977	68%	316472	32%	988977
Mombasa	136773	70%	41032	30%	136773
Tana River	147294	87%	19148	13%	147294
Taita Taveta	94689	81%	17990	19%	94689.
Total	**9,135,000**	**87%**	**1,365,000**	**13%**	**10,521,038**

Source: AFA-Nuts and Oil Crops Directorate

2.3 Area under coconut

The farming system commonly practiced by coconut farmers is intercropping whereby the coconut trees are intercropped with other crops. This farming system makes it difficult to determine with precision the acreage under coconut. While it was difficult to get the right figures on acreage under coconut estimates have been made based on the number of trees in the farms.

Table 4: Area under Coconut Per County

Name of County	**Area (Ha)**	
	2018	**2019**
Kilifi	40,225	41,432
Kwale	30,895	31,358
Lamu	10,503	10,713
Mombasa	151	156
Taita Taveta	97	99
Tana River	1,050	1,066
Total	**82,921**	**84,824**

Source: NOCD Year book 2018, NOCD Year book 2019

CHAPTER THREE: COCONUT VALUE CHAIN ANALYSIS

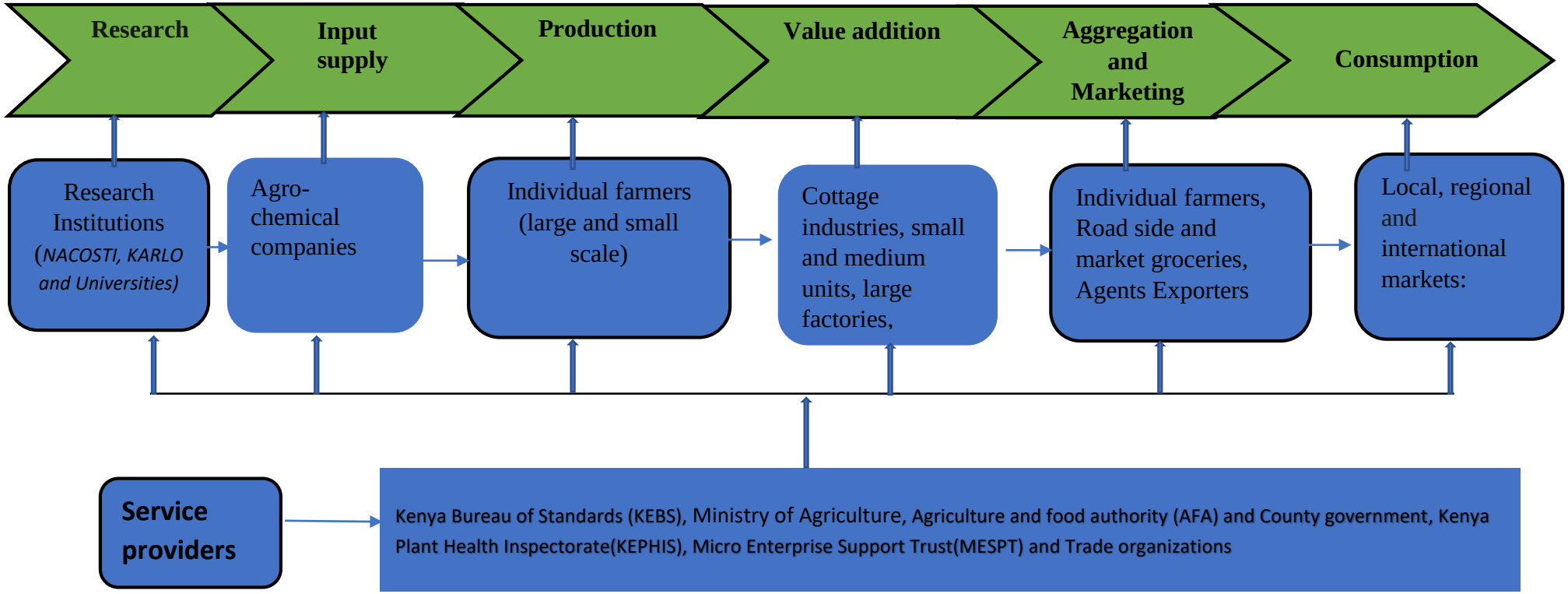

Figure 1: The value chain map

3.1 Research

Coconut research in Kenya has been dedicated on the improvement of varieties, multiplication of planting materials, value addition technologies and product development. These research endeavors have been undertaken by Kenya Agricultural and Livestock Research Organization(KALRO), AFA -NOCD in collaboration with Universities like Jomo Kenyatta University of Agriculture and Technology(JKUAT), Moi University and Pwani University. The development of better coconut crop varieties is yet to deliver positive results. The multiplication of planting materials through tissue(embryo) culture was undertaken at JKUAT, Pwani University and Moi University but success recorded was only up to the level of growing the seedlings in the green houses. Seedlings developed however were unable to survive in the open field. Currently, AFA-Nuts and Oil Crops Directorate is engaged in a collaborative research project called Manufacturing Research Chair on Enhancing Coconut Value Addition that is funded by NACOST and domiciled at JKUAT Juja. The objective of this research project is to find technological innovations/developments that can improve the value addition of the coconut resource. So far some of the coconut products technologies developed include: coco peat product development, increasing coconut kernel utilization (making of yoghurt, ice cream candies, etc.), husk decorticating, soap stirring and de-huskers.

3.2 Input supply

Most coconut orchards in Kenya are organic by default. The coconut crop grows naturally without the application of neither organic nor inorganic fertilizers. Main input is either the seed nut in the case of direct sowing or the seedling in case of nurseries. The use of pesticides, herbicides and other disease control chemicals has not been common among coconut farmers. Major pest that affects coconut is the rhinoceros beetle while the most common disease is the lethal yellowing. In most instances, farmers use traditional methods to mitigate coconut diseases and pests e.g. sand which is used to kill rhinoceros beetle. The table below shows the increase in tree population as a result of new planting

Table 5: New plantings per county - 2018/19

Name of County	Number of seedlings planted
Kilifi	217,416
Kwale	252,218
Lamu	55,800
Mombasa	7,110
Taita Taveta	7,000
Tana River	43,484
Total	**583,028**

Source: NOCD Database

3.2.1 Input suppliers

Nursery operators play an important role of ensuring adequate and quality coconut seedlings are available for farmers and other stakeholders. There is a total of fifty-eight (58) privately owned coconut seedling-nurseries distributed in the coastal region which have been trained by the Directorate. The list is as shown below shows the active nursery operators.

Table 6: Nursery operators by county

Name of County	Sub County	Number of Nurseries
Kilifi	Kaloleni	5
	Kilifi North	7
	Kilifi South	7
	Malindi	1
	Rabai	2
Kwale	Msambweni	5
	Matuga	9

Lamu	Lamu East	3
	Lamu West	8
Tana River	Garsen	8
Taita Taveta	Taveta	2
Mombasa	Kisauni	1
Total		**58**

Source: AFA-Nuts and Oil Crops Directorate

3.3 Production

3.3.1 Ecological Requirements for coconut

a) Soils.

Coconut palms have the best competitive advantage on sandy shorelines. Their ability to grow in infertile and saline soils, tolerate short inundations of the roots in salt water, and thrive in a wide range of pH environments gives coconut palms this advantage. Coconut palms are naturally found on course sandy soils, but their ideal growth medium is well drained fertile loam or clay soils. Ideal PH range is 5.5-7 although the palm can tolerate pH ranges from 4.5-8. The tree cannot tolerate water logging within its root zone.

b) Temperatures:

The palms require mean annual temperature of between 21-30 °C (mean max of hottest months 28-37 °C, mean minimum of coldest months 4-12 °C and coldest tolerated temperature of 0 °C (32 °F) (Chan and Elevitch 2006; Last 2001). Freezing will kill seedlings and young palms and prolonged exposure will kill older palms (Chan and Elevitch 2006).

c) Rainfall

For optimal coconut production, the level of precipitation required should not be less than 1000 mm, but the most preferred is 1500-2500 mm (60-100. Ideally, the precipitation

should be evenly distributed throughout the year (Chan and Elevitch 2006; Last 2001). A supply of ground water by seepage from upslope or a reachable water table could mitigate a lack of rainfall (Last 2001). Inadequate water supply is not well- tolerated and results in faster dropping of fronds, death of emerging fronds, premature fruit drop, and poor fruit crop in later years (Chan and Elevitch 2006; Last 2001; Prado et al. 2001). Poorly draining soils receiving the sufficient rain quantities could become water-logged; two weeks of water-logged soil kills coconut palms (Chan and Elevitch 2006).

d) Altitude:

Coconuts grow well in elevations ranging between 0-600 m above sea level; however, exceptions exist especially in Kenya where coconuts have been grown at higher elevations.

e) Sunlight: Coconuts can grow in shade but nut production will be adversely affected (Chan and Elevitch

3.3.2 Farming systems

Coconut is one of the cash crops along the lower coast region of Kenya and is cultivated by almost every household. The tree crop is cultivated by small holder farmers with small pieces of land ranging between 2 - 10 acres in Taita Taveta, Kwale and Lamu, and 1 - 5 acres in Kilifi, while the acreage averages 0.5 - 2 acres in Mombasa. Most farmers have no knowledge of the use of manure, fertilizers or any pesticides for coconut. The tree grows depending on natural rain with no extra care. Most coconut farms are not pure stands but are intercropped with other tree crops like mango, citrus or orange trees. Coconut orchards may also be inter-cropped with annuals like cassava, sesame, maize and passion fruit. Most farms are communally owned or GL (Government Land). Very few farmers have title deeds.

3.3.3 Coconut Propagation

Coconut is primarily propagated through seed. Attempts at clonal propagation and embryo culture have so far been employed in some countries. In Kenya coconut orchards are mainly established through: direct sowing in the field and nursery establishment.

During the survey it was observed that most farmers prefer use of seedlings obtained from nurseries.

3.2.4 Total number of coconut farmers

The coastal region of Kenya has a total of 90,952 coconut farmers whereby Kilifi accounts for the highest number of farmers (47,561) followed by Kwale County (31,954), Lamu 5,017 and only 1,688 farmers are in Mombasa.

Table 7: Number of coconut farmers in Kenya

Name of County	Number of farmers
Kilifi	47,561
Kwale	31,954
Lamu	5,017
Tana River	2,228
Taita Taveta	2,504
Mombasa	1,688
Total	**90,952**

Source: KNBS, Housing and Population Census, 2019

3.3.5 Farming Activities by Gender

The survey findings indicate that coconut farming in Kenya is heavily dominated by males. The gender distribution of coconut farmers was represented by 77% male and 23% female. Across the counties, the male dominance ranged between 86% in Taita Taveta, to 64% in Lamu. The findings largely agree with the African cultural perspectives in many communities where the ownership of land and permanent crops is more associated with men than their women counterparts. The findings are as illustrated in the Figure hereunder

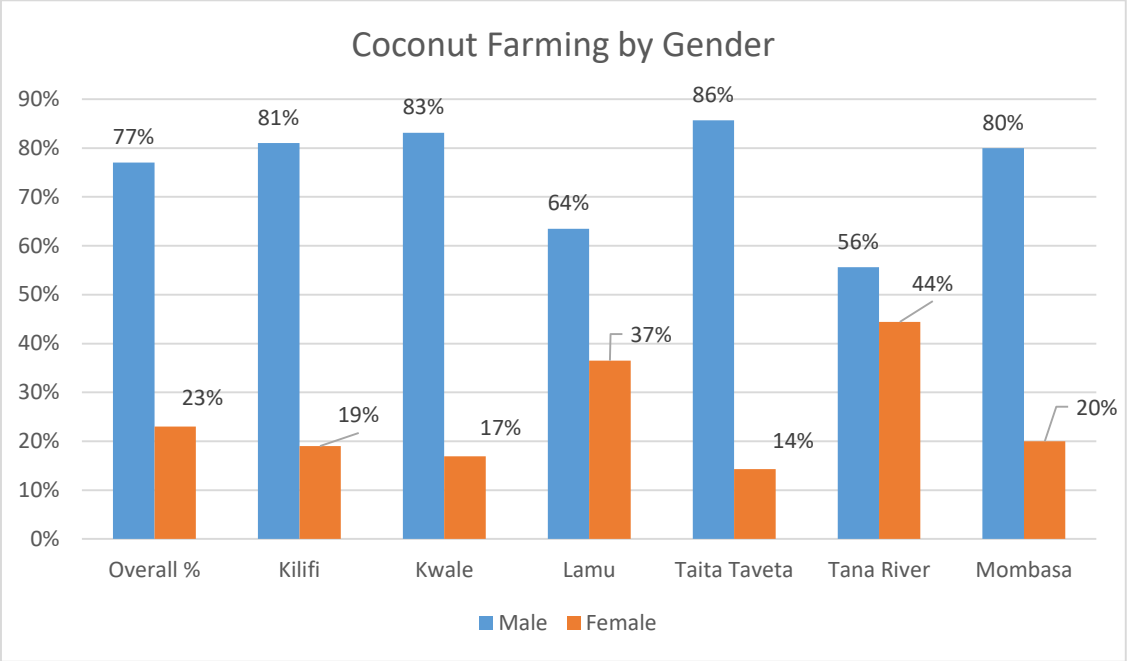

Figure 2: Coconut Farming Activities by Gender.

3.3.6 Number of coconut trees in coastal region by age

The number of trees in the coastal region stands at 10,521,038. 62% of the total trees are between 10-60 years, 25% are above 60 years and only 13% are young trees below 10 years as illustrated in table 8 below:

Table 8: Number of trees by age

Below 10 years	10 - 60 years	Above 60 years
1,342,934	6,538,696	2,639,408

Source: AFA-Nuts and Oil Crops Directorate

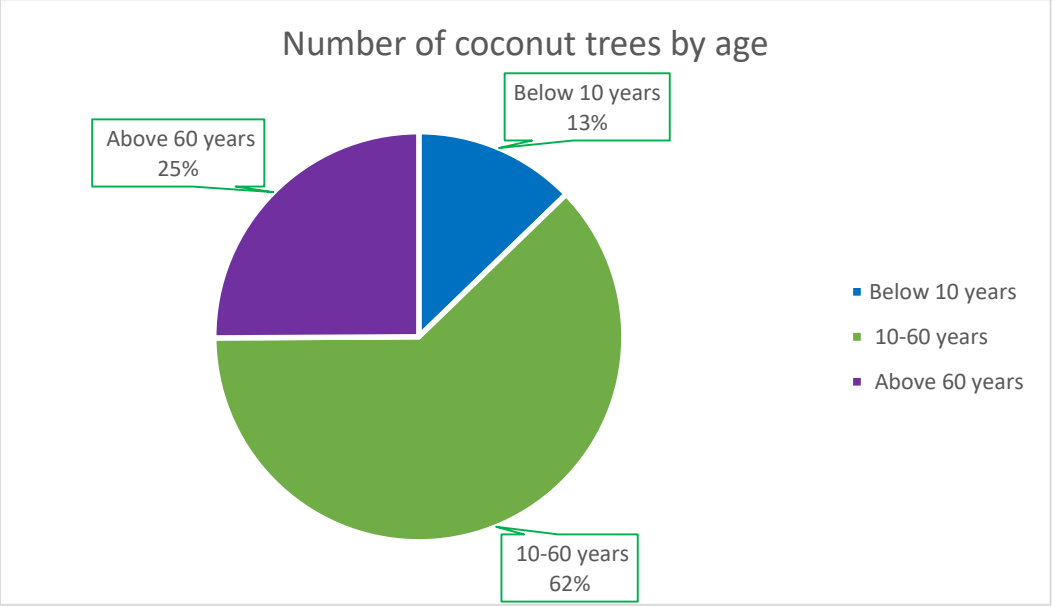

Figure 3: Number of trees by age

3.3.7 Size of land under coconut

Currently the area under coconut is approximated at 84,824 which is a marginal increment from the 82,921 hectares reported in the year 2017. The acreage has increased as a result of new plantings being undertaken by farmers on their own initiative in response to favorable prices for coconut products. Additionally, the increased acreage can also be attributed to the subsidy seedling program implemented by AFA through the nuts and oil crops Directorate through which farmers receive high quality planting material. Under the programme farmers receive seedlings at no cost save for transport, planting and land preparation costs. This coupled with the favorable weather conditions experienced in the last two years motivated farmers to dedicate more land for coconut expansion. The findings were as shown below

Table 9: Land under coconut

Name of County	Area (Ha)		
	2017	**2018**	**2019**
Kilifi	40,114	40,225	41,432
Kwale	30,543	30,895	31,358
Lamu	9,193	10,503	10,713
Mombasa	168	151	156

Taita Taveta	96	97	99
Tana River	1,049	1,050	1,066
Total	**81,163**	**82,921**	**84,824**

Source: AFA-Nuts and Oil Crops Directorate

3.3.8 Sources of seedlings

The findings indicate that the main source of coconut seedlings for planting is from their own farms constituting 45% of the respondents, 23% get the seedlings from the government subsides, 20 % from other farmers and only 12% indicate to have sourced their seedlings from commercial nurseries as shown in the table below.

Table 10: Sourcing seedlings by farmers

Source of seedlings	**Responses**	
	Frequency	**Percentage (%)**
Own farm	164	45%
Commercial nursery	45	12%
Government subsides	82	23%
Other farmers	74	20%
Total	**365**	**100 %**

Source: AFA-Nuts and Oil Crops Directorate

Coconut production has significantly increased from 180 million nuts in 2007 to 260 million nuts in 2013 to 300 million nuts in 2019 (Gachanja, 2007, UNIDO 2014, Danda 2020). This has been as a result of sensitization on replanting of quality coconut tree seedlings to replace the aged and senile trees as well as the empowerment of the farmers to embrace good agricultural practices as depicted in the graph below:

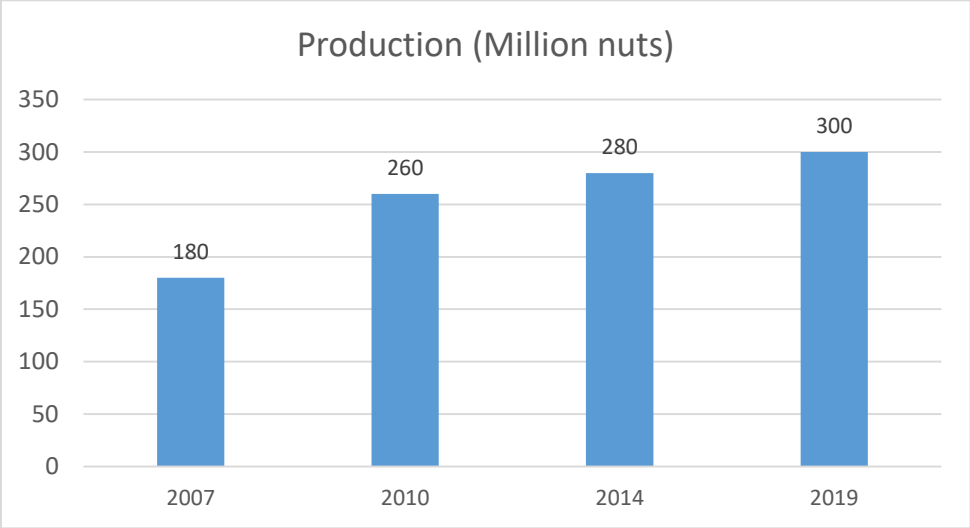

Figure 4: Coconut production trend 2007-2019

3.3.9 Seasonal trends in coconut production

The coconut tree produce nuts throughout the year, however harvesting is done three or four times annually depending on the rainfall amount received. There are two distinct coconut production seasons i.e. high and low. The high nut production season begins in October and ends in April while the low season is between May and September. Harvesting of immature nuts is one of the causes of scarcity of mature nuts in the industry. The Indiscriminate harvesting lengthens the harvesting cycle and leads to wastage as the nuts harvested cannot be utilized for processing or seed material.

The production seasons variations affect quantity of mature nuts supplied. Demand for nuts varies much less through the year than variations in supply. Low supply characterized by high demand increases price for the mature nuts. This becomes uneconomical for processors and hence most of them shut off at such times (May to October) to reopen when the prices become economical for them (November to April)

The requirement for funding along the coconut value chain is mostly at the processing stage.

There need for increased linkage creation between various value chain actors for business to blossom. Forward and backward linkages between actors needs to be strengthened.

Different actors along the value chain require different loan products with varied repayment arrangements. Those whose businesses that are affected by the production seasons will need loan facilities with staggered repayment plans.

3.4 Harvesting

Coconuts can be harvested as tender for tender coconut meat and tender water; and as mature nuts. Harvesting in the country is mostly by climbing the tree. However, fully matured nuts with fully dried husk may fall on their own.

Branches for making makuti and brooms may also fall down for collection and aggregation or may be harvested through physically climbing the trees. The harvesting of toddy is by physically tapping of the spadix (inflorescence) where a tapper climbs the tree selected for production of toddy to cut the flower and tie a collecting container where the toddy drips into. Toddy remains fresh and can be used as a non-alcoholic beverage up to three hours after tapping. Other harvesting methods include power tiller operated ladder, climbing cycle / equipment, use of trained monkeys

Yields: Potential coconut yields per variety are as follows:

- Average yield: 30 – 80 nuts/palm/year depending on the variety.
- Dwarf varieties-40 – 60 nuts/palm/year
- Tall varieties -30 – 80 nuts/palm/year
- Hybrid varieties – 200 – 300 nuts/palm/year

3.5 Aggregation, Storage and Distribution

Harvested nuts should be kept with their husks intact under shade conditions. This will increase their shelf life to a maximum period of six months. Dehusked nuts should not be exposed to sun light as the shells will crack causing quality deterioration.

Harvested tender nuts should be carefully handled during transportation and stored in cool and dry places under shade to increase their shelf life. Due to the collapse of the Producer Cooperative Societies in the early 1980s aggregation of mature nuts and other coconut produce is done by private buyers/brokers/middlemen. Middlemen buy nuts directly from farmers, aggregate them in collection centers and then sell to domestic

users, processors, retailers who stock in their *vibandas* or grocery shops or sell to exporters. Some processors own collection centers where contracted farmers and non-contracted supply nuts. Such centers have desk clerks who manage the deliveries. Before payment is done, quality of nuts is checked and confirmed to be good.

The coconut distribution chain is characterized by many middlemen who end up reducing the farmers' profit margin and making the nut expensive to the final consumer.

3.6 Value Addition

The coconut tree is traditionally known for many uses ranging from the fruit, leaves and the trunk. There are hardly any parts of the coconut that are left unused. Utilization of coconut resource is done through several ways that include transporting to where the consumers are, storing until demand arises and processing. Utilization of the coconut produce in the country is still limited because of poor technologies and lack of business finance. Coconut can be converted into more than 120 products through value addition but only about 60 products are processed in Kenya. Major value added products include virgin coconut oil, desiccated coconut, coconut milk, cream, brooms, makuti, coir fiber, coco peat, door mats and briquettes. Sub-value chains that have not been developed include toddy *(mnazi wine),* the shell, the husk and the leaves. In general terms, the coconut sub-sector demonstrates an immense potential to drive economic development in the main coastal belt. In Kenya, only a few products are obtained and utilized from the coconut tree as shown below:

Table 11: Parts of coconut tree and utilization

No.	***Type of produce***	***Form of Utilization (products obtained)***
1	Mature Coconuts	Virgin coconut oil, carbonized shell dust(char), coconut milk, shell artifactual products, coco-peat, coconut fibre, copra oil, coconut cream, desiccated coconut, copra cake, charcoal briquettes, cosmetic products, coconut water, coir mats/ropes
2	Tender coconut	Coconut water, coconut jelly/tender meat, coconut fibre.

3	Coconut leaves	Thatching materials (makuti), brooms, toothpicks, fishing equipment
4	Toddy (coconut sap)	Coconut wine, coconut vinegar, coconut honey, toddy juice (tembo tamu)
5	Coconut trunk (coco wood)	Coconut timber, coconut furniture, coconut carvings, coconut flower pots, coconut timber flooring products, coconut boats and canoes.

The coconut value chain can be split further into several other value chains that have wide utilizability and yielding a spectrum of final products and by-products as follows:

3.6.1 The tender coconut (madafu) Value chain

The tender nut in Kenya is most used as a refreshing beverage. Tender nuts are harvested green at the age of about 3-6 months and sold mostly by vendors in towns like Mombasa, Malindi, Ukunda, Kwale, Mazeras, Watamu and Lamu. Tender nuts prices fluctuate seasonally between a price range of KES 25 to KES 45 at the market and KES 10 to KES 15 at farm gate. However, the price fall can be to KES 5 during high supply and low demand.

The tender nut can be value added into packaged tender water, spiced tender meat and ice cream. The green husk can be made into manure and fertilizer.

Table 12: Estimated quantity and Value of tender coconut Produced in 2019

Name of County	Pieces Produced	Average Price (KES)	Value (KES)	Percent Contribution to Total Value
Kwale	13,008,687	22	286,191,120	61.8%
Kilifi	6,249,843	16	99,997,486	21.6%
Mombasa	2,556,834	30	76,705,014	16.6%

Lamu		15		3.8%
	1,178,333		17,675,002	
Tana River		15		1.7%
	518,224		7,773,361	
Taita Taveta		20		0.1%
	24,520		490,409	
Total		**20**		**100.0%**
	23,536,442		**462,883,357**	

Source: AFA-Nuts and Oil Crops Directorate

The tender coconut water produced in Kenya is marketed using different channels, however THE most common outlet is traders who buy at farm gate and sale in the towns and cities to retailers at a profit. The responses are as shown below

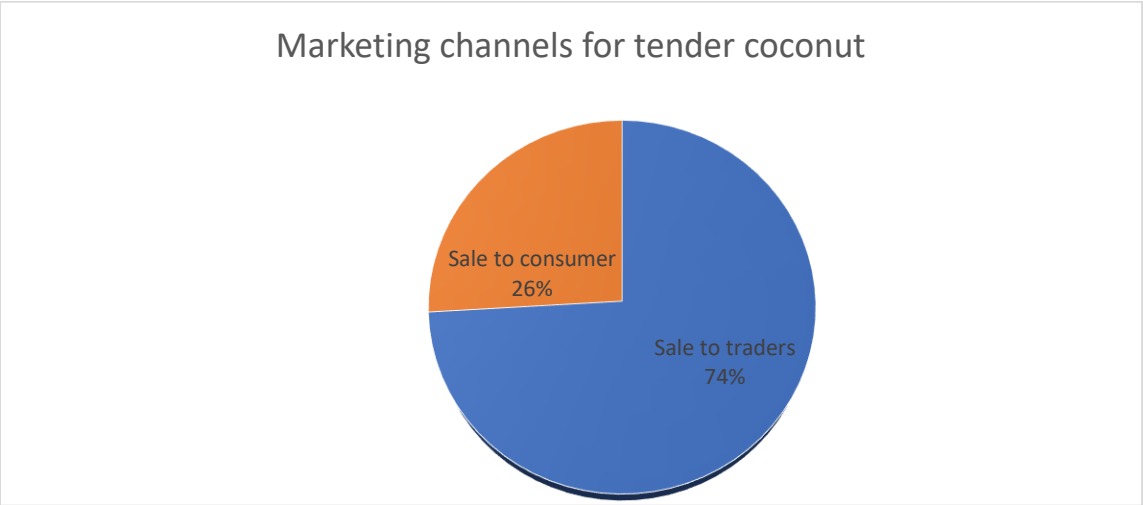

Figure 5: Marketing channels for tender nuts

3.6.2 The mature nut meat (kernel) value chain

For a long time in Kenya, the coconut kernel was only utilized for milk used for graving/spicing food at the domestic level, extraction of copra oil and copra cake as a by-product that is used as animal feed. With increase in awareness on processing technologies and innovations on product development wider utilization is discovered.

This includes extraction of VCO, coconut cream, desiccated coconut, coconut flour, ice cream, yoghurt, pinneacolada, coconut flakes (coconut chips) and animal treats. All these

can be developed into certified products, processed by SMEs and groups and become profit generating businesses for improvement of livelihoods.

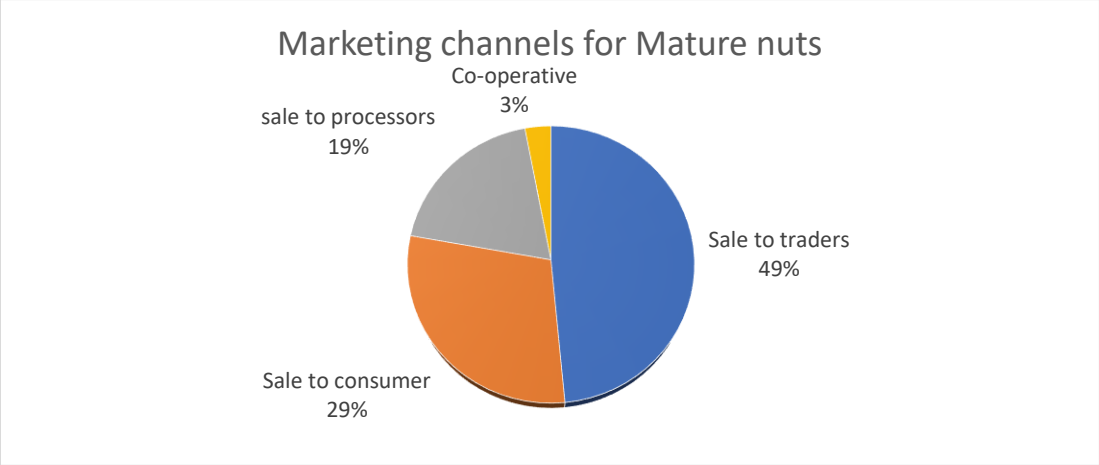

Figure 6: Marketing channels for Mature nuts

3.6.3 The coconut wine value chain

Coconut wine is the second most valuable product obtained from coconut in Kenya. The wine has higher potential which can be exploited through value addition. The wine can be value added to cater for the subserviced domestic beer market as well as look out for export opportunities, especially within the East African Community, then to the rest of Africa and the world. The coconut wine value chain can also be developed further to produce more commercial products for the local market and the international market. These include vinegar, coconut sugar, coconut honey and spirits which have good market values worldwide. The coconut sugar is edible sugar made from fresh coconut sap. The process of producing sugar starts from tapping or collecting of coconut sap. Produced by small scale cottage industries in Asian Pacific coconut growing countries, coconut sugar is essentially used as a sweetening agent in many traditional food preparations and food products. The concentration of total sugars in coconut sugar is 80 percent total soluble solids. It is 100% organic, minimally processed, unfiltered and unbleached. Natural sweetener made from coconut syrup contains no preservatives and is naturally low on glycemic index (GI), which has benefits for weight control and improving glucose and lipid levels in people with diabetes (type 1 and type 2). This potential from the coconut wine value chain is yet to be exploited in Kenya despite it being so lucrative.

Table 13: Nutritional Composition of Coconut sugar

Specifications	Percentages
Sucrose	70-79%
Glucose/fructose	3-9%
Vitamins	B1, B2, B3, B6 and C

Table 14: Estimated value of coconut wine produced in 2019

Coconut wine				
County	**Litres**	**Average Price (KES)**	**Value (KES)**	**% contribution to the total value**
Kilifi	248,503,614	54	13,419,195,183	74.8%
Kwale	65,001,467	57	3,705,083,599	20.7%
Taita Taveta	8,872,253	55	487,973,888	2.7%
Mombasa	4,175,178	60	250,510,689	1.4%
Lamu	1,215,486	47	57,127,822	0.3%
Tana River	357,003	40	14,280,105	0.1%
Total	**328,125,000**	**52**	**17,934,171,286**	**100.0%**

Source: NOCD

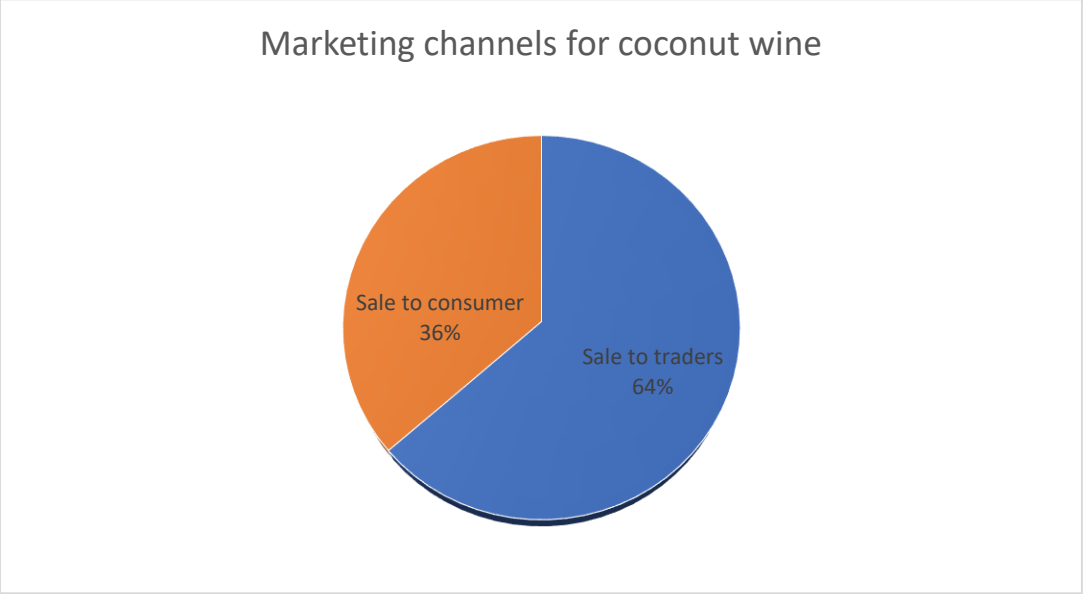

Figure 7: Marketing channels for coconut wine

3.6.4 The coconut husk Value Chain

The coconut husk has become the main product of the coconut growing in some countries like India. However, in Kenya this product is almost wasted and a nuisance in the homesteads. Apart from being used as an energy source, there is some emerging interest to process coco peat by a number of private investors like Coco Grow and Coir Supplies in Kwale County, Coco Ponics and Kocos Kenya Limited in Kilifi County. There are also a number of social groups that are using coir fiber to make door mats and ropes. NOCD has also sensitized the use of coir geo-textiles on many occasions and expect to see an upsurge in the value addition of the husk. However, due to inadequate disposal, the coconut husk has become an environmental hazard and is often turned into bonfires.

According to FAO sources, out of the total annual global production of coconuts, only 10% of the coconut husk is being used for coco peat extraction amounting to an estimated 1.5 million metric tons of coir pith. Together India and Sri-Lanka contribute almost 90% of the global coco peat production

Emerging applications of coir fiber and coir pith present husk processing with potential lucrative business venture investors cannot ignore. Concerted effort is thus required to

exploit the potential in this product line as it emerges that it has both forward and backward linkages that can propel the coconut sub-sector to greater levels.

The development of the husk would add eco-friendly products to the market, farm incomes, providing gainful employment to the rural masses, provide inputs for other sectors, earn revenue for the economy, help in poverty alleviation and enable rural development. Utilization of the husk would contribute to both effective managements of environmental pollution and development of international competitiveness for the coconut subsector.

The husk can also be value added into charcoal briquettes and charcoal pellets produced as final products and certified by KEBS, branded and packaged for the formal market. This will in effect bring income for the youth and women.

3.6.5 The coconut shell value chain

This is the hard material that houses the coconut meat. It is placed between the fibrous husk and the coconut meat. In the countries of Asian Pacific where the coconut value chain exploitation is much advanced, the shell is used for production of Gasifier (shell gasification). Shell gasifier is used as a source of heat energy in cooking, burning, steaming and all areas where heat may be needed. Shells are also used for the manufacturing of activated carbon, charcoal briquettes and pellets (green charcoal). The shell can further be grinded to produce shell powder that is used as a resin in the making of mosquito coils and for many other uses.

The shell has also found great use in the world of art where its used for making artifacts like necklaces, wrist bungles, earrings, ash trays, sugar dishes, candle holders, flower vases and bowls.

3.7 Marketing

Marketing of coconut produce is mainly done by brokers and middlemen who buy from the producers. Marketing of processed products is still not aggressively done and this accounts for the reason why many a potential consumer is not aware of most of the coconut products being introduced in the market. AFA-NOCD has been assisting nuts and oil crops based processors market their products through giving them space at the annual

ASK shows that happen once a year in all the major towns of the country. A Large proportion of coconut produce is sold in raw form at farm gate. The presence of middlemen in the marketing channels, has over time prevented farmers from obtaining a higher share of the price offered. The mature coconut trade in Kenya is essentially monopolistic in nature with a large number of farmers selling to only a few, middlemen and processors. Farm gate prices of the whole nut in the country currently average KES 15-20. About ten years ago when the interest in the industry was at its lowest, farms were virtually abandoned and a piece of coconut fetched less than KES 5. This however changed with the entry of the Tanzanian traders. The Tanzanians have made the prices to move from KES 5 to an average of KES 15 per nut. Although other parts of the nut such as the husk can be processed into other products, focus is placed on selling of the dehusked mature nut. Mature nuts trading at the farm gate earned farmers approximately KES 2.9 billion. The nature of coconut trade is summarized in the diagram below:

A recent interaction with farmers revealed that marketing of mature coconuts happens in three ways as follows:

Method 1: This comprises of household level coconut harvesting for local consumption, and sale to agents representing different processors. This method may involve the tree owner, the harvester (usually on hire), the neighborhood small scale buyer for consumption.

Method 2: Households harvest (using a hired harvester), buyers/brokers collect from decentralized farms and transport to a central collection center for de-husking. The nuts are then transported to local processors (e.g. Kentaste or Amor coco). This method attracts additional market players such as middle-men and processors.

Method 3: Buyers monitor the production calendar of nuts, organize for their harvest (and meet the costs), organize for assembly of nuts to a central place, de-husk and export whole (unbroken nuts) nut by road to Tanzania.

Important aspects to note across the three market methods are on price setting. In the first method, prices are determined by the forces of demand and supply and therefore fluctuated with coconut production levels. As for the second and third methods, prices are controlled by the buyers especially where nuts are bought in bulk. Bulk buyers use a

strategic approach of pre-payments (either full or partial payments) to coconut farmers/owners as a bait to price control.

Table 15: Quantities of mature coconuts produced and traded per County in 2019

Name of County	Volume produced (in pieces)	Price per nut	Value (KES)	Percentage contribution
Kilifi	140,370,252	14	1,965,183,528	39%
Kwale	123,225,052	16	1,971,600,832	39%
Lamu	21,207,103	15	318,106,549	6%
Mombasa	10,341,438	20	206,828,768	4%
Taita Taveta	2,734,167	18	49,215,013	1%
Tana River	2,575,048	18	46,350,856	1%
Total	**300,453,061**	**17**	**5,057,626,527**	**100%**

Source: AFA-Nuts and Oil Crops Directorate

3.7.1 Contract farming in coconut subsector

Any sustainable supply arrangements with coconut farmers are those that enable farmers to enjoy positive shifts in produce prices both in the short and long run. Most surveys done point to the fact that there are no formal contracts existing between most farmers and middlemen. Middlemen who are agents of processing companies manage agreements between principals and farmers. There exist upfront or advance payments between most foreign buyers, brokers and farmers for nuts before maturity and harvesting. Payment is made on an agreed price for nuts before they mature. This system is prevalent in some parts of Kwale county such as Mkongani, Kubo south and Msambweni. In Kilifi county, the prepayments are prevalent in Chonyi, Chumani, Tezo, Matsangoni, Gede, Kinani, Chanagande and Jibana areas. This arrangement is accepted by farmers because of their urgent needs for money such as payment of school feels and medical needs which may not wait.

Our interaction with the stakeholders revealed that a few farmers have entered into farm lease agreements where farms are put under temporary ownership of buyers for a specified number of years after which ownership reverts to the farmer. The lease arrangement however is disadvantageous to farmers who cannot benefit from the

prevailing market prices during the period of the lease. However increased sensitization is discouraging this practice. Some companies have contracted more than 3,000 farmers to supply both organic and non-organic nuts.

3.7.2 The role of cooperatives societies in marketing of coconut produce

The co-operative interventionary measures for coconut marketing in Kenya have previously failed, this is largely attributed to poor corporate governance in their management and external interference. The poor management and their failure to pay farmers promptly led to farmers selling directly to traders (side selling), thus damaging the functioning economics of the co-operatives.

Processors are advocating for the revival of cooperatives to help coordinate the harvesting, purchase, bulking and storage of nuts for sale to both the middlemen and processors. There is an urgent need to have a paradigm shift in the management of cooperatives in addition to change of names from cooperatives societies to collection centers. The change of names is informed by the previous negative experiences of cooperatives. In order to address poor governance which has made it impossible for cooperatives to operate effectively and inspire confidence among farmers, industry players propose a different approach in the management of cooperatives

3.8 Imports and Exports of finished coconut products.

Imports of coconut based products into Kenya have been increasing over time to register sizeable quantities. The year 2019 registered increased coconut based imports in terms of volume from 3,069.11 tons valued at KES 689.21 Million to 3,721 tons valued at KES 732.89 Million realized in 2018. As a result of the importation, a wide array of coconut based finished products are now available on retail outlets precipitating competition between locally produced commodities and imports. In addition to edible coconut products, other high end products are imported into the country in form of cosmetics and beauty products.

Copra oil is the major product imported into the country accounting for up to 55% of all coconut kernel based products. In most instances the copra oil imported is cheaper

because of the large scale processing level and integrated production systems in the origin countries such as Malaysia, Thailand, Philippines, and India which enables producers to take advantage of economies of scale. The imports and exports of coconut has been summarized in the tables below:

Table 16: Exports of the major products in 2019

a) Coconut oil

Importing Country	Qty (Kgs)	Exported value in 2019 2019 (USD thousand)
Yemen	29,390	115
Uganda	9,840	74
Tanzania, United Republic of	970	9
United States of America	1,024	4
Rwanda	468	3
Somalia	2,700	2
Total	**44,421**	**207**

Source: AFA-Nuts and Oil Crops Directorate

b) Desiccated coconut

Importing Country	Value exported in 2019 (USD thousand)	Quantity (tons) exported in 2019
Uganda	23	7
Mozambique	13	8
Rwanda	2	1
Total	**38**	**16**

Source: AFA-Nuts and Oil Crops Directorate

c) Coconut Hair oil

Importing Country	Value exported in 2019 (USD thousand)	Quantity exported in 2019 (Tons)
Rwanda	1,272	571
Uganda	895	356
Egypt	109	10
Tanzania, United Republic of	62	43
Congo, Democratic Republic	56	34
Burundi	35	17
Ethiopia	5	2
Malawi	4	1
Zimbabwe	4	1
United Arab Emirates	3	4
Total	**2,445**	**1,039**

Source: AFA-Nuts and Oil Crops Directorate

d) Coco peat

Importing Country	Value in 2019 (USD 000)	Qty exported in 2019(tons)
Ethiopia	30	27
Tanzania,	21	56
Uganda	11	11
Total	**62**	**94**

Source: AFA-Nuts and Oil Crops Directorate

e) Crude coconut oil

Importing Country	Value exported in 2019 (USD thousand)	Quantity (tons) exported in 2019
Netherlands	99	24
United States of America	82	11
Yemen	32	25

Tanzania	10	7
Mozambique	7	2
Rwanda	5	1
Total	**235**	**70**

Source: AFA-Nuts and Oil Crops Directorate

Table 17: Imports of the major coconut products in 2019

a) Coconut oil

Country of Origin	Value2019(USD thousand)	Imported Qty Kilograms
Indonesia	55	45,600
Malaysia	35	44,550
India	77	24,112
South Africa	8	1,667
Germany	1	399
United Kingdom	1	368
United Arab Emirates	3	366
Total	**181**	**117,062**

Source: AFA-Nuts and Oil Crops Directorate

b) Desiccated coconut

Country of Origin	Value imported in 2019 (USD thousand)	Quantity imported in 2019(tons)
Viet Nam	37	26
India	21	6
Malaysia	19	13
China	19	26
Indonesia	18	13
Total	**114**	**84**

Source: AFA-Nuts and Oil Crops Directorate

c) Coco peat

Country of Origin	Value imported in 2019 (USD thousand)	Quantity imported in 2019(tons)
Finland	302	812
India	271	848
Sri Lanka	163	190
Netherlands	52	143
United States of America	26	12
Germany	19	36
Spain	6	12
Total	**839**	**2,053**

Source: AFA-Nuts and Oil Crops Directorate

Table 16: A comparison of prices for imported and domestically produced products in the shelves

Product	Country of origin	Price of import (KES/Lt, Kg)	Domestic prices (KES/Lt, Kg)
Desiccated coconut	Indonesia	976	1,140
Coconut cream	Thailand	628	573
	Indonesia	840	
	Malaysia	616	
Coconut milk	Thailand	425	413
	Indonesia	700	
VCO	Thailand	1,250	1,200
	India	3,495	
Copra oil	Mozambique	180	300
	Vietnam	131	

Source: NOCD

From the analysis above, imports are price competitive when compared to locally produced commodities save for imported copra oil which costs half the price of locally produced oil. The demand for processed coconut market is yet to match supply.

CHAPTER FOUR:

VALUE CHAIN UPGRADING PROGRAMS

4.0 Introduction

The under exploitation of the coconut resource has been a major setback in the socio-economic development of the Coast region and by extension the entire country. The sub-sector is a major source of raw materials for SMEs that are seen as the drivers of industrialization as envisaged in the Vision 2030 and the BIG FOUR Agenda in the country. Robust strategies need to be undertaken to turn around the situation and pull the contribution of the sub-sector to the GDP from the current KES 13 billion out of the potential KES 25 billion. AFA-NOCD has been undertaking programs to upgrade the value chain in collaboration with other development partners. Some of the programs are outlined below.

4.1 Increasing Coconut Production and Productivity

Despite the fact that coconut grows well in agro-ecological coastal lowlands (CL), frequent droughts in these zones have been affecting the coconut yields with most trees drying up or tipping off. The unavailability of drought resistant varieties and access to quality planting materials as well as the lack of hybrid varieties, is a major hindrance to growth and productivity in the coconut industry in Kenya. As part of the efforts to address this challenge, the government through nuts and oil crops Directorate has been running a seedling subsidy program is aimed at increasing the area under coconut. In addition, the program is to facilitate the introduction of disease and pest resistant varieties as well as training of farmers on good crop husbandry practices. Further, the program is to support existing coconut nurseries and encourage the establishment of new ones. The Directorate has trained more than 4000 farmers on nursery establishment and management. About 100 farmers out of the total trained have embraced nursery operation as a business. The nursery operators are also supposed to get certification from KEPHIS on the quality of the seedlings raised.

To date the Directorate has distributed about 2million seedlings under the Government funded seeding subsidy programme. The Directorate collaborated with MESPT, KALRO and County Governments of Kilifi and Kwale to import 6000 hybrid seed nuts from India in 2018. However, the germination was below expectation and only 2950 were raised and distributed to farmers who were willing to pay KES 500 per seedling. The Directorate has also put in some effort to introduce and develop the crop in new regions like Makueni and Tharaka Nithi.

4.2 Facilitating Product Development and Technology Transfer

The potential of the coconut industry in Kenya remains unexploited, largely due to inadequate, obsolete and inflexible technology. The development and transfer of the low level market research, coupled with low innovation and technology on coconut varietal development, agronomy, product development and marketing has been low. This situation is aggravated further by the low research priority accorded to the coconut industry characterized by low research funding. NOCD seeks to facilitate the establishment of rural based coconut processing industries to increase the utilization of coconut products at the domestic level and intensify the competitiveness of the coconut industry.

In this regard NOCD has partnered with research institutions; Jomo Kenyatta University (JKUAT), Moi University, Multi Media University, KIRDI, KALRO and NACOST in a project called Enhancing Coconut Value Addition. The program is facilitating the development and acquisition of appropriate value addition technologies. So far prototypes of a soap stirrer, dehuskers and briquetting machines have been successfully fabricated and given out to SMEs for trial. It is also collaborating with other stakeholders in supporting business development, product incubation and promotion of innovations. The program also has a component of facilitating awareness creation on the benefits of the range of coconut products at the household and national level.

4.3 Improving the regulatory framework

The prevalence of legislative inconsistencies in the coconut sub sector has been the impediment to the development and growth of the coconut industry. There is also an absence of strong stakeholder institutions such as farmer cooperatives. Limited operating and processing standards, hinder exploitation of the coconut potential as the locally processed coconut products and by-products cannot compete favorably both in the local and international markets. Subsequently, the coconut industries that are established close down due to stiff competition from cheap and low quality imports

These challenges however have been part addressed through the gazettment of Nuts and Oil Crops industry rules and regulations,2020. It is expected that the successful implementation of these regulations will restrict imports through the import levy, the involvement of too many brokers in the coconut distribution chain will be reduced and that the exportation of raw nuts out of the country will be discouraged. The Rules and Regulations will help govern the production, processing, marketing, exploitation and importation of coconut and coconut based products.

4.4 Strengthening Marketing Systems and Facilitate Market Access

Coconut farmers are the most disorganized category in the agricultural sector. As a result, they are not in a position to reap the benefit of most of the programmes implemented by various agencies. They are also unable to raise their voice for premium prices of their very little value added or semi processed coconut products and by-products. The Directorate initiated the establishment of Common Interest Groups (CIGs) and Producer Organizations in different areas organizing the farmers with a view of collectively acquiring agricultural inputs, selling their produce, getting information and disseminating it, or sharing expertise. The program also aims at developing coconut marketing infrastructure to enable farmers to access markets.

Value chain analysis is to be carried out continuously, to identify gaps and technology development in all the stages of the value chains. To exploit the multi-products and uses of coconut products and by products, NOCD also trains and supports farmers and

stakeholders in value addition, product diversification, technology improvement and transfer and adoption. Great emphasis is to be placed on diversification, not only to enhance exports and attract additional revenues but also to minimize importation of cheap coconut products and substitutes. By raising the price of coconut based coconut products' imports, local importers will pay better prices for local coconut products.

Consequently, an appropriate support tariff will be levied on non-processed coconut products to create incentives for value addition and thus increase investment in the coconut sub sector.

4.6 Business Opportunities along the Coconut Value Chain

a) **Input supply:** There is huge potential Enterprises that can be initiated here, they include nursery operation for the supply of seedlings and the supply of certified seed nuts to nursery operators. Requirements for nursery establishment are: source of water (pan, borehole, lake, dam or river), water pump, a simple irrigation system and a water tank in addition to capital for purchase of seed nuts

b) **Production:** Potential investors could be encouraged to start Coconut Plantations. Investment capital required here would be to cater for purchase of land, farm preparation, procurement of planting materials and maintenance until when the farm starts yielding income. A coconut orchard would take 4 to 5 years to begin realizing investor returns.

c) **Aggregation:** Aggregation is done at the collection centers. The collection centers can be owned as commercial units by private brokers and middlemen who buy at a lower price and collect to sell at a marked up price. NOCD licenses traders as marketing agents and are regulated to ensure their businesses are legal. Collection centers can also be owned and operated as business units by farmers and private investors through Public Private Partnership (PPP) arrangements.

d) **Processing:** This is where major value addition takes place. Coconut produce can be divided into the following value chains which can be substantively exploited and contribute to establishment of factories and employment.

   Tender coconut*(madafu)*: tender meat, yoghurt, tender water, green husk utilization for mature

Mature nut: husk utilization for coco peat, coir fiber, kernel utilization for oils, desiccated coconut, milk and cream, utilization of the shell for briquettes, activated carbon, shell gasifier, shell powder and artifacts. The mature coconut water can also be processed into vinegar and wine.

e) **Product Dealership:** This is where a trader buys a produce from the farmer or another dealer so as to sell to another dealer, processor or final user. Examples are makuti dealers, toddy vendors, madafu sellers, brooms sellers and broom

f) **Distribution/Marketing:** Large processors like AMOR COCO, Kwale Coconut, Cocos Kenya, and cocoponics can sell their products through selected and able brokers who can buy from processors in large quantities and sell to retailers who then sell to final consumers. Wholesalers or Agents are supplied at lower price by processors and then supply to retailers then to final consumers. Potential investors here could establish wholesale, Retail or Agency (stockists). The requirement is Capital to purchase the stock and hire of business premises.

4.6 Common Business Challenges in the coconut subsector

- **Lack of appropriate processing technologies coupled with inefficiencies**
- Inability to access to financial credit
- Lack of awareness about the existing products among potential consumers
- Little product diversification due to limited product development
- Highly fluctuating cost of raw material especially the mature nut. Prices for nut fluctuate from KES 5 during high supply season to around KES 25 during low supply season. Low supply season is characterized by high demand partly occasioned by demand for nuts by Tanzanian buyers.

4.7 Funding Needs for coconut value Chain

Inaccessibility to credit and other financial services has been a major challenge facing coconut businesses. The coconut sub-sector yearns for capital intensive investments in terms of factories and large plantations through which processing will be enhanced. In Kenya today, the processing of coconut products is highly fragmented, small in scale and highly informal compared to other well developed agricultural commodities such as tea, coffee and sugar. The high number of products which can be obtained from the coconut tree further complicate the scenario. Through capital injections, optimal processing capacity can be realized which will improve efficiency in the whole value chain. To realize this, efforts ought to be put in place to create a low level of risk and favourable investment climate for both local and foreign actors. Government and the private sector will take responsibility in supporting access to inputs and machinery through targeted financial services such as a stimulus package to jumpstart the subsector. Due to the challenges outlined above financial challenges experienced across the value chain. The following proposed financing methods may be appropriate in mitigating the financial challenges in the coconut value chain:

Table 17: Funding Needs for coconut value Chain

	Financing method	Targeted Value chain player	Salient features of the method
1.	Warehouse receipt system	Coconut farmers	The proposed warehouse receipt system to tailor-make products for coconut farming as an enterprise. Mature coconuts can be stored for up to 6 months as the farmer seek markets and secure better prices. Respective County government have a role in securing the produce and providing a direct link to potential buyers.

2.	Credit guarantee financing scheme	Coconut Processors and farmers	Processors and farmers can secure financing for their operations through a credit guarantee financing scheme. The value chain financiers such as government or NGOs to provide money to be domiciled in a banking institution for lending to the value chain players. It is worth noting that scheme can only benefit the coconut subsector if the minimum requirements are set bearing in mind the unique challenges facing the value chain players which makes in it difficult for them to secure financing from the banks currently.
3.	Tri-partite financing method	Coconut Farmers	Under this method an agreement/contract between the processor(buyer) and the producer(coconut farmer) becomes the basis for the Financial instructions to provide financial credit on condition that payments to the farmer must be channeled through the bank
4.	Minimum price guarantee method	Coconut Farmers	This method is best suited to mitigate against price fluctuations predominant in the coconut subsector. It calls for a well-organized marketing system where the farmer is always assured of a minimum price. In case the market price falls below the set minimum, the government tops the difference through an established price fund
5.	Invoice discounting	Coconut Processors	In this method, a percentage of the total amount invoiced is paid in leu of the final payment by the financing institution. The amount being given to

	the processors may be a special fund established for this purpose. The conditions for payments are best spelt out in the fund regulations but the credibility of the processor is a primary consideration. This method will help mitigate the cash flow challenges experienced by coconut processors who are unable to pay cash on delivery and stock sufficient quantities for processing during off season.

4.8 SWOT analysis of the industry

Strengths	**Weaknesses**
• Close proximity to the Port of Mombasa • Availability of resources • Existence of legal/Regulatory framework in place • High Political good will • Good working relationship with other stakeholders • A large number of mature productive trees • Existence of gazetted Regulations	• Lack of comprehensive Coconut policy • Weak stakeholder linkages • Large percentage of senile trees. • Use of obsolete and inflexible technologies. • Inadequate quality planting materials • Lack of improved planting materials -ie hybrids • Low level of research and development • Inadequate number of agricultural technical and support staff at grass root level. • Inadequate private sector involvement
Opportunities	**Threats**
• Availability of domestic raw materials	• Untimely harvesting of young coconut trees for timber.

• Emerging agribusiness financial products • Appropriate technologies • Research and development facilities at national research institutions and universities • Wide range of products and by products • Availability of public private policy • Development of special economic clusters	• Untimely harvesting of coconut for copra • Prevalence of Pests and diseases • Competition from cheaper imports • Unpredictable weather patterns. • High cost of processing • Poor Land /tree tenure system at coconut growing areas • Threats from HIV/ AIDS • Poverty and unemployment • Poor physical infrastructure • No technology transfers from generation to generation • Existence of cartels and unscrupulous traders in the marketing chain

CHAPTER FIVE:

CHALLENGES AND MITIGATIONS

5.1 The processors' supply chain inefficiencies

Processors often face raw material supply chain challenges which adversely affects their operations, it is however important to note that this is a seasonal challenge that is primarily influenced by the seasonality in coconut production. Prices for coconuts also fluctuate depending on the season. During the peak season (October to April) prices are lower and they average between KES 5 and KES 10. The prices however change and double off season (May to September) to range between KES 15 and KES 20. The following are salient features dominating the Kenyan coconut processors' supply chains:

- Some companies operate their own collection centers and have their own clerks who purchases on behalf of the company. Under this arrangement, farmers deliver produce to the collection centers.
- There is a growing global market for organic products and some companies have put in place mechanisms to register famers for purposes of certification. This will require that the processors have formal contracts to supply them with nuts. However, the prices offered are not attractive enough to assure the processors of the produce
- Processors obtain produce directly from farmers or through middlemen, on credit. Payments, or settlement of claims often take too long or are unnecessarily delayed. The delays have resulted in complaints from farmers and eroded their confidence in the processors as a ready market for their produce
- Processors indicate that there are other factors leading to inadequate supply of raw materials for processing. Some of the concerns include:
  - Most of the nuts have been prepaid for by middlemen selling to Tanzania hence not available to processors
  - Most farmers prefer selling to middlemen because they offered cash on delivery unlike the processing companies which buy on credit. They also prefer middlemen because they take up harvesting costs

- Immature harvesting results in scarcity as the produce obtained is unsuitable for processing

Table 19: Other Challenges and corresponding mitigation

	challenge	Mitigation
1.	Inadequate funding	Enhance resource mobilization
2.	Poor infrastructure	Lobby for improved infrastructure
3.	Inadequate personnel	Enhance budget allocation
4.	Inadequate research and development	Enhance collaboration/resource mobilization
5.	Poverty among the coconut growing communities	Enhance market access for coconut products
6.	Prevalent diseases and pests	Enhance collaboration with research institutions/Universities
7.	Uncontrolled logging	Sensitization of the players
8.	Inadequate planting materials	Enhance quality seedlings production
9.	Inadequate value addition	Enhance investment/technology transfer
10.	Unstructured marketing systems	Organise players into cooperatives

ANNEXES

Annex 1: SMES engaged in coconut value addition

S/ No	Name and Contact	Location	Product	Capacity	Status/Remarks
1	Kentaste Ltd - 0722843743	Mazeras (Kilifi County)	Coconut milk/cream	2,000 litres/week	Sold off to Kwale coconut ltd.
2	Navida Natural Foods – 0723939769	Msumarini	Virgin coconut oil (edible oil)	1,750 litres/week	Standard, bar coded, Branded products, sold in formal market.
3	Kocos Kenya Ltd – 0722682018, 0733741640	Kilifi-Mwazang'ombe (Kilifi County)	Coir Fiber and coco peat	2,000 kgs fiber and 2,000 kgs peat/week	Stable.
4	Tohariri Industry - 0721592934	Kilifi (Kilifi County)	Copra oil (non-edible oil) & copra cake	500 litres/week of oil	Closed. Machines still in place. Governance issues
5	Ken Coco-Twahir 0786263036	Majengo kwa Kadzengo	Charcoal briquette	1.5 tonnes daily. 15 employees (10 females)	Standard, bar coded, Branded products, sold in formal market. Progressing well. Needs to helped link to the market.
6	Amua Self Help Group - 0700168751	Chonyi (Kilifi County). 23	Copra oil (non-edible oil)	Over 200 litres per hour installed	On and off. Needs more follow up to tighten loose ends on management. Needs

		members. US Embassy aid, CDF,KCB Foundation &KCDA grants.		capacity. However still pulled back by poor management and negative group dynamics	to be linked to a partner or employ staffs to run the operations on behalf of the group.
7	Bundacho Youth Group – 0713531948	Chonyi (Kilifi County)	Charcoal briquettes	2000 tonnes daily installed capacity. Yet to start commercial production. Has no KEBS, bar codes, licences.	Stalled due to governance issues
8	Barani Self Help Group - 0711824589	Kikambala (Kilifi County)	Door mats	Capacity to do 50 pieces daily. Produces on order.	Progressing well
9	Pwani Classic products - 0727941032	Bamburi- (Mombasa County)	Soap, lotions, oils and creams	500 pcs of soap/daily	Progressing well
10	Malindi Industries - 0774622267	Malindi (Kilifi County)	Copra oil (non-edible oil)	1,000 litres/daily	Standard, bar coded, Branded products, sold in formal market.

11	Kwale Coconut Ltd - 0727926608	Ukunda-Msambweni (Kwale County)	Organic Virgin Coconut Oil (edible oil)	Processes 20,000 nuts daily.(1000 litres daily)	Very stable.
12	Auni Mselem - 0723880000	Gongoni (Kilifi County)	Copra oil (non-edible oil)	500 litres/week	Progressing well.
13	Alwy Abbas - 0715487505	Amu Island (Lamu County)	Copra oil (non-edible oil)	1,000 litres/week	Healthy operations.
14	Sharrif Abbas - 0720854953	Amu Island (Lamu County)	Copra oil (non-edible oil)	1,000 litres/week	Healthy operations
15	Manoso - 0725694515	Mishomoroni (Mombasa county)	Coconut artefacts	50 pcs/daily	Up and well. Needs exposure for product diversification and market linkage
16	Mwaboma Arts - 0712951410	Kanana – Msambweni (Kwale County)	Coconut artefacts	50 pcs daily	Up and well. Needs exposure for product diversification and market linkage
17	Ukunda Youth Polytechnic - 0711835788	Ukunda-Msambweni (Kwale County)	Coco wood furniture	10 pcs/week	On and off.
18	Makomona - 0726330205	Kisauni (Mombasa county)	Brooms	On order	Stalled due to financial hiccups.

19	Tazamia Women Group - 0721950148	Ukunda – Msambweni (Kwale County)	Makuti	2,000 pcs/week	On and off. Doing table banking and other businesses. Does little of coconut based business.
20	Watamu Cocowood works - 0733579725/0723 162650	Watamu (Kilifi County)	Coco wood furniture	On order	Up and running
21	Wakesho Women Group - 0723007822	Kisauni (Mombasa county)	Virgin Coconut Oil (edible oil)	200 litres/week	Stable group.
22	Millennium Handicrafts - 0724910466	Ukunda - Msambweni	Coconut artefacts	100 pcs/week	Stable group.
23	TM Abdul Hussein & Sons (Minara) - 0735512152	Bondeni (Mombasa County)	Copra oil	10,000 litres/week	well established
24	Coco Vita - 0727631114	Makomboan i –Kaloleni (Kilifi County)	Virgin Coconut Oil (edible oil)	500 litres/week	Progressing well.
25	Lamu Cultural Group - 0704476428	Amu Island (Lamu County)	Coconut artefacts	50 pcs/week	unstable
26	Zachariah and Sons - 0729329250	Kikambala (Kilifi County)	Coir mats	100 pcs/week	well established

27.	Masasada International Ltd - 0725634888	Mombasa (Mombasa County)	Tender Coconut Water	100 litres /week	Dormant. Stopped operations. Has no operating capital.
28.	Mnazi Network 0729279232	Kaloleni (Kilifi County)	Coco syrup	50 litres /week	Stable group.
29.	Coir Suppliers 0722365058	Msambweni (Kwale County)	Coir fibre	2,000 kgs/day	Stable.
30.	Kilifi Social Enterprises 0734051942	Kilifi Town (Kilifi County)	Copra oil	200 ltrs/8 hrs	On and off.
31.	Coco Ponics 0723270107	Rabai (Kilifi County)	Coco peat	6x25 kg/ day	Progressing well.
32.	Kenya Fruit Solutions	Gede (Kilifi County)	Coconut chips	Not known	Closed.
33.	Mohammed Copra Oil Extractors 0724944872	Ukunda (Kwale County)	Copra Oil	200 ltrs/8 hrs per order	Progressing well. Needs a lot of exposure for better performance. Very suitable for sponsorship
34.	Safina Artefacts	Rabai (Kilifi County)	Coconut artefacts	50 pcs daily	closed
35.	Umoja Muslim Women Group	Magongo (Mombasa County)	Virgin coconut oil and bar soap	Yet to start commercial processing	Disintegrated. Not known where members are.
36.	Edward Charo and Sons Enterprises	Kaloleni (Kilifi County)	Coconut Syrup	Produces on order	closed

37.	Mpeketoni Maisha Copra Oil Extractors - Daniel Njenga - 0718686986	Mpeketoni (Lamu County)	Copra oil extraction	500 ltrs /day	Nascent and progressing well.
38.	Garithe Environmental Conservation Group	Garithe-Malindi (Kilifi County)	Cashew nut roasting and copra oil extraction	200 ltrs /50 kgs per day	Young with good progress. Suitable for sponsorship
39.	Cocowin Ltd - Milton Baya - 0722760447	Kaloleni in Kilifi County	Copra oil	100 litres daily	Still nascent. Exposure to established processors would improve performance
40.	Reality Dreams	Kilifi	Artefacts	20 pcs weekly	Closed
41	AMOR COCO LTD -Jane Sikolia - 0700030996	Majengo, Mtwapa Kilifi County	Dessicated coconut, VCO, coconut milk.	Processing 60,000 nuts daily	Scheduled to start processing in June 2018 at EPZ Zone.
42	FUEL WINDS - Silas Mazera - n0727994468	Kilifi county	Briquettes	Being installed	Scheduled to start operation in January 2021
43	JOPHINA Women Group	Mombasa - Kisauni	Charcoal Briquettes	Starting operations soon	Have challenges of getting connected to three phase power supply.
44	Smartwood Enterprises-Bakari Mwaenda - 0707345144	Kwale - Mtongwe	Coconut oils, cosmetics,	1000 per week	Good progress at cottage level.

			lotions, soaps		
45	Lola Rako Women Group -Lucy Kea - 0791029622	Chonyi - Mafisini	VCO	100 Litres per week	Progressing well.
46	Silverline Enterprises Susan - Sarah- 0723696230	Kilifi Mwazangombe	Copra oil	200 per day	Stable. SME level
47	Coco Grow - James Kapombe - 0727977175	Kwale- Msambweni -Milalani	Coco peat/fibre	4000 tons husks crushing per day	At SME level. Stable
48	Msabaha Coconut Artifacts Youth Projec Chudu Baya Msanzu - 0719333993	Malindi Msabaha	Coconut artifacts	On order or 10m pcs per day	Stable
49	Bakuli Enterprises Judy-0721853837	Nairobi	Coconut crisps	100 kgs per day	Started in November 2020.

Annex 3: Sample List of Trained and Practicing Nursery Operators

No	Name	Contact	County	Sub County
1	Tabitha Kalunda	0710483655	Tana River	Garsen
2	Jamila Maingi	0726080784	Tana River	Garsen
3	Sheikh Alwi	0704108503	Tana River	Garsen
4	Awadh Omar Said	0728526163	Tana River	Garsen
5	Jairus Sagurani	0729747411	Tana River	Garsen
6	Masud Ali Abdalla	0715613630	Tana River	Garsen
7	Abeid Abdalla Hassan	0712971927	Tana River	Garsen
8	Gaafari Ali Mohamed	0710886375	Tana River	Garsen
9	Furaha Charo	0713505358	Kilifi	Kaloleni
10	Joseph Edward Charo	0726010574	Kilifi	Kaloleni
11	Lucy Rehema Kalume	0724351758	Kilifi	Kaloleni
12	Ziro Charo Kakio	0710420779	Kilifi	Kaloleni
13	Fredrick Nyanje	0720822043	Kilifi	Kaloleni
14	Christine Jira Chigunda	0728450902	Kilifi	Kilifi North
15	Susan Sonje	0721278856	Kilifi	Kilifi North
16	Bahavidzho SHG	0727399122	Kilifi	Kilifi North
17	Racheal Chengo	0716787780	Kilifi	Kilifi North
18	Judith Kadii Charo	0728594550	Kilifi	Kilifi North
19	Stanslus Shindo	0712381901	Kilifi	Kilifi North
20	Agnes Kahonzi	0718902795	Kilifi	Kilifi North
21	Takaye Hunulane Women Group	0720905646	Kilifi	Malindi
22	Kiti Mwatsuma Deche	0727154947	Kilifi	Kilifi South
23	Titus Tunje Kadere	0722285937	Kilifi	Kilifi South
24	Sabastian Chilango	0711153577	Kilifi	Kilifi South
25	Jaribuni Women G	072315033	Kilifi	Kilifi South

26	Emanuel Thoya	0717888941	Kilifi	Kilifi South
27	Christopher K.Wanje	0717238120	Kilifi	Kilifi South
28	Gladys Kalume	0729304318	kilifi	Rabai
29	Esther Maku	0702479084	Kilifi	Rabai
30	Amina Nelima	0735472731	Kwale	Matuga
31	Anthony Kahindi	0710243100	Kwale	Matuga
32	Jonathan Safari	0716619659	Kwale	Matuga
33	Selphar Omenda	0711842866	Kwale	Matuga
34	Boniface Muthoka	0718457626	Kwale	Matuga
35	Sera Sammy	0715441891	Kwale	Matuga
36	Irene Njengo	0701865013	Kwale	Matuga
37	Chrispus Kavivya	0711150932	Kwale	Matuga
39	Msambweni Coconut Producers	0724146850	Kwale	Msambweni
40	Mwinyi Amiri	0712560983	Kwale	Msambweni
41	Norman Mutinda	0727129223	Kwale	Msambweni
42	Benson Mutiso	0713376415	Kwale	Msambweni
43	Jackson Musyoka	0714542088	Kwale	Msambweni
44	Irshard SHG	0720136897	Lamu	Lamu East
45	Aboud Omar	0706774044	Lamu	Lamu East
46	Tchundwa FADC	0700073106	Lamu	Lamu East
47	Mpeketoni Modern Technology	0720738578	Lamu	Lamu West
48	Mwangaza Tererani SHG	0721685644	Lamu	Lamu West
49	Abdulrehaman Abdalla	0726832570	Lamu	Lamu West
50	Fidelis Wambui Muriithi	0727013587	Lamu	Lamu West
51	Stephen Mbuvi	0727982866	Lamu	Lamu West
52	Kameme Ndogo	0720792639	Lamu	Lamu West

53	Francis Getare	0710488881	Lamu	Lamu West
54	Irungu Joseph	0702998463	Lamu	Lamu West
56	Chihanga Dubi Doda	723977820	Mombasa	Kisauni
57	Kimorigo Coconut SHG	724008218	Taita Taveta	Taveta

Annex 2: Sample of coconut Farmers with more than Five Acres (more than 100 trees)

No.	**Name of Famers**	**County**	**Acre/No. coconut Trees**	**Tel.no**
1.	Lenjo Kubo	Taita Taveta	350 trees	0734836734
2.	Benson Mwachia	Taita Taveta	300 trees	0724008218
3.	Javason Kubo	Taita Taveta	500 trees	0727301430
4.	Jospene Mbale	Taita Taveta	300 trees	-
5.	Lawrence Mhaso Nyasi	Kilifi	175 trees	0727230565
6.	Ngumbao Nyani Fondo	Kilifi	105 trees	0714453900
7.	Cosmas Mole	Kilifi	140 trees	0727631114
8.	Stansious Safari Lewa	Kilifi	105 trees	0721723749
9.	Irene Kagiwe	Kilifi	280 trees	07034583311
10.	Silvester Mwasuga	Kilifi	420 trees	0702530345
11.	Chege	Lamu	1500 trees	0729961798
12.	Nicholas	Lamu	350 trees	0702118582
13.	John	Lamu	400 trees	0798903515
14.	Mutegi	Lamu	600 trees	0729355851
15.	Edward Wainaina	Lamu	250 trees	-
16.	Karani	Lamu	500 trees	0791252688
17.	Alui Shariff Abdala	Lamu	450 trees	0722107366
18.	Fredrick Mati	Lamu	500 trees	0724213684
19.	Fidelis Muriithi	Lamu	500 trees	0727013587
20.	Mwinyiamir Bendera	Kwale	320 trees	0712560983

21.	Ruth Nthenya Kimeu	Kwale	200 trees	0724006287
22.	Jackline Kiluva	Kwale	150 trees	0720866110
23.	Mutinda Ngumbi	Kwale	300 trees	0725967314
24.	Hellen Thomas	Kwale	350 trees	0717411675
25.	Joyce Chombo	Kwale	300 trees	0716711866
26.	Hamadi Dzengo	Kwale	50 trees	0724066696
27.	Omar Kiponda	Kwale	100 trees	07022194984
28.	Boniface Muthoka	Kwale	600 trees	0718457626
29.	Mbodze Ishumail	Kwale	70 trees	0708693528
30.	Juma Mwazinga	Kwale	57 trees	0727366957
31.	Jackson Kombe Charo	Tana River	140 tree	0737406061
25.	John Ngei	Tana River	350 trees	0711497015
26.	Rose Monje Kiti	Tana River	600 trees	0714188310
27.	Masu Ali Abdala	Tana River	300 trees	0714447952
28.	Gaafal Mohamed	Tana River	700 trees	0710886375
29.	Salim Mzomba	Mombasa	35 trees	0723178813
30.	Bernard Mosoni	Mombasa	50 trees	0719697670
31.	Kiti Charles Kiti	Mombasa	25 trees	-

Annex 3: Sample of coconut farmers per county

No.	Name of Famers	County	Acre/No. coconut Trees	Tel.no
1.	Lenjo Kubo	Taita Taveta	350 trees	0734836734
2.	Benson Mwachia	Taita Taveta	300 trees	0724008218
3.	Javason Kubo	Taita Taveta	500 trees	0727301430
4.	Jospene Mbale	Taita Taveta	300 trees	-

5.	Lawrence Mhaso Nyasi	Kilifi	175 trees	0727230565
6.	Ngumbao Nyani Fondo	Kilifi	105 trees	0714453900
7.	Cosmas Mole	Kilifi	140 trees	0727631114
8.	Stansious Safari Lewa	Kilifi	105 trees	0721723749
9.	Irene Kagiwe	Kilifi	280 trees	07034583311
10.	Silvester Mwasuga	Kilifi	420 trees	0702530345
11.	Chege	Lamu	1500 trees	0729961798
12.	Nicholas	Lamu	350 trees	0702118582
13.	John	Lamu	400 trees	0798903515
14.	Mutegi	Lamu	600 trees	0729355851
15.	Edward Wainaina	Lamu	250 trees	-
16.	Karani	Lamu	500 trees	0791252688
17.	Alui Shariff Abdala	Lamu	450 trees	0722107366
18.	Fredrick Mati	Lamu	500 trees	0724213684
19.	Fidelis Muriithi	Lamu	500 trees	0727013587
20.	Mwinyiamir Bendera	Kwale	320 trees	0712560983
21.	Ruth Nthenya Kimeu	Kwale	200 trees	0724006287
22.	Jackline Kiluva	Kwale	150 trees	0720866110
23.	Mutinda Ngumbi	Kwale	300 trees	0725967314
24.	Hellen Thomas	Kwale	350 trees	0717411675
25.	Joyce Chombo	Kwale	300 trees	0716711866
26.	Hamadi Dzengo	Kwale	50 trees	0724066696
27.	Omar Kiponda	Kwale	100 trees	07022194984
28.	Boniface Muthoka	Kwale	600 trees	0718457626
29.	Mbodze Ishumail	Kwale	70 trees	0708693528
30.	Juma Mwazinga	Kwale	57 trees	0727366957
31.	Jackson Kombe Charo	Tana River	140 tree	0737406061
25.	John Ngei	Tana River	350 trees	0711497015
26.	Rose Monje Kiti	Tana River	600 trees	0714188310

27.	Masu Ali Abdala	Tana River	300 trees	0714447952
28.	Gaafal Mohamed	Tana River	700 trees	0710886375
29.	Salim Mzomba	Mombasa	35 trees	0723178813
30.	Bernard Mosoni	Mombasa	50 trees	0719697670
31.	Kiti Charles Kiti	Mombasa	25 trees	-

References

1. ABD/KCDA, (2009); Kenya Coconut Development Authority (KCDA, 2009) ; Annual report, 2009
2. ABD-DANIDA/CDA, (2007); The coconut sub-sector in Kenya; Results of a census of coconut trees in coast Province. Annual report 2007.
3. Danda M. K, Mwabonje, O. Lorenzo Di Luci and Woods, J. (2019): feasibility study of clean energy generation and supply from coconut shells value chain in Kilifi and Kwale counties of Kenya; Case study delivered as part of the AGRICEN project
4. Gachanja, G., Musinga, M., Ngigi, G., Onyango, N & Bett, J. (2010). Coconut value chain analysis report, ASPS-ABD/KCDA
5. Gachanja, G., Odhiambo, Z. & Musinga, M. (2007). The Coconut Subsector: Baseline Survey Report, ABD-DANIDA/CDA
6. Jätzold, R and Kutsh, H. (1982): Agro-ecological zones of the tropics with a sample from Kenya
7. Kadere, T. T., Oniang`o, R.K., Kutima, P.M. and Njoroge, S.M. (2009): Production, Marketing and Economic Importance of *Mnazi* and Other Coconut-based Products in Kenya. In the Research Journal of Agriculture and Biological Sciences, 5(5): 815-822, 2009
8. Kahindi, R. (2012, January June). Challenges Facing Coconut Subsector. *Coco News*, 2, 6
9. Kenya Coconut Development Authority (KCDA), 2014 "National Coconut Survey – Final Report", ALPEX Consulting Africa Ltd (ACAL).
10. Kenya Coconut Development Authority (KCDA, 2009); Annual report, 2009
11. Kenya Coconut Development Authority (KCDA, 2012); Annual report, 2012
12. MoALFI (2019): Regulatory impact statement (ris); the crops (nuts and oil crops)
13. regulations, 2019
14. Nuts and Oil Crops Directorate(NOCD,2018); Statistical report 2018
15. Nuts and Oil Crops Directorate(NOCD,2019); Statistical report 2019