

KENYA COCONUT DEVELOPMENT AUTHORITY



NATIONAL COCONUT SURVEY 2013 FINAL REPORT

SUBMITTED BY



Table of Contents

Abbreviations	4
List of Figures	5
List of Tables.....	7
Acknowledgments	8
Executive Summary	9
1.0 INTRODUCTION.....	11
1.1 Background	11
1.2 Kenya Coconut Development Authority (KCDA)	11
1.3 Rationale of the Survey	12
1.4 General Objectives of Survey	12
1.5 Specific Objectives of Survey	12
1.6 Methodology of the Survey	13
1.7 Organization of the Report	14
1.8 Limitations of the Survey.....	15
2.0 NATIONAL COCONUT SURVEY.....	16
2.1 Introduction	16
2.2 Tree Estimation.....	16
2.3 Sampling	17
2.4 Coconut Population	18
Survey Summary	19
2.5 Characteristics of Coconut Farmers.....	20
2.6 Growth in the Population of Trees.....	26
3.0 AGRONOMY.....	28
3.1 Definition and Classification	28
3.2 Agronomy and Husbandry	29
3.3 Current Practices and Productivity.....	30
3.4 Agronomic Practices and Application of Technologies.....	31
3.5 Challenges in Coconut Production	35
3.6 Coconut Growing Potential Outside Coast	37
4.0 THE COCONUT VALUE CHAIN ANALYSIS	41
4.1 Introduction	41
4.2 Findings and Analysis	41
4.3 Summary of Products and Value.....	64
4.4 Current Economic Value of the Coconut Sub-Sector	65
4.5 Import and Export of Coconut Products.....	65
4.6 Key Industry Players in the Coconut Value Chain	70
4.7 Trading of Coconut Products.....	72
4.8 Challenges Facing Players in Coconut Subsector.....	74
4.9 Key Drivers of Coconut Farming.....	89
4.10 Service Delivery Gaps.....	91

4.11 Other Service Delivery Gaps	94
4.12 Indicative Gap Analysis.....	95
5.0 CONCLUSIONS AND RECOMMENDATIONS.....	96
5.1 Estimates.....	96
5.2 Agronomy	97
5.3 Value Chain	98
5.4 Way Forward	101
References.....	102
Appendices.....	104
Appendix I: Glossary of Selected Coconut Products.....	104
Appendix II: Value Chain Questionnaires	106
Appendix III: Statistics on Coconut Population Survey Tools (GIS, Maps, scope & Questionnaire)	129
Appendix IV: National Coconut Survey Questionnaire	138
Appendix V: Agronomy Maps for Potential Coconut Growing Areas	139

Abbreviations

<i>ABD</i>	Agricultural Business Development
<i>ASL</i>	Above Sea Level
<i>ASPS</i>	Agricultural Sector Program Support
<i>BDS</i>	Business Development Services
<i>CBO</i>	Community Based Organisation
<i>CSR</i>	Corporate Social Responsibility
<i>DANIDA</i>	Danish International Development Agency
<i>FAO</i>	Food and Agriculture Organization
<i>FBO</i>	Faith Based Organisation
<i>GDP</i>	Gross Domestic Product
<i>ISO</i>	International Standards Organization
<i>KARI</i>	Kenya Agricultural Research Institute
<i>KCDA</i>	Kenya Coconut Development Authority
<i>KEBS</i>	Kenya Bureau of Standards
<i>KEPHIS</i>	Kenya Plant Health Inspectorate Services
<i>KIRDI</i>	Kenya Industrial Research and Development Institute
<i>KRA</i>	Kenya Revenue Authority
<i>KES</i>	Kenya Shillings
<i>NACADA</i>	National Authority for Campaign against Alcohol and Drug Abuse
<i>NGO</i>	Non-governmental Organisation
<i>ROSCA</i>	Rotating Savings and Credit Association
<i>SACCO</i>	Savings and Credit Cooperative Society
<i>VCO</i>	Virgin Coconut Oil

List of Figures

Figure 1: Farming Activities by Gender.....	21
Figure 2: Number and Age of Trees by County.	22
Figure 3: Average Number of Trees per Farmer by County.....	23
Figure 4: Acreage under Coconut.	24
Figure 5: Average Acreage per Farmer.....	25
Figure 6: Forms of Land Ownership.	26
Figure 7: Source of Planting Materials for the Farmers	32
Figure 8: Type of Manure/organic matter used in Nursery and Fields	33
Figure 9: Estimated No. of Seedlings Produced and Planted in 2012.....	42
Figure 10: Estimated Volume of Mature Coconuts Produced in 2012.....	43
Figure 11: Chart of County Contribution to Production of Mature Nuts in 2012.....	44
Figure 12: Marketing Channels for Mature Nuts in 2012.....	45
Figure 13: Figure of Estimated Volume of Immature/tender Nuts Produced in 2012.	47
Figure 14: Chart of County Contribution to Production of Immature Nuts in 2012.	47
Figure 15: Chart of Marketing Channels for Immature Nuts.	48
Figure 16: Figure of Estimated Production of Palm Wine in 2012.	50
Figure 17: Chart of County Contribution to Production of Palm Wine in 2012.....	51
Figure 18: Chart of Marketing Channels for Palm Wine.	52
Figure 19: Figure of Estimated Production of Cocowood in 2012.....	54
Figure 20: Chart of County Contribution to Production of Cocowood in 2012.	55
Figure 21: Chart of Marketing Channels for Cocowood.	56
Figure 22: Figure of Estimated Production of Makuti in 2012.....	58
Figure 23: Chart of Estimated Production of Makuti in 2012.	58
Figure 24: Chart of Marketing Channels for Makuti.....	59
Figure 25: Figure of Estimated Production of Brooms in 2012.	60
Figure 26: Chart of Estimated Production of Brooms in 2012.....	61
Figure 27: Chart of Marketing Channels for Brooms.	61
Figure 28: Chart of Contribution by Products to Value of Total Imports in 2011.....	66
Figure 29: Contribution by Countries to Value of Total Imports in 2011.	67
Figure 30: Contribution by Products to Value of Total Exports in 2011.	69
Figure 31: Chart of Contribution by Country to Value of Total Exports in 2011.....	69
Figure 32: Figure of Trends in Export over the Years	70
Figure 33: Figure of Production Challenges Facing Nursery Operators.....	75
Figure 34: Figure of Marketing Challenges Facing Nursery Operators	75
Figure 35: Figure of Financial Challenges Facing Nursery Operators.	76
Figure 36: Figure of Business Management Challenges Facing Nursery Operators.....	76
Figure 37: Figure of Production Challenges Facing Coconut Farmers.....	78

Figure 38: Figure of Marketing Challenges Facing Coconut Farmers.	79
Figure 39: Figure of Financial Challenges Facing Coconut Farmers.	80
Figure 40: Figure of Business Management Challenges Facing Coconut Farmers.	81
Figure 41: Figure of Production Challenges Facing Coconut Processors.....	82
Figure 42: Figure of Marketing Challenges Facing Coconut Processors.....	83
Figure 43: Figure of financing Challenges Facing Processors Coconut Products.	83
Figure 44: Figure of Business Management Challenges Facing the Processors.	84
Figure 45: Figure of Operational Challenges Faced by Traders of Coconut Products.	85
Figure 46: Figure of Marketing Challenges Faced by Traders of Coconut Products.	86
Figure 47: Figure of Financial Challenges Faced by Traders of Coconut Products.	86
Figure 48: Figure of Business Management Challenges Faced by Traders of Coconut Products.....	87
Figure 49: Figure of Other Challenges Faced by Traders of Coconut Products.....	87
Figure 50: List of Key Drivers of Coconut Farming.	89
Figure 51: Figure of Support Level for Nursery Operators.....	92
Figure 52: Figure of Support Level for Farmers.....	92
Figure 53: Figure of Support Level for Processors.	93
Figure 54: Figure of Support Level for Traders.	94

List of Tables

Table 1: Methodology Assigned to each Objective	13
Table 2: Flow of the Report.....	14
Table 3: Sample Size.....	17
Table 4: Survey Summary	19
Table 5: Ownership by Age	20
Table 6: Literacy Levels of Farmers by County	21
Table 7: Distribution of Coconut Trees by Type	24
Table 8: Estimated Rate of Coconut Re-planting.....	27
Table 9: Sample Distribution and Validation.....	31
Table 10: Findings on Agronomic Practices from the Six Counties.	36
Table 11: Definition of Land Suitability Classes	37
Table 12: Optimal Growth and Productivity Requirements.....	39
Table 13: Coconut Growing Potential Areas outside Coastal Region	40
Table 14: Estimated Value of Mature Nuts Produced in 2012.....	45
Table 15: Estimated Value of Immature Nuts Produced in 2012	49
Table 16: Estimated Value of Palm Wine Produced in 2012	53
Table 17: Estimated Value Cocowood Produced in 2012.....	57
Table 18: Estimated Value of Makuti Produced in 2012.....	59
Table 19: Estimated Value of Brooms Produced in 2012.....	62
Table 20: Production Capacity of Some of the Virgin Oil Processors.....	63
Table 21: Production Capacity of a Key Processor of Desiccated Coconut	63
Table 22: Production Capacity of Key Processors of Copra Oil	64
Table 23: Estimated Volume and Value of Coconut Products Produced in 2012	64
Table 24: Imports of Coconut Products in 2011	66
Table 25: Imports of Coconut Products in 2011	68
Table 26: Intensity of challenges facing various players	88
Table 27: Indicative Situational Analysis.....	95

Acknowledgments

We wish to express our sincere gratitude to the many institutions and individuals who have significantly contributed to the successful process and conclusion of the coconut survey exercise. We take this opportunity to thank the Kenya Coconut Development Authority for setting aside resources to finance this study through their Chief Executive Dr. Fondo, the KCDA technical officer; Raymond Kahindi (General Manager Technical Services), Baha Nguma (Extension Officer), Emanuel Masha (Research Officer), Jeremiah Alukwe (Manager, Business Development & Quality Assurance) for providing data and useful contacts. We would like to recognize the contribution of the County Director of Agriculture, Mombasa County; Kenya Agricultural Research Institute (KARI); Ministry of Agriculture Livestock and Fisheries (MoALF); processors, traders, farmers, nursery operators among others.

Special thanks go to the data collection supervisors, Khadija Khamisi (Lamu County), Evans Baya (Mombasa County), Harry Muteti (Tana River County), Benjamin Mturi (Kilifi County), Peter Mwamkuu (Taita Taveta County), Mary Mbeya (Kwale County) and the hundreds of enumerators who ensured that all the earmarked areas were reached. We wish to appreciate the effort of all the informants and respondents who took their time to provide information which formed this report.

We highly recognize the work of the management team of the ACAL Group, Joseph Kibe (Group CEO), Benjamin Karume (Technical Director) and Catherine Magua (Director, Administration) for their leadership role throughout this process. We are greatly indebted to the team of ACAL consultants who worked on different components of this report namely; Ephraim Njega (Value Chain and Marketing expert), Joseph Muchangi (Statistician), Simon Mwangi (Agronomist) and David Maina Thuita for his role in designing the study, reviewing the various study components and compiling drafts.

To all those who contributed to this study in one way or another, whether mentioned herein or not, we are indeed grateful. It is because of the role you played that we have been able to prepare this report.

Executive Summary

The coconut tree is recognized as an industrial crop in Kenya. The sub-sector is estimated to support over 100,194 farmers contributing over 1.5% of the agricultural GDP and 0.4% of the national GDP. However, the industry faces challenges in managing statistics and therefore a lot of transactions go unaccounted. In addition, the subsector provides income to many actors in the chain including seedling farmers, harvesters, de-huskers, wine tappers, traders, transporters and processors among others.

This report presents the findings of a coconut subsector survey that was conducted between June and August of 2013. The objective of the survey was to establish reliable estimates of the coconut trees in the country, establish the current economic value of the coconut tree and the potential value; establish agronomic practices and their effects on production and establish the potential areas for coconut growing outside the coast region. The coconut palm (*Cocos nucifera*) is mostly found in the Kenyan coastal region due to adoption of subsistence agriculture practices and its specific agro-climatic requirements. However, it is highly adaptable to a variety of environments of up to 600m(ASL) but limited in terms of commercial orientation in Kenya. Climatic conditions is a crucial factor that ought to be considered especially when establishing plantations in new regions that coconut has not been established since its productivity is highly dependent on agro ecological and climatic conditions. The agronomic assessments conducted to identify other areas that have potential to support coconut production especially outside coast classified the regions as follows;moderately suitable and marginally suitable. The moderately suitable area is approximately 5,737.73 hectares and spans mainly from the Western Kenya regions of Butere Mumias, Bungoma, Kakamega, Kericho, Kisumu, Nandi, Suba and Vihiga. The marginally suitable area is approximately 157,636.446 hectares and spread in various districts² of the former Eastern, Central, Rift valley, Nyanza and Western Provinces.

According to this study, the total number of coconut trees in the country stands at **9,907,115**. The coconut trees are more highly concentrated in two counties; Kwale County with 4,714,157 trees and Kilifi with 4,192,983 trees. Other counties barely account for a tenth of the total population. The study established that 325,395 coconut trees are being planted on annual basis, total land size under coconut currently stands at 436,634 acres (176,699 Ha) and the population of coconut trees currently established occupies just a quarter of the land potentially available for coconut. This study established that coconut farming is in the hands of the older generation with most farmers aged above 50 years and is heavily dominated by men with an average literacy level of basic (primary) education.

Overall, the average yields of 27 nuts per tree, reported by these farmers are quite low and could be as a result of the poor adherence of the crop growing recommendations.

However, the highest yield recorded per tree was 167 while the lowest was 4. On average, higher yields per tree were recorded in Lamu while Mombasa recorded lower yields per tree.

The survey findings indicate that coconut farmers in Kenya generally lag behind in husbandry and agronomic practices, adoption of new farming technologies and consequently production. The crop's potential is generally unexploited not necessarily due to lack of attention by the farmers but mostly as a result of limited support by the agencies that ought to provide technical information good agricultural practices especially at the production level. Poor yields are partly due to farmers' lack of technical know-how on crucial agronomic practices and limited adoption of technologies as demonstrated in this study. Coconut farming in Kenya is also faced by the challenges of less than adequate rainfall, insect pests and lack of clean quality seedlings.

The processing of coconut products is highly fragmented, small in scale and highly informal compared to other agricultural sub-sectors making traceability and valuation of processed products difficult. This is complicated further by the high number of products which can be made from the coconut tree and the unavailability and inaccuracy of data given for the volumes of raw materials utilized and final output of the processed products. The current production capacity hardly meets the market demand. During the survey, some the processors interviewed had closed temporarily due to scarcity and high cost of raw materials.

The study findings show under-investment in coconut research. Sector regulation at different stages has been met with hostility and resistance by the players. Delays in issuance of licenses should be eliminated and enforcement of regulations should be devoid of harassment and extortion in order to fulfill the real purpose for which regulation has been put in place.

From a value chain perspective, the study proposed the formation of a sub-sector information system, value chain mobilization and organization, subsector research, marketing, financing and regulation. These are viewed as areas where there exists obvious gaps.

This study recommends the development of an action plan to aid in the implementation of the proposed actions in order to address the existing gaps. The actions include; reviewing and prioritizing the of the recommendations of this report, evaluating the internal capacity, structure and mandate of KCDA with regard to increasing institutional capacity to support the coconut sub-sector.

1.0 INTRODUCTION

1.1 Background

The coconut palm scientifically known as *Cocos nucifera* is believed to be a native of South East Asia in countries such as Malaysia, Indonesia, Thailand, Vietnam and Philippines amongst others. From there it has spread to most tropical and subtropical areas through ocean currents and explorers. It is currently found in over 50 countries mainly in Africa, America and Asia. In Kenya it is almost exclusively found in the coastal areas though other areas are known to have varying potential for suitability of coconut farming.

The coconut palm has many uses both as a cash crop and a food crop. All parts of a coconut are commercially exploitable. The roots, stem, leaves, flowers and fruits have a multiplicity of applications. The roots can be used for dye stuff and medicinal purposes, the stem/trunk for timber used for fuel, construction and furniture. Coconut inflorescence is used to produce toddy which when fermented is used as an alcoholic drink. The fruit is used as food and is also processed into many products such as copra, copra oil, virgin coconut oil, desiccated coconut, coconut milk, coconut cream and many more.

The coconut husk part of the fruit produces fibre which is used for making ropes, door mats and rugs. It also yields coco peat which has various agricultural uses especially in horticulture. The shell produces charcoal, handicrafts and activated carbon. The leaves are used for making roofing materials and brooms.

The palm contributes tremendously to the economic through its many products which are widely commercialised. Apart from the economic value of the products it creates numerous employment opportunities across the entire value chain.

1.2 Kenya Coconut Development Authority (KCDA)

Kenya Coconut Development Authority (KCDA) was established through a Legal Notice No. 165 of 27th August 2007 under the State Corporations Act Cap 446 with the following mandate:

- (i) To provide advisory services on matters related to coconut industry for planning purposes;
- (ii) To collect and collate data, maintain a database on coconut industry, and register all players in the industry;
- (iii) To assist in the production, processing, grading, storage, collection, transportation and warehousing of all the produce and by products destined for markets;
- (iv) To arbitrate on disputes arising between the growers and any of the players or among other players in the industry;

- (v) To vet and witness contracts entered into between the growers and any other players or between other players in the industry before they are executed;
- (vi) To appoint agents for the implementation or performance of any function of the Authority; and
- (vii) To monitor imports and exports of coconut produce and by-products for efficient management of the coconut industry.

1.3 Rationale of the Survey

Despite its enormous contribution to the economy the 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 KCDA found it necessary to commission a study which would provide stakeholders with the necessary information. The study was designed and implemented to meet the objectives below.

1.4 General Objectives of Survey

The overall objective of the coconut survey exercise was to establish a reliable current estimate of the total population of coconut trees in the coast region, disaggregate by age and geographical areas of distribution, and generate information on the various coconut products, their markets and key challenges facing farmers in their farming activities

1.5 Specific Objectives of Survey

1.5.1 Agronomy

- (i) To establish the potential of coconut growing areas outside coast region.

1.5.2 Statistics

- (ii) To establish reliable estimates of the total population of coconut trees.
- (iii) To disaggregate by age and geographical areas of distribution.

1.5.3 Value Chain Analysis

- (i) To establish the coconut products currently produced and their volumes and economic value.
- (ii) To establish the coconut products being export and import, their volumes, economic and market value.
- (iii) To establish key players along the coconut value chain.
- (iv) To determine the current overall economic value of the coconut industry.
- (v) To establish the Market key challenges facing coconut players.

1.6 Methodology of the Survey

The above survey objectives presented a spectrum of three surveys in one. While it was possible to generate one report from the three almost distinct components by way of objective, the methodology was designed in such a way that objectives would first be classified and then a suitable methodology would be assigned for each class of objectives.

Table 1: Methodology Assigned to each Objective

Category of Objectives	Assigned Methodology
Objective (i)	The FAO assessment procedure of land evaluation and desk review was applied. This procedure is based on a matching exercise between crop growth requirements and other relevant parameters, whether solely edaphic or global, i.e. including both physical and socio-economic contexts (FAO, 1976).
Objective (ii)	The research focused on tree estimation. The use of sampling as a research tool was applied by sampling coconut blocks and number of trees per farmer. Sampling of inventory was used to draw some conclusions, such as the frequency age of the tree. Stratification helped increase the survey precision when extrapolated for the total population once the characteristics of the strata (Location) were taken into account. A sample of 2,660 (n) Coconut farmers was proportionately allocated to six (6) counties depending on the concentration of coconut farmers in the counties.
Objective (iii)	The survey focused on sampling, questionnaire and desk review. The sample was then distributed using multistage allocation with the primary sampling point being a location. Within a location, systematic sampling was used where every fifth household was picked regardless of whether they grew coconut or not.
Objectives (iv), (v) (vi)(vii) & (viii)	Both primary and secondary data was obtained from various value chain players. Desk review was used to collect secondary data and standard questionnaire was used to collect primary data. The sample size comprised 33 input suppliers, 299 farmers, 64 processors, 108 traders and 10 value chain facilitators. Due to general lack of a sampling frame, non-probabilistic sampling techniques such as judgmental sampling and snowballing were used. Data was collected using interviewer administered questionnaire comprising open-ended and closed-ended questions. The data was collected during the month of July, 2013. This happened to be the holy month of Ramadhan for Muslims. Consequently during such times the demand for some coconut products is usually high. This is expected to have had an effect on some of the responses.

1.7 Organization of the Report

The arrangement of this report follows a logical flow of the various components as well as the initial arrangement of the terms of reference to ensure that the problem statement is comprehensively covered and that the three almost distinct parts of the study are integrated in such a way that they generate one homogeneous report of the coconut subsector. The flow is explained as follows;

Table 2: Flow of the Report

Section	Content
Preliminary sections	These sections cover the executive summary, the background to the survey, objectives and the rationale of the survey
Findings and Analyses	
Part 1	This is the section that deals with the estimates of the coconut trees and their characteristics, ownership by age, ownership by gender, numbers per counties as well as the acreages under coconut.
Part 2	This part deals with the agronomic aspects of the coconut tree, right from the definition, the classification of ecological zones from least to most suitable for coconut production and the assessment of the current agricultural practices for the region under survey
Part 3	This constitutes the larger section of the report as it looks at all the aspects of coconut farming from production, processing, markets of the various products, the economic value, trade levels, the actors along the value chain and their roles as well as their circumstances with a particular interest on the challenges that different actors face at different stages.
Epilogue	This is a brief section towards the end of the report that details all the recommendations for the above section of findings and analyses. For this report, It also includes the indicative gap analysis and the way forward, under which the next steps for the consumers of this report are spelt out.
Appendices	These include critical accompanying documents that constitute the study process including the survey report which bears the names and the contacts of the informants especially for the statistics section.

1.8 Limitations of the Survey

Whereas this survey process was to a large extent successful, it was notably inhibited by two key limitations (discussed hereunder), which in effect compromised the depth of analysis in the specific areas where these limitations were registered.

(a) Validity and Accuracy of information provided:

The analyses in this report could have been more detailed and more up to date if more current data was provided. In some cases the data was unavailable, outdated or doubtful. While this could not have affected the recommendations significantly, it could have provided a more detailed analysis to support the conclusions. A case in point is the export data which was only provided from 2010 to 2012, making it very difficult to generate a trend from the previous years to date. There are cases where this data could have been available but it was delayed and therefore left out in the interest of submitting the study report within the allowed time frame. This is likely to be the case with the comparative data on the productivity and practices of coconut farming in other coconut producing countries.

(b) Scope of the Survey

It could have been possible to undertake a benchmarking survey in other countries and generate a more accurate and up to date gap analyses on the varying competitiveness of the local sector compared to another country with a leading coconut sector. Based on how the report was structured from the terms of reference, the comparative data would have been expected but there was no provision to visit and closely examine the practices and trends of another comparable context.

2.0 NATIONAL COCONUT SURVEY

2.1 Introduction

A key component of this study was the determination of the current estimates of coconut trees in the region. Findings of this section go further to disaggregate the data obtained into regions, and the nature of ownership. This section required a wide selection of informants to improve accuracy of the estimation. A full list of those informants from different regions is annexed to this report.

2.2 Tree Estimation

The survey focused on tree estimation. Although a total tree census is a challenging undertaking, there are statistical sampling methods that are used to estimate the whole population from samples. The use of sampling as a research tool was applied by sampling coconut blocks and number of trees per farmer.

Once the limits and characteristics of the population of coconut trees were known and the desired level of precision was established, the use of sampling techniques was used for coconut tree evaluation. Using location and number of trees per farmer as the main variables, systematic sampling procedures provided a significant efficiency for tree counting, as previously demonstrated by Milano (1994).

The counties were divided into sub populations (Locations), so that each of it was more homogeneous. Thus, a precise mean value of the location estimate was obtained using a small sample of those farmers in that location. According to Cochran (1977), such estimates can be combined to produce an accurate estimate of the total population. The mean number of trees per coconut growing farmer was multiplied by the number of farmers in that location to estimate the total number of trees. The choice of sampling type was informed by the pre-sample of the area to be studied.

The measured variables were the number of trees per farmer and total number of farmers in a location. The estimate of the total number of trees in the location is important, even though it does not express a difference in the tree density. The number of trees per farmer gives a clearer measure of the presence of the trees per farm.

2.3 Sampling

A sample of 2,660 (n) Coconut farmers was proportionately allocated to six (6) counties depending on the concentration of coconut farmers in the counties. The determination of the sample size (n) was informed by the level of precision needed for the survey and the available resources thus, 1.96 = Z score values at 95% confidence level, the level of precision for 2,660 respondents where the population of the study is large enough to consider infinite as +/-1.9%.

The sample was then distributed proportionally with the primary sampling unit being a location. Within a location, systematic sampling was used where every fifth house was picked regardless of whether they grew coconut or not. The idea was to estimate the number of farmers in a population of households. Whilst respondents within a location could have different number of trees and different attributes, the difference is assumed to be probabilistic - thus the percentage of the sample giving the same result was generalised to the entire population.

The sample size from each primary unit in the survey was not proportionate to the number of the farmers. This balancing was hard to achieve because of their size relative to the population for instance some locations recorded very small numbers of farmers growing coconut and as such sampling only one farmer in a location may give results that are not typical for that location. In such cases, a minimum of 10 farmers was taken from that location to reduce the chances of non-typical farms biasing the results thus the final sample studied was 3,500 farmers.

The sample size formula for the infinite population (81,000¹) is large enough and is expressed as:

Table 3: Sample Size

$SS = \frac{Z^2 p(1 - p)}{C^2}$	
SS	Sample Size
Z	Confidence level at 95% (standard value of 1.96)
p	Estimated Prevalence of coconut farmers in the project areas
C	Margin of error
$SS = \frac{1.96^2 0.5(1-0.5)}{0.019^2} = 2,660$	

¹2006 Coconut Census

Number of Trees

The estimate of the total number of trees was done by multiplying the sample mean number of trees per farmer by the total number of farmers.

Number of Farmers

The total number of farmers was estimated from the number of households growing coconut against the total number of rural households in a location. During the sampling, the interviewers used the right hand rule. Once a starting point was established and sampled, every 5th household regardless of whether they grew coconut or not to a maximum of 100 household per primary sampling unit (Location) was selected. The number of households found to be growing coconut per sample was then extrapolated to the total number of the rural household in that location.

2.4 Coconut Population

The coconut census conducted by ABD-DANIDA/CDA in 2006 shows that there were 7.4 million coconut trees distributed across the coast region. This current (2013) Coconut Survey also seeks to establish the total number of trees albeit using a different methodology. This section presents information on size and magnitude of the coconut production across four different parameters namely: the population and the characteristics of the trees; number of farmers, size of land under production and the nature of ownership.

The total number of trees and the total number of farmers distributed by county are summarised in the table below:-

Survey Summary

Table 4: Survey Summary

County	Total	Kwale	Mombasa	Taita Taveta	Tana River	Kilifi	Lamu
No. of trees age 0-5	787,528	273,420	19,586	20,625	23,426	369,488	80,983
No. of trees age 6-20	1,801,361	673,154	58,587	27,917	26,460	892,138	123,106
No. of trees age 21-40	2,685,344	1,104,076	49,252	21,479	8,273	1,245,917	256,346
No. of trees age 41-60	2,509,943	1,115,512	62,081	2,075	3,457	1,218,099	108,719
No. of trees age 61+	1,830,048	1,291,728	12,714	0	6,509	454,578	64,519
Total Number of Trees	9,907,115	4,714,157	208,978	78,868	81,620	4,192,983	630,508
No. of dead trees in the farm	984,236	323,842	55,036	17,726	29,618	467,342	90,673
Size of land under coconut	436,634	227,677	15,234	7,811	11,748	149,890	24,275
No. of mature nuts produced in 2012	246,416,329	111,538,751	6,952,922	2,859,092	1,129,948	117,053,025	6,882,592
No. of immature nuts produced in 2012	24,775,202	13,693,355	2,691,404	25,811	545,499	6,578,782	1,240,351
Volume of Palm wine produced in 2012	153,311,377	30,370,939	1,950,788	4,145,424	166,804	116,109,505	567,917
Number of trees cut down in last 5 years	841,117	484,463	45,931	6,651	3,934	260,834	39,305
Number of trees planted in the last 5 years	1,626,973	604,019	52,288	61,600	29,194	709,849	170,024
Total Number of Farmers	100,194	51,981	5,727	3,051	1,764	32,727	4,944

2.5 Characteristics of Coconut Farmers

2.5.1 Ownership by Age

Majority of the coconut farmers (35%) are aged over 55 years. It was quite clear that ownership of trees is generally in the hands of the older generation – explained by the fact that most of the trees are over 20 years old hence the owners are also aged. Land ownership is therefore seen as an inhibiting factor for the younger generation in exploiting the potential that lies in coconut farming.

Table 5: Ownership by Age

	Total	COUNTY					
		Kwale	Mombasa	Taita Taveta	Tana River	Kilifi	Lamu
Below 25	5%	7%	11%	7%	5%	4%	5%
26-35	17%	16%	19%	9%	26%	16%	19%
36-45	22%	19%	20%	29%	28%	19%	26%
46-55	21%	22%	19%	20%	20%	21%	20%
Above 55	35%	37%	31%	36%	21%	41%	30%

Source: KCDA Coconut Tree Survey, June 2013

2.5.2 Farming Activities by Gender

Coconut farming is heavily dominated by males. The gender distribution of coconut farmers was represented by 72% male and 28% female. Across the counties, the male dominance ranged between 66% in Lamu, to 77% in Kilifi. 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 were as illustrated in the Figure hereunder.

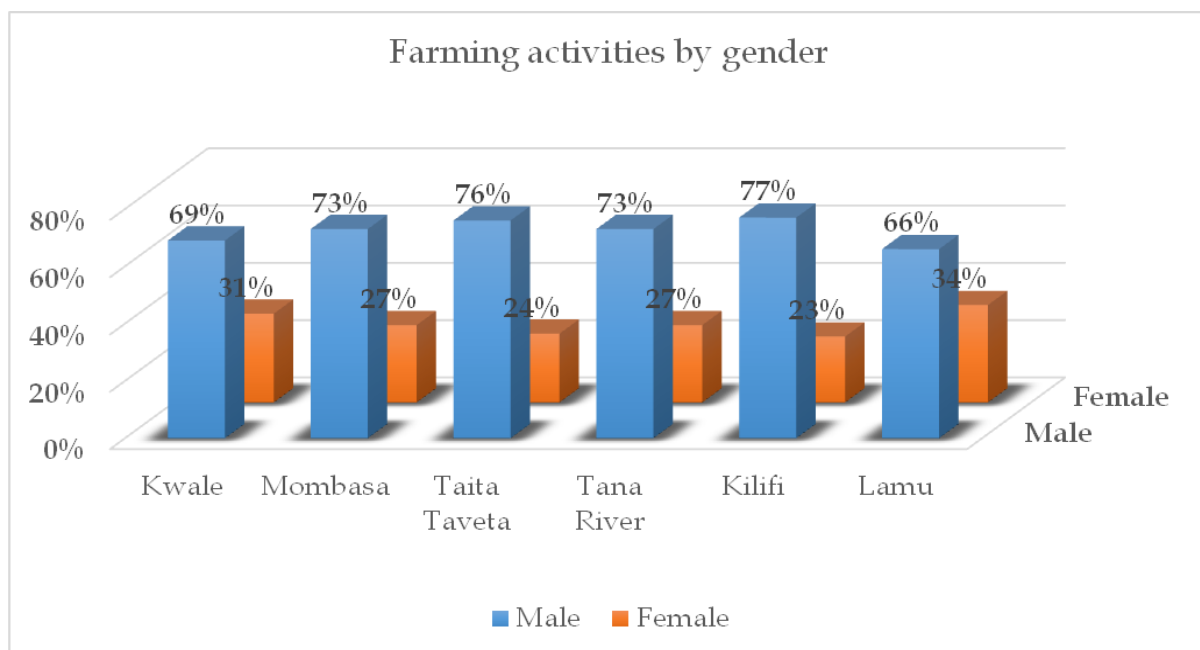


Figure 1: Farming Activities by Gender.

2.5.3 Education Levels

In terms of education, most coconut farmers have basic level (primary) education (42%). Those with no formal education account for 35% of the farmers while those with at least secondary education account for 23%. This presents an important finding to actors in the coconut development sector in terms of communication and on the choice of channels for improved farming practices.

Table 6: Literacy Levels of Farmers by County

Education	Total	COUNTIES					
		Kwale	Mombasa	Taita Taveta	Tana River	Kilifi	Lamu
No formal Education	35%	41%	32%	17%	19%	34%	41%
Primary	42%	39%	37%	54%	61%	41%	39%
Secondary	17%	15%	19%	21%	18%	19%	16%
Middle level college	5%	3%	10%	4%	1%	5%	4%
University	1%	1%	4%	3%	1%	1%	1%

Source: KCDA Coconut Tree Survey, June 2013

2.5.4 Number of Trees

The total number of coconut trees in the country stand at **9,907,115**. The trees are however concentrated in two counties. Kwale County is the highest in terms of tree population with 4,714,157 trees and is followed closely by Kilifi at 4,192,983 trees. Other counties barely account for a tenth of the total population.

On average, 17% of the total population of coconut trees are aged over 61 years thus classified in terms of production capacity as senile. On the other hand, young trees before the bearing age (0-5) constitute 7% of the trees while those aged 6–20 years account for 17%. The largest proportion of trees are in the age category of 21–40 and 41–60 years accounting for 25% and 24% of the total coconut tree population respectively.

Comparatively by counties, large numbers of trees aged 0-5 years are seen in Tana River and Taita Taveta. Although it is surprising that the same counties have more or less the same number of dead trees in the farms (Over 20%). This is an indication that although a lot of efforts have been put to planting of trees in those counties, the survival rate of the same trees is still low.

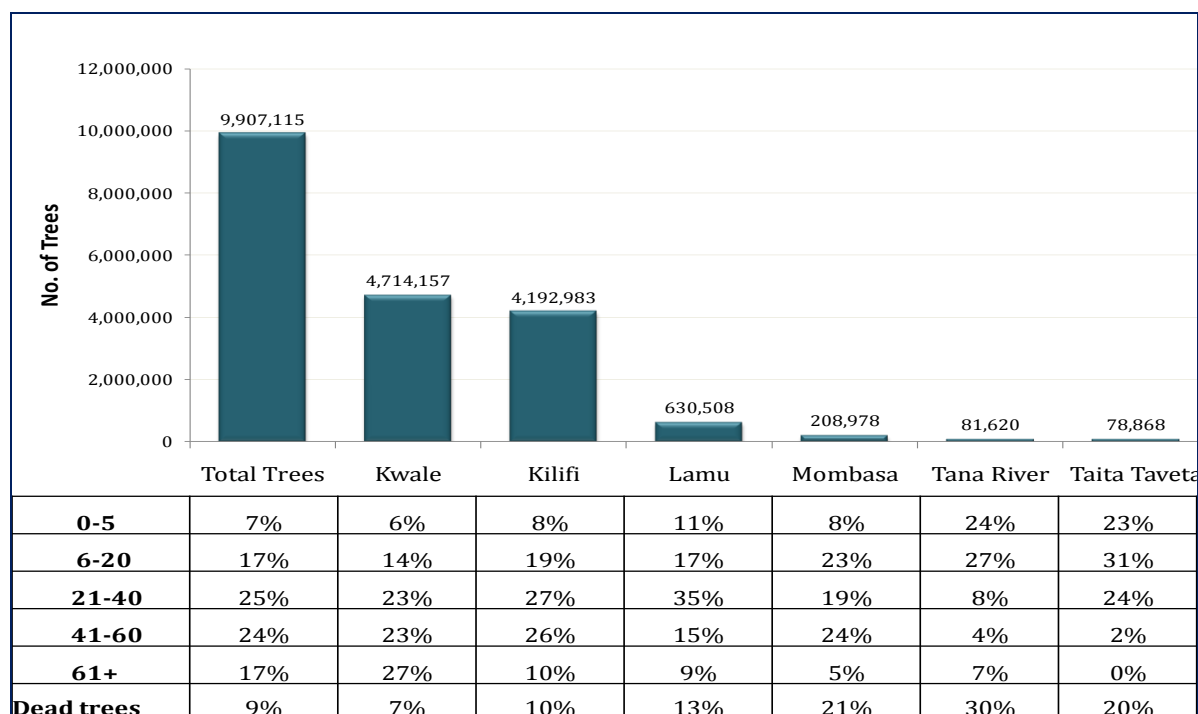


Figure 2: Number and Age of Trees by County.

2.5.5 Average Number of Trees per Farmer

Overall the mean number of coconut trees per farmer is 105. This ranges from a low of 26 trees (Taita Taveta) to a high of 128 (Kilifi and Lamu). An interesting finding to note is that although counties such as Tana River had the high mean acreage per farmer, the number of trees per farmer is just 46 trees. These findings reinforce the conclusion from the earlier finding that the potential for expansion in coconut farming is enormous in the traditional coconut growing zones.

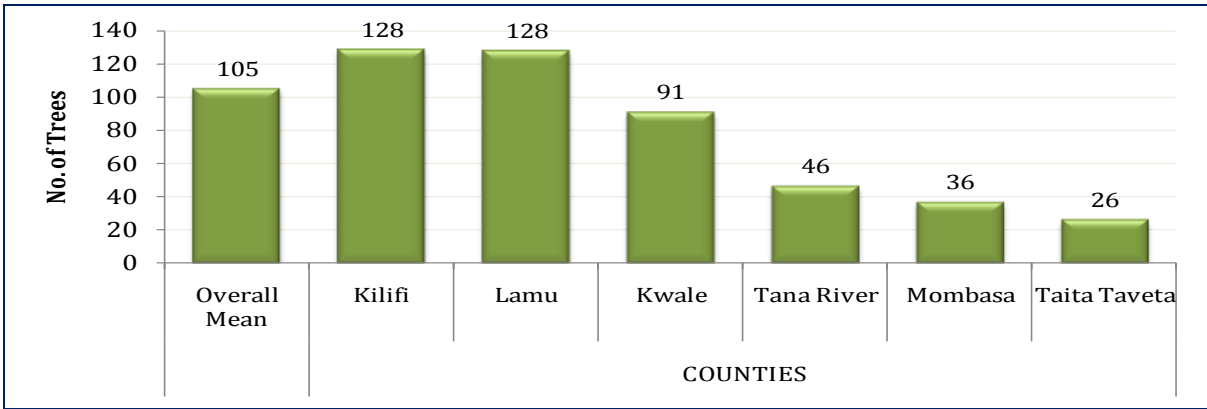


Figure 3: Average Number of Trees per Farmer by County.

2.5.6 Coconut Types

There are three broad varieties of coconut grown around the World – the Tall variety, Dwarf variety and Hybrid variety obtained from a mix of the Tall and Dwarf varieties. There are however many sub-varieties found among each of these main varieties. For instance, in Africa alone, there are about 11 sub-varieties of the Tall variety, each generally associated with a region such as the East African Tall (EAT) variety generally found along Eastern Africa. There are three major sub-varieties of the Dwarf Variety – the Yellow Dwarf, Orange Dwarf, and Green Dwarf. Out of these varieties, there are numerous hybrid varieties developed for suitability for various products and agro-ecological adaptability. In Kenya, however, there have not been any studies to establish the distinct varieties grown. The findings of this survey identifies them as types.

Results of the Survey show that Kenya cultivates only two of the main types – the East African Tall and the Dwarf types. Table 7 shows that the majority of coconut trees are of the East African Tall type accounting for slightly over 84% of the trees with only 16% of the trees being of the Dwarf type. Across counties, some contrasts are observed in Lamu and Mombasa with the two counties reporting higher percentage of this newer types.

Table 7: Distribution of Coconut Trees by Type

Counties	Total	Tall Type		Dwarf Type	
		Count	Per cent	Count	Per cent
Kwale	4714157	4075461	86%	638,696	14%
Kilifi	4192983	3560675	85%	632,308	15%
Lamu	630508	416956	66%	213,552	34%
Mombasa	208978	140883	67%	68,095	33%
Tana River	81620	68215	84%	13,406	16%
Taita Taveta	78868	62576	79%	16,293	21%
Total	9907115	8324767	84%	1582349	16%

2.5.7 Size of Land under Coconut

Determining the total estimated acreage under coconut emerged as a challenge since trees are not planted on pure sand and on the recommended 9 by 9 metres spacing. In most cases, coconut trees were found intercropped with other tree crops such as cashew nuts. However farmers appeared to know the total size of land they own even when some portions of land had no trees at all. While it was difficult to get the right figures on land acreage the figures provided are important especially in providing indication for potential expansion within the areas already doing coconut farming. By estimating the number of trees on the farm and the spacing of the trees, it was therefore possible to determine the approximate acreage of land under coconut.

Results of the survey show the total land under coconut currently stands at 436,634 acres or 176,699ha (Figure 4). Comparatively by counties, the result indicates the highest land under coconut is in Kwale (227, 677 acres) followed by Kilifi (149,890)

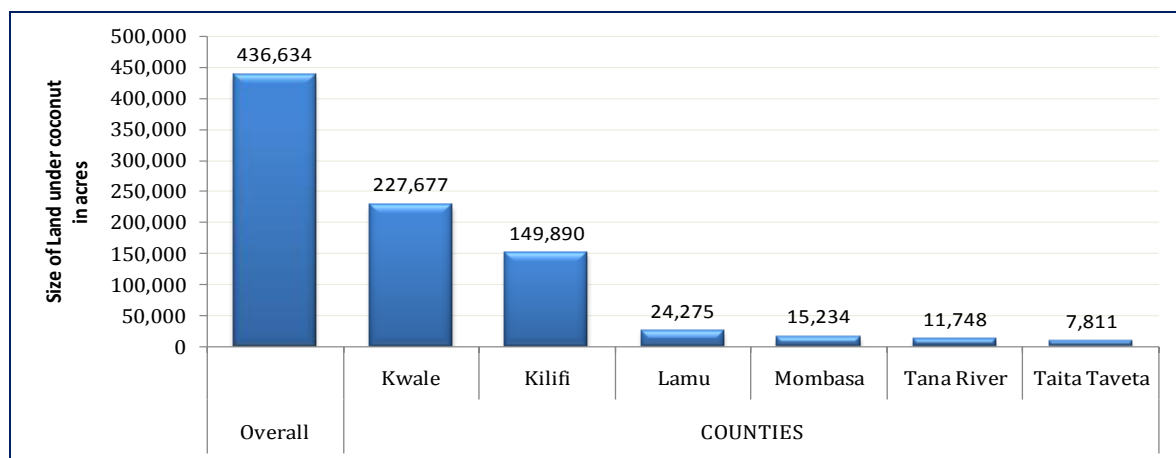


Figure 4: Acreage under Coconut.

2.5.8 Average Land Holding

Land holding translates to an overall average of 4.57 acres per farmer with Tana River leading with higher land spaces of up to 6.6 acres on average. Taita Taveta and Mombasa had the least at 2.56 and 2.66 acres per farmer respectively. It is however important to note that this is the total size of land owned by coconut farmers in which certain portions are planted with coconut, generally mixed with other crops. Comparatively, results of the survey show that, planted on pure sand and on the recommended 9 by 9 metres spacing², the population of coconut trees now established occupy about a quarter of the potential land area.

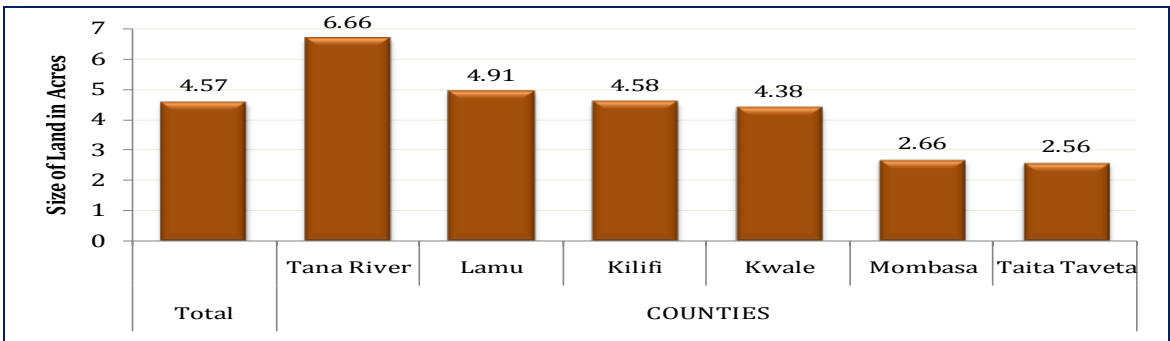


Figure 5: Average Acreage per Farmer.

2.5.9 Land Ownership

Just over a half of the land under coconut (58%) is owned by individual coconut farmers, 41% is family owned while other ownership such as institutional account for 1% of the land under coconut. In terms of tree ownership, it’s noted that the number of tree ownership increases by 5 % from the land ownership and reduces from family to individual, a pointer that very few youth have taken coconut growing from their parents (Figure 6).

² Ministry of Agriculture (MOA) recommended coconut spacing

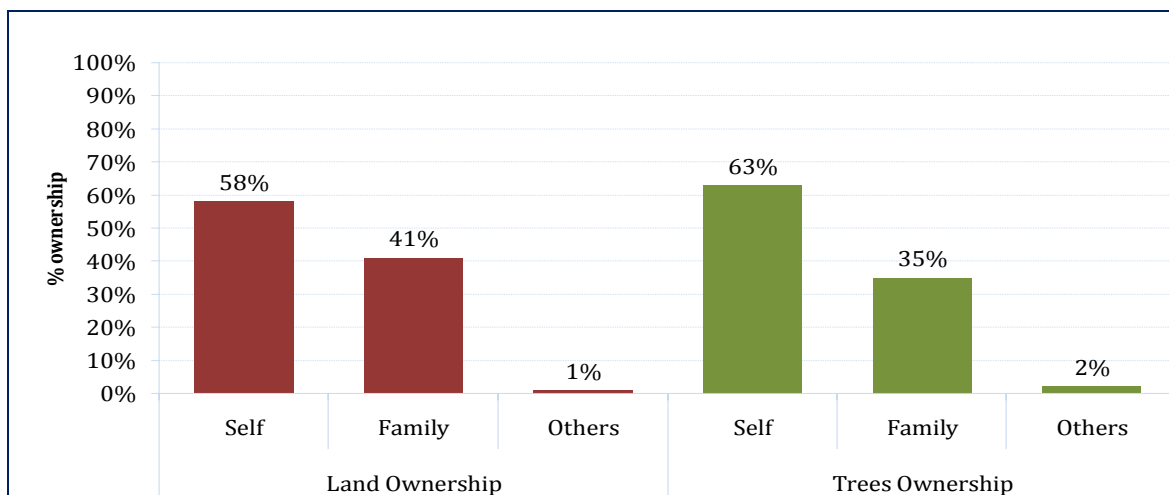


Figure 6: Forms of Land Ownership.

2.6 Growth in the Population of Trees

Computations generated from a comparison of the number of coconut trees planted in the last five years against the number of trees cut down during the year shows that the population of coconut trees is generally on the rise at an annual growth rate of 1.6%. however, compared to a growth rate of 2.2 % established in 2006 census, there has been a decrease in the growth rate. Overall, farmers have planted 1,626,973 coconut trees in the last five years. On the other hand, farmers cut down 841,117 trees in the last five years preceding the survey.

The results reveal that Taita Taveta recorded the highest growth in the last five years (69%). Of note is that, out of around 80,000 trees found in Taita Taveta, approximately 60,000 trees have been planted in the last five years. The baseline survey of 2006 did not include Taita Taveta as a coconut growing area.

Table 8: Estimated Rate of Coconut Re-planting

County	Total Number of trees	Number of trees planted in the last 5 years	Number of trees cut down in last 5 years	Net Trees Planted	Growth in five years	Annual Growth
Kwale	4,714,157	604,019	484,463	119,556	2.5%	0.5%
Kilifi	4,192,983	709,849	260,834	449,015	10.7%	2.1%
Lamu	630,508	170,024	39,305	130,719	20.7%	4.1%
Mombasa	208,978	52,288	45,931	6,357	3.0%	0.6%
Tana River	81,620	29,194	3,934	25,260	30.9%	6.2%
Taita Taveta	78,868	61,600	6,651	54,949	69.7%	13.9%
Total	9,907,115	1,626,973	841,117	785,856	7.9%	1.6%

3.0 AGRONOMY

3.1 Definition and Classification

The coconut palm (*Cocos nucifera*) is not very fastidious or exacting in its climatic requirements and is highly adaptable to a variety of environments. It is found to grow under varying climatic and soil conditions. In Kenya, coconut is mainly grown in the agro-ecological coast low land (CL) zones, CL3 and CL4, but can also be found in the lower parts of CL5. It is also grown on a smaller scale in CL6, especially along rivers and sections with sandy soils (Gachanja et al., 2007).

3.1.1 Agro-Climatic Requirements for Coconut Growth³

Rainfall: The coconut palm can grow and bear fruits with well distributed rainfall of 1000 mm. However, for profitable cultivation, it requires rainfall of 1,000 mm to 2,500 mm per annum, evenly distributed throughout the year. It can also withstand much higher precipitation if the soil is well drained.

Temperature: The optimum mean annual temperature for best growth and maximum yields is stated to be 27°C with a diurnal variation of 6°C to 7°C. High temperatures might cause the young developing inflorescences to dry up, and limit production to those months in the year when the temperature remains at a satisfactory level.

Humidity: The coconut palm, in general, performs well in climate characterised by warm and humid conditions. However, highly humid conditions are not good for the palm as this reduces transpiration which reduces the uptake of nutrients. It also provides congenial conditions for the rapid spread of the fatal diseases of the palm such as bud-rot¹.

Sunshine: The palm requires plenty of sunlight and does not grow well under shade or in regions that are too cloudy. The importance of sunlight can be observed in the manner that palms growing in the shade lean away from obstruction in order to expose the crowns to the sun. Sunlight raises the temperature of the leaf surface to promote better activity in the tree. The importance of sunlight is the synthesis of organic food materials by the chlorophyll of green plants.

Drainage: The coconut root is unable to withstand stagnant water whether saline or non-saline. Provided with good drainage, the coconut is one of the most drought-resistant trees. The essentials for natural drainage, therefore, are a free-working soil of open texture or a deep water table or free water movement through the soil.

³ Source: http://www.ikisan.com/Crop%20Specific/Eng/cache/ap_Coconut.shtml (Accessed on 12th July 2013)

Soils: Coconut is grown under different soil types such as loamy, laterite, coastal sandy, alluvial, clayey and reclaimed soils of the marshy low lands. The ideal soil conditions for better growth and performance of the palm are proper drainage, good water-holding capacity, presence of water table within 3m and absence of rock or any hard substratum within 2m of the surface.

Soil Depth: The coconut palm requires a good soil depth. Even though the palm has an efficient root system, the roots are not strong enough to penetrate any hard layer such as a hard stiff pan of clay or hard laterite. Coconuts can flourish and yield normally with a very restricted root system provided the surface soil is physically suitable and chemically rich.

Soil Fertility: An important factor orienting soil suitability for good coconut growth and high yields is soil fertility. Six principal factors play a major role in relation to coconut cultivation, viz., soil moisture, soil nutrients including the major and trace elements, soil air, soil temperature, root space and the presence of injurious substances toxic to plant growth.

3.2 Agronomy and Husbandry

Like with any other crop, proper agronomic practices need to be carried out for optimal yields in terms of volumes and quality to be realized. In growing coconut, coconut fields should have palms with a high proportion of heavy bearers. The fields should be free from the incidence of diseases and not prone to severe attacks of pests.

When starting a coconut stand, a careful selection of the mother trees and the seed nuts should be carried out. Palms from which seeds are selected should be regular bearers with average annual yields of greater than 80 nuts and copra content not less than 150g/nut under rain-fed condition. Palms should have reached full bearing stage and have been giving consistently high yields for at least four years. It is important to leave out palms that are over 60 years age in the selection. Palms which produce barren nuts or those shedding large number of immature nuts should be discarded. Only seeds that are fully matured are collected, the selected nuts should be about 12 months old. Nuts should not be damaged during harvesting while nuts having irregular shape and size should be also be discarded. The planting of the nuts can either be done in a nursery bed or planted directly in the fields. Starting a coconut stand from seedlings is better in that one can be able to plant at the recommended depths without the fear that the seedling will fail to emerge from the ground.

During the planting of the seedlings, the pits are filled up with top soil and powdered cow dung / compost up to a depth of 50 to 60 cm. Then a small pit is made inside this mixture, so as to accommodate the nut attached to the seedling. The seedling should then be planted inside this pit and filled up with soil. The soil should be pressed well to avoid

incidences of water stagnation. Planting should be done during the rainy months, otherwise constant watering of the seedling will be required.

Continuous application of fertilizer or organic manure will ensure continuous supply of macro and micro nutrients required by the crop for better growth and production. Different forms of organic manures like compost, farm yard manure, bone meal, fish meal, blood meal, neem cake, groundnut cake etc. can be used while fertilizer that would supply both the macro and micro elements are recommended. In addition to manure and fertilizer application, burying fresh or dried coconut husks around the palm is a very beneficial practice particularly for moisture retention during the dry months of the year. The husk can be buried either in linear trenches dug 3m away from the trunk between rows of palms or in circular trenches dug around the palm at a distance of 2m from the trunk. The trenches may be dug 0.5 m wide and 0.5 m deep. The husks are to be placed in layers and covered with soil. The benefits of husk covered in soil should last for several years.

Only minimum tillage is required for coconut. Inter-cultural operations are mainly intended to control weeds and to provide aeration to the soil. If these objectives are met, any tillage system (ploughing / digging, making mounds) will have the same effect and can be followed up depending on the local conditions.⁴⁵ In Kenya, according to the Coconut Sub-Sector Baseline Survey Report of 2007, these appropriate agronomic practices necessary to optimize coconut yields are often neglected.

In view of this, an interview of the coconut growing farmers was carried out to elucidate some of the agronomic practices applied on-farm, determine the production technologies adopted by farmers if there are any, and try to relate the impact(s) of these agronomic practices and technologies on the productivity of coconut. Additionally and in relation to the agro-climatic requirements for coconut growing, a land use evaluation of the entire country was carried out to establish if there are areas outside the Kenyan coast that could have varying potentials for coconut production.

3.3 Current Practices and Productivity

In order to ascertain this, a total of 411 coconut farmers sampled from the six counties of the coast region namely: Kwale, Kilifi, Taita Taveta, Lamu, Tana River and Mombasa were interviewed. These farmers were selected from groups of farmers who had been interviewed on both value chain and tree population aspects covered elsewhere in this report. Interviewees were contacted directly to validate what had already been observed

⁴ Source: coconut cultivation board. Sri-lanka. 2011.

http://www.coconut.gov.lk/web/index.php?option=com_content&view=category&id=47&itemid=70&lang=en
Accessed 24th April 2013

⁵ http://www.indg.in/agriculture/crop_production_techniques/coconut-2013-production-management-and-products
Accessed 24th April 2013

during the value chain analysis data collection stages. The distribution of the farmers interviewed in the six counties is shown on table 9 below. Farmers interviewed from each county were picked from administrative locations, which were also the sampling unit used for the statistical data section of this report. The interview was carried out through a questionnaire. However, additional information was obtained from the farmers during the interview with a view of finding out whether the response could be taken to represent the majority of the farmers from the locality. From the list of farmers provided, a strategic selection as opposed to random selection was applied to ensure that other factors like the age groups and the gender of the farmers provided in the list of the previously interviewed farmers were considered.

Table 9: Sample Distribution and Validation

District	Kwale	Kilifi	Taita Taveta	Lamu	Tana River	Mombasa	Total
Sample Size	55	60	81	56	81	75	411

Note: It should be noted that from the initial sample of 276, the rule proportionality was observed whereby the region with the highest numbers of farmers was allocated the highest number of respondents, however due to other non-fundamental factors like logistics, there are places where it was easier to get more data beyond what was required. The data from the additional respondents was found useful and did not alter the findings as far as this subject is concerned.

3.4 Agronomic Practices and Application of Technologies

a. Unexploited Coconut Potential:

The findings of the interview portray a picture of a crop whose potential remains unexploited. Majority (72%) of the farmers indicated that they had young coconut trees planted during the last five years and that they planned to continue planting more trees. This demonstrates the interest of the farmers and their reliance on the crop as a major source of livelihood.

b. Limited Access to Clean Certified Seeds:

On average, 54.5% of the farmers planted seeds or seedlings obtained from their own trees, 25% bought seedlings, 13.5% obtained them from the agricultural office while seven per cent borrowed seeds from friends and neighbors.

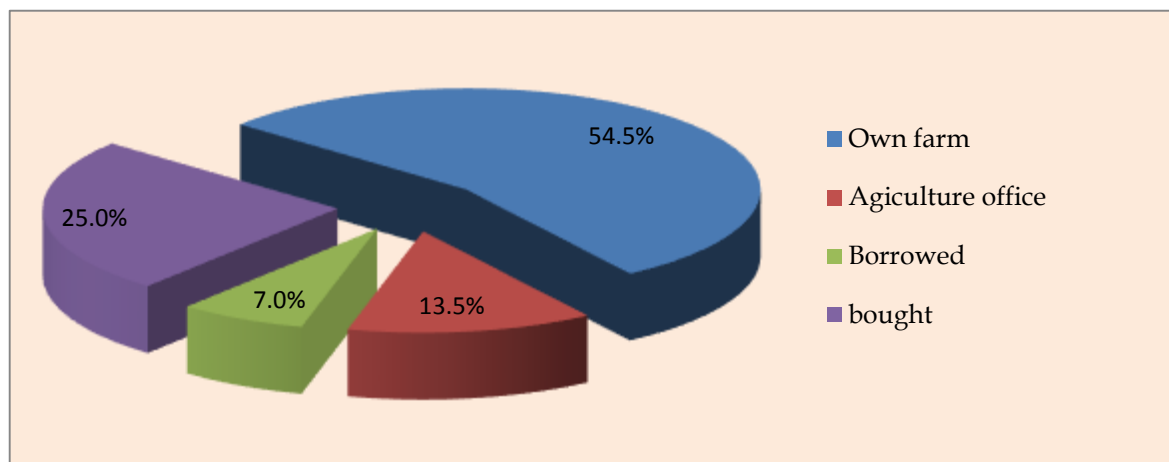


Figure 7: Source of Planting Materials for the Farmers

c. Limited Knowledge Skills:

Seventy one percent of the farmers interviewed indicated that they selected nuts to be used as seeds from trees showing good growth and with good yields. Even though selection was done it could have been done better. Good selection of mother trees should consider factors like yields, shape of the crowns, nature of petiole and inflorescence stalks, size and shape of nuts, weight of bunches and nuts, defective trees and the age of the mother palm⁶. In view of this, farmers should select trees from which to obtain seeds from. However, of those that indicated that they carry out seed selection, only 18% have set some trees aside for that purpose. Most farmers from the remaining 82% planted fallen nuts that they considered to be mature and from any tree.

Additionally, 55% of those that planted seeds obtained from their fields did direct sowing of the nuts while the others established their own nurseries or did both. The method of sowing showed no consistency within the group interviewed; for instance the size of the sowing hole was varied with the majority being two feet deep and two feet wide. For those who did direct planting, they preferred to plant on a hole that measured one and a half (1.5) feet deep and one and a half (1.5) feet wide for the reason that if the seeds were planted deeper than this they would fail to emerge. When planting, 49% indicated that they used manure or some form of organic matter. 47% percent of them used cow-dung as manure while planting, 20% used chicken waste while 33% used grass and/or decomposing plant remains which would be laid at the base of the hole (Figure 2).

⁶ http://www.lkisan.com/crop%20Specific/Eng/Cache/ap_coconut.html Accessed on 27th July 2013

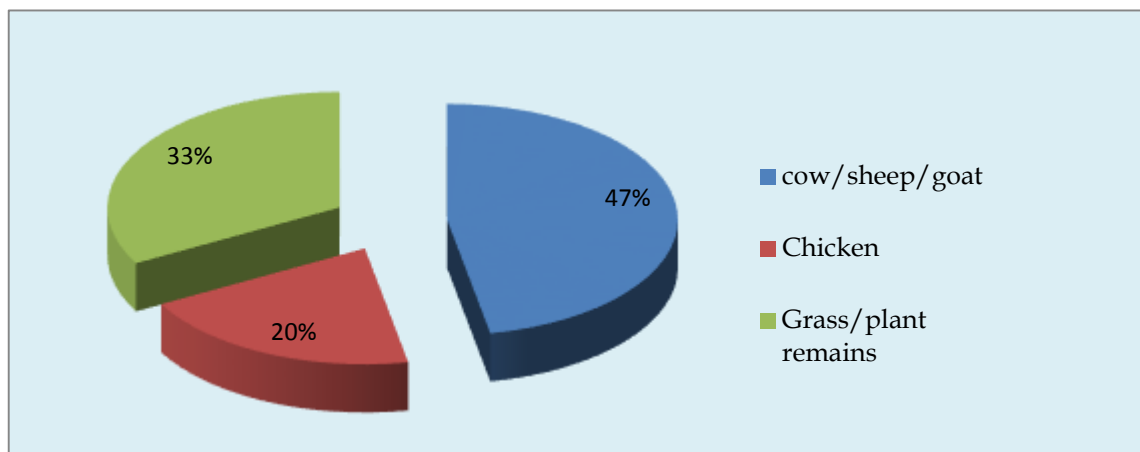


Figure 8: Type of Manure/organic matter used in Nursery and Fields

d. Poor Coconut Farming Practices:

Coconut farmers that used cow dung and chicken manure continued to add it to the growing plant based on availability. Though use of in-organic fertilizer is recommended, and has been showed to improve or increase yields of coconut (Magat and Liberty), only four percent of the interviewed farmers reported to have (ever) used fertilizers when planting or growing the crop. On further probing 83% of those who use or ever used fertilizer did not know which fertilizer in particular they had used. On the practice of mulching, only 36% of the respondents had (ever) applied mulch to their crop. 68% of them used grass, 13% used plant remains, four per cent used cow dung while, the last 15% used cocopeat and a combination of the other materials mentioned here. Despite coco peat having been shown to be a good source of both macro and some micro-elements and a good mulching material (Philippine Coconut Authority, Techno Guide 2003), only a very small percentage of the farmers interviewed have ever used it as a mulching material.

Eighty five (85) per cent of the farmers indicated that they do carry out weeding and sanitation to their crop. However, the reason for weeding varied. 27% of the farmers carry out weeding during the onset of rains, eight (8) per cent do weeding every once a month, 12% and another eight (8) per cent do weeding every two and three months respectively, 21 % weed when the fields are weedy while 16% only weed during the dry months as a way of protecting the trees from fires, especially those in Kwale and Kilifi. Information collected on pests and diseases indicated that 59% of the farmers had observed pests in their farm. The Rhinoceros beetle (*Oryctes rhinoceros*) was reported to be the most prevalent as well as the most destructive pest and scored 81 per cent, ants and termites six (6) per cent, and wild animals one (1) percent. The one (1) per cent was reported by farmers from Taita Taveta who cited elephants as a constraint towards production. To cite one example, a farmer who had planted 45 seedlings lost 43 of them to elephants and to date only the two trees stand in his farm.

Twelve (12) per cent of the respondents could not identify the pests. The farmers reported using wires and sand to control the pests especially shortly after the trees become infested. Of the two, use of the wire was more common when the trees had already fallen over due to pest damage, while sand could be used on growing trees. Sand was reported as being effective especially if applied early enough. The Rhinoceros beetle was however reported in very low levels in Taita Taveta region. About 12 per cent of farmers interviewed indicated they have recorded coconut diseases, however, they were not able to identify or even distinguish a disease from the symptoms of the Rhinoceros beetle and what could have been identified as abiotic symptoms.

e. Coconut Yields

Overall, the average yields of 27 nuts per tree, reported by these farmers are quite low and could be as a result of the poor adherence of the crop growing recommendations. The highest yield recorded per tree was 167 while the lowest was 4. On average, higher yields per tree were recorded in Lamu while Mombasa recorded lower yields per tree. According to FAO, one tree may yield on average 70-100 nuts to a maximum of 150 nuts per year.⁷ These low yields can be attributed to poor agronomic practices which can be confirmed by these findings. From these findings it is also clear that there are no technologies especially advanced ones being practiced in coconut production. While some challenges for example the Rhinoceros beetle and Drought can be addressed through technologies for example, use of biological control agents and use of drought tolerant varieties respectively, there are no indications that these two technologies exist. It is worth noting that such technologies can only be implemented with the assistance of the government through its agencies for instance the Kenya Agricultural Research Institute due to the complexities of establishing and implementing them.

However, there are simple technologies that can be easily adopted at the farm level that could lead to improved yields and high quality nuts, but which are not in use presently. Such technologies include, composting or even vermin-composting, irrigation where water is readily available, use of inorganic fertilizers, selection of mother trees based on sound criterion as well as selection of the seed nuts. In adopting such simple technologies, technical support is very crucial. For instance, it is crucial that soil samples are taken and analysis be done in order for in-organic fertilizers recommendations to be done. While this may sound simple, certain protocols and procedures should be adhered to while collecting the samples and a farmer need to be well informed on how to go about it. Similarly composting using the traditional way or by use of worms (vermin-composting) can easily be achieved at the farm level but the farmers should be trained and guided on how to go about it.

⁷ <http://www.fao.org/docrep/005/y3612e/y361203.htm> Accessed 23rd August 2013

No technologies were reported to be in use by at the farmer level. It was also noted that the link between the farmer, the end user and the researcher was either weak or non-existent. This link can be provided through extension services. Various extension methods for example, farmer field schools and farmers participatory programs, use of contact farmers etc. should be adopted. While a yield of 150 nuts per tree per year that is given as the optimal may appear farfetched, a modest yield of 70 nuts per tree per year is achievable and all efforts should be put in place to achieve it.

3.5 Challenges in Coconut Production

Regarding the challenges that the farmers faced, various challenges were given and even in cases where a challenge was common in all the districts, the weight of the challenge varied from one county to the other.

The farmers in Kilifi, Kwale and Lamu rated drought followed by Rhinoceros beetle as the main challenges. Even though the Rhinoceros beetle was reported by some few farmers in Taita Taveta, it was not highly rated as a challenge like in the rest of the places. All the farmers in Taita Taveta did not think drought was a challenge to them, they instead indicated that their soils were mostly wet and if not they have plenty of water around to irrigate. Those in Tana River did not view drought as a challenge too, since they mostly grow their trees along the rivers. It was clear that floods presented a major challenge in this county.

Seedlings availability was only a challenge in Taita Taveta since most of the farmers are starting coconut farming and have no mature trees to harvest seeds from. Farmers from the other areas did not view it as a challenge but as reported earlier in this report that some farmers establish their trees from the fallen seeds and from trees not specifically selected as mother trees, the quality of the seedlings could be poor. Farmers indicated desire to establish new and better yielding types of coconut but they have limited access to such seeds.

All the farmers cited lack of technical information and support on how to grow the crop as a challenge. For instance, some farmers indicated zero-usage of inorganic fertilizers, in their view, coconut is a tree and it did not require fertilization. In fact, only 18% of the interviewed farmers indicated that they had accessed some form of technical advice on the crop.

Table 10: Findings on Agronomic Practices from the Six Counties.

Agronomic Practice/Technology		County						Totals (β)
		T. Taveta	Kwale	T. River	Lamu	Mombasa	Kilifi	
Planted in last 5 years		87 α	43	65	96	86	55	72
Source of Seedlings	Self	46	76	21	40	67	82	55
	Agric. office	9	8	6	47	11	3	14
	Buying	25	12	71	12	16	13	25
	Others	20	4	2	1	6	2	6
Seed Selection		77	64	46	82	81	75	71
Planting	Nursery	24	16	52	60	56	39	41
	Direct Planting	71	80	48	38	40	54	55
	Both	5	4	0	2	4	7	4
Use of Manure		46	22	9	87	84	48	49
Type of Manure used	Cow/sheep/goat	80	25	43	65	21	48	47
	Chicken	13	25	43	4	31	4	20
	Plant Remains	7	50	14	31	48	48	33
Use fertilizer on crop		5	0	6	4	4	5	4
Use mulch on crop		33	7	47	27	51	53	36
Received technical support		22	18	5	52	7	5	18
Practice weeding		86	76	81	91	86	88	85
Insect pest challenge		57	47	73	55	63	57	59
Disease challenge		28	2	5	9	9	17	12

α - Figures represent per cent affirmative response

β - Column represent the average affirmative response across all the counties.

3.6 Coconut Growing Potential Outside Coast

3.6.1 Assessment Criteria

In this assessment, the Food and Agriculture Organisation of the United Nations (FAO) procedure of land evaluation was applied. This procedure is based on a matching exercise between crop growth requirements and other relevant parameters, whether solely edaphic or global, i.e. including both physical and socio-economic contexts (FAO,1976). If those conditions match perfectly well with the optimal crop production needs, then the land is considered suitable. The more those conditions deviate from the requirements, the less suitable the land is considered to be. The step by step land evaluation approach of Verheye, 1986, and outlined below, was followed.

- (i) Land utilization type
- (ii) Crop growth requirements, including climate, soil and land form
- (iii) Data collection on climate, soil and physiography i.e. the mean data and extremes.
- (iv) Matching of land attributes with crop requirements and definition of preliminary suitable classes.
- (v) Definition of suitable classes
- (vi) Evaluation of biophysical potential.

Suitability level for each of the variables were defined following the description of FAO, 1976. These levels were used as a base to construct the criteria maps. The suitability levels were: Highly suitable (S1), Moderately suitable (S2) Marginally suitable (S3) and Not suitable (N) as described in table one below.

Table 11: Definition of Land Suitability Classes

Class S1: Highly Suitable:	Land having no significant limitations to sustained application of a given use, or only minor limitations that will not significantly reduce productivity or benefits and will not raise inputs above an acceptable level.
Class S2: Moderately Suitable:	Land having limitations which in aggregate are moderately severe for sustained application of a given use; the limitations will reduce productivity or benefits and increase required inputs to the extent that the overall advantage to be gained from the use, although still attractive, will be appreciably inferior to that expected on Class (S1) land.
Class S3: Marginally Suitable:	Land having limitations which in aggregate are severe for sustained application of a given use and will so reduce productivity or benefits, or increase required inputs, that this expenditure will be only marginally justified.

Table 12: Optimal Growth and Productivity Requirements

Characteristic	Highly suitable	Moderately Suitable	Marginally suitable	Not Suitable
	S1	S2	S3	N
Rainfall	+ 2,000	1,600-2,000	1,000-1,600	<1,000
Temperature	27-32	24-26 and +34	20-24	20
Dry season	-1	1-2	2-3	>4
Soil texture	Loamy to sandy loamy			
Depth	+100	75-100	75-100	25-50
Drainage	Well drained soils			

The total areas in hectares were calculated based on the number of selected points in the final suitability maps with the use of GIS. This was achieved by use of the grids provided on the climatic grids map. The final areas were in square kilometres (km²) and were finally converted into hectares.

3.6.2 Results of Coconut Growing Potential in Kenya

The results showed that there is potential of growing coconut in various parts of the country besides the coastal area. The results also showed that Kenya can be classified into two suitability classes with regard to coconut growth namely; moderately suitable and marginally suitable. There were no highly suitable areas and the main limitation to those areas that showed potential to this class based on rain were disqualified based on temperature. These were areas falling under agro-climatic zone (1) which mostly falls under the very high elevations and considered as forested land and land for generation of water (Sombroek *et al.*, 1982; FAO, 2006). These areas would also pose a threat to coconut development due to high prevalence of fungal diseases which prefer wet and humid weather conditions.

The greatest part of the country fell under classification (N) - land not suitable. The major limitation to these lands/areas was rainfall. These are areas that receive less than 1000mm of rainfall annually and which is also poorly distributed. Based on the agroclimatic categorization of Kenya, these are areas in agroclimatic zones 7, 6 and some parts of 5 and 4. Based on the land classification, even the areas under coconut in the coastal region fell under class S3- land that is marginally suitable. This was attributed to the limitation of the annual rainfall and its distribution at the coast. The Study's classification for S3 were areas receiving annual rainfall of between 1,000-1,600mm but currently coconut is grown in areas receiving annual rainfall of between 1000-1200mm (Gachanja *et al.*, 2007) and experiencing three to over three months of drought (Mwachiro and Gakure, 2011). For optimal productivity, coconut requires rainfall of 1000mm to 2500mm that is well

distributed over the year. The crop cannot tolerate long dry periods that extend to more than four months (Ikisan.com, 2,000)

Overall, the study found that the area outside the coast with potential for the crop falling under class (S2) -land moderately suitable- to be approximately 5,737.73 hectares, spanning mainly the Western Kenya regions of **Butere, Mumias, Bungoma, Kakamega, Kericho, Kisumu, Nandi, Suba and Vihiga** (Map 1). Map 2, shows the exact sublocations⁹ within these districts. Besides the coast, an area of approximately 157,636.446 hectares was found to be marginally suitable for coconut production. This area is spread in various districts² of the former Eastern, Central, Rift valley, Nyanza and Western provinces², as shown in Maps 3. Map 4 shows the sublocations within those districts.

Table 13: Coconut Growing Potential Areas outside Coastal Region

No.	Ecological Zone	Approximate Hectares	Proposed Areas
1.	Moderately Suitable (S2)	5,737.73	Butere, Mumias, Bungoma, Kakamega, Kericho, Kisumu, Nandi, Suba & Vihiga
2.	Marginally Suitable (S3)	157,636.45	Eastern, Central, Rift Valley, Nyanza & Western

3.6.3 Recommendations on Coconut up scaling Process

Although this exercise was carried out following the recommended procedures and tools as outlined within the methodology section, a physical evaluation of the specific areas is recommended prior to establishing the crop. This is considering the fact that general maps, for instance, the one on properties of Kenyan soils were used and may have failed to capture very specific traits in greater detail. Also, some minor variations can be expected within an area that may not have been captured by the maps, or some new land use may have been started in an area or far away from an area that would have some effect on another area. One example can be flooding which can be observed in an area due to land use change in a far a way land.

⁹ Administrative boundaries based on the delineations prior to the latest revisions to administrative units

4.0 THE COCONUT VALUE CHAIN ANALYSIS

4.1 Introduction

The value chain approach involves a consideration of all players involved from product conception to consumption. According to Barnes, (2004) value chain is an alliance of enterprises collaborating vertically to achieve a more rewarding position in the market. As in any system, the sum of the parts is greater than the whole due to synergy. A value chain comprises of chain actors (involved in formation, transformation and distribution of the product) and service providers and supporters who facilitate the chain. Major value chain activities include input supply, production, transportation, processing and marketing as well as eventual consumption.

The coconut value chain is complicated by the multiplicity of product value chains involved. In the Kenyan case there is a general lack of industry statistics necessary for analysis. Despite being a key cash crop in the coastal region the coconut hardly features in national statistics. This report's approach considers generic agricultural value chain with broad categories of key players namely; input suppliers, farmers, processors, traders and chain facilitators.

The study further recommends that for KCDA to achieve any meaningful data in future, they should commission separate value chain studies for various products in order to exhaustively assess the real value. The current survey was restricted in scope and costs.

4.2 Findings and Analysis

4.2.1 Volume and Value of Coconut Products

The coconut tree has many products both at the farm level and at the processing level. From the root to the leaves there is no part of a coconut tree which cannot be commercially exploited. The main products produced at the farm level include mature nuts, immature nuts, palm wine, coconut thatch, brooms and coco wood. Some by-products of the nuts namely fibre and husks are also commercially exploited by some farmers.

Some of the semi-processed products produced include desiccated coconut, copra, copra oil and coco timber. These are processed both by farmers and in established factories. These products can be further processed to yield other consumer products.

As the South Seas proverb goes... "He who plants a coconut tree, plants food and drink, vessels and clothing, a habitation for himself and a heritage for his children"

Fully processed coconut products in the Kenyan coconut industry include the following:

Virgin coconut oil (VCO); Coconut milk

(cream and light); Bottled palm wine; Coconut vinegar; Brooms; Shell charcoal; Coco-wood Furniture; Makuti; Coco-peat; Coir fibre and ropes; Door mats; Body lotion and cream; Soap; Lamp shades and Artefacts.¹⁰

4.2.2 Seed Systems

In assessing the products it is important to look at an often neglected aspect of the value chain which is the supply of inputs. The main input in coconut farming is seedlings.

In the past, farmers had a lot of challenges in accessing seedlings. Consequently KCDA initiated a project to supply quality seedlings to farmers during the 2011/2012 season. This resulted in production of 251,798 with a market value of 12,589,900 based on an average value of KES 50 per seedling. However the nursery operators under the project were compensated at a rate of KES 30 per seedlings.

On average the survey indicated that a total of 325,395 trees are being planted on annual basis. This would translate to a value of KES 16,269,730 at an average of KES 50 per seedling. However some of the seedlings planted are not transplanted due to lack of market. Based on trees planted the volumes of the seedlings planted is distributed as follows:

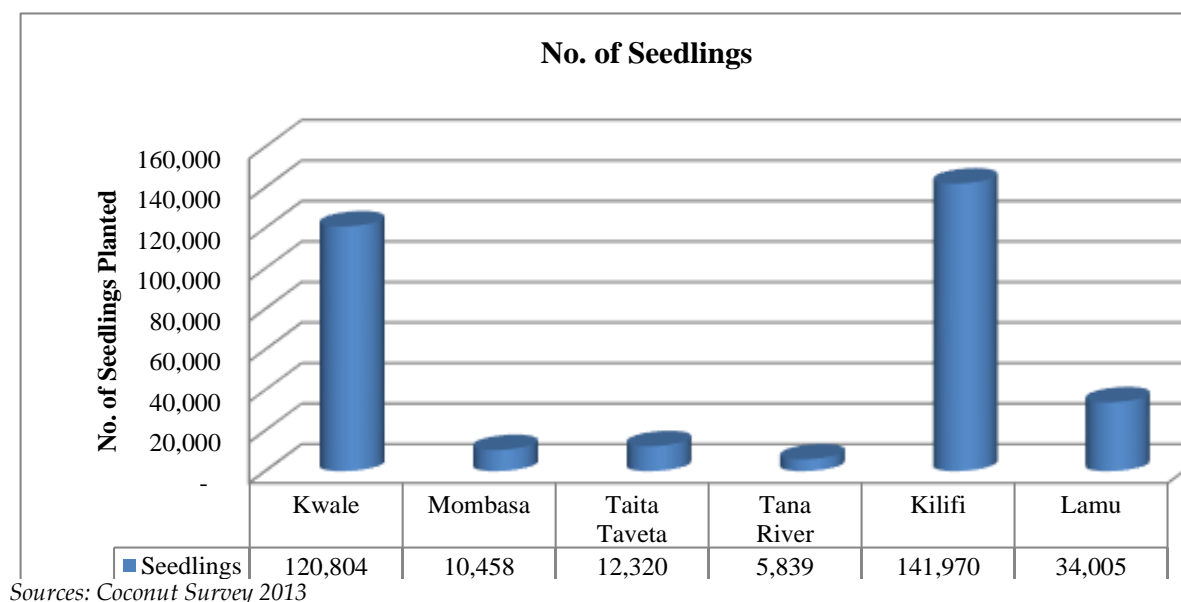


Figure 9: Estimated No. of Seedlings Produced and Planted in 2012.

Considering the market average of KES 50 per seedling with a range of between of KES 30 to KES 60, KCDA should consider raising the amount paid to nursery operators under the project towards the average market rates. This will motivate them to continue taking part in the project.

¹⁰ Kenya Coconut Development Authority <http://bit.ly/13Oq1p1>

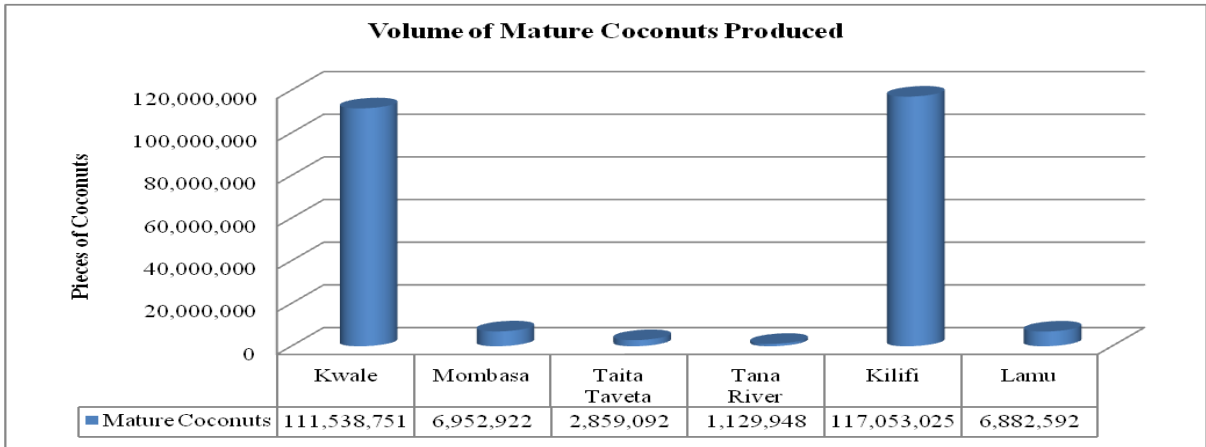
4.2.3 Mature nuts



Production of mature nuts is done nearly by all farmers except those whose trees are yet to start production. The mature nuts have both domestic and industrial uses. At the domestic level they are a key ingredient in preparation of various dishes whereby the inner flesh is utilised. At industrial level various products can be generated both from the flesh as well as the shell and the husks.

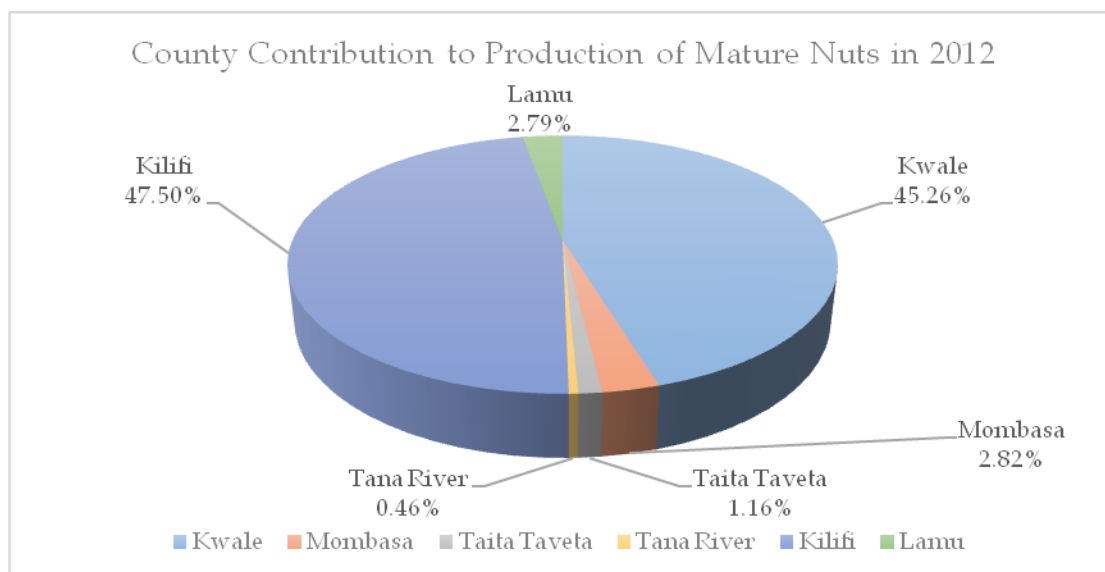
Volume of Mature Nuts Produced and Contribution to Production by Counties

During 2012 it is estimated that a total of 246,416,329 pieces of mature coconuts were produced. These are distributed as follows.



Sources: Coconut Survey 2013

Figure 10: Estimated Volume of Mature Coconuts Produced in 2012.



Sources: Coconut Survey 2013

Figure 11: Chart of County Contribution to Production of Mature Nuts in 2012.

The data shows that Kwale County accounted for 45.26% of the total production while Kilifi County accounted for 47.5%. On its part, Mombasa accounted for 2.82% while Lamu accounted for 2.79%. On the other hand Taita Taveta accounted for 1.16% whereas Tana River accounted for 0.46% of the total output.

Despite Kilifi having more trees in the productive age bracket it contributes nearly the same as Kwale County. This can be explained by wine tapping which is more prevalent in Kilifi than in Kwale. Most of the tapped trees do not yield nuts.

Marketing Channels for Mature Nuts

Out of the total nuts produced 10.13% were consumed at the farm level, 60.9% were sold to traders, 23.22% were sold directly to consumers while 4.96% were sold to processors. A paltry 0.79% was sold through cooperatives.

This is shown in the chart below.

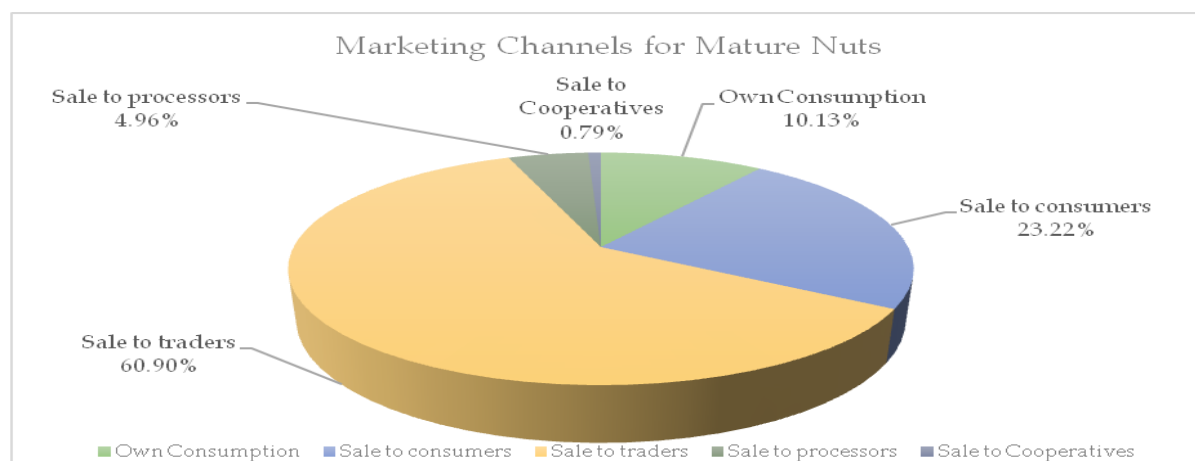


Figure 12: Marketing Channels for Mature Nuts in 2012¹¹.

There is a need for farmers to be mobilised into associations or cooperatives to ensure they sell directly to processors thus bypassing the traders and middlemen. This would improve their bargaining capacity resulting in higher prices. It should be noted that the percentage consumed at farm level may also include semi-processing. The sales to consumers include direct sales at farm gate and also taking to market.

c) Estimated Value of Mature Nuts Produced in 2012

The estimated value of mature nuts produced stands at KES 2.7 billion. Kwale County contributed 45.6% of this value followed by Kilifi at 43.5%. Mombasa County accounted for 5.1% while Lamu accounted for 3.8%. Taita Taveta and Tana River counties accounted for 1.5% and 0.5% respectively. This is shown in the table below.

Table 14: Estimated Value of Mature Nuts Produced in 2012

Mature Nuts Value				
County	Pieces Produced	Average Price (KES.)	Value (KES.)	Percent Contribution to Total Value
Kwale	111,538,751	11	1,226,926,261	45.6%
Kilifi	117,053,025	10	1,170,530,250	43.5%
Mombasa	6,952,922	20	139,058,440	5.2%
Lamu	6,882,592	15	103,238,880	3.8%
Taita Taveta	2,859,092	14	40,027,288	1.5%
Tana River	1,129,948	12	13,559,376	0.5%
Total	246,416,330	13.7	2,693,340,495	100.0%

¹¹Sources: Coconut Survey 2013

There is significant disparity in price across counties. There is also a wide price range from a low of KES 3 to a high of KES 42. There is need for farmers to be assisted with market information on the value of produce to protect them from exploitation. The high price reported in Mombasa may however be attributed to proximity to a ready and large market in Mombasa town. Low price in areas of high supply and high price in areas of low supply point to a need for deepening inter-county trade.

4.2.4 Immature/tender nuts



Tender coconut (7 to 8 months old maturity) is valued both for its sweet water, which is a refreshing drink and the delicious gelatinous meat (kernel), (Haseena, Bai and Padmanabhan, 2010). According to India Coconut Board tender coconut water is “the most nutritious wholesome beverage that nature has provided for the people of the tropics to fight the sultry heat.”¹²

In Kenya tender nuts commonly known as *madafu* are consumed mainly by the roadside where vendors have stalls/stands, hawking where vendors approach buyers mostly in vehicles and in tourist hotels where they are used as welcoming drink. The *madafu* are hardly sold in formal channels such as restaurants.

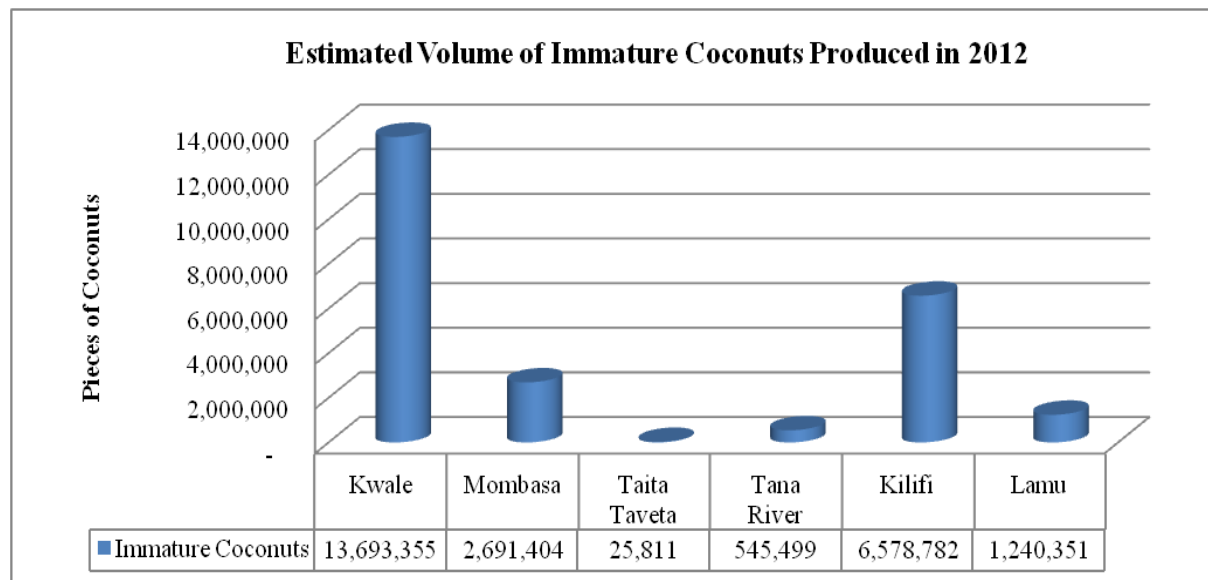
These marketing patterns are driven by two factors. First the tender coconuts are highly perishable with quality deteriorating within 24-36 hours of harvesting. According to Haseena, Bai and Padmanabhan, (2010) it is seen that tender coconut cannot be stored for more than one week at room temperature due to shrinkage and discoloration of skin, fall of perianth and fungal attack on the soft perianth region.

The second factor influencing marketing of tender nuts is that they are bulky as they still contain husks which limit their transportation. Nonetheless processing technology exists to increase the shelf life of the product. The application of such technologies in Kenya is largely non-existent. Consumption is limited to the Coastal areas and in parts of Nairobi mainly inhabited by Kenyans of Asian descent mainly Westlands, Parklands and Ngara.

¹² India Coconut Development Board website <http://bit.ly/15r9oM4>

a) Estimated Volume of Immature/Tender Nuts Produced in 2012

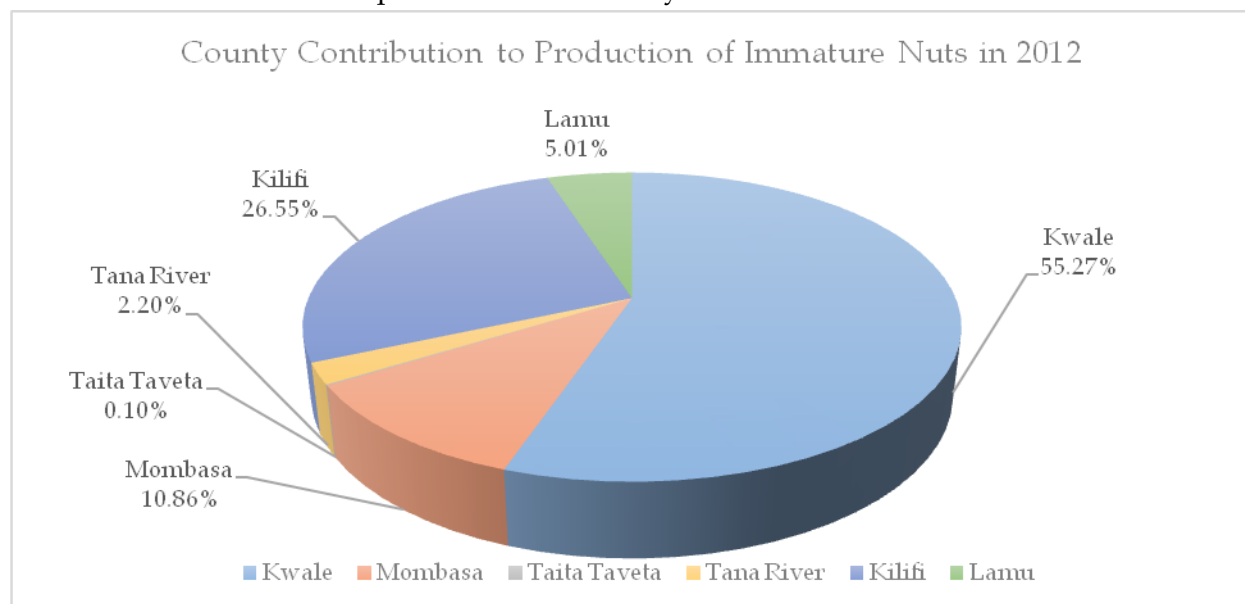
It estimated that 24,775,202 pieces of immature coconuts were produced. These are distributed as follows;



Sources: Coconut Survey 2013

Figure 13: Figure of Estimated Volume of Immature/tender Nuts Produced in 2012.

The share of contribution to production volumes by counties is as shown below.



Sources: Coconut Survey 2013

Figure 14: Chart of County Contribution to Production of Immature Nuts in 2012.

Kwale county accounts for 55.27% of the total volume of tender coconuts produced. Kilifi County accounts for 26.55% Mombasa follows with a contribution of 10.86% whereas Lamu contributes 5.01%. Tana River contributes 2.2% while Taita Taveta accounts for a paltry 0.1%.

The interesting point is that Mombasa accounts for 11% whereas it only accounts for 3% when it comes to production of mature nuts. This can be attributed to large and easily accessible market in Mombasa town. This makes transportation easy in view of bulkiness as well as making consumption fast in view of perishability. The low contribution of Kilifi County while compared to Kwale can once again be attributed to wine tapping which is more common in Kilifi.

b) Marketing Channels of Immature Nuts

The major outlet for immature nuts is through sales to traders who account for 45.22%. Residents’ own consumption accounts for 25.82% while direct sales to consumers account for 28.66%.

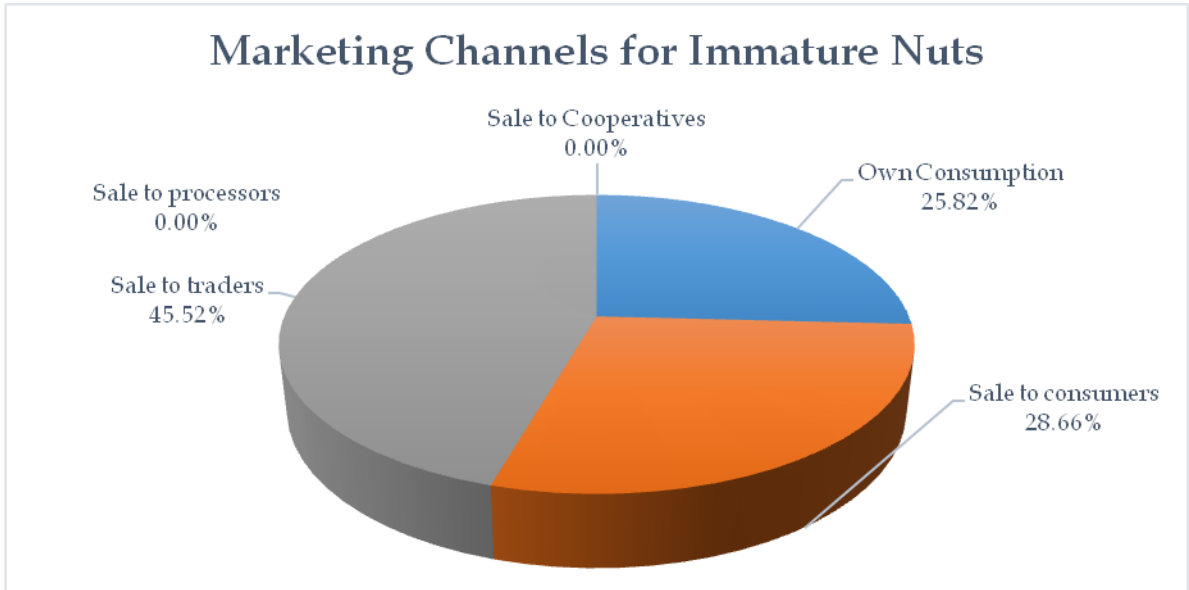


Figure 15: Chart of Marketing Channels for Immature Nuts.

The large percentage of sales to consumers and own consumption can be linked to earlier discussed issues of perishability and bulkiness. No sales to processors or cooperatives were recorded. This can be explained by the lack of value addition when it comes to processing and the high level of informality when it comes to trading of immature nuts.

c) Estimated Value of Immature Nuts Produced in 2012

The estimated value of immature nuts is KES 260,971,955. Kwale County accounted for 47.22% of this value while 30.25% is accounted for by Kilifi County. Mombasa County on the other hand accounts for 15.47% while Lamu accounts for 5.7% of the total value of tender nuts produced. At the tail end are Tana River and Taita Taveta accounting for only 1.25% and 0.1% respectively.

Table 15: Estimated Value of Immature Nuts Produced in 2012

Immature/Tender Nuts Value				
County	Pieces Produced	Average Price (KES)	Value (KES)	Percent Contribution to Total Value
Kwale	13,693,355	9	123,240,195	47.22%
Kilifi	6,578,782	12	78,945,384	30.25%
Mombasa	2,691,404	15	40,371,060	15.47%
Lamu	1,240,351	12	14,884,212	5.70%
Tana River	545,499	6	3,272,994	1.25%
Taita Taveta	25,811	10	258,110	0.10%
Total	4,775,202	10.67	260,971,955	100.00%

Sources: Coconut Survey 2013

With the average price of mature nuts at KES 13.7 and that of immature nuts at KES 10.67 the only advantage to the farmers in selling immature nuts is that they do not have to wait for the coconuts to fully mature. Prices are lowest in Tana River due to lack of established immature nuts trade. In Mombasa the prices are high due to proximity to a ready market. The overall price range is a low of KES 5 and a high of KES 42.

4.2.5 Palm Wine/Toddy



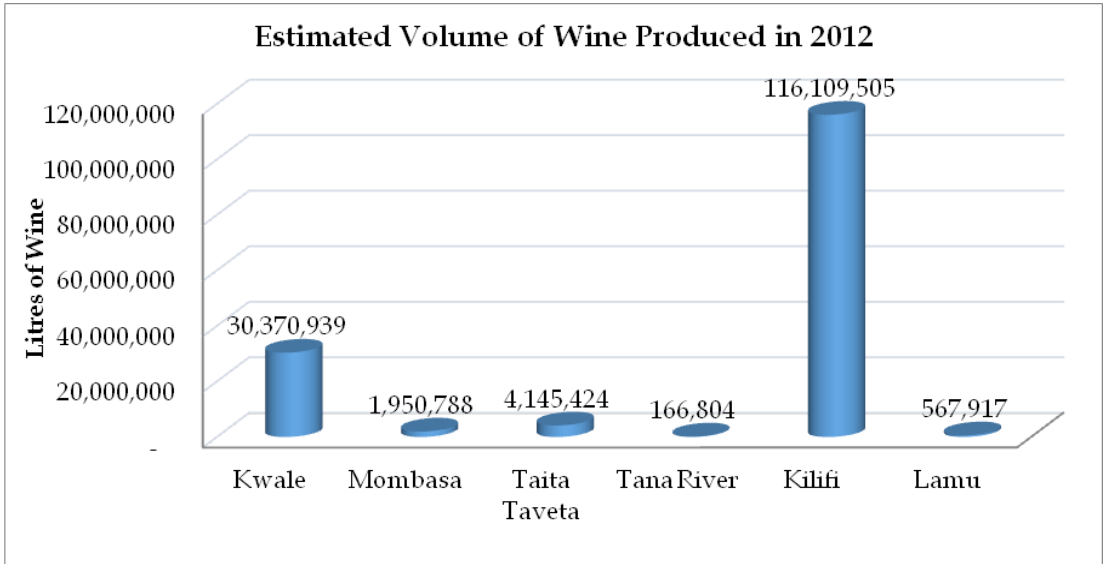
This is an alcoholic drink made by the fermentation of the sap from a coconut palm. It is white and sweet with a characteristic flavor. It is between 5 and 8% alcohol as approved by Kenya Bureau of Standards. Toddy is harvested by cutting off a slice of tissue from the tip of the spathe (the newly emerged but not yet open sheath of the flower). The sap (or toddy) provides drink (sweet and rich in vitamins when fresh; alcoholic after fermentation) and sugar, (Foale, 2003).

Normally, the toddy is consumed within 12 hours after the sap is collected. The nutritional value of toddy thiamine and riboflavin reside mainly in the yeast-free fluid portion. Toddy also contains small amounts of protein, fat and other nutrients, (Gachanja, Musinga, Ngigi, Onyango and Bett, 2010).

In Kenya coconut wine is mainly consumed at the coast in drinking bars locally known as *mangwes*. Consumption is limited outside the Coast due to the short shelf life. Some limited processing and packaging is being done thus enabling it to be sold beyond the coastal region.

a) Estimated Volume of Palm Wine Produced in 2012

It is estimated that a total of 153,311,377 litres of palm wine were produced in 2012. This is shown in the figure below.

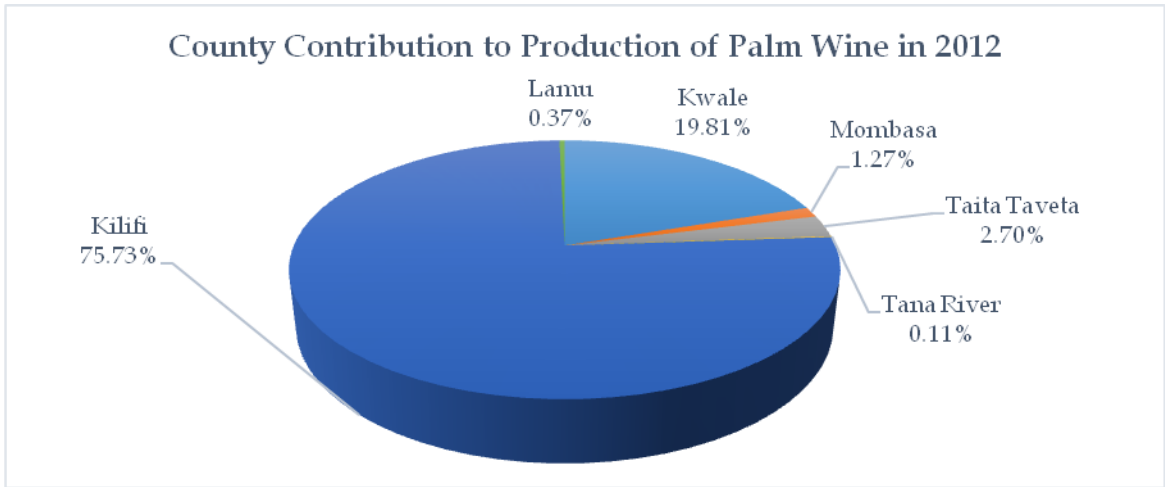


Sources: Coconut Survey 2013

Figure 16: Figure of Estimated Production of Palm Wine in 2012.

The leading county in production of palm wine is Kilifi contributing 76% to total production. It is followed by Kwale County contributing 20%. Taita Taveta accounts for 2.7%, Mombasa accounts for 1.27% while Lamu and Tana River account for 0.37% and 0.11% respectively.

This is shown in the figure below.



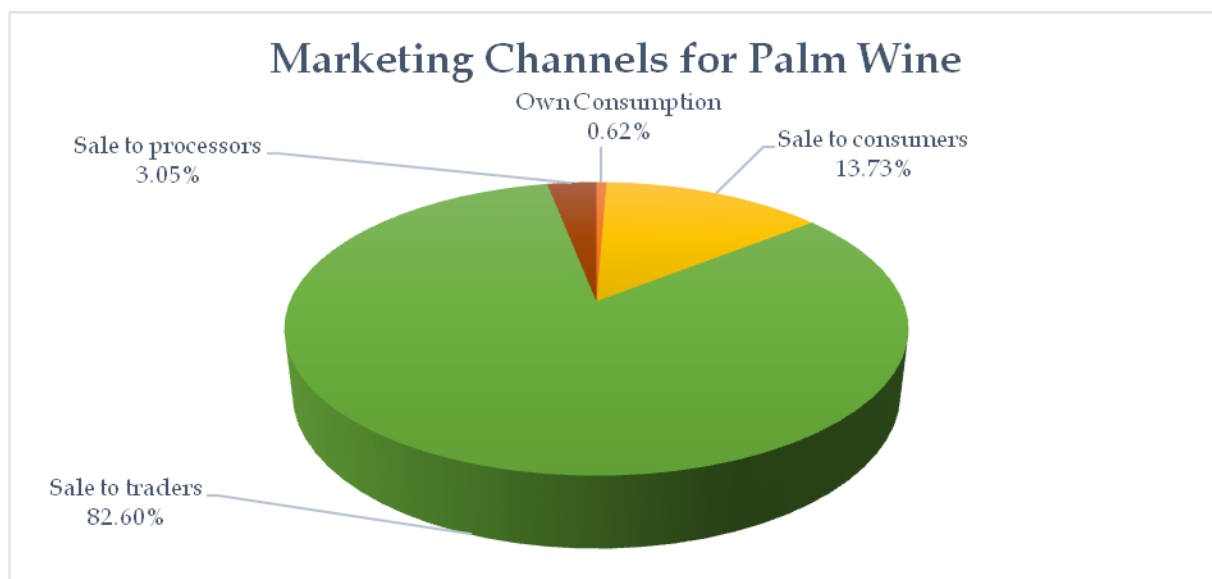
Sources: Coconut Survey 2013

Figure 17: Chart of County Contribution to Production of Palm Wine in 2012.

Counties inhabited largely by Muslims produce less due to religious beliefs which prohibit alcohol consumption. This explains why despite Kwale and Kilifi having nearly the same number of trees Kilifi produces more than thrice what Kwale produces.

b) Marketing Channels for Palm Wine

Findings indicate that 82.6% of the wine is sold through traders. Out of the balance 13.73 % is sold directly to consumers, 3.05% to processors and 0.62% is consumed at the farm level.



Sources: Coconut Survey 2013

Figure 18: Chart of Marketing Channels for Palm Wine.

This is one product whereby the market is dominated by one channel which points to poor market development. There is need to develop the market by diversifying the channel through value addition.

Packaging and prolonging the shelf-life should be immediate priorities. Distillation of the palm wine to produce other high value alcoholic drinks should be promoted. Direct sales to consumers may point to unlicensed operations.

c) Estimated Value of Palm Wine Produced in 2012

The estimated value of the palm wine is KES 7.2 billion. Kilifi County earns most of this money accounting for 72.2% of the entire value. Kwale County follows with 23.08% while Taita Taveta accounts for 2.64% and Mombasa 1.54%. Lamu and Tana River contribute little to the value accounting for 0.44% and 0.10% respectively.

Table 16: Estimated Value of Palm Wine Produced in 2012

Palm wine/Toddy Value				
County	Litres	Average Price (KES)	Value (KES)	Percent Contribution to Total Value
Kilifi	116,109,505	45	5,224,927,725	72.20%
Kwale	30,370,939	55	1,670,401,645	23.08%
Taita Taveta	4,145,424	46	190,689,504	2.64%
Mombasa	1,950,788	57	111,194,916	1.54%
Lamu	567,917	56	31,803,352	0.44%
Tana River	166,804	45	7,506,180	0.10%
Total	153,311,377	50.67	7,236,523,322	100.00%

Sources: Coconut Survey 2013

Despite the high average price it should be noted that high price disparities were noted. A high of KES. 100 per litre and a low of KES. 10 per litre were recorded. There is need to provide market information for farmers on the prices for the produce.

It should be further noted that nearly half of the amount does not accrue to farmers as it is paid to the wine tappers at an average of KES. 22 per litre. Considering the high percentage which is sold wine is the most commercialised of all the coconut products.

4.2.6 Cocowood/Coconut Wood



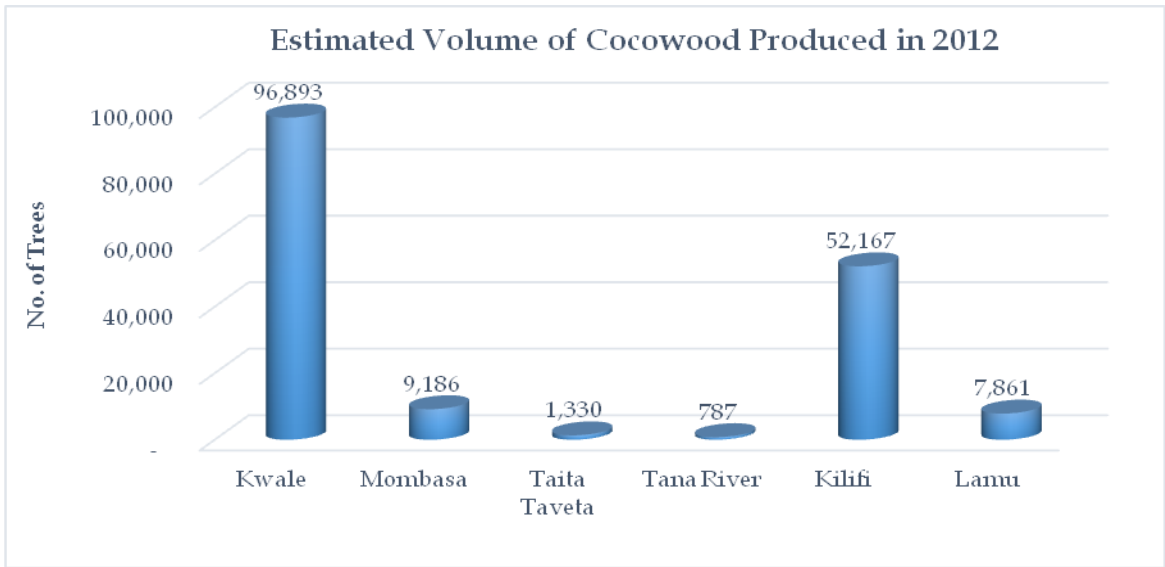
The coconut tree trunk is a source of high quality hardwood which is used for construction, furniture making and production of artifacts. According to research done on Kenyan coconut wood the characteristics and properties obtained were comparable with those from other parts of the world.

The density ranges from low to heavy density 0.248 – 0.852gcm³. The bending strength, bending stiffness and crushing strength also range from very weak to very strong due to the density variation (Oduor and Githiomi, 2010). Thus coconut wood can be a good substitute for more common hardwoods hence aiding in conservation.

The wood is used in making premium quality furniture. However not many are aware of the coconut wood and its characteristics. Thus market awareness is necessary to ensure customers willingness to pay the premium rates.

a) Volume of Cocowood Produced and Contribution to Production by Counties

Findins indicate that a total of 168,224 were cut in 2012. The distribution by counties is as shown below.

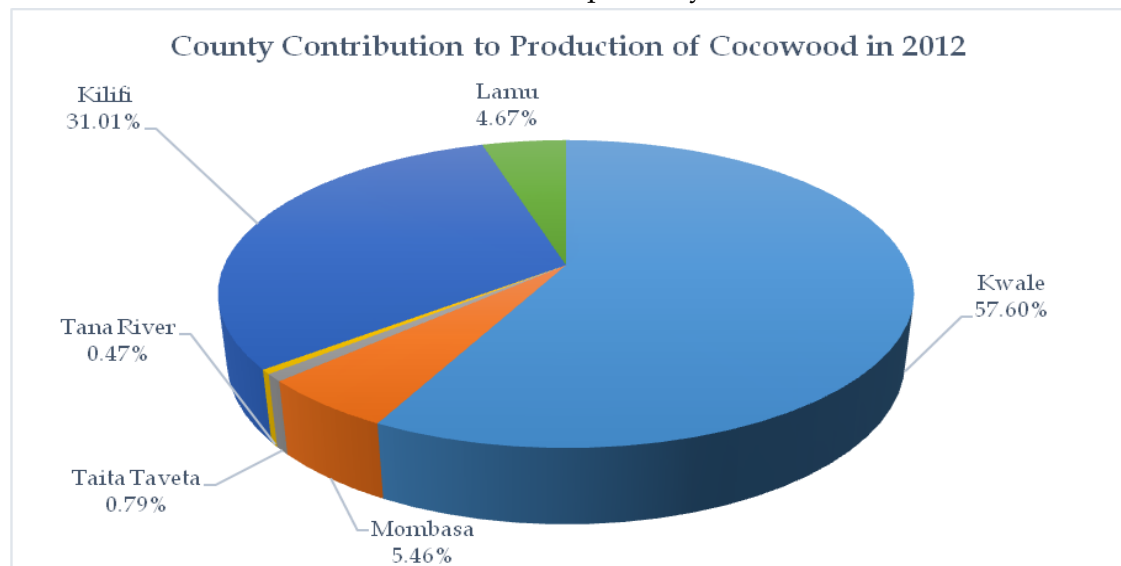


Sources: Coconut Survey 2013

Figure 19: Figure of Estimated Production of Cocowood in 2012.

These findings further show that Kwale County was the leading producer of Cocowood accounting for 57.6%. It was followed by Kilifi County which accounted for 31.01%,

Mombasa at 5.46% and Lamu at 4.67%. Tana River and Taita Taveta counties made minimal contribution at 0.47% and 0.79% respectively. This is shown in the chart below.



Sources: Coconut Survey 2013

Figure 20: Chart of County Contribution to Production of Cocowood in 2012.

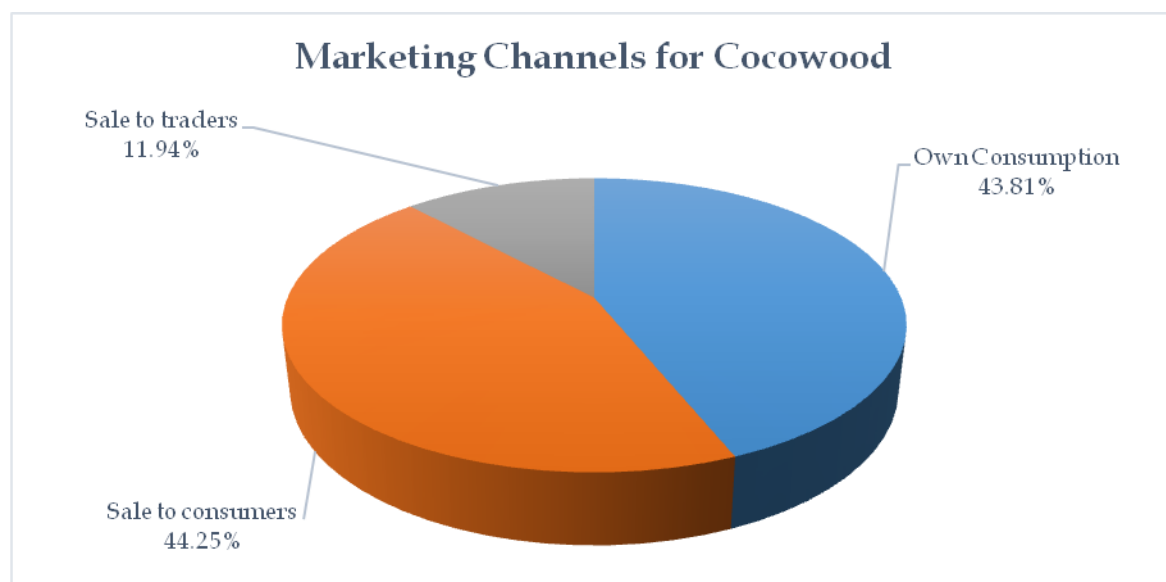
These findings may create an alarming impression that massive felling of coconut trees is going on in Kwale when compared to Kilifi as both have nearly the same number of trees. This can however be explained by the findings on age of trees which show that Kwale is leading in no. of trees aged 61 and above which are 1,291,728 compared to Kilifi with 454,578 such trees. It is at this age that the trees become senile and underproductive.

b) Marketing Channels for Cocowood

The marketing dynamics indicate interesting results which point to low commercial exploitation of the coconut wood. According to Oduor and Githiomi (2010), efforts to promote the use of Cocowood in Kenya started in early 2003 in an attempt at searching for alternative wood species which could be used in the wood carving sub-sector.

Findings indicate that majority of the wood cut is sold to consumers i.e. 44.25% which is followed closely by 43.81% which is utilized by the farmers. The remaining 11.94% is sold to traders.

This is shown in the figure below.



Sources: Coconut Survey 2013

Figure 21: Chart of Marketing Channels for Cocowood.

These findings reveal low commercial utilization. There is need to step-up the effort to promote the commercial utilization to ensure farmers get value for the trees. Oduor and Githiomi (2010) highlighted various challenges which may explain this situation. These include;

- (i) Selection of the senile coconut tree, splitting/sawing and grading for specific use not yet fully understood by most players in the Kenyan market;
- (ii) High cost of seasoning (Kiln technology) and other operations on coconut wood;
- (iii) Lack of know-how in coconut wood finishing and preservation technology;
- (iv) Inadequate market acceptance of coconut wood products at “premium” prices; and
- (v) Low level of coconut tree replenishment in the country for sustainable harvesting and utilization of the resource.

c) Estimated Value of Cocowood Produced in 2012

The Cocowood harvested in 2012 is valued at KES 188,670,295. As expected, Kwale contributes the bulk of this accounting for 62.04% followed by Kilifi at 27.1% while Mombasa and Lamu each contribute 4.87%. Taita Taveta contributes 0.71% while Tana River Contributes 0.42%.

This is shown in the table below.

Table 17: Estimated Value Cocowood Produced in 2012

Cocowood Trees Production				
County	No. of Trees	Average Price (KES)	Value (KES)	Percent Contribution to Total Value
Kwale	96,893	1,208	117,046,261	62.04%
Kilifi	52,167	980	51,123,464	27.10%
Mombasa	9,186	1,000	9,186,200	4.87%
Lamu	7,861	1,170	9,197,370	4.87%
Taita Taveta	1,330	1,000	1,330,200	0.71%
Tana River	787	1,000	786,800	0.42%
Total	168,224	1,059.67	188,670,295	100.00%

Sources: Coconut Survey 2013

4.2.7 Makuti/Coconut Thatch



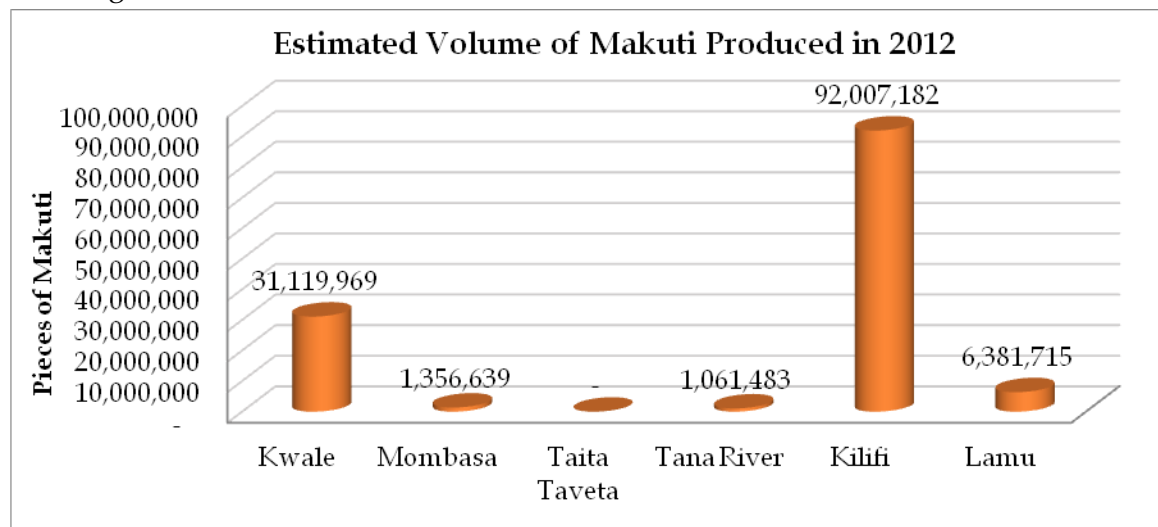
Makuti are pieces of roofing material made from coconut leaves. It is a very eco friendly or “green” building material as it is made from leaves that are naturally wilting on the palm tree and therefore harvesting does not affect the parent plant in any way. The individual pieces (or tiles) have to be weaved first, (“Makuti”, 2013).

The *Makuti* are valued for aesthetic value and their ability to stay cool under the hot coastal weather. The demand and value of *Makuti* has risen rapidly over the last ten years. Long held as a cheap alternative to the expensive roofing materials, palm branches commonly referred to as *makuti* are fast rising as a symbol of prestige and cultural attraction in coast hotels, a phenomenon that has seen their prices on an unprecedented upward trajectory for the last decade with even five star hotels and villas spending millions in *makuti* roofing, (Muinde, 2013).

This rise in demand though positive has resulted in some undesirable activities. Some farmers now harvest the leaves and dry them under the sun instead of waiting for them to fall off the trees. This might affect the trees if not properly handled. It also results in poor quality.

a) Volume of Makuti Produced and Contribution to Production by Counties

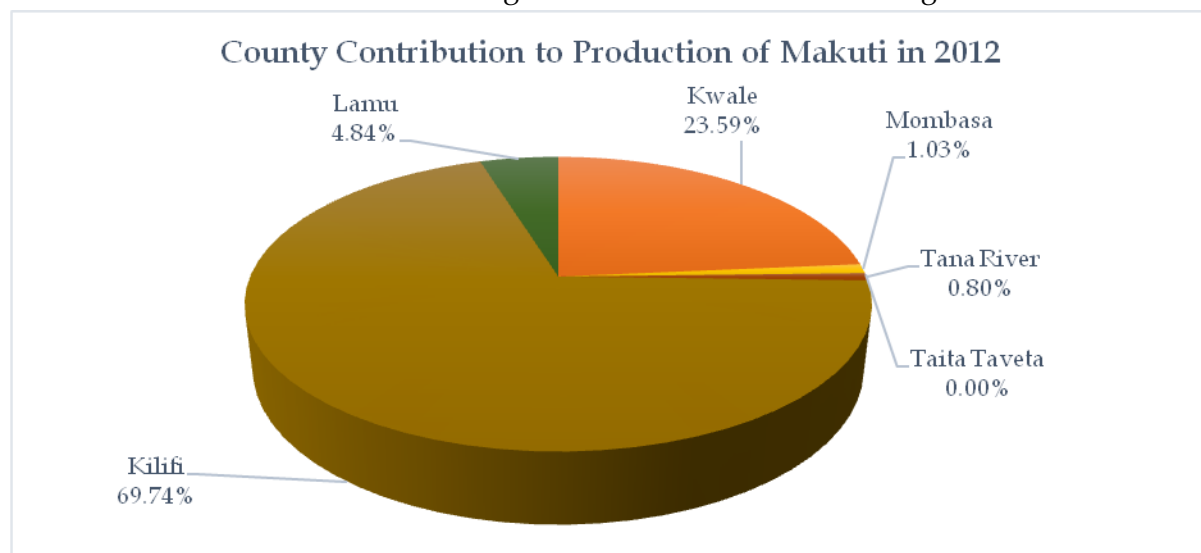
It is estimated that a total of 131,926,990 pieces of Makuti were produced in 2012 as shown in the figure below.



Sources: Coconut Survey 2013

Figure 22: Figure of Estimated Production of Makuti in 2012.

Kilifi County led in production accounting for a whopping 69.74% of the total production. It was followed by Kwale County which contributed 23.59%. Lamu on its part contributed 4.84% whereas Mombasa settled for 1.03%. Tana River County contributed the least with 0.8% whereas Taita Taveta had nothing to offer. This is shown in the figure below.

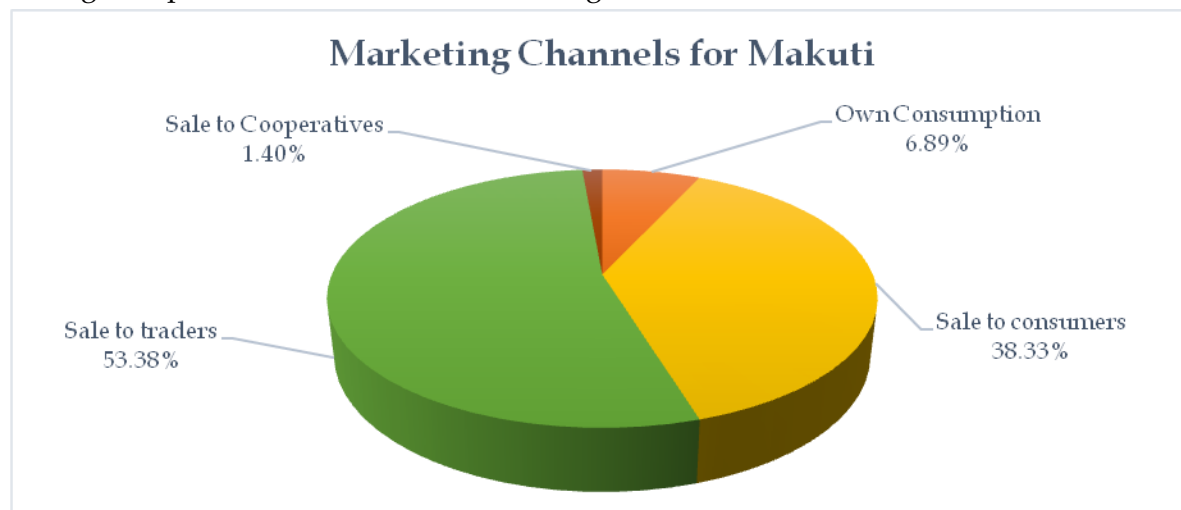


Sources: Coconut Survey 2013

Figure 23: Chart of Estimated Production of Makuti in 2012.

b) Marketing Channels for Makuti

Out of the entire production 6.89% was consumed by the farmers, 38.33% was sold directly to final consumers whereas 53.38% was sold to traders. The remaining 1.4% was sold through cooperatives. This is shown in the figure below.



Sources: Coconut Survey 2013

Figure 24: Chart of Marketing Channels for Makuti.

c) Estimated Value of Makuti Produced in 2012

The value of the Makuti produced is estimated at KES 1.7 billion. As expected, Kilifi contributed a large share of this value at 68.52% followed a distant second by Kwale which weighed in with 23.18%. Lamu was third with a contribution of 6.95% while Mombasa contributed 0.93%, Tana River 0.43% whereas Taita Taveta contributed nothing.

Table 18: Estimated Value of Makuti Produced in 2012

Makuti Production				
County	Pieces of Makuti	Average Price (KES)	Value (KES)	Percent Contribution to Total Value
Kilifi	92,007,182	13	1,196,093,371	68.52%
Kwale	31,119,969	13	404,559,603	23.18%
Lamu	6,381,715	19	121,252,589	6.95%
Mombasa	1,356,639	12	16,279,671	0.93%
Tana River	1,061,483	7	7,430,383	0.43%
Taita Taveta	-		-	0.00%
Total	131,926,990	12.80	1,745,615,617	100.00%

Sources: Coconut Survey 2013

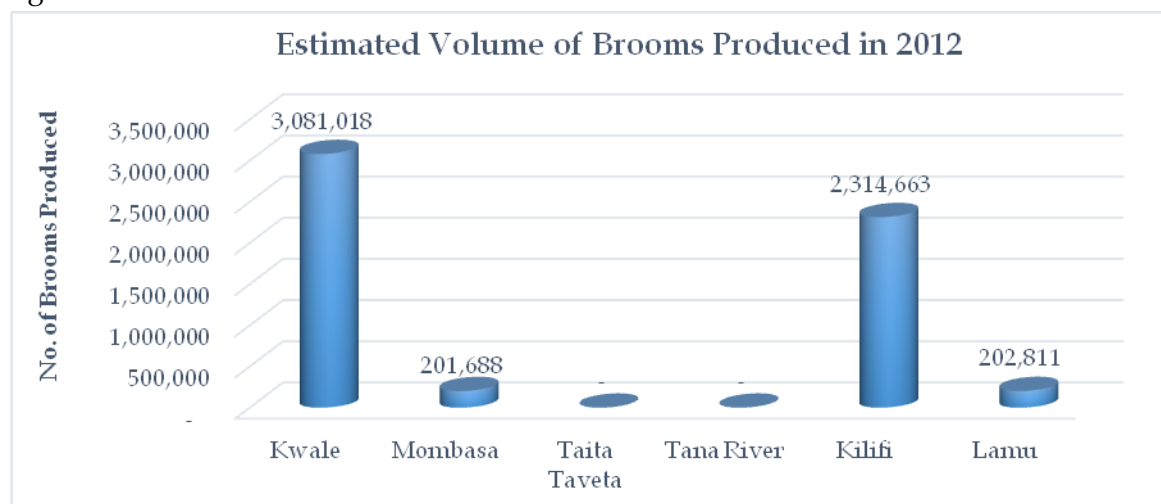
4.2.8 Brooms



Coconut brooms are made from the leaves of a coconut tree. They are said to be easy to use and have a long functional life. Many types of brooms can be made from the coconut leaves. One can make brooms with stick and others without for instance.

a) Volume of Brooms Produced and Contribution to Production by Counties

It is estimated that a total of 5,800,179 brooms were made in 2012. This is shown in the figure below.



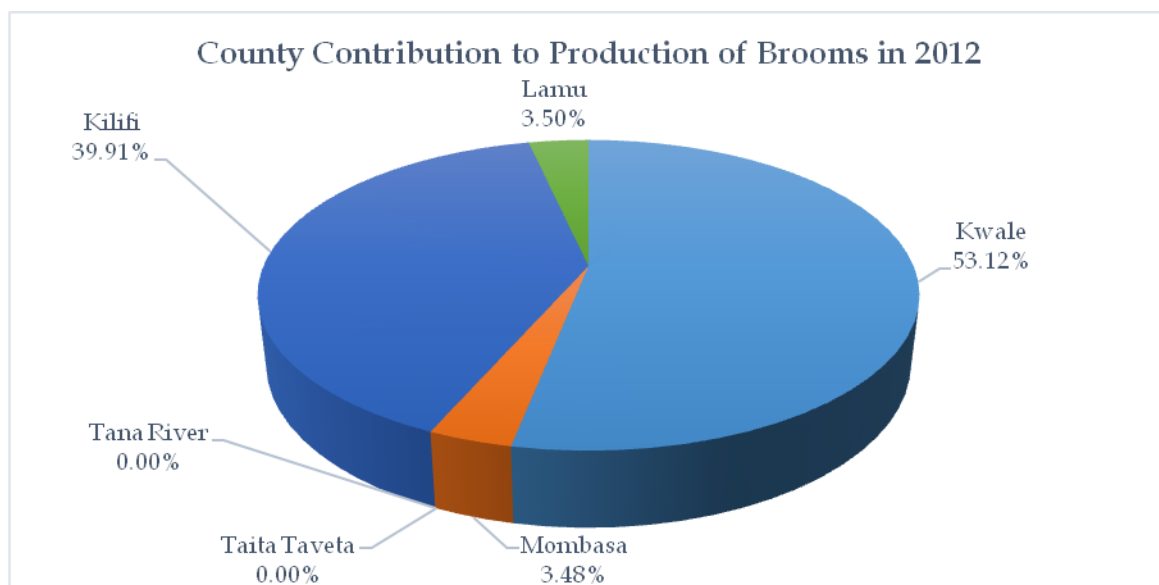
Sources: Coconut Survey 2013

Figure 25: Figure of Estimated Production of Brooms in 2012.

One interesting point is that Gachanja, Odhiambo and Musila, (2007) reported the production of brooms at 8,760,254 pieces while our findings reflect 5,800,179 pieces. The likely explanation is that Makuti being also a product of coconut leaves are offering stiff competition to brooms. Both the demand and value of Makuti is rising rapidly.

This view is also supported by the finding that while in 2006 Kilifi and Kwale produced nearly the same volume of Makuti Kilifi is now leading by a large margin. On the contrary Kilifi now trails Kwale when it comes to production of the brooms.

Findings indicate that Kwale County contributed most to production of brooms with a share of 53.12%. It was followed closely by Kilifi with 39.91%. Lamu weighed in a distant third 3.5% whereas Mombasa drew in 3.48%. Tana River and Taita Taveta counties didn't register any contribution. This is shown in the figure below.

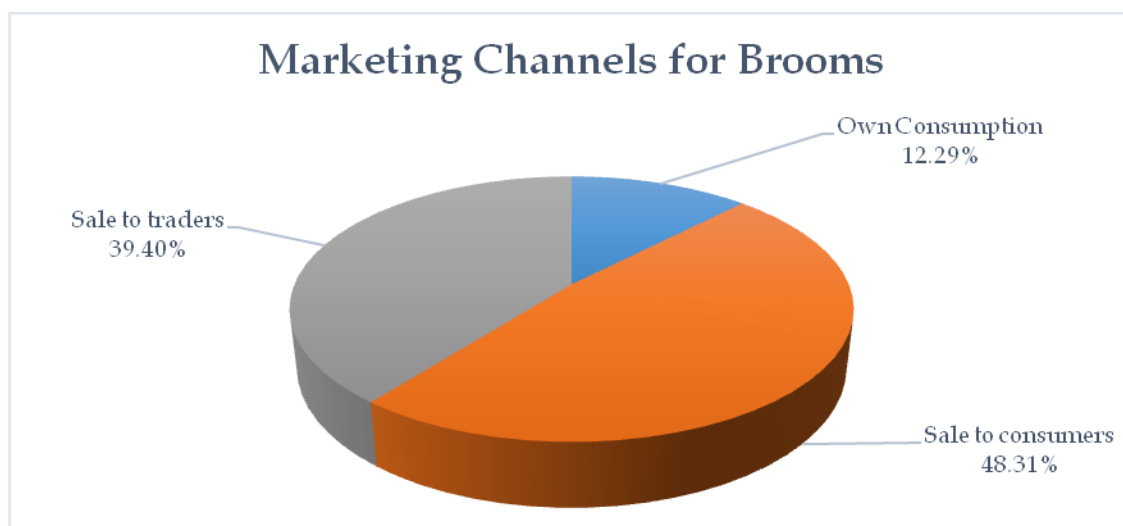


Sources: Coconut Survey 2013

Figure 26: Chart of Estimated Production of Brooms in 2012.

b) Marketing Channels for Brooms

There are three outlets for the produced brooms. Out of the total production 12.29 was consumed by the producers, 39.4% was sold to traders whereas 48.31% was sold directly to consumers. This is shown below.



Sources: Coconut Survey 2013

Figure 27: Chart of Marketing Channels for Brooms.

The high percentage of brooms sold directly to consumers point to market inefficiency. There is need to improve the volume of sales progressing through the formal channel where it is possible to stimulate more demand and get higher value.

c) Estimated Value of Brooms Produced in 2012

The estimated value of brooms produced stands at KES 119, 640, 071. Kilifi leads in contribution to this value with a share of 50.3% while Kwale follows closely with a share of 43.78%. Lamu and Mombasa account for the balance at 3.39% and 2.53% respectively. This is shown in the table below.

Table 19: Estimated Value of Brooms Produced in 2012

Brooms Production				
County	No. of Brooms	Average Price (KES)	Value in KES	Percent Contribution to Total Value
Kilifi	2,314,663	26	60,181,235	50.30%
Kwale	3,081,018	17	52,377,303	43.78%
Lamu	202,811	20	4,056,216	3.39%
Mombasa	201,688	15	3,025,316	2.53%
Taita Taveta	-		-	0.00%
Tana River	-		-	0.00%
Total	5,800,179	19.50	119,640,071	100.00%

Sources: Coconut Survey 2013

It is interesting to note that Kilifi accounts for a higher percentage than Kwale despite Kwale leading in the volumes produced. This is because higher prices were realised in Kilifi compared to Kwale.

4.2.9 Husks and Fibre

Most farmers are ignorant of the value addition capacity of the coconut husk. During the year 2011 the country imported coco-peat products worth KES 94.7M for use mainly in the horticulture sector. This is product made from coconut husks. Only 7% of the farmers indicated selling the husks. It should however be noted that some coconuts are exported with the husks on. Regarding value addition to the husks only 3.7% of the farmers indicated producing fibre.

4.2.10 Processed Products

The processing aspect of the industry is highly fragmented, small in scale and abnormally informal when compared with other agricultural sub-sectors. This is complicated further by the many number of products which can be made from the coconut tree. This makes traceability and valuation of processed products difficult. In addition there are no statistics of volume of raw materials taken in and final output of the processed products. KCDA

should therefore prioritise and expedite the process of collecting monthly raw materials intake and finished goods output from all licensed processors.

Some of the processors have closed shop albeit temporarily e.g. Mutpet, Deepan Manufacturers Ltd, Kokocepts and Msambweni Partners Self Help Group. Some of the reasons given for closure include unavailability and high cost of raw materials. Some of the processors produce as per order. The following tables the processors of some nut product and their capacity.

Table 20: Production Capacity of Some of the Virgin Oil Processors

VIRGIN COCONUT OIL PROCESSORS				
Name	Location	Capacity	Annual Capacity	Employees
Serendi Kenya	Diani - Msambweni	600 Ltrs /Week	31,200	10
BICODE	Kaloleni	1000 Ltrs /Month	12,000	3
New Hope Women Group	Kilifi – Chonyi - Banda-Rasa	8 Ltrs/Week	416	10
Tarumbeta Women Group	Kisauni - Majaoni	8 Ltrs/Week	416	10
Jibana Farmers Co-op. Society	Kaloleni	50 Ltrs/Week	2,600	10
		Total	46,632	43

Sources: KCDA

Table 21: Production Capacity of a Key Processor of Desiccated Coconut

DESICCATED COCONUT PROCESSORS				
Name	Location	Capacity	Annual Capacity	Employees
Kentaste Ltd	Mazeras	- Milk – 4980 ltrs/month	59,760.00	10
		- Cream – 4320 ltrs / month	51,840.00	
		- Desiccated coconut – 1700 kg /month	20,400.00	

Sources: KCDA

Table 22: Production Capacity of Key Processors of Copra Oil

COPRA OIL PROCESSORS				
Name	Location	Capacity	Annual Capacity	Employees
Swaleh Abuodh	Gongoni	200 Ltrs/ day	60,000	1
Amua Self Help Group	Kilifi - Chonyi	60 Ltrs/Month	720	5
Malindi Industries	Malindi	200 Ltrs/ day	60,000	5
Alwy Abas	Lamu West - Amu	100 Ltrs/ day	30,000	3
Sherif Abas Alwy	Lamu West - Amu	200 Ltrs/ day	60,000	3
Minara Oil Processors	Msa - Bondeni	2000 Ltrs/ day	600,000	10
Eastern Industrial (Lola Lola)	Kilindini-Changamwe	500 Ltrs/ day (on and off due to unavailability of copra)	150,000	10
Honest Copra Oil Processors	Majengo - Mtwapa	100 Ltrs/ day (on and off)	30,000	5
		Total	990,720	42

NB: Conversion of daily capacity to annual assumes a 300 day/year operating time

Sources: KCDA

4.3 Summary of Products and Value

Below is a summary of estimated volume and value of coconut products produced in 2012.

Table 23: Estimated Volume and Value of Coconut Products Produced in 2012

Product	Units	Volume	Value (KES)	Percent Contribution
Wine	Litres	153,311,377	7,236,523,322	59.0%
Mature nuts	Pieces	246,416,329	2,693,340,495	22.0%
Makuti	Pieces	131,926,990	1,745,615,617	14.2%
Immature nuts	Pieces	24,775,202	260,971,955	2.1%
Tree trunks	No. of Trees	168,224	188,670,295	1.5%
Brooms	Pieces	5,800,179	119,640,071	1.0%
Seedlings	No. of Seedlings	325,395	16,269,730	0.1%
		Total	12,261,031,484	100.0%

Source: 2013 Coconut Survey

Palm wine continues to provide a huge proportion of the sub-sector earning. There is need to increase value addition of palm wine to ensure more gains are realised.

4.4 Current Economic Value of the Coconut Sub-Sector

The coconut industry contributes to the economy in diverse ways that include contribution to the GDP, employment and livelihoods, mitigation of forex losses, and to the hospitality industry as discussed hereunder.

4.4.1 Contribution to GDP

According to World Bank country statistics Kenyan GDP in 2012 stood at KES 3.4 trillion while agriculture GDP stood at KES 809.4 billion. It can be concluded that the coconut sub-sector contributed 1.5% of the agricultural GDP and 0.4% of the national GDP. While these figures may appear low hence it should be noted that the industry faces challenges in managing statistics and therefore a lot goes unaccounted for.

4.4.2 Contribution to Employment and Livelihoods

The number of farmers engaging in coconut production is estimated at 100,194. In addition the subsector provides income to seedling farmers, harvesters, de-huskers and wine tappers. Up the value chain the subsector provides a livelihood to traders, transporters and processors.

4.4.3 Prevention of Forex Losses

The value of the production is estimated \$144.2 million. Were these products to be imported the country's forex reserves would be negatively impacted.

4.4.4 Contribution to Hospitality and Tourism

The industry contributes through decorative value of live trees and Makuti which are widely used in construction of tourism hotels. Madafu are also used as a welcoming drink for tourists within the coastal region.

4.5 Import and Export of Coconut Products

This section analyses the data on import and export trade for coconut products. The year analysis data is for the year 2011.

4.5.1 Value and Volumes of Imports

The imports for 2011 were as shown below. Products weighing a total of 8.1 million Kgs valued at KES 825.1 million were imported.

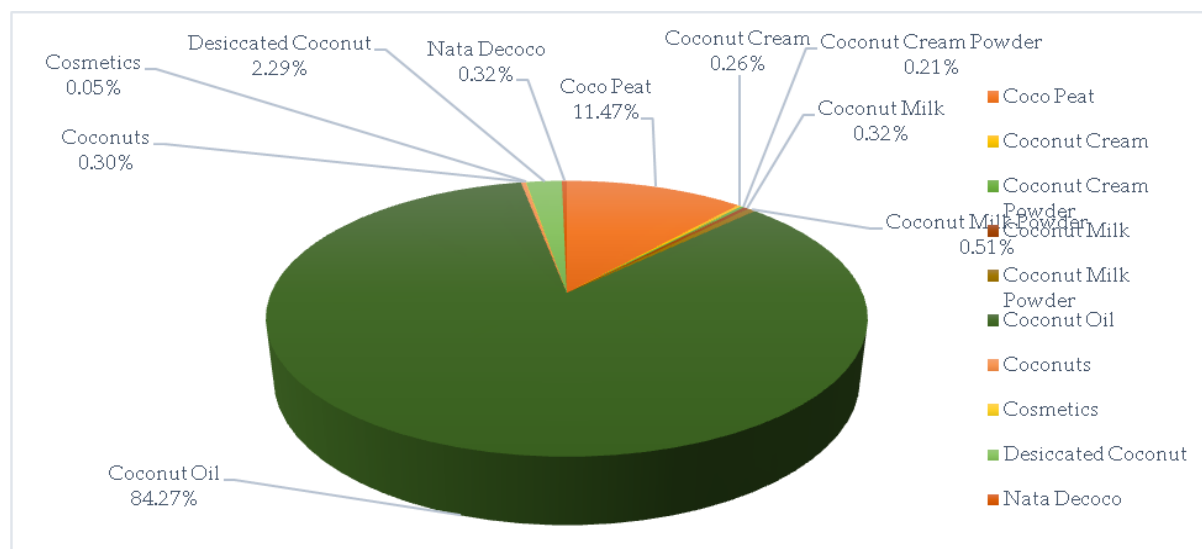
Table 24: Imports of Coconut Products in 2011

Product	Weight in Kgs	CiF Value in KES
Coco Peat	3,209,290.00	94,663,329
Coconut Cream	8,084.00	2,148,137
Coconut Cream Powder	2,693.00	1,733,457
Coconut Milk	22,552.00	2,658,785
Coconut Milk Powder	8,703.00	4,235,433
Coconut Oil	4,659,415.00	695,297,386
Coconuts	76,077.00	2,443,789
Cosmetics	2,728.00	374,255
Desiccated Coconut	85,100.00	18,919,492
Nata Decoco	33,441.00	2,606,956
Grand Total	8,108,083.00	825,081,019

Sources: Data by KRA Customs Department. Analysis by Author

4.5.2 Contribution by Various Products to Value of Total Imports

The major products imported were coconut oil, coco peat and desiccated coconuts contributing 84.27%, 11.47% and 2.29% of the total value of imports respectively. This amounted to 98.03% of the total imports with the balance of 1.97% being contributed by other products as shown in the figure below.



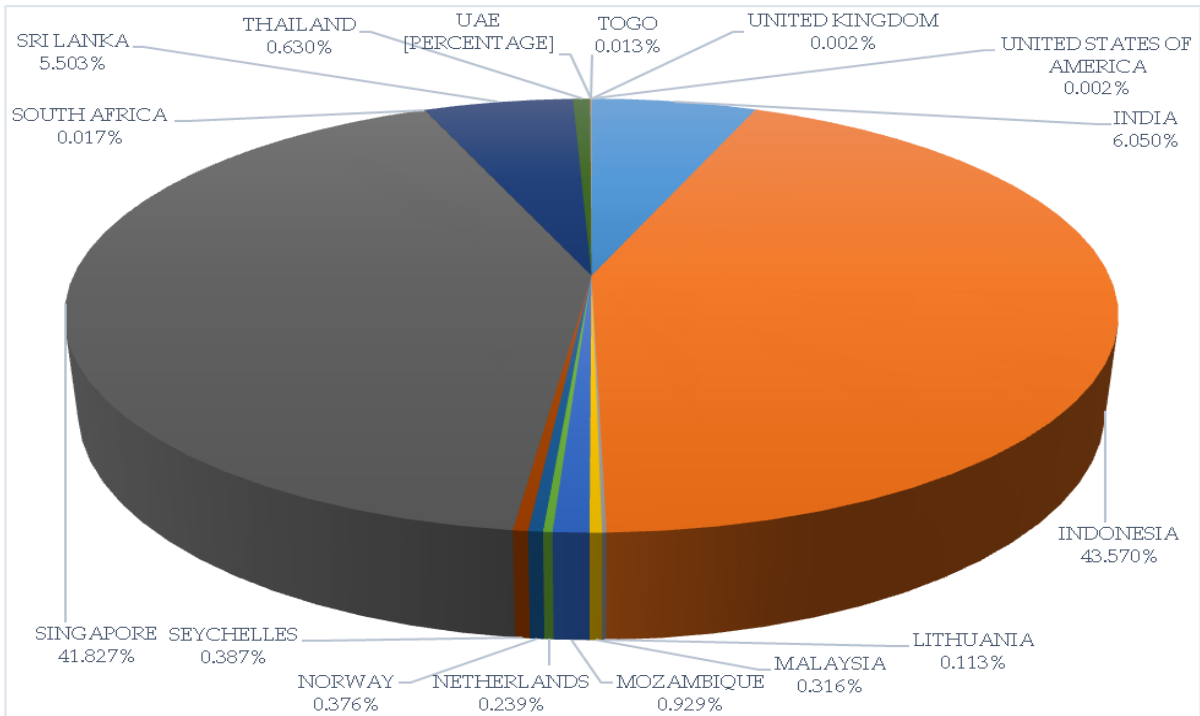
Sources: Data by KRA Customs Department. (Analysis by Author)

Figure 28: Chart of Contribution by Products to Value of Total Imports in 2011.

There is need to increase production of coconut oil and coco peat as there is a local market for the products. Most of the coconut oil was crude oil which is a raw material in manufacture of beauty products. Unfortunately most of the coconut husks from which coco peat is made are thrown away or used as fuel by the farmers oblivious of their value. There is also a need to link the importing companies with local producers to stem the loss of forex in importing products which can be substituted by local production.

4.5.3 Origin of Imports

The key origins of coconut imports into the country were Indonesia accounting for 43.57%, followed by Singapore at 41.83%, India at 6.05% and Sri Lanka at 5.5%. Together these countries accounted for 97% of the imports with the balance coming from other countries as shown below.



Sources: Data by KRA Customs Department. Analysis by Author

Figure 29: Contribution by Countries to Value of Total Imports in 2011.

4.5.4 Exports

Kenyan coconut exports mainly comprise raw nuts. This has been a source of serious concerns with some even arguing for a ban on raw nuts exports. However, this would be counterproductive without an assured local market. It could lead to an oversupply in local market depressing prices leaving farmers with no option but to abandon the trees like was the case with cashew nuts sometime back.

4.5.5 Value and Volumes of Exports

Products weighing a total of 8.6 million Kgs valued at KES 39.8 million were exported. It should be known that there is a lot of cross border coconut trade between Kenya and Tanzania all of which may not be captured in official statistics. Also the value of coconuts appears to be grossly understated at KES 2.5 per kg. This is shown in the table below.

Table 25: Imports of Coconut Products in 2011

Exports 2011		
Products	Weight in Kgs	CIF value in KES
Coconuts	8,426,271	21,532,504
Virgin Coconut Oil	18,976	6,070,995
Coco Peat	88,200	5,133,105
Coconut Oil	16,460	3,430,055
Desiccated Coconuts	9,177	3,038,012
Coconut Fibre	15,025	608,133
Coconut Milk	25	6,244
Grand Total	8,574,134	39,819,049

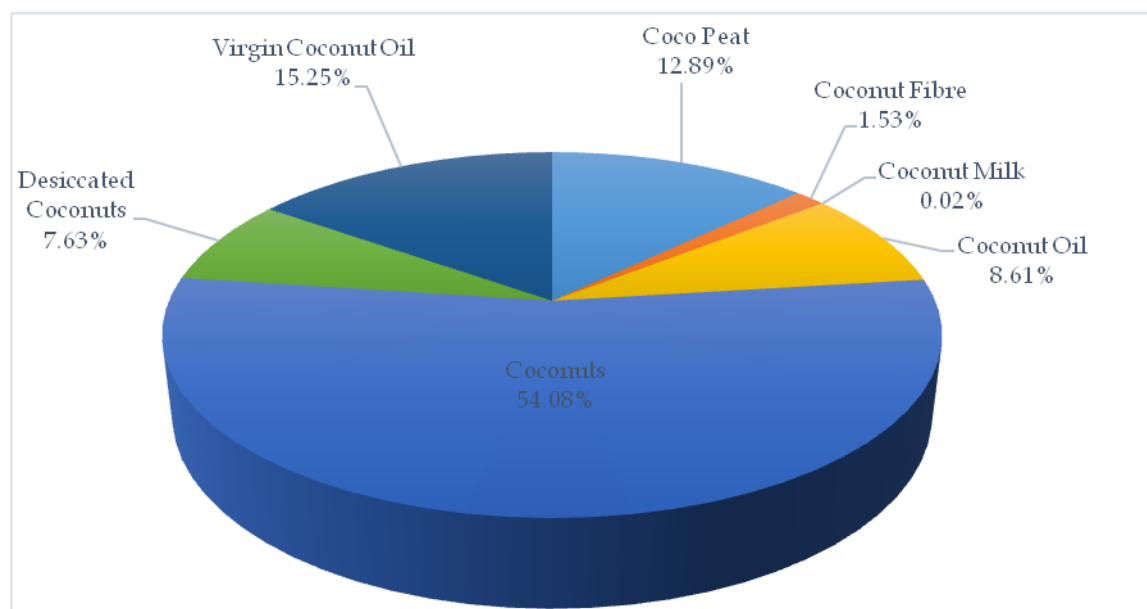
Sources: Data by KRA Customs Department. Analysis by Author

The high export of raw coconut is a threat to value addition to the coconuts. This is reflected by the fact that the imports are dominated by value added coconut products. This results in low commercialization of the sector, poor income to value chain actors, loss of employment creation opportunities as well as forex losses. The overall impact of this is diminished contribution of the coconut subsector to wealth creation and development in the Coastal region. While an export ban is not recommended factors that limit processors capacity to add value need to be addressed. Linkages between farmers and processors also need to be strengthened.

4.5.6 Contribution by Various Products to Value of Total Exports

Key coconut products exported by Kenya are raw coconuts which in 2011 accounted for 54.08% of all exports. The other products contribution to exports was as follows; virgin coconut oil at 15.25%, Coco peat at 12.89%, Coconut oil at 8.61%, desiccated coconut at 7.63%, coconut fibre at 1.53% and coconut milk at 0.02%.

This is shown in the figure below.

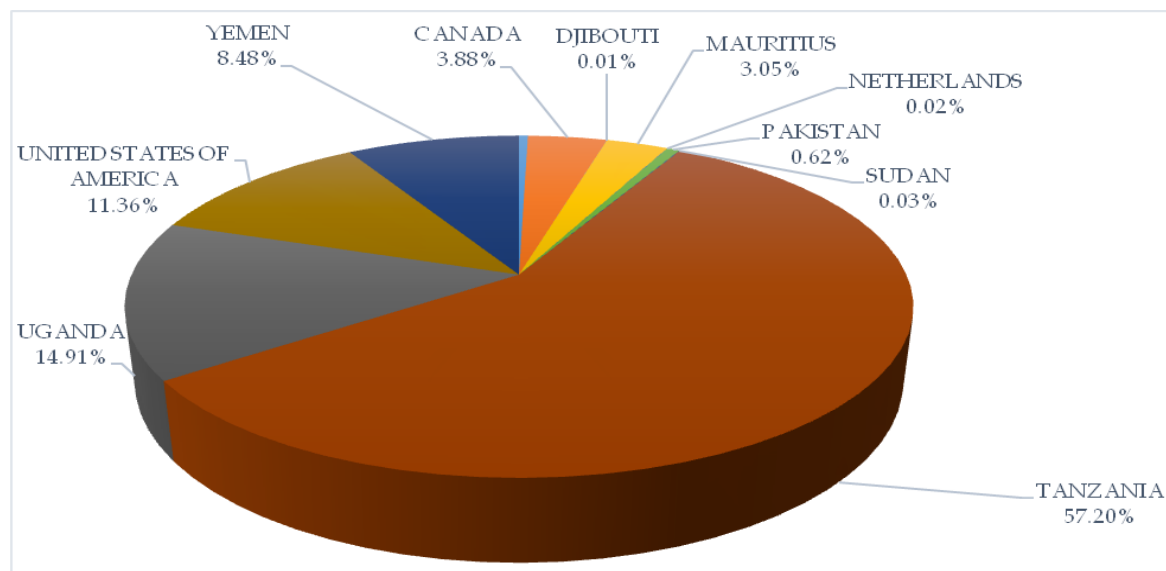


Sources: Data by KRA Customs Department. Analysis by Author

Figure 30: Contribution by Products to Value of Total Exports in 2011.

4.5.7 Destination of Exports

The key coconut exports destination in 2011 were Tanzania (57.2%), Uganda (14.91%), USA (11.36%) and Yemen at (8.48%). These accounted for 92% with the balance going to other countries as shown below.



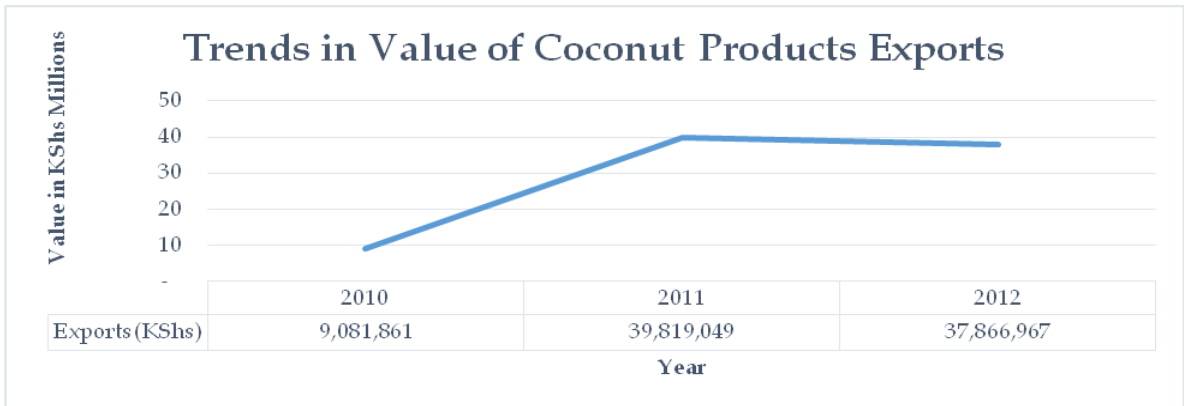
Sources: Data by KRA Customs Department. Analysis by Author

Figure 31: Chart of Contribution by Country to Value of Total Exports in 2011.

4.5.8 Export Trends

The following analysis would have been more informative if it had captured a longer period preferably 10 years. The available information however only allowed a comparison of a three year trading period (2010 - 2012). In the limited observation there was an increasing trend from 2010 towards 2011 which dropped in 2012. It is not predictable how the future trends in this segment will look like but this will depend a lot on what interventions the value chain influencers will direct towards the sector.

Figure 32: Figure of Trends in Export over the Years



Sources: Data by KRA Customs Department. Analysis by Author

4.6 Key Industry Players in the Coconut Value Chain

An agricultural value chain comprises five key activities namely; input supply, production, processing, trading and consumption. In addition to these are various support services providers. The coconut value chain has the following key players along the value chain.

4.6.1 Input Supply

The key inputs in the coconut value chain are seeds, seedlings, fertilizers, manure and water. Higher up the value chain are suppliers of equipment, tools, machines and consumables used in activities such as farming, wine tapping, harvesting and processing. The key players in input supply in coconut value chain are;

4.6.2 Seed Nut Suppliers

The seed nut suppliers are farmers who allow the nuts to mature to level where they can be used as seeds. To ensure quality seeds KCDA engaged in an exercise which led to marking of over 8,000 coconut trees with good production qualities, (Kahindi, 2012). This will ensure quality seedlings with ultimate improvement in productivity. Seed nut supplier play a critical role in ensuring adequate and consistent supply of seeds for planting by the nursery operators.

4.6.3 Nursery Operators



They supply coconut seedlings to farmers. They play an important role of ensuring adequate and quality seedlings are available. They can also play a key role in introducing new seedling varieties. KCDA has continued to invest in nursery operators through supply of seeds, financing, extension and training. In this regard more than 400 nursery operators have been trained throughout the coastal region, (KCDA, 2012).

4.6.4 Suppliers of Other Farming Inputs

These provide inputs such as chemicals and fertilizers. Most coconut farmers do not use these inputs due to lack of awareness and financial constraints. They play a key role in stocking the supplies and offering advice to farmers. They can also pass critical information to farmers e.g. through distribution of farming pamphlets and brochures.

4.6.5 Suppliers of Non-farming Inputs

They provide tools, equipment, machinery and consumables. Players in this area include fabricators of processing equipment, suppliers of labeling and packaging materials. They play a key role in facilitating value addition to various coconut products.

4.6.6 Production of Primary Coconut Products



The key players here are farmers. It is estimated that there are about 100,194 farmers spread across the coastal region. The farmers are mainly small scale with an average of 99 trees per farmer. The farmers play a critical role in ensuring that upstream value chain players such as traders and processors have consistent supply of quality products. At the production level there are other players who are important. They include;

4.6.7 Harvesters

The harvesters climb the tree and fell the tender or mature nuts. This in a way a specialised skill since not everyone can climb the trees. The harvesters are paid per nuts or per tree harvested. Some of the harvesters are family members who offer the services for free.

4.6.8 De-huskers

They prepare the nuts for the market by removing the outer cover known as the husks. The de-husked nuts are easier and cheaper to transport as they are less bulky. The de-huskers are paid mostly on the basis of number of nuts de-husked rather than duration worked.

4.6.9 Wine Tappers

These are people with specialised skills in wine tapping. They climb the tree to tap the wine and to collect the toddy which has settled on the bottle attached to the cut fluorescence. The payment for wine tappers is usually in kind through various arrangements. In some cases the tappers share the wine on a 50:50 basis or alternate days whereby the tapper takes one day's harvest and the farmer takes for the next days.

4.7 Trading of Coconut Products

The key players here are traders, farmer organisations, agents and logistic service providers.

4.7.1 Traders in the Coconut Value Chain

The traders play key roles which include:

- (i) Identification of location of produce;
- (ii) Bulking of products – they gather produce from various farmers for sorting, grading and packaging;
- (iii) Facilitating logistics e.g. transport, packaging and storage;
- (iv) In coconut value chain traders play critical financing role as they pay the farmers upon which point they take ownership of produce and all the risks thereafter. They also often pay for harvesting and de-husking of coconuts; and
- (v) Traders also provide feedback to farmers e.g. on quality of products and consumer complaints or suggestions

The traders include retailers, wholesalers/distributors, exporters and importers. There is also the palm wine bar operators known as *mangwes* who sell the palm wine to final consumers.

4.7.2 Farmers/Producer Organisations

Some farmers and wine tappers are organised into associations or groups such as cooperatives. The groups play key role in bulking produce, looking for market and negotiating for good prices for members. Such groups can also play key role in value addition and provision of financial services. In addition the groups make it easier for members to receive services such as information, linkage, extension and training.

4.7.3 Agents/Middlemen

These also known as brokers play key role of linking buyers and sellers. They are hated by farmers who complain that they exploit them. Nonetheless the brokers play a key role in managing information along the value chain.

4.7.4 Logistic Service Providers

They provide services such as transport, warehousing and packaging in distribution logistics. Most farmers and traders do not own means of transport and rely on external transport such as PSVs, commercial distribution vehicles, human beings, bi-cycles, motorcycles, carts and animals such as donkeys among others. They ensure the products reach the consumers at the right place, at the right time and at the right condition.

4.7.5 Processing of Coconut Products

Key players here are the primary and secondary processors. They play a key role in value addition. Where processors have contractual arrangement with producers they can play a critical role of providing, stable, reliable and favorable market. In the coconut sub-sector the primary processors are mainly farmers or farmer groups who make products such as *Makuti*, brooms and artifacts. Secondary processors engage in more advanced value addition by producing various nut, timber and wine products.

4.7.6 Consumers of Coconut Products

Consumers are critical for without them there can be no industry. There are various ways in which consumers of coconut products can be categorized. These include:

- (i) Domestic vs. international consumers;
- (ii) Urban vs. rural consumers;
- (iii) Coastal vs. up-country consumers;
- (iv) Individuals vs. institutional consumers; and
- (v) Final consumers vs. industrial consumers.

4.7.7 Value Chain Facilitators

These play a critical role of offering support services to various value chain actors. The key players here are;

- (i) Government both national and county governments who offer various services such as subsidized inputs and extension services
- (ii) Regulators ensure players abide by stipulated rules for the benefit of the industry. Key regulators relevant to coconut subsector include KCDA, NACADA, KEPHIS, KEBS, KRA e.t.c
- (iii) Research institutions create a knowledge base for various aspects of the chain from production to consumption. In the coconut sector we have institutions such as KARI which provide agricultural research services, Kenya Industrial Research and

Development Institute (KIRDI) which conducts research and development in all industrial and allied technologies. Other research related institutions include universities and National Council for Science and technology

- (iv) Non-governmental organizations – these are mainly not for profit organizations which are not owned or operated by government. In the coconut sectors there are many non-state actors involved. These in addition to NGOs include Community Based Organizations (CBOs) and Faith Based Organizations (FBOs). Such groups are involved in activities such as advocacy and even value addition. Most of the processors in the coconut sector have a non-profit orientation or background.
- (v) Trade facilitators are organizations which promote trade in the coconut products such as Export Promotion Council
- (vi) Business development service providers are private professionals offering advisory services such as research, consultancy and training on various business aspects
- (vii) Financial institutions provide financial services to players along the value chains. They include banks, SACCOs, ROSCAS, Microfinance Institutions, donors, government devolved funds and private equity firms among others

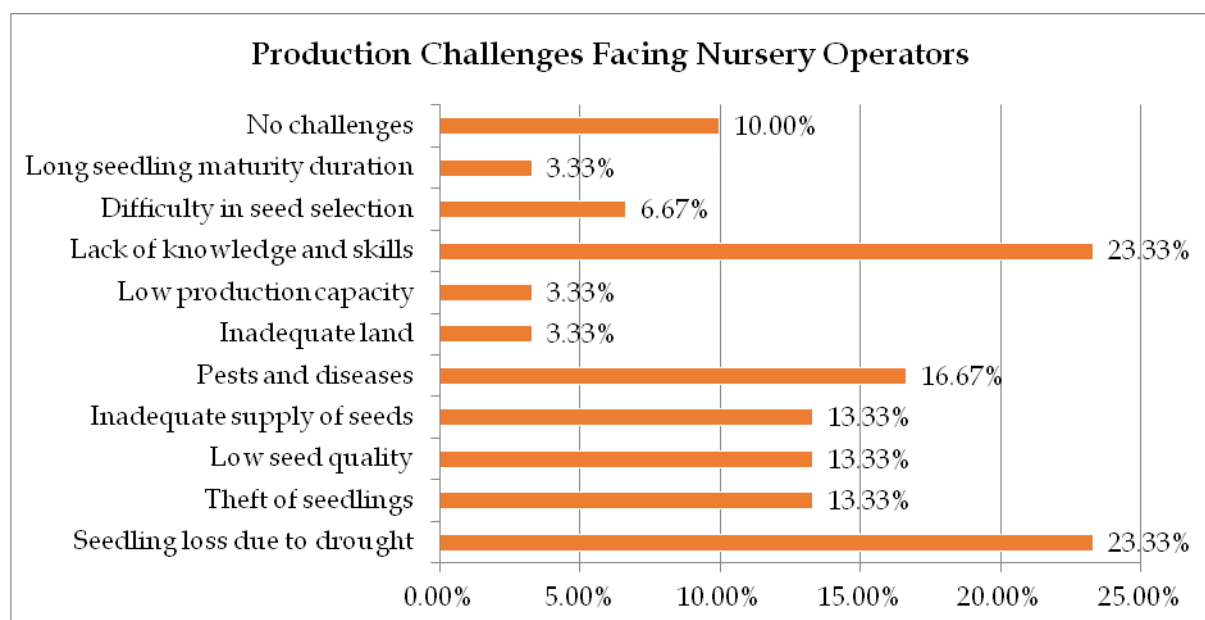
4.8 Challenges Facing Players in Coconut Subsector

This section looks at the challenges encountered along the value chain by various players. Addressing these challenges will increase value chain efficiency and the subsectors gains.

4.8.1 Challenges Faced by Nursery Operators

Production Challenges Faced by Nursery Operators

Challenges were encountered by 90% of the operators. The major production challenges faced are drought and lack of knowledge and skills each noted by 23.3% of the respondents. These are followed by pests and diseases by 16.7%, theft of seedlings by 13.3%, low seed quality by 13.3% and inadequate supply of seeds also faced by 13.3% of the respondents. Other challenges are faced by less than 10% of the respondents as shown in the figure below.

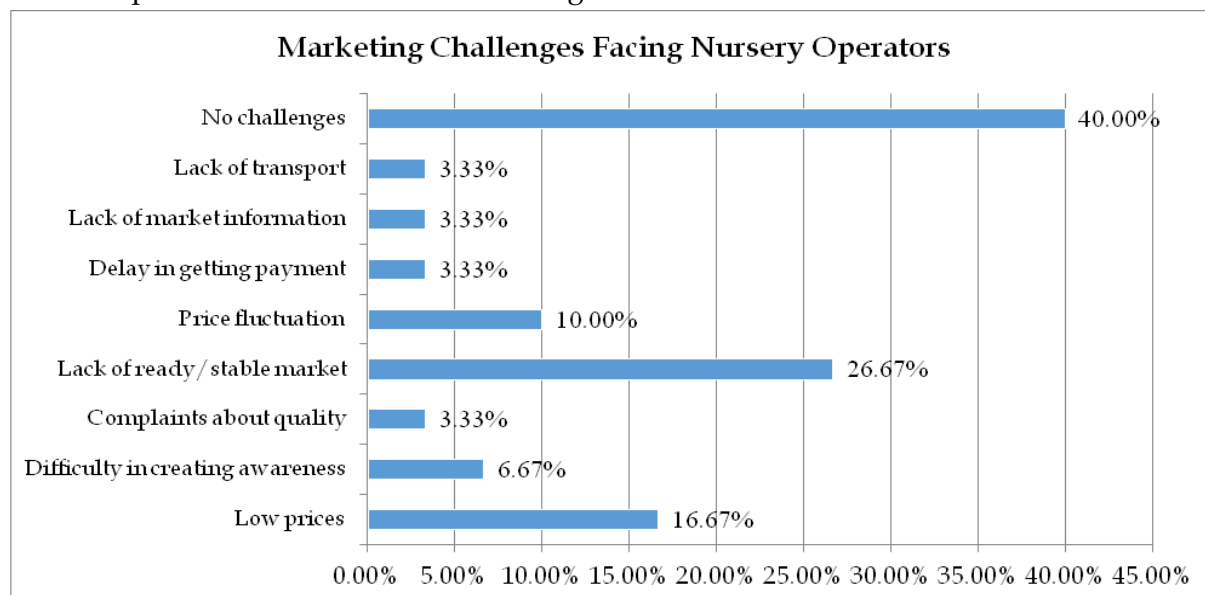


Sources: 2013 Coconut Survey

Figure 33: Figure of Production Challenges Facing Nursery Operators.

Marketing Challenges Faced by Nursery Operators

Marketing challenges were encountered by 60% of the respondents. The major marketing challenge faced by Nursery Operators is lack of ready/ stable market reported by 26.7% of the respondents. Other key challenges are low prices at 16.7% and price fluctuation at 10%. Other challenges are awareness creation, delays in payment, lack of market information and transport difficulties as shown in the figure below.

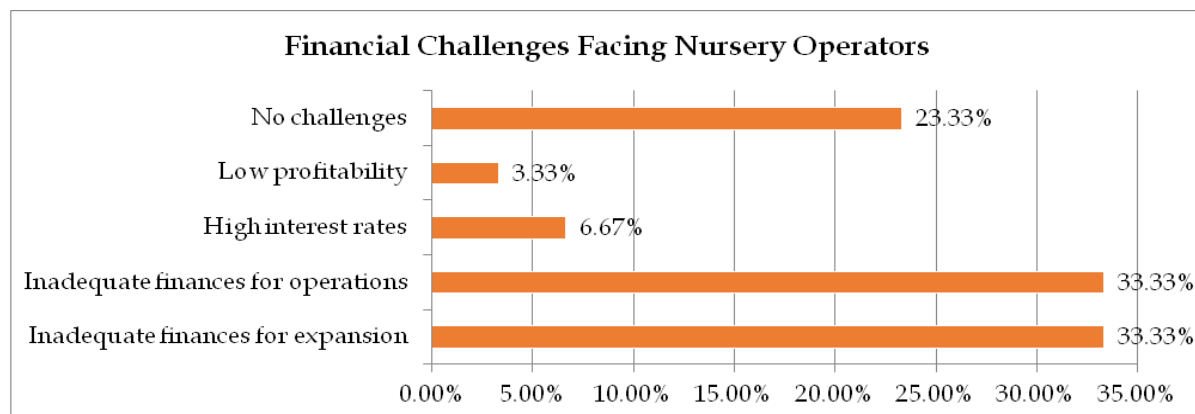


Sources: 2013 Coconut Survey

Figure 34: Figure of Marketing Challenges Facing Nursery Operators

Financial Challenges Faced by Nursery Operators

These were encountered by 77% of the operators. The key challenges faced are lack of funds for expansion by 33.3%, lack of sufficient funds for operations by 33.3% and high interest rates by 6.7%. Low profitability is also a challenge reported by 3.3%. This is illustrated in the Figure below.

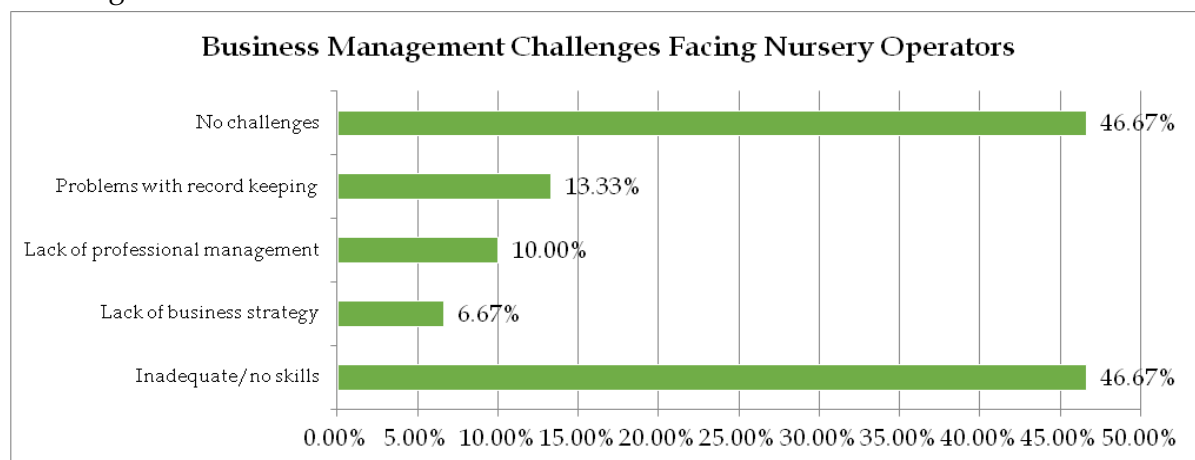


Sources: 2013 Coconut Survey

Figure 35: Figure of Financial Challenges Facing Nursery Operators.

Business Management Challenges Faced by Nursery Operators

Challenges in this area were encountered by 53% of the respondents. The operators cite lack of business management skills as a key challenge at 46.7%. This is followed by problems with record keeping by 13.3% of the respondents and lack of professional staff by 10%. Lack of business strategy was reported by 6.7% of the respondents. This is illustrated in the figure below.



Sources: 2013 Coconut Survey

Figure 36: Figure of Business Management Challenges Facing Nursery Operators.

Other Challenges Faced by Nursery Operators

Other challenges faced by operators are lack of title deeds. They also complain that the legal framework on cutting down of trees slows down replacement of dead trees and therefore demand for seedlings.

4.8.2 Challenges Cited by Supplier of Other Inputs

Supplier of other inputs such as fertilizers and pesticides indicate their major challenges as lack of awareness among farmers and poverty. Many farmers are unaware of the need to use inputs and those aware have no financial capacity to procure the inputs.

Analysis of Input Supply Challenges

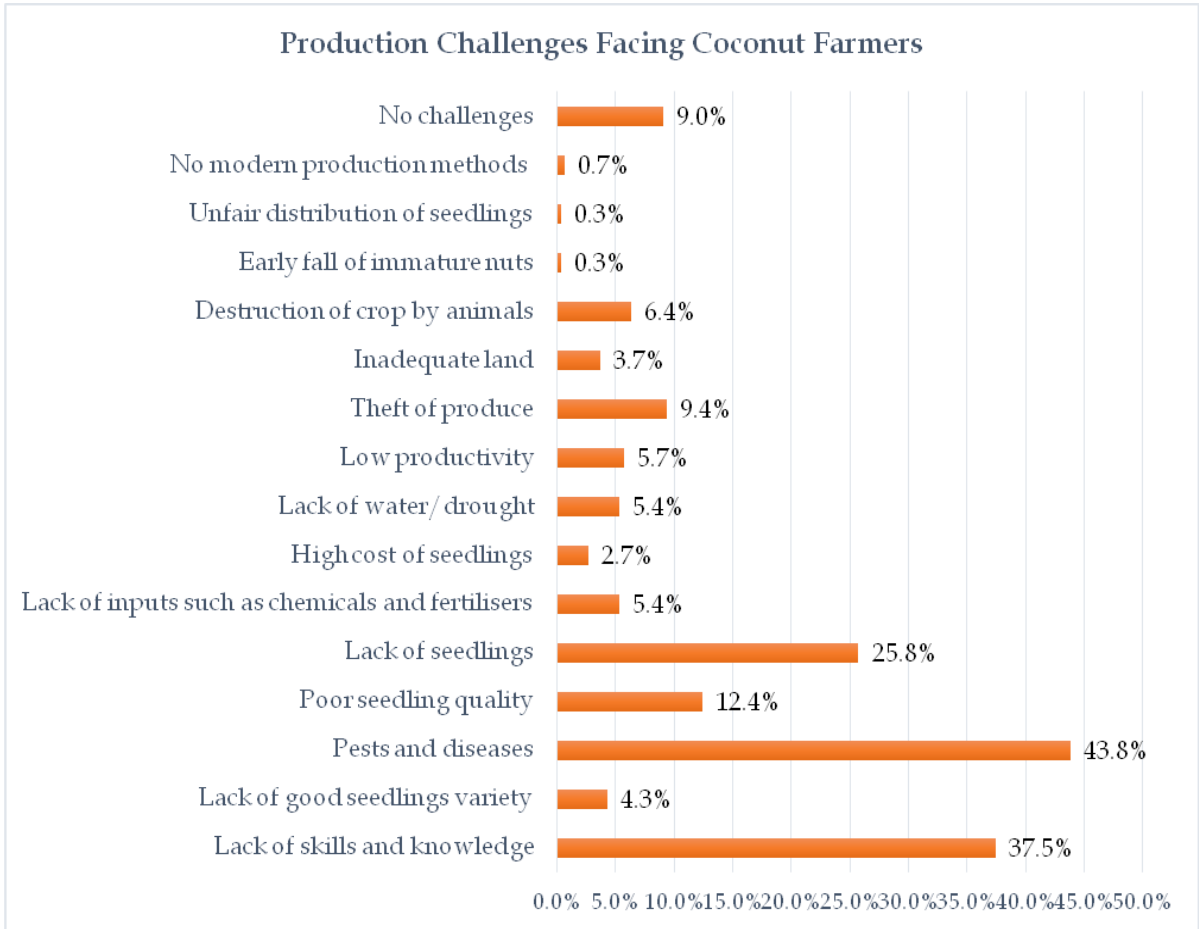
In conclusion, it is noted that Nursery Operators still need enhancement in their skills. The seedlings project should step up training and extension. Regarding marketing there is need to manage the supply chain. Nursery Operators complain of lack of market yet farmers complain of inadequate supply of seedlings. There is need to match demand and supply by strengthening the supply chain. This will be enhanced by ensuring smooth flow of information and guiding Nursery Operators on demand level to avoid over-production. Export and upcountry markets should also be explored.

The suppliers also need to be trained on business management, business strategy and recordkeeping. The farmers should be encouraged to form associations through which linkages can be done with business development service providers.

4.8.3 Challenges Faced by Coconut Farmers

Production Challenges Faced by Coconut Farmers

Challenges in production were reported by 91% of the farmers. The key production challenges facing coconut farmers are pests and diseases reported by 43.8%, lack of knowledge and skills faced by 37.5% and lack of seedlings faced by 25.8%. Other challenges are as shown in the figure below.

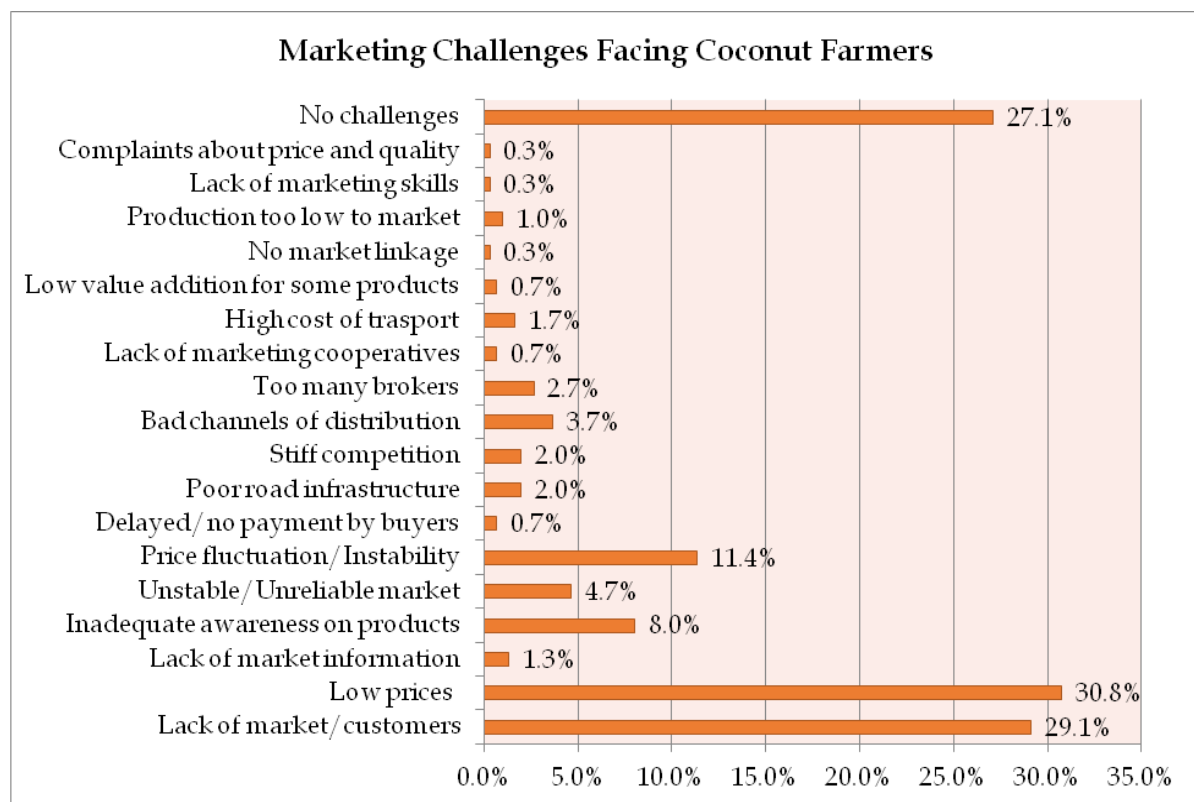


Sources: 2013 Coconut Survey

Figure 37: Figure of Production Challenges Facing Coconut Farmers.

Marketing Challenges Faced by Coconut Farmers

Marketing challenges were cited by 73% of the respondents. The key challenges noted are low prices reported by 30.8%, lack of customers faced by 29.1% and price fluctuation/instability by 11.4%. Other challenges are as illustrated in the figure below.

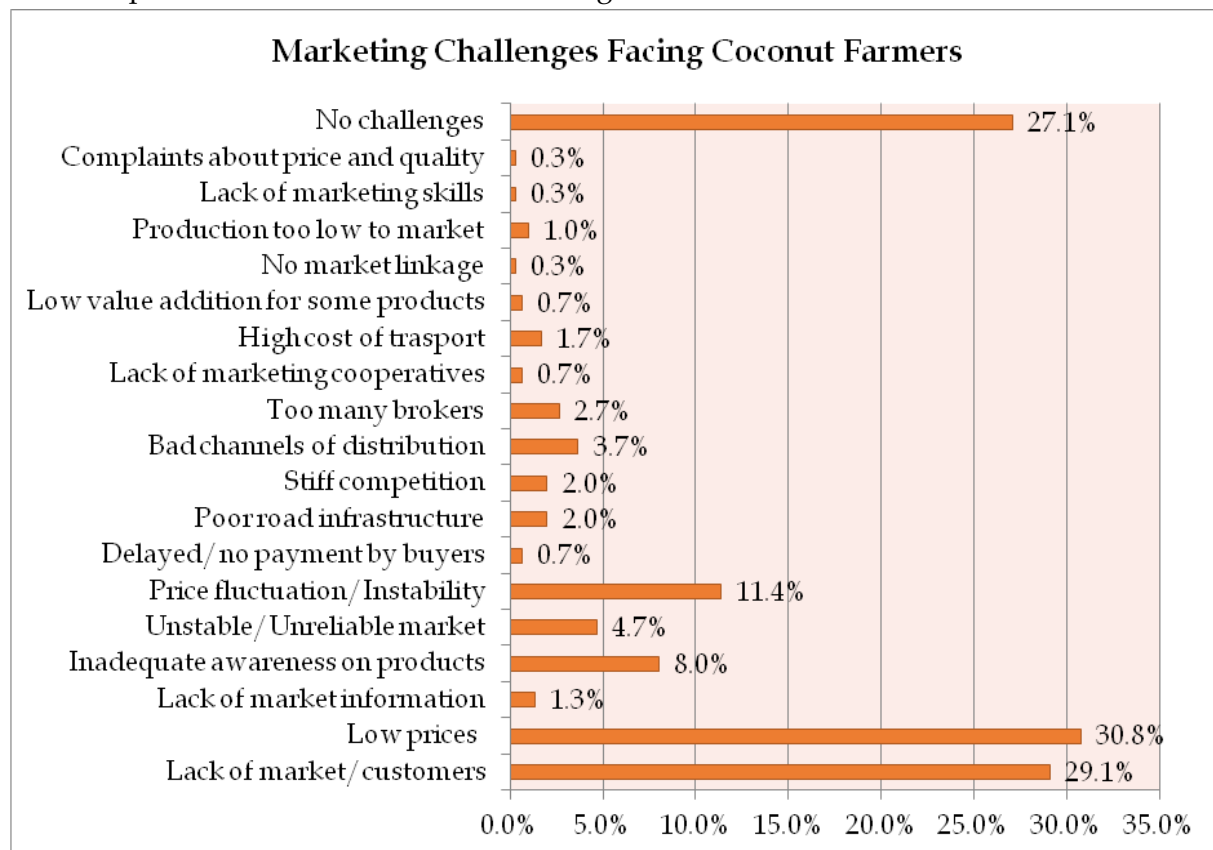


Sources: 2013 Coconut Survey

Figure 38: Figure of Marketing Challenges Facing Coconut Farmers.

Finance Challenges Faced by Coconut Farmers

Financial challenges were encountered by 64% of the farmers. Key challenges were lack of capital for expansion and lack of enough funds for operations reported by 35.8% and 23.4% of the respondents. This is illustrated in the figure below.



Sources: 2013 Coconut Survey

Figure 39: Figure of Financial Challenges Facing Coconut Farmers.

Business Management Challenges Faced by Coconut Farmers

The proportion of farmers facing business management challenge was 57%. The key issue was lack of skills reported by 47.2%. Other issues were lack of seminars and training opportunities 3.3% and inability to keep proper record at 5.4%. This is illustrated below.

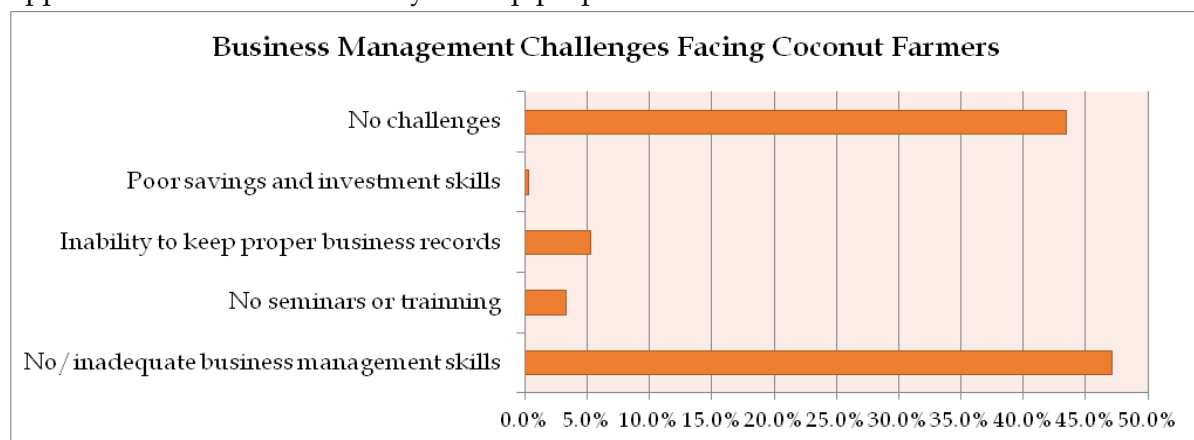


Figure 40: Figure of Business Management Challenges Facing Coconut Farmers.

Other Challenges Faced by Coconut Farmers

Other challenges reported by the farmers were as follows:

- (i) Lack of title deeds;
- (ii) Land disputes;
- (iii) Police harassment when transporting goods;
- (iv) Lack of awareness or understanding of regulations;
- (v) Restriction on cutting of trees and difficulty in getting license;
- (vi) Expensive license for sale of mnazi/palm wine;
- (vii) Poor transport network;
- (viii) High indirect and direct taxes;
- (ix) No extension services available; and
- (x) Cutting of trees to provide land for buildings.

Analysis of Challenges Faced by Coconut Farmers

The farmers need support in tackling the various pests attacking coconuts. Extension services and training should be intensified to stem the loss of trees to these attacks as it can have dire upstream consequences in the value chain. Despite the efforts in increasing the supply of seedlings more needs to be done especially on the varieties and quality.

The farmers need to be mobilized into groups such as cooperatives which can negotiate prices and store produce during times of oversupply in order to reduce price fluctuations.

Inasmuch as farmers complain of low prices there is need to avoid price controls which can distort the market and affect other value chain players such as processors and traders.

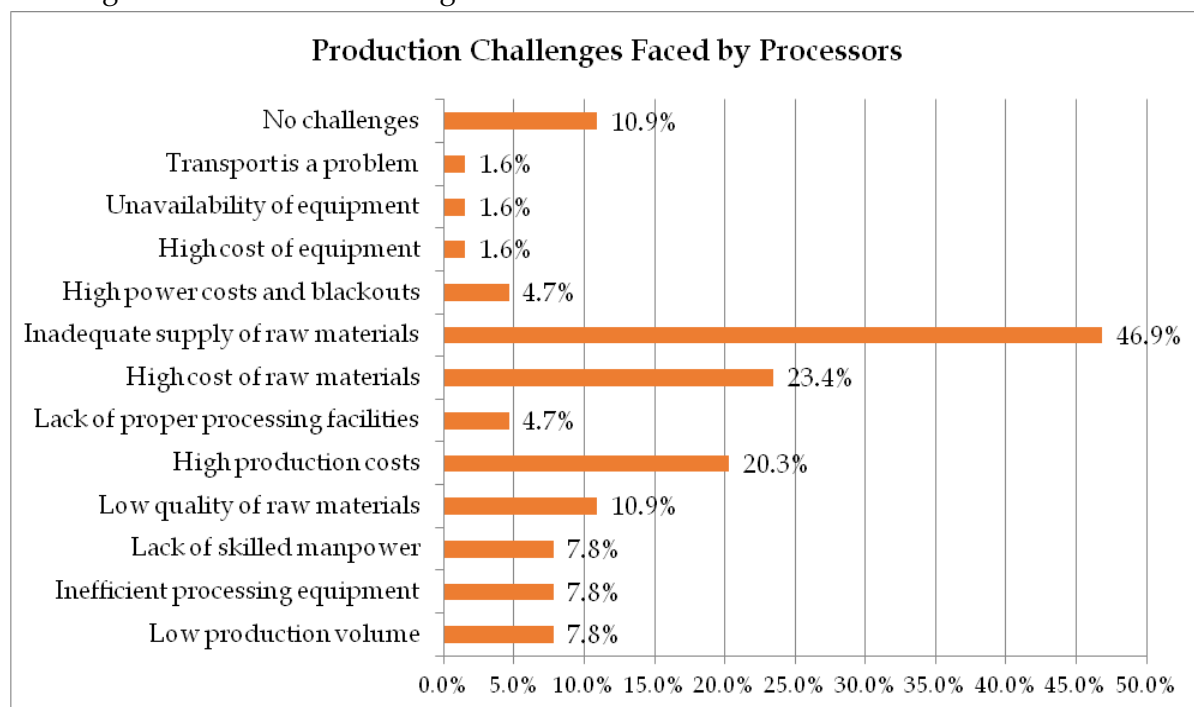
Provision of seedlings is a good step in eradicating financial issues facing farmers. Support to procure other inputs such as fertilizers may be accorded through subsidies. Farmers cooperatives can also upgrade to SACCOs to ensure farmers get appropriate financing.

Many farmers do not see coconut farming as a business. This is manifested by the low number of respondents acknowledging lack of skills in business management. They need capacity building in acquiring basic business management skills and adopting a commercial growth-orientation to farming.

4.8.4 Challenges Faced by Coconut Products Processors

Production Challenges Faced by Coconut Products Processors

Processors indicating experiencing challenges in production were 89% of the respondents. The key challenges noted were inadequate supply of raw materials by 46.9%, high cost of raw materials by 23.4% and high production costs by 20.3% of the respondents. Others are low quality of raw materials at 10.9%, low production volumes at 7.8%, inefficient equipment at 7.8% and lack of skilled manpower also at 7.8%. These and other operational challenges are illustrated in the figure below.

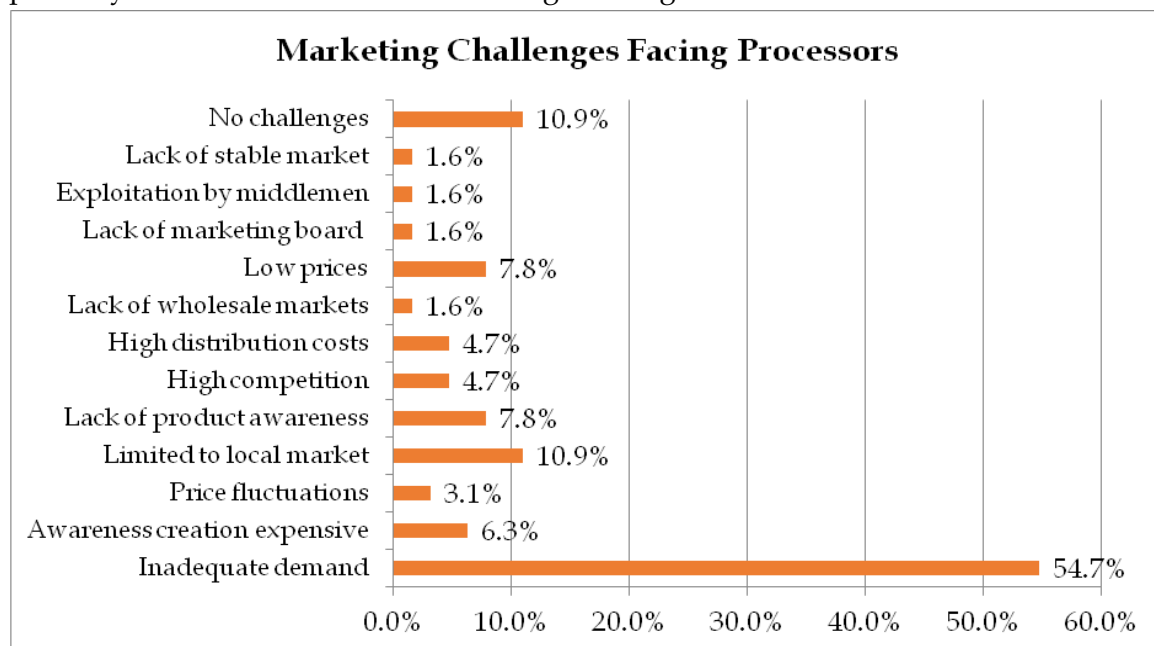


Sources: 2013 Coconut Survey

Figure 41: Figure of Production Challenges Facing Coconut Processors.

Marketing Challenges Faced by Coconut Products Processors

Marketing challenges were experienced by 89% of the respondents. The key issues reported were inadequate demand by 54.7% of the respondents, lack of access to diverse markets i.e. limited to local market by 10.9%, lack of product awareness by 7.8% and low prices by 7.8%. These and other marketing challenges are illustrated below.

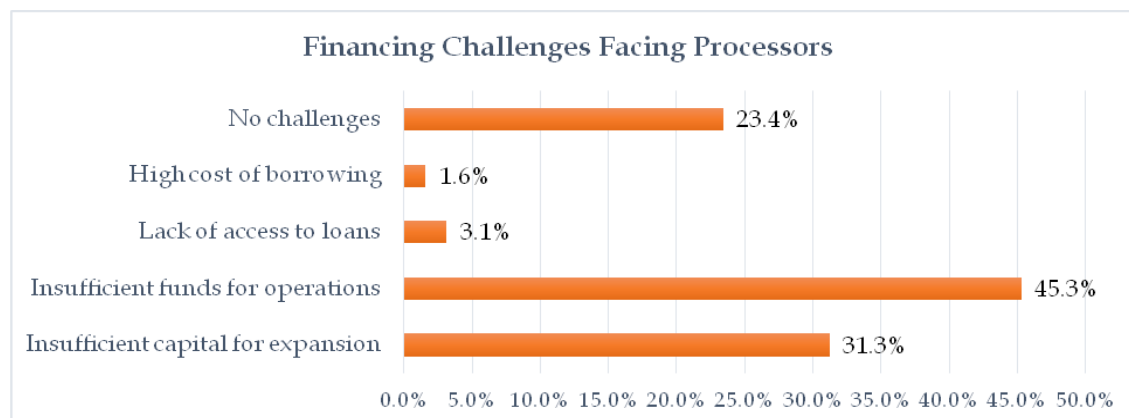


Sources: 2013 Coconut Survey

Figure 42: Figure of Marketing Challenges Facing Coconut Processors.

Financing Challenges Faced by Coconut Products Processors

Financial challenges were encountered by 76.6% of the respondents. Key among them were lack of enough funds for operations reported by 45.3% of the respondents, lack of funds for expansion reported by 31.3% and lack of access to loans by 3.1%. This is illustrated below.

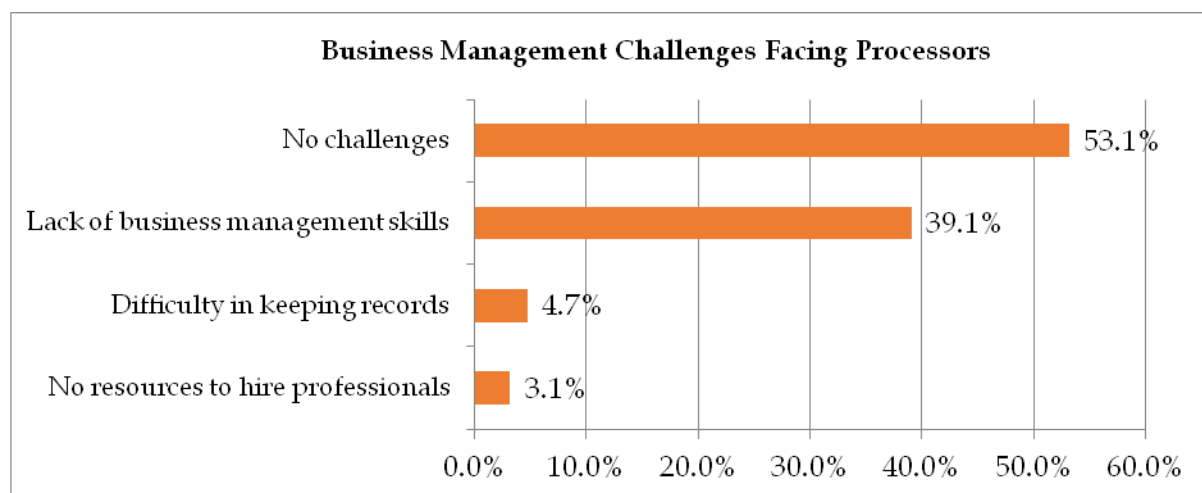


Sources: 2013 Coconut Survey

Figure 43: Figure of financing Challenges Facing Processors Coconut Products.

Business Management Challenges Faced by Processors of Coconut products

Those who reported difficulties in this area constituted 46.9% of the respondents. The key issue was lack of business management skills reported by 39.1% of the respondents. Other issues were difficulty in record keeping by 4.7%, lack of resources to hire professionals by 3.1% of the respondents as shown in the figure below.



Sources: 2013 Coconut Survey

Figure 44: Figure of Business Management Challenges Facing the Processors.

Other Challenges Faced by Coconut Products Processors

Other challenges noted were as follows:

- (i) Harassment by police officers;
- (ii) High cost of trading licenses having increased e.g. from KES. 7,000 to KES. 21,000;
- (iii) Palm wine business has not been accepted by the administration especially NACADA;
- (iv) Bribing to carry out their business;
- (v) Lack of clarity in regulation; and
- (vi) Procedure to be ISO certified is very long.

Some of the challenges facing processors such as unavailability and high cost of raw materials should be taken seriously as they were also noted by some who had closed business. There is need to stimulate demand by diversifying the markets through creating awareness in areas where consumption of coconut products is not established e.g. Nairobi and upcountry. Export markets also need to be explored.

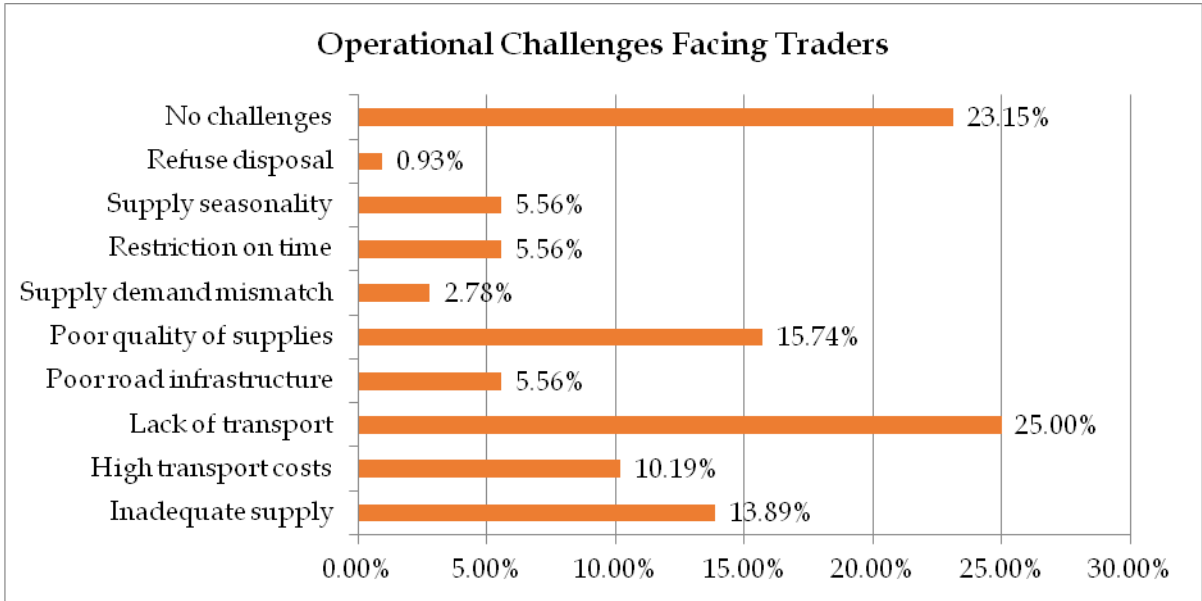
The processors need support to obtain funds for expansion and operations. Financing processing is key in creating market for downstream value chain players. The processors need to be trained on how to raise external finances for business growth. Further skills in managing cash flows are necessary to ensure the operational finance challenges noted are not due to leakages and wastages.

While few respondents reported business management challenges this could be attributed to processing being more formalised than aspects such as trade and farming. It may also be due to the small scale nature of operations which may not expose them to full-blown business management challenges. Capacity building in this area is necessary to inculcate growth orientation and entrepreneurial spirit.

4.8.5 Challenges Faced by Traders of Coconut Products

Operational Challenges Faced by Traders of Coconut Products

Various operational challenges were experienced by 77% of the respondents. Key challenges were lack of transport and poor quality of supply reported by 25% and 15.7% of respondents respectively. Other challenges were poor supply of raw materials reported by 13.9%, high cost of transport by 10.2%, poor road infrastructure by 5.6% and supply seasonality also by 5.6% of the respondents. These and other challenges are illustrated below.

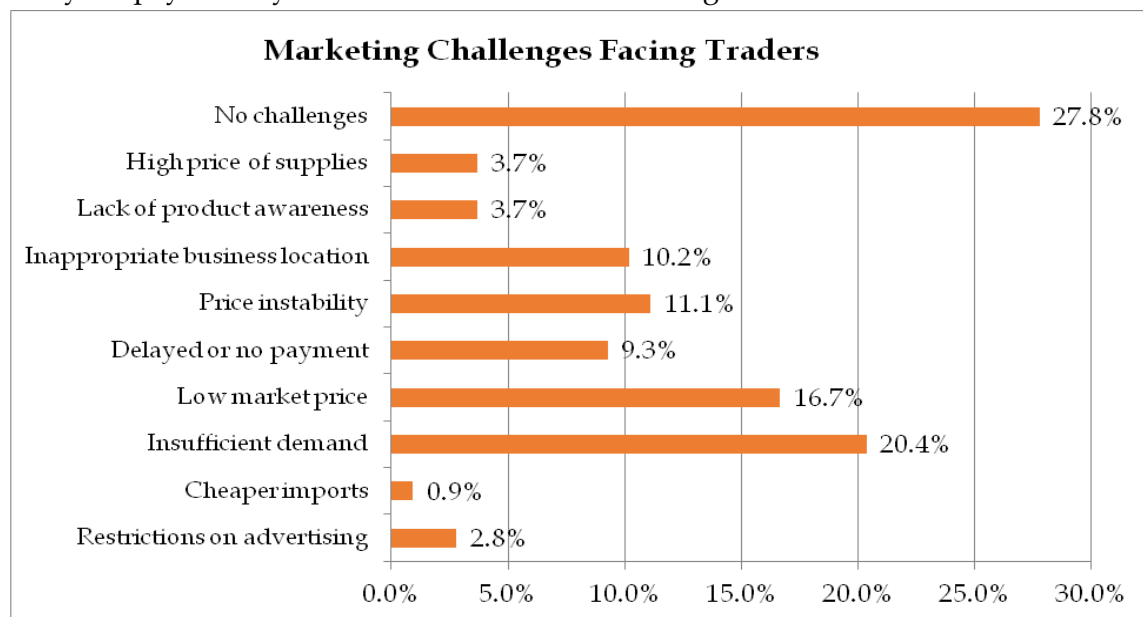


Sources: 2013 Coconut Survey

Figure 45: Figure of Operational Challenges Faced by Traders of Coconut Products.

Marketing Challenges Faced by Traders of Coconut Products

Various marketing challenges were experienced by 72.2% of the respondents. The key challenges reported were insufficient demand by 20.4% of the respondents, low market price by 16.7%, price instability by 11.1%, inappropriate business location by 10.2% and delays in payment by 9.3%. This is illustrated in the figure below.

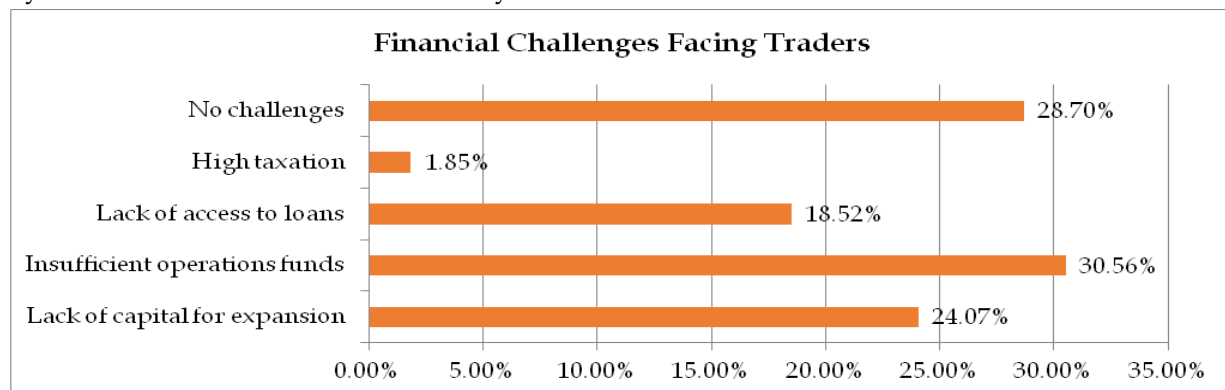


Sources: 2013 Coconut Survey

Figure 46: Figure of Marketing Challenges Faced by Traders of Coconut Products.

Finance Challenges Faced by Traders of Coconut Products

There were various challenges reported by 71% of the respondents. The key ones were insufficient funds for operations reported by 30.1%, lack of capital for expansion reported by 24.1% and lack of access to loans by 18.5%. This is illustrated below.

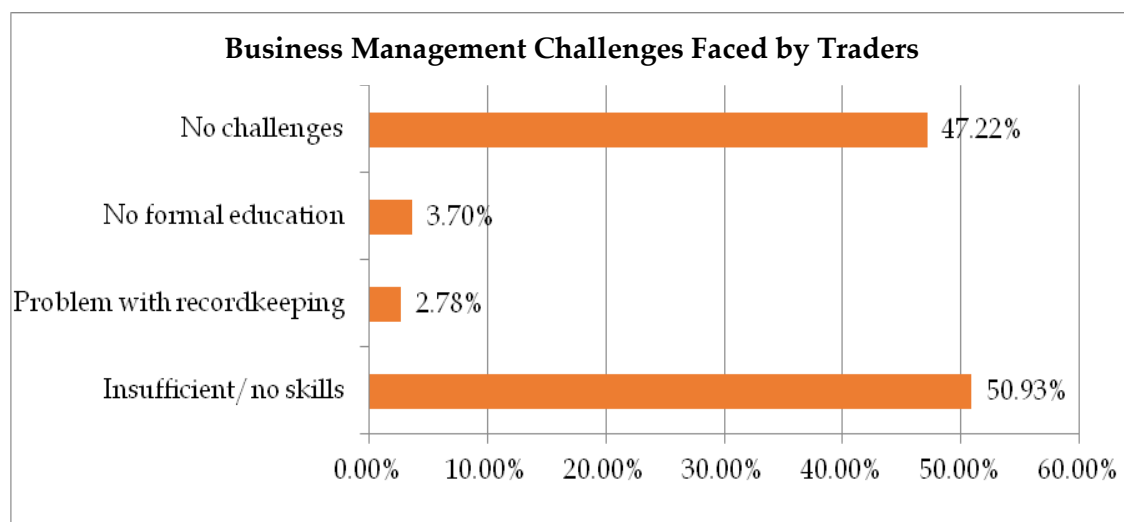


Sources: 2013 Coconut Survey

Figure 47: Figure of Financial Challenges Faced by Traders of Coconut Products.

Business Management Challenges Faced Traders of Coconut Products

Business management challenges were encountered by 53% of the respondents. The key challenge is lack of business management skills reported by 50.9% of the respondents, problem in recordkeeping at 2.8% and lack of formal education reported by 3.7%. This is illustrated below.

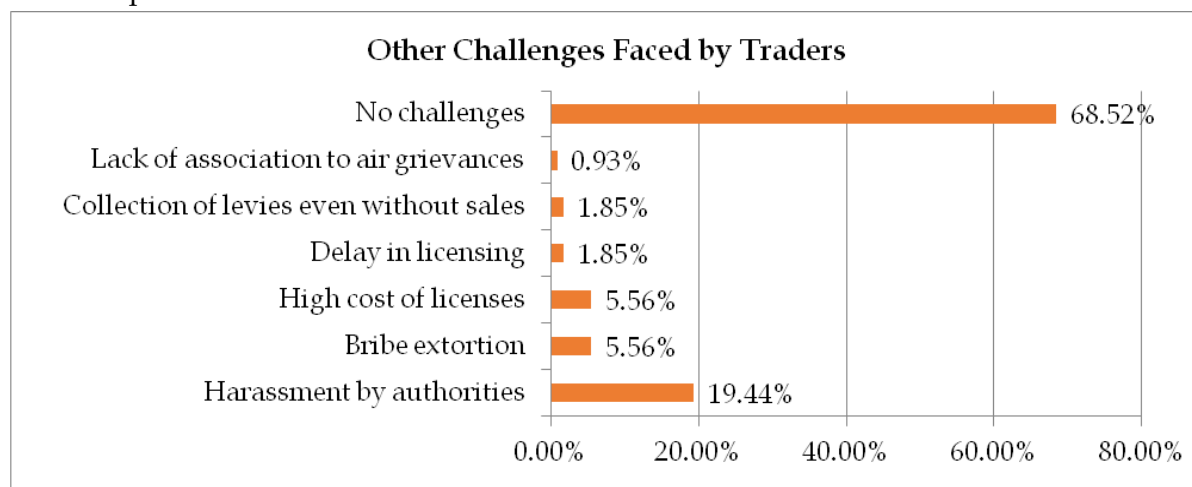


Sources: 2013 Coconut Survey

Figure 48: Figure of Business Management Challenges Faced by Traders of Coconut Products.

Other Challenges Faced by Traders of Coconut Products

There were other challenges encountered by 34% of the respondents. Key among these was harassment by authorities such as police and county government officers reported by 19.4%, bribe extortion and high cost of licenses were each reportedly encountered by 5.6% of the respondents as shown below.



Sources: 2013 Coconut Survey

Figure 49: Figure of Other Challenges Faced by Traders of Coconut Products.

Analysis of Challenges Faced by Traders of Coconut Products

There is need to strengthen the supply chain to ensure supply constraints are eliminated. Such constraints can distort the market forces of supply and demand and result in price distortion and instability. Quality of products also needs to be improved through training of farmers on harvesting and handling. Perceptions of low prices by traders mean they also squeeze the farmers by lowering producer prices. This can be cured through stimulating demand and eliminating cases of artificial over-supply.

Traders need financial support in order to boost their stock and increase turnover of products. Inadequate finances may manifest the challenge of inadequate supply whereas there is no shortage of products but traders can't stock up or afford transport for goods. This weakens the entire supply chain system i.e. farmers complain of lack of demand while processors complain of inadequate supply.

Few traders report lack of business management contrary to expectations. This happens when value chains are underdeveloped hence characterised by informality and poor self-awareness among players. The narrow perception of management skills as being only necessary by employing others shows that most traders need training on basic business issues.

The challenge of harassment by police and authorities is a key issue which has persisted for long. This is manifested more among *mangwe* operators and informal traders operating on roadsides. KCDA needs to find ways to ensure those operating legally are protected against harassment and bribe extortion.

4.8.6 Summary of Intensity of Challenges Facing Various Industry Players

This table shows the overall percentage of respondents experiencing challenges in various aspects of business and the issues scoring highest ought to be prioritized in interventions.

Table 26: Intensity of challenges facing various players

Challenge Player	Production or Operations	Marketing	Finance	Business Management
Farmers	91%	73%	64%	57%
Seedling suppliers	90%	60%	77%	53%
Processors	89%	89%	77%	47%
Traders	77%	72%	71%	53%

Sources: 2013 Coconut Survey

4.9 Key Drivers of Coconut Farming

From the foregoing discussion it can be concluded that the following are the key drivers of coconut farming. These constitute key success factors that must be addressed if coconut farming is to improve and thrive beyond the current state of affairs.



Sources: 2013 Coconut Survey

Figure 50: List of Key Drivers of Coconut Farming.

4.9.1 Availability of Quality Inputs

Farmers need inputs such as seedlings, chemicals and fertilizers to ensure productive and profitable farming. In particular, farmers long for high quality seedlings, adequate availability of seedlings and diversity in varieties available.



The picture on the left shows a coconut tree which was attacked by rhinoceros beetle in Mpeketoni Lamu. Incidences like these can discourage farmers from coconut farming.

4.9.2 Knowledge and Skills

Farmers need to get proper skills to undertake proper agronomical practices. Such practices would enhance yields towards the optimal levels realisable. If farmers can get 100 nuts per tree and 300 litres of wine per tree then higher productivity would be realised. This would be reflected in higher quality of life drawing more farmers into coconut

farming. On the contrary little yields make farmers see no value in planting coconuts while other crops deliver better and faster returns

4.9.3 Financing

Farmers need financial resources to increase acreage under coconuts and optimize current operations. Lack of adequate funds leads to underinvestment which in turn lowers productivity and discourages farmers from coconut farming. Farmers can be assisted in this regard through provision of free or subsidised inputs such as seedlings and fertilizers.

4.9.4 Market for Products

Any enterprise is market driven. Farmers need a ready and stable market offering fair prices. These are key issues that farmers complain of. Farmers will not be attracted into producing if they are not sure of selling and more so at a profit. Currently, farmers complain bitterly of low prices especially what they receive from Tanzanian traders.

The farmers complain of over-intermediation in the supply chain whereby brokers with knowledge and information on the market take advantage of their ignorance. Better prices will only be realised with increased value addition. Processors making many products under one roof will lower production costs and afford to pay higher price for produce. The current situation where processors concentrate on just a few products squeezes their margins and with farmers demanding higher prices many have been forced to close business.

4.9.5 Infrastructure

Infrastructure is a broad concept in this regard covering issues among them land, water, roads, information communication technology and security. Increased population continues to push pressure on land with places like Mombasa County facing near extinction of coconut farmers as trees give way to buildings.

Lack of water in places like Kwale County stresses trees resulting in low productivity. Proper ICT systems ensure farmers can get information on farming and marketing of produce. Lack of security has seen many farmers lose produce to theft and trees felled by wild animals. Poor transport infrastructure makes it hard and expensive for produce to reach markets. Coconuts are bulky and occupy much space during transportation. Some products such as tender coconuts and palm wine are perishable and must be delivered quickly to the market. Inadequacy in these areas can discourage further investment in coconut farming.

4.9.6 Regulation

Every economic subsector thrives in an environment with clear legal and regulatory framework. Lack of regulation or clarity in its enforcement causes constraints and confusion. For instance farmers complain of being unaware of regulations and high cost of compliance e.g. having to travel long distances to get permits for cutting of trees.

Also many see the regulations on palm wine as curtailing their business. If farmers perceive that mnazi regulation will reduce demand/consumption then they will be discouraged from farming. Issues like harassment of farmers while transporting produce to market point to a weak regulatory environment which can be very discouraging to the farmers.

No subsector can thrive in a legal environment which is characterised by chaos, excesses and uncertainty. Farmers need assurances that no unnecessary legal constraints will harm their enterprises. Thus the legal framework should be clear and its implementation fair. This will ensure the good players are protected and the bad ones weeded out.

4.10 Service Delivery Gaps

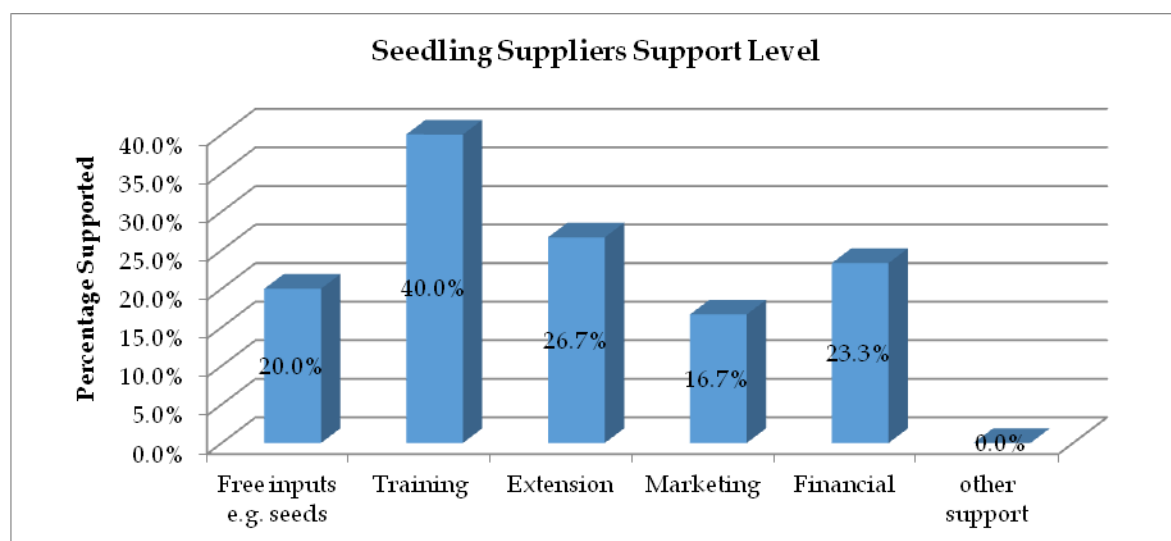
In view of the challenges faced by the subsector in general and value chain actors in particular there are many aspects of service delivery that call for improvement. These are discussed below.

4.10.1 Business Support Services to Value Chain Actors

It should be noted that the areas of support may not be the direct mandate of KCDA but nonetheless require more attention. Linkages need to be established between the farmers and various service providers such as research institutions, Ministry of Agriculture, financial institutions, development organisations and business development service providers.

Support to Seedling Suppliers

The level of support among Nursery Operators is high compared to other value chain actors. Findings indicate that 40% of the suppliers had received training while 26.7% had received extension services. Other support received was financial support at 23.3%, free inputs at 20% and marketing at 16.7%. This is shown in the figure below.



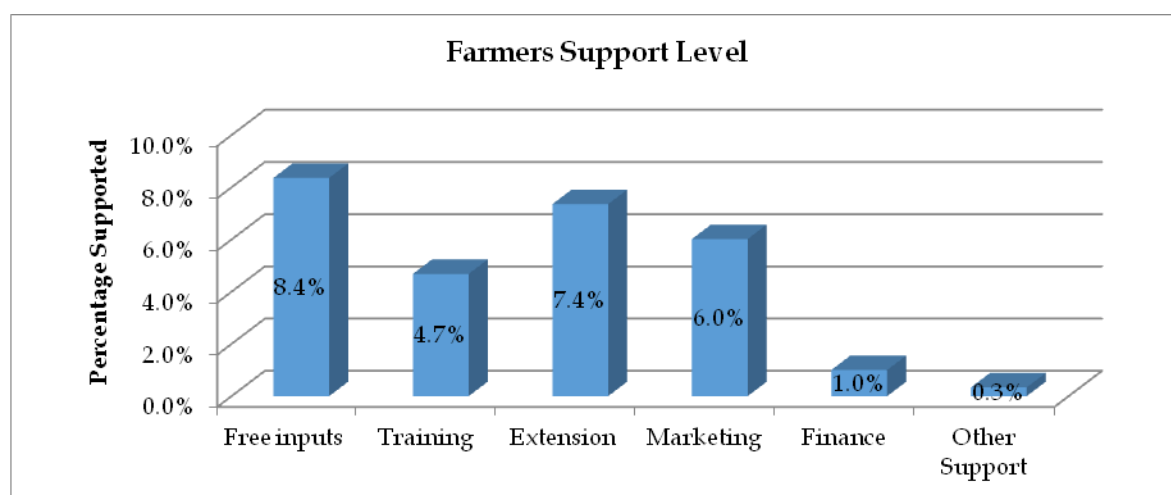
Sources: 2013 Coconut Survey

Figure 51: Figure of Support Level for Nursery Operators.

Despite these high levels there is need to step up the support especially in supply of quality seeds as farmers still face many challenges in that regard. The high levels of support reported here may be attributed to the current ongoing seedlings project.

Support to Farmers

Support to farmers is largely below 10%. This means that more concerted efforts are necessary to raise the level of support which will in the end impact on the productivity. Support was highest in the area of free inputs at 8.4%, extension at 7.4% and marketing at 6%. Support was lowest in training at 4.7% and finance at 1%. This is shown below.



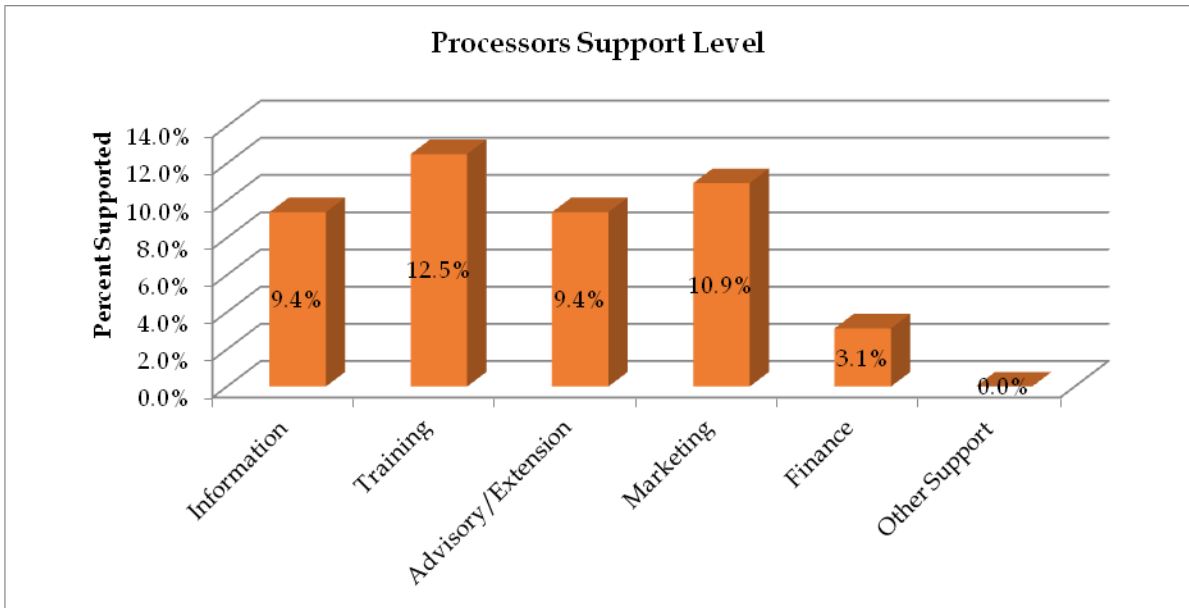
Sources: 2013 Coconut Survey

Figure 52: Figure of Support Level for Farmers.

The level of support accorded to farmers is dismal and more must be done. There is need for all stakeholders to be invited to adopt joint strategies in improving the situation. County government under which agricultural extension falls should be lobbied to increase support to farmers. Financial institutions need to develop suitable products and KCDA needs to provide linkages with other financiers such as development organizations, government and corporations with agricultural CSR programs.

Support to Processors

Support offered to processors is low which reflects on the low level of value addition for coconut products. Support was highest in training at 12.5% and in marketing at 10.9%. Information had been received by 9.4% of processors while 9.4% had received support in form of extension/advisory services. Support was lowest in finance with only 3.1% indicating having received support. This is shown in the figure below.

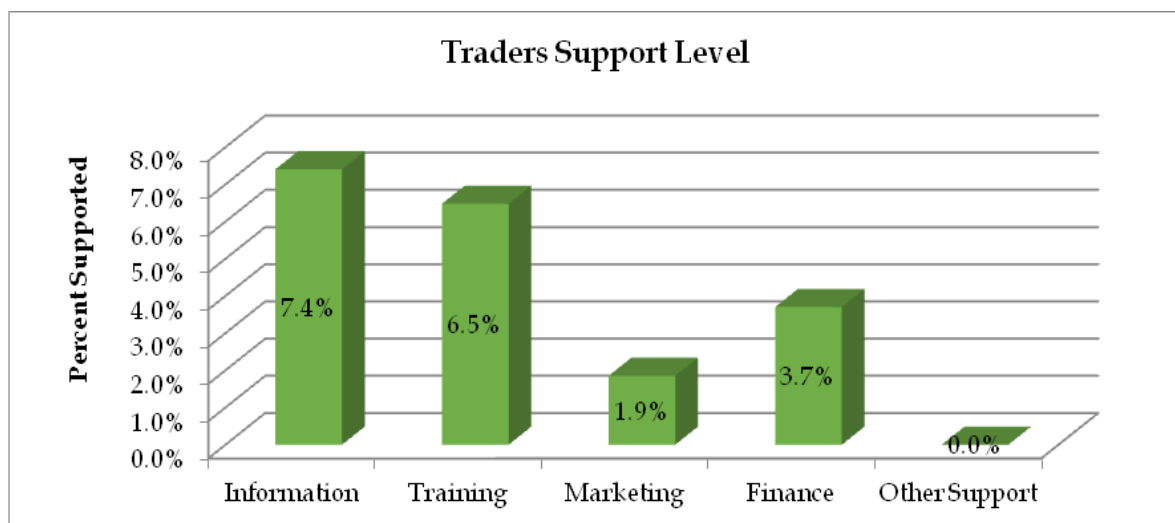


Sources: 2013 Coconut Survey

Figure 53: Figure of Support Level for Processors.

Support to Traders

Support accorded to traders is the lowest with all areas performing dismally. Highest levels of support were in the areas of information and training at 7.4% and 6.5% respectively. Finance and marketing support recorded 3.7% and 1.9% respectively as shown in the figure below.



Sources: 2013 Coconut Survey

Figure 54: Figure of Support Level for Traders.

Lack of adequate support to traders manifests itself in high volumes of products accessing the market via informal channels such as direct sales. More support is necessary to diversify distribution channels and expand demand. One of the key challenges faced by the chain actors is in the area of supply where scarcity is a key issue. The supply chain needs to be strengthened by supporting traders to widen their reach and increase their volumes.

4.11 Other Service Delivery Gaps

The following areas also manifest weaknesses in service delivery

Compilation and Dissemination of Sub-sector Data and Information

Data on the subsector is minimal and scattered. All chain actors and facilitators need credible, reliable, timely and valid data to support decision making. There is need to step up compilation of statistics on a monthly and annual basis.

Conducting of Research and Dissemination of Findings

Many areas of the subsector from seedling, farming, trading and processing need further investment in research. Where research has been done dissemination of findings should be fast-tracked.

Regulation of the Sub-sector

For many years the subsector was left on its own without a regulatory framework. Following the establishment of KCDA in 2007 a regulatory framework has been developed and is being implemented. Nevertheless value chain actors have issues that still need to be addressed in terms of regulation. These are:

- (i) Lack of awareness on regulations;
- (ii) Perceptions that regulation is harassment;
- (iii) Negative attitudes towards regulation due to many years of no regulation;
- (iv) Lack of understanding of regulations;
- (v) Perceptions that license fees are too high;
- (vi) Delays by KCDA in issuing licenses; and
- (vii) Complaints about long distances to travel to reach the authority in order to comply with regulations.

4.12 Indicative Gap Analysis

Table 27: Indicative Situational Analysis

	Ideal situation (Best case scenario)	Local situation (current scenario)
Seed Systems	Defined seed sources with screening for disease and pest infestation and genetic productivity potential	Majority of the farmers recycling their own seedlings back to the nursery or planting fields
Input Supply	Provision of fertilizers, chemicals, seedlings etc, by the marketing agencies checked off during payments	Inputs purchased by farmers depending on their own abilities, this leads to low productivity as some farmers have limited ability to afford the required inputs.
Extension Support	Established public sector supported extension workforce and /or trained (private sector) extension practitioners regulated by a government department.	Limited extension support with the two most pressing challenges for the coconut producers being listed as lack of skills and information and the incidence of pests and diseases
Research and Publications	Specific students financed to pursue Msc and Phd with Coconut issues as their research subjects to bring in new knowledge to the sector players.	Minimal publications from the agriculture universities specifically on coconut. No on-going research processes at KARI (even the coast centres) aimed at addressing the challenges affecting coconut.
Bulking and Marketing	Established marketing agencies regulated by sector players with government oversight.	Underdeveloped marketing channels leading to unregulated informal trade on coconut products.
Post harvest and Agroprocessing	Direct government interest to promote processing, with semi autonomus processing factories to benchmark good practices. Proper regulation on processing activities	Few (private sector) processing factories. No visible public sector interest to develop or regulate processing with a view of making it more competitive.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Estimates

(i) Ownership by Age

The study found out that Coconut farming is currently in the hands of the older generation with most coconut farmers aged above 55 years. This is important to note as it spells out the future of the sector. If the coconut sub-sectors's plan is to expand, then it must be embraced by the younger generation. With the rising cost of living, one of the ways to attract the younger generation back to farming is by ensuring that the crop is reliable in generating household income.

(ii) Ownership by Gender

Ownership and to a large extent the control of coconut tress, it is heavily dominated by men. It is important that gender mainstreaming is done within the sector to ensure that the role of women in the growth of the sector is properly integrated.

(iii) Literacy Levels

In terms of education levels, most coconut farmers have only attained the basic (primary) education. This closely related to the fact that trees are curretly in the hands of the older generation. This reality has an adverse effect on the uptake of new technologies that may be introduced with a view of improving productivity. The situation right now is such that all services rendered to the farmers will have to be administered bearing in mind the literacy levels of the farmers.

(iv) Trees by Numbers

The study concluded that the total number of coconut trees in the country stands at 9,907,115. The trees are however most highly concentrated in two counties; Kwale County holds the highest number with 4,714,157 trees and is followed closely by Kilifi at 4,192,983 trees. Other counties barely account for a tenth of the total population. The population of coconut trees as established occupies only a quarter of the land potentially available for coconut.

(v) Next Steps

At the application stage, it is expected that the findings of this study will provide various players with knowledge on factors that are currently affecting productivity to improve on their performance in the coconut value chain. The marketers, financial institution and service providers will benefit in enhancing linkages with farmers. The farmers can also use these findings to lobby for support to value chain

facilitators including development organizations. The study has provided empirical findings on factors that influence coconut research and thereby formed a basis for further research in the suggested areas including; causes of low female and youth participation in the sector, Value addition of coconut in Kenya for local market and the effects of the subdivision of farming land on coconut production.

5.2 Agronomy

(vi) Productivity Potential

While 150 nuts per tree per year provided as the estimated optimal productivity may seem idealistic compared to the current productivity of 27 nuts per tree per year, a productivity of 70 nuts per tree per year is achievable with proper production practices. The current productivity is far below potential, and less than half of what would be achieved under average circumstances.

(vii) Weak Dissemination

There potential for coconut in the surveyed region is unexploited. There is little effort by the supporting agencies (government or non-governmental) who are expected to disseminate new information and technologies aimed at improving productivity.

(viii) Underdeveloped Seed Systems

The seed systems are under developed. For a crop that plays a major role in household incomes in the coast, there should be a proper structure on how farmers can access clean and high quality seeds. This is evident in the fact that only 20% of the farmers were reported to obtain their seedlings from the agricultural offices and related sources while 72% (over two and a half times higher) of the farmers recycle their own nuts either into direct planting or in to their own nurseries. Ideally, good selection of mother trees should consider the following factors: yields, shape of the crowns, nature of petiole and inflorescence stalks, size and shape of nuts, weight of bunches and nuts, defective trees and the age of the mother palm as discussed elsewhere in the report. The fact that there exists no defined systems of obtaining clean seed, and if they exist they are not utilized by farmers, is an indication of unsupported production system which affects the sub sectors productivity.

(ix) Weak Extension Support

There is little evidence of consistent extension support. Extension mechanisms come between new information being generated by research agencies and the end users for whom the research information is targeted. In the absence of a clear extension mechanism, it is difficult to register improvement in the productivity of the subsector.

5.3 Value Chain

- (i) The coconut value chain faces many challenges and deficits which require concerted and coordinated efforts of the regulator, value chain actors and facilitators. This will be undertaken under a fast changing environment characterized by challenges of the newly devolved system of government. This will require addressing the following recommendations;
- Sub-Sector Information System**

The sub-sector faces severe challenges in management of information. There are hardly any credible statistics regarding most aspects. This area should be given serious attention going forward. Quality data is needed by all value chain actors to ensure they make proper decisions. Data is also helpful for policy making by the government. One of the reasons the sector has faced neglect could be due to lack of data to project its true value and potential. In particular there is need to maintain data on the following;

- (a) Annual production statistics for coconut produce
- (b) Annual production statistics of key processed products such as copra, coconut oil, desiccated coconut, coconut milk and virgin coconut oil amongst others. KCDA should collect monthly data from licensed players such as nursery operators, processors, importers and exporters
- (c) Import and export statistics of coconut produce and products should be collected on a monthly basis. KCDA needs to work closely with KRA as current data on imports and exports is largely incomplete and unreliable
- (d) Statistics on conversion rate for various coconut products will be helpful in guiding potential investors in the sector
- (e) A one stop online portal should be created whereby the statistics can be accessed easily by industry players. KCDA needs to work closely with Kenya National Bureau of Statistics and relevant government departments to ensure coconut statistics are mainstreamed into national statistics.

(ii) Value Chain Mobilization and Organization

There is need to establish strong organizations to represent various value chain actors. This will ensure there is a unified and strong voice in responding to various issues affecting the sub-sector. It will also improve on service delivery as it is less costly and easier to deliver services where actors are well organized. There is need for the following sector organizations.

- (a) National Coconut Sector Umbrella Association for all players
- (b) Coconut Farmers Association – representing seedling and coconut farmers and their cooperatives. Kenya Nut Growers association might not be sufficient for coconuts

- (c) Coconut Service Providers Association – to cater for those providing services such as harvesting and wine tapping
- (d) Coconut Traders Association – representing all traders i.e. retail, wholesale, importers, exporters etc.
- (e) Coconut Processors Association – to represent all those involved in value addition to various products
- (f) A working group of all value chain facilitators such as:
 1. Research institutions;
 2. Non-governmental organizations;
 3. Institutions of higher learning;
 4. Business development service providers; and
 5. Financial institutions and intermediaries.

A one stop online portal should be created providing a directory of all sub-sector organizations. Existing organizations such as Palm Working Group need to be restructured and strengthened.

(iii) Sub-Sector Research

The coconut subsector reflects a lot of under investment in research. The following areas of research need to be given attention. There is need to provide a centralized repository for all research on the subsector to ensure it is easily accessible by value chain players

Gross Margins Analysis: The coconut tree has about 30 products emanating from it. There are several trade levels for each product. It is recommended that KCDA commissions an additional study (founded on this) to cover the gross margins only for all those products. It would have been possible to work out the gross margins for one key product (say the nut, or madafu), but this would still be incomplete as all the other products would be left unanalyzed and would not eliminate the need for the gross margins analysis study. This response is unique for Coconut because of the number of products and by products.

It should be noted that KCDA would need to have an estimated number of players per products on their annual inventories, (or use the next assignment to create this baseline) – so that the gross margins x number of players will help estimate the economic value of the sector.

- (a) Production Research – There is need to research and disseminate information on the following aspects;
 1. Coconut varieties – develop more varieties which are high yielding and diseases and pest resistant;
 2. Best practices in coconut agronomy for improved productivity. Available handbook and other resources need to be disseminated widely;

(b) Processing and Value Addition Research

1. Research on best processing technologies for high product recovery.
2. Research on conversion rates for various products – finding of ongoing and past research on this area should be disseminated widely.
3. Research and development on various products which can be developed from the coconut based on market trends.
4. Research on benefits such as nutritional and medical for various products – the current ongoing research on this areas should be speeded up and results disseminated widely.
5. Research on business potential of various products.

(c) Marketing Research

1. Demand and supply of various products both local and international
2. Prices of various products – the Ministry of Agriculture collects weekly produce prices across the country and coconuts should be included in this survey
3. Consumers behavior regarding acquisition, consumption and disposal of various coconut products

Proceedings of various coconut conferences which have been taking place need to be availed online. There is need to adopt ICT technology in dissemination of research e.g. DVDs/VCDs documentaries on various research issues such as agronomy and processing technologies.

(iv) Sub-Sector Marketing

One of the challenges facing the subsector is lack of awareness among consumers on various coconut products and their benefits. Products such as Virgin Coconut Oil have tremendous potential in beauty and culinary sectors but more awareness among potential consumers is needed. The following recommendations can reverse the situation.

- (a) Stakeholders to organize and finance a joint awareness campaign backed by research on benefits of various products.
- (b) Adopt a country brand identity for various coconuts products originating from the country. This has been done in other agricultural value chains such as coffee.
- (c) Market information to be provided to all stakeholders preferably through use of ICT technologies. Provision of quality information will empower value chain actors and improve efficiency in the marketing system.
- (d) Price regulation should be handled with caution as it may result in market distortion. While KCDA is regulating producer prices it is noted that many of the processors who have closed shop complain of high price of raw materials. Price regulation should be in the interest of all value chain actors to ensure chain sustainability.

- (e) Regulation of international trade should be through setting tariffs rather than through bans. The tariffs should consider other trade issues with origin countries.
- (f) Mobilization of farmers through marketing cooperatives to be stepped up to ensure enhanced bargaining power in the market as well as value addition.
- (g) A one stop shop for various coconut products should be established.
- (h) An online directory of various players in the coconut subsector needs to be maintained.

(v) Subsector Financing

Value chain players face many financing constraints.

- (a) Establishment of subsector development fund i.e. Coconut Development Fund which should be initially funded by government. Players are likely to resist levies prior to seeing benefits.
- (b) Building capacity of player groupings to upgrade to provision of financial services such as SACCOs
- (c) Financial linkages are necessary as there are many devolved funds that can boost the players financially without excessive conditions

(vi) Sub-sector Regulation

Regulation of the sector has been met with hostility and resistance. There is need to ensure that the fees are affordable. Delays in issuance of licenses should be eliminated and enforcement of regulations should be devoid of harassment and extortion.

5.4 Way Forward

Based on the analysis of issues and the findings discussed in this document, the study proposes that an action plan be drawn to spell out how the gaps indicated will be addressed within a given time frame. This action plan will include the following;

1. Reviewing the study report to generate and prioritize key actions;
2. Evaluating the internal capacity and structure of the implementing agencies and most specifically KCDA to best play its role to facilitate the growth of the sector;
3. Reviewing the mandate of KCDA with a view of either increasing or integrating new functions that will effectively address the gaps identified through this study; and
4. Formation of a sector stakeholder platform to drive the implementation process of the identified interventions.

References

- Barnes, M. (2004): *Value Chain Guidebook: A Process for Value Chain Development*, Agriculture and Food Council of Alberta Value Chain Initiative, Alberta
- Coconut Development Board [CDA] (2013). Ministry of agriculture, Government of India-
<http://www.coconutboard.nic.in/welcome.html> Accessed 24th July 2013
- FAO (1996). Agro-ecological Zoning Guidelines. FAO Soils Bulletin 73. Rome www.fao.org
Accessed 15th July 2013
- FAO (2006) *Country Pasture/Forage Resource profile*.
<http://www.fao.org/ag/AGP/AGPC/doc/counprof/PDF%20files/Kenya.pdf> Accessed 29th July 2013
- Foale, M. (2003). The Coconut Odyssey – the bounteous possibilities of the tree of life. Australian Centre for International Agricultural Research, Canberra
- Food and Agriculture Organization of the United Nations [FAO] (1976). *A framework for land evaluation*. FAO Soils bulletin 32(24-47) <http://www.fao.org/docrep/x5310e/x5310e00.htm> Accessed 17th July 2013
- Gachanja, G., Musinga, M., Ngigi, G., Onyango, N & Bett, J. (2010). *Coconut value chain analysis report*, ASPS-ABD/KCDA
- Gachanja, G., Odhiambo, Z. & Musinga, M. (2007). *The Coconut Subsector: Baseline Survey Report*, ABD-DANIDA/CDA
- Haseena M., Bai K. V. K., & Padmanabhan S. (2010) Post-harvest quality and shelf-life of tender coconut, *Journal of Food Science and Technology* (Nov-Dec 2010) 47(6): PP 686–689
doi: 10.1007/s13197-010-0097-y
- Kahindi, R. (2012, January June). Challenges Facing Coconut Subsector. *Coco News*, 2, 6
- Makuti. (2013). Retrieved August 01, 2013, from <http://buildinwatamu.com/index.php/our-services/category/makuti>
- Muinde, A. (2013). Coastal coconut farmers find value for their palms. Retrieved August 01, 2013 from <http://www.farmbizafrica.com/index.php/hopemenu4/675-coastal-coconut-farmers-find-value-for-their-palms>
- Mwachiro E. C. and R.W. Gakure. (2011). Factors affecting coconut industry from benefitting the indigenous communities of Kilifi District, Kenya. *International Journal of Humanities and Social Sciences*. 1 (4): 214-230

Oduor, N. & Githiomi, J. (2010). Wood Characteristics and properties of *Cocos nucifera* (the coconut tree) grown in Kwale District. Kenya Forestry Research Institute (KEFRI), Nairobi






Paramanathan S. (1987). Soil Surveys; Malaysia Field Legend for Soil Surveys in Malaysia. UPM Press, Serdang

Sombroek, W.C., H.M.H. Braun and B.J.A van der Pour (1982). *Explanatory soil map and agro-climatic zone map of Kenya. Report E1*. National Agricultural Laboratories, Soil Survey Unit, Nairobi, Kenya, 56 pp.

Verheyne, W. (1986). Principles of land use planning within the European community. Soil use management, 2(4). In: *FAO, Land Use, Land Cover and Soil Sciences-Vol.11*. The FAO guidelines for land evaluation.

Appendices

Appendix I: Glossary of Selected Coconut Products

Product	Definition/Description	Uses/Remarks
<p>Coco peat</p> 	<p>Cocopeat (also known as cocos or coir) is the pithy by product from coconut husk.</p>	<p>It is used as growth medium for high value crops. Its demand in Kenya is rising.</p> <p>Also used as an industrial absorbent</p>
<p>Coconut milk</p> 	<p>This is the white liquid that comes out after pressing wet, grated coconut kernel</p>	<p>Used as ingredient in preparation of various dishes</p>
<p>Coir Fibre</p> 	<p>coir is the fibrous material found inside the coconut husk</p>	<p>Typically, white coir spun into yarn is used in the manufacture of rope and, thanks to its strong resistance to salt water, in fishing nets.</p> <p>Brown coir is stronger and more widely used than white coir. Applications include sacking, brushes, doormats, rugs, mattresses, insulation panels and packaging</p>
<p>Copra</p> 	<p>This is the dried kernel or meat of the coconut i.e. the white flesh inside the shell</p>	<p>Coconut oil is extracted from it</p> <p>The resulting residue called copra cake is used as livestock feed</p>
<p>Copra cake</p> 	<p>The residue of copra after extraction of oil</p>	<p>Used as livestock feed</p>

Product	Definition/Description	Uses/Remarks
<p>Copra oil</p> 	Oil extracted from copra	<p>Industrial uses e.g. biodiesel, engine lubrication, transformer oil etc</p> <p>Used for cooking</p> <p>Used in the manufacture of soaps, detergents and other cosmetic products</p>
<p>Desiccated coconut</p> 	Desiccated Coconut is a grated, dried (3% moisture content max.), and unsweetened fresh meat or kernel of a mature coconut.	Desiccated Coconut is ideal for use as fillers, toppings and as ingredients, especially in the baking of biscuits, snack bars, cakes, cookies and so on.
<p>Nata de coco</p> 	It is a chewy, translucent, <u>jelly</u> -like <u>foodstuff</u> produced by the <u>fermentation</u> of <u>coconut water</u> .	Nata de coco is most commonly sweetened as a candy or dessert, and can accompany many things including pickles, drinks, ice cream, puddings and fruit mixes.
<p>Virgin Coconut Oil</p> 	Coconut oil is an edible oil extracted from the kernel or meat of matured coconuts harvested from the coconut palm. It has various applications in food, medicine, and industry.	<p>It has many applications in cooking e.g. frying</p> <p>It has industrial application such as lubrication and fuel</p> <p>Oral intake as an immune booster</p> <p>It has personal application where it can be used a moisturizer and is used as an ingredient in soap and hair products</p>

Source: Compiled by authors from various online sources

Appendix II: Value Chain Questionnaires

Input Suppliers

Form Serial No: _____ Date: ____/____/____ Start Time ____/____ End Time ____/____
dd mm yyyy HH MM HH MM

Alpex Consulting Africa Limited has been contracted by the Kenya Coconut Development Authority to conduct a survey on the coconut sector in Kenya. The objective of the survey is to establish a reliable estimate of coconut trees in the country as well as determine its economic potential and factors that may hinder or support the development of the sector. We are currently interviewing various stakeholders in the sector depending on the role they play along the value chain.

We are therefore requesting you to spare a few minutes to discuss with us issues related to this very important sector. We assure you that the information provided will be treated in confidence and shall be used solely for the purposes of this survey. Thank you.

Section A: Respondent Details

1. Name of respondent

2. Ward Constituency

County

3. Age: Below 35 ☐ Above 35 ☐

4. Gender: Male ☐ Female ☐

5. Are you a member of any group involved in supply of coconut related supplies?
Yes ☐ No ☐

6. If yes above explain the nature of the group and the services it provides

Section B: Business Details for Nursery Operators

7. Where do you get your seeds from?

Own farm ☐

Neighbours ☐

Certified sources ☐ please specify _____

8. What varieties and how many seedlings did you produce in the year 2012

Variety	Number produced 2012
East Africa Tall	
Dwarf	
Hybrid	
Total	

9. How long does it take from planting of seeds till ready for sale:_____

10. How much land size are you using for the coconut seedlings:_____

11. How many seedlings do you currently have in the nursery:_____

12. What costs did you incur in producing the seedlings in 2012

Item	Monthly Costs	Annual Costs
Land lease if not owned		
Seeds		
Manure and fertilizers		
Chemicals		
Water		
Labour (planting, maintenance, harvesting)		
Other costs (please specify)		
Total		

13. What support services have you received in your business in the last one year

Free seeds or other inputs ☐

Training e.g. in crop husbandry or business skills ☐

Extension services e.g. advice from government, research dissemination ☐

Marketing support ☐

Financial support ☐

Others (please explain)_____

14. Which months can you categorise as low season and which ones can you categorise as high season

Low season months_____

High season months_____

15. To whom did you sell the seedlings to and at what price in 2012

Channel	No. Of Seedlings Sold	Extra-costs incurred e.g. transport	Low season Selling Price per seedling	High season Selling Price per seedling
Farmers at the nursery				
Traders at the nursery				
Taking them to a market or outlet				
Other (please explain)				
Total				

Section C: Business Details for other suppliers

16. What inputs do you supply,

Inputs	Unit costs	Other Costs	Total Costs incurred	Selling price per unit
Total				

Section D: Business challenges and other issues

17. How many employees do you have apart from yourself _____

18. What challenges and do you face in the following areas and what support do you need?

Business Aspect	Challenges	Support needed
a. Production or operations e.g. skills, sources and quality of inputs		
b. Marketing e.g. price, customers, distribution		
c. Finance – sourcing of funds for operations and equipments		
d. Business management skills		
e. Other areas		

Section E: Contacts

19. Contact of the person interviewed_____
20. Name of person conducting interview_____
21. Contact of person conducting the interview_____

Farmers

Form Serial No: _____ Date: ____/____/____ Start Time ____/____ End Time ____/____
dd mm yyyy HH MM HH MM

Alpex Consulting Africa Limited has been contracted by the Kenya Coconut Development Authority to conduct a survey on the coconut sector in Kenya. The objective of the survey is to establish a reliable estimate of coconut trees in the country as well as determine its economic potential and factors that may hinder or support the development of the sector. We are currently interviewing various stakeholders in the sector depending on the role they play along the value chain.

We are therefore requesting you to spare a few minutes to discuss with us issues related to this very important sector. We assure you that the information provided will be treated in confidence and shall be used solely for the purposes of this survey. Thank you.

Section A: Respondent Details

1. Name _____ of _____ respondent

2. Ward _____ Constituency _____
County _____
3. Age: Below 35 ☐ Above 35 ☐
4. Gender: Male ☐ Female ☐
5. Are you a member of any group involved in coconut farming? Yes ☐ No ☐
6. If yes above explain the nature of the group and the services it provides

Section B: Business Details

7. Where do you get your seedlings from?
Own nursery ☐
Commercial nursery ☐
Free seedling source ☐ please specify _____
Other sources ☐ please specify _____

8. What production costs did you incur in 2012

Item	Cost per month (KES)	Cost per year (KES)
Land lease if not owned		
Seedlings		
Manure and fertilizers		
Chemicals/pest control		

Item	Cost per month (KES)	Cost per year (KES)
Water/irrigation		
Labour (planting, maintenance)		
Other costs		
Total		

9. What volumes of the following products did you produce in 2012

Product	No. Of trees harvested from	Production Units	Units harvested/ made	Harvesting Costs Incurred per Unit	Other per unit preparation costs e.g. taping de-husking	Total costs
Immature nuts		pieces				
Toddy (mnazi)		litres				
Mature nuts		pieces				
Wood		No. Of trees				
Makuti		Pieces				
Brooms		Pieces				
Husks		kgs				
Fibre		kgs				

10. To whom do you sell/dispose the products to and at what price?

a. Immature nuts (madafu) value chain

Product and Channel	Units sold	Other costs e.g. transport, commission	Sale Price per unit
Own consumption			
Direct sales to consumers			
Sales to traders			
Sales to processors or their agents			
Sales to cooperatives			
Other channels (specify)			
Total			

b. Mature nuts value chain

Product and Channel	Units sold	Other costs e.g. transport, commission	Sale Price per unit
Own consumption			
Direct sales to consumers			
Sales to traders			
Sales to processors or their agents			

Sales to cooperatives			
Other channels (specify)			
Total			

c. Toddy/palm wine value chain

Product and Channel	Units sold	Other costs e.g. transport, commission	Sale Price per unit
Own consumption			
Direct sales to consumers			
Sales to traders			
Sales to processors or their agents			
Sales to cooperatives			
Other channels (specify)			
Total			

d. Coconut wood value chain

Product and Channel	Units sold	Other costs e.g. transport, commission	Sale Price per unit
Own consumption			
Direct sales to consumers			
Sales to traders			
Sales to processors or their agents			
Sales to cooperatives			
Other channels (specify)			
Total			

e. Makuti value chain

Product and Channel	Units sold	Other costs e.g. transport, commission	Sale Price per unit
Own consumption			
Direct sales to consumers			
Sales to traders			
Sales to processors or their agents			
Sales to cooperatives			
Other channels (specify)			
Total			

f. Brooms value chain

Product and Channel	Units sold	Other costs e.g. transport, commission	Sale Price per unit

Own consumption			
Direct sales to consumers			
Sales to traders			
Sales to processors or their agents			
Sales to cooperatives			
Other channels (specify)			
Total			

g. Husks value chain

Product and Channel	Units sold	Other costs e.g. transport, commission	Sale Price per unit
Own consumption			
Direct sales to consumers			
Sales to traders			
Sales to processors or their agents			
Sales to cooperatives			
Other channels (specify)			
Total			

h. Fibre value chain

Product and Channel	Units sold	Other costs e.g. transport, commission	Sale Price per unit
Own consumption			
Direct sales to consumers			
Sales to traders			
Sales to processors or their agents			
Sales to cooperatives			
Other channels (specify)			
Total			

11. What support services have you received in your business in the last one year

Free seedlings or other inputs ☐

Training e.g. in crop husbandry or business skills ☐

Extension services e.g. advice from government, research dissemination ☐

Marketing support ☐

Financial support ☐

Others (please explain)_____

Section C: Business challenges and other issues

12. How many employees do you have apart from yourself_____
13. What challenges and do you face in the following areas and what support do you need?

Business Aspect	Challenges	Support needed
a. Production or operations e.g. seedlings, inputs, knowledge, skills, pests, land size		
b. Marketing –customers, price, distribution, awareness		
c. Finance for expansion		
d. Business management skills		
e. Other areas e.g. legal, regulation		

Section D: Contacts

14. Contact of the person interviewed_____
15. Name of person conducting interview_____
16. Contact of person conducting the interview_____

Processors

Form Serial No: _____ Date: ____/____/____ Start Time ____/____ End Time ____/____
dd mm yyyy HH MM HH MM

Alpex Consulting Africa Limited has been contracted by the Kenya Coconut Development Authority to conduct a survey on the coconut sector in Kenya. The objective of the survey is to establish a reliable estimate of coconut trees in the country as well as determine its economic potential and factors that may hinder or support the development of the sector. We are currently interviewing various stakeholders in the sector depending on the role they play along the value chain.

We are therefore requesting you to spare a few minutes to discuss with us issues related to this very important sector. We assure you that the information provided will be treated in confidence and shall be used solely for the purposes of this survey. Thank you.

Section A: Respondent Details

1. Name of respondent

2. Company/business Name:

3. Is your business registered? Yes ☐ No ☐

4. Ward Constituency

County

5. For how long have you been in the business?

Less than 5 years ☐

5 to 10 years ☐

Over 10 years ☐

6. How many employees does your firm have _____

7. Are you a member of any processors groupings e.g. association

Yes ☐ No ☐

8. If yes above explain the nature of the group and the services it provides

Section B: Details of the processing business

9. Where do you get your raw materials from?

Source	% of Total Monthly Volume
Direct from individual farmers	
Direct from farmer organisations e.g. cooperatives and self-help groups	
From traders	
Importing from other countries	
Total	100%

10. What is your overall view of the quality of the raw materials (tick one only)

- Excellent ☐
- Very good ☐
- Good ☐
- Bad ☐
- Very bad ☐

11. What products do you make and what are your monthly production volumes and expenses

Product	Raw Material Units e.g. pieces, kgs, litres	Volume of Units of raw material bought	Producti on units e.g. pieces, kgs,	Volume of Units produce d per month	Cost of raw materials	Cost of Transport	Manu factur ing costs	Total Costs
Coco timber								
Desiccated coconut								
Copra								
Copra oil								
Virgin coconut oil								
Coconut milk (cream and light)								

Product	Raw Material Units e.g. pieces, kgs, litres	Volume of Units of raw material bought	Producti on units e.g. pieces, kgs,	Volume of Units produce d per month	Cost of raw materials	Cost of Transport	Manu factur ing costs	Total Costs
Bottled palm wine								
Coconut vinegar								
Brooms								
Shell charcoal								
Coco-wood Furniture								
Makuti								
Coco-peat								
Coir fibre and ropes								
Door mats								
Body lotion and cream								
Soap								
Lamp shades								
Artifact								
Total								

12. What other monthly costs do you incur?

Item	Monthly Costs

13. On average how much do you sell per month to each of these clients groups and at what price

Product	Volume sold individuals e.g. 50kgs	Selling price per unit	Volume Sold to traders	Selling Price Per Unit	Volume exported	Selling Price Per Unit
Coco timber						
Desiccated coconut						
Copra						
Copra oil						
Virgin coconut oil (VCO)						
Coconut milk (cream and light)						
Bottled palm wine						
Coconut vinegar						
Brooms						
Shell charcoal						
Coco-wood Furniture						
Makuti						
Coco-peat						
Coir fibre and ropes						
Door mats						
Body lotion and cream						
Soap						
Lamp shades						
Artefact						
Total						

14. Do you have any quality standardisation or certification e.g. KEBS, ISO etc

Yes ☐ No ☐

15. If yes above kindly state the quality standardisation or certifications so far attained

16. What support services have you received in your business in the last one year

Information on processing technology ☐

Training e.g. in improving quality ☐

Extension services e.g. advice from government, research dissemination ☐

Marketing support e.g. trade facilitation such as export ☐

Financial support e.g. subsidised loans or grants ☐

Others (please explain) _____

Section C: Business challenges and other issues

17. What challenges and do you face in the following areas and what support do you need?

Business Aspect	Challenges	Support needed
f. Production or operations e.g. seedlings, inputs, knowledge, skills, pests, land size		
g. Marketing –customers, price, distribution, awareness		
h. Finance for expansion		
i. Business management skills		
j. Other areas e.g. legal, regulation		

Section D: Contacts

18. Contact of the person interviewed _____

19. Name of person conducting interview _____

20. Contact of person conducting the interview _____

TRADERS

Form Serial No: _____ Date: ____/____/____ Start Time ____/____ End Time ____/____
dd mm yyyy HH MM HH MM

Alpex Consulting Africa Limited has been contracted by the Kenya Coconut Development Authority to conduct a survey on the coconut sector in Kenya. The objective of the survey is to establish a reliable estimate of coconut trees in the country as well as determine its economic potential and factors that may hinder or support the development of the sector. We are currently interviewing various stakeholders in the sector depending on the role they play along the value chain.

We are therefore requesting you to spare a few minutes to discuss with us issues related to this very important sector. We assure you that the information provided will be treated in confidence and shall be used solely for the purposes of this survey. Thank you.

Section A: Respondent Details

1. Name of respondent

2. Company/business Name:

3. Is your business registered? Yes ☐ No ☐

4. Ward

Constituency

County

5. For how long have you been in the business?

Less than 5 years ☐

5 to 10 years ☐

Over 10 years ☐

6. How many employees does your business have _____

7. What type of a trader are you?

Retailer ☐

Wholesaler ☐

Bulker ☐

Processor agent ☐

Exporter ☐

8. Are you a member of any traders groupings e.g. association
Yes ☐ No ☐
9. If yes above explain the nature of the group and the services it provides
-

Section B: Business Details

10. Where do you get your products from?

Source	% of Total Monthly
Direct from individual farmers	
Direct from farmer organisations e.g.	
From other traders	
From processors	
Importing from other countries	
Total	100%

11. What is your overall view of the quality of the products procured (tick one only)

Excellent ☐
 Very good ☐
 Good ☐
 Bad ☐
 Very bad ☐

12. What transport modes do you use?

Human beings ☐
 Bicycles and motor cycles ☐
 Public service vehicles ☐
 Commercial transporters e.g. Lorries, pickups ☐
 Other (specify) ☐

13. What is the ownership of means of transport used?

I own the means of transport ☐
 I hire the means of transport ☐

14. What products do you trade in and what selling costs do you incur?

Product	Units of Trade e.g. pieces,	Volume of Units traded per month	Buying Cost per unit	Cost of transport	Other direct costs e.g. storage, packaging, preparation
Immature nuts					
Mature nuts					
Toddy (palm wine)					
Husks					
Fibre					
Wood					
Makuti					
Desiccated coconut					
Copra					
Copra oil					
Coco timber					
Desiccated coconut					
Copra					
Copra oil					
Virgin coconut oil					
Coconut milk (cream and light)					
Bottled palm wine					
Coconut vinegar					
Brooms					
Shell charcoal					
Coco-wood Furniture					
Makuti					
Coco-peat					
Coir fibre and ropes					
Door mats					
Body lotion and					

Product	Units of Trade e.g. pieces,	Volume of Units traded per month	Buying Cost per unit	Cost of transport	Other direct costs e.g. storage, packaging, preparation
cream					
Soap					
Lamp shades					
Artifact					
Total					

15. What sales channels do you use and what prices are realised through each channel?

Product	units sold to individuals	Unit Price	Units sold to other traders	Unit Price	units Sold to processors	Unit Price	Units Exported	Unit Price
Immature nuts								
Mature nuts								
Toddy (palm wine)								
Husks								
Fibre								
Wood								
Makuti								
Desiccated coconut								
Copra								
Copra oil								
Coco timber								
Desiccated coconut								
Copra								
Copra oil								
Virgin coconut oil								
Coconut milk (cream and light)								
Bottled palm wine								
Coconut vinegar								
Brooms								
Shell charcoal								
Coco-wood Furniture								
Makuti								
Coco-peat								
Coir fibre and ropes								

Product	units sold to individuals	Unit Price	Units sold to other traders	Unit Price	units Sold to processors	Unit Price	Units Exported	Unit Price
Door mats								
Body lotion and cream								
Soap								
Lamp shades								
Artifact								
Total								

16. What support services have you received in your business in the last one year

Information on markets

☐

Training e.g. in improving quality and handling

☐

Marketing support e.g. trade facilitation such as export, market surveys etc

☐

Financial support e.g. subsidised loans or grants

☐

Others (please explain) _____

Section C: Business challenges and other issues

17. What challenges and do you face in the following areas and what support do you need?

Business Aspect	Challenges	Support needed
a) Production or operations e.g. seedlings, inputs, knowledge, skills, pests, land size		
b) Marketing –customers, price, distribution, awareness		
c) Finance for expansion		
d) Business management skills		
e) Other areas e.g. legal, regulation		

Section D: Contacts

18. Contact of the person interviewed _____

19. Name of person conducting interview_____

20. Contact of person conducting the interview_____

SUPPORT INSTITUTIONS INTERVIEW GUIDE

Form Serial No: _____ Date: ____/____/____ Start Time ____/____ End Time ____/____
dd mm yyyy HH MM HH MM

Alpex Consulting Africa Limited has been contracted by the Kenya Coconut Development Authority to conduct a survey on the coconut sector in Kenya. The objective of the survey is to establish a reliable estimate of coconut trees in the country as well as determine its economic potential and factors that may hinder or support the development of the sector. We are currently interviewing various stakeholders in the sector depending on the role they play along the value chain.

We are therefore requesting you to spare a few minutes to discuss with us issues related to this very important sector. We assure you that the information provided will be treated in confidence and shall be used solely for the purposes of this survey. Thank you.

Section A: Respondent Details

1. Name of respondent

2. Institution:

3. Is your business registered? Yes ☐ No ☐

4. Ward Constituency

County

5. For how long have you been in existence

Less than 5 years ☐

5 to 10 years ☐

Over 10 years ☐

6. What is your mandate as far as supporting the industry is concerned?

Section B: Industry Issues

7. Do you collect any industry data Yes ☐ No ☐
8. If yes above kindly request for the data to be availed
9. What other bodies do you partner with in promoting the coconut industry

10. In your view what are the key challenges facing the coconut industry?

11. What solutions would you propose for the above challenges?

12. What views do you have regarding the future of the industry

Section C: Contacts

1. Contact of the person interviewed_____
2. Name of person conducting interview_____
3. Contact of person conducting the interview_____

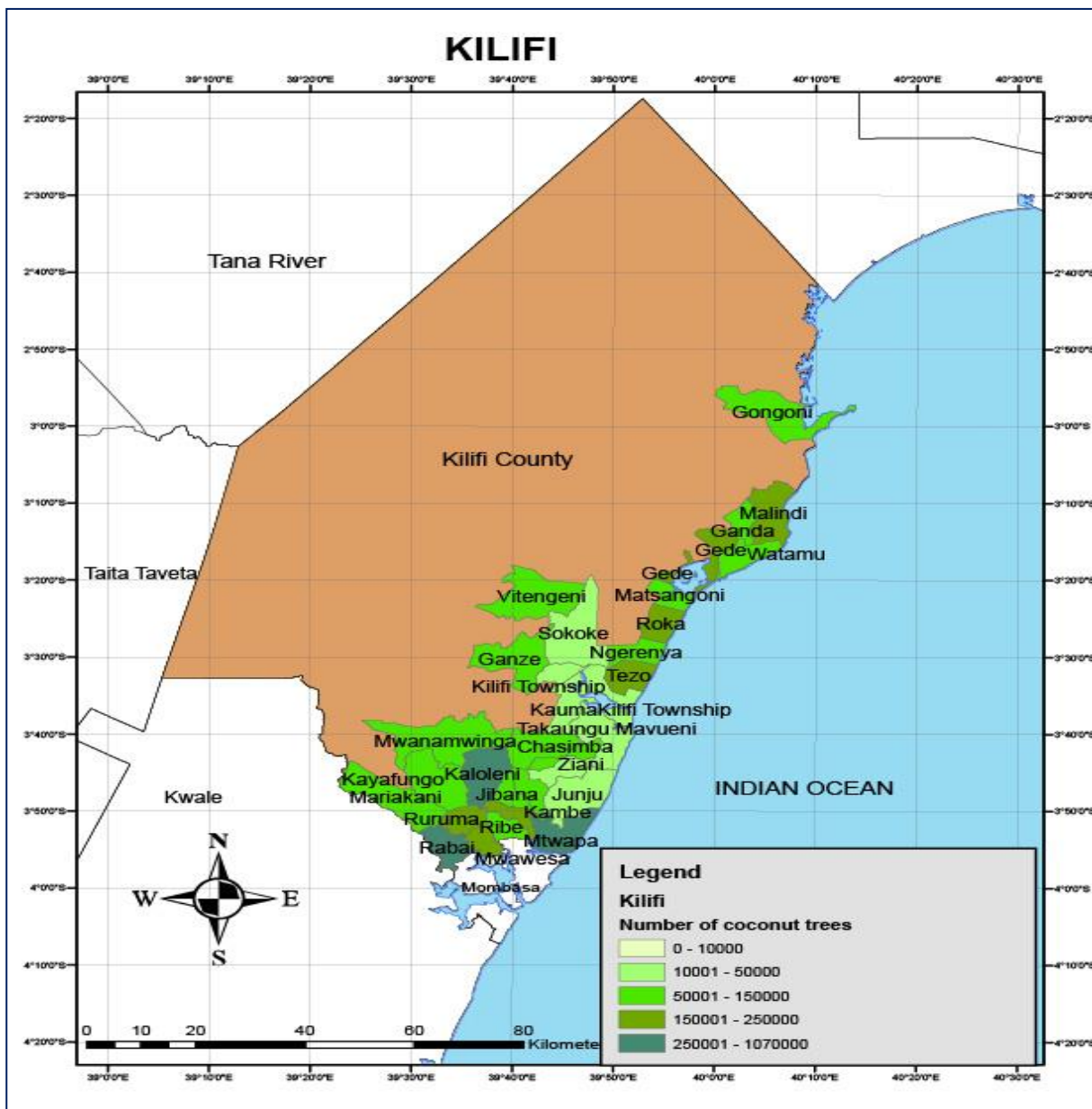
Appendix III: Statistics on Coconut Population Survey Tools (GIS, Maps, scope & Questionnaire)

Data Statistics			Data Classification used	
Count	104.00		1)	0 to 10,000
Minimum	3,127.85		2)	10,001 to 50,000
Maximum	1,065,063.36		3)	50,001to 150,000
Sum	10,482,414.46		4)	150,001 to 250,000
Mean	100,792.45		5)	250,001 to 1,070,000
Median	63,846.08			
Standard Deviation	133,517.74			

Maps produced

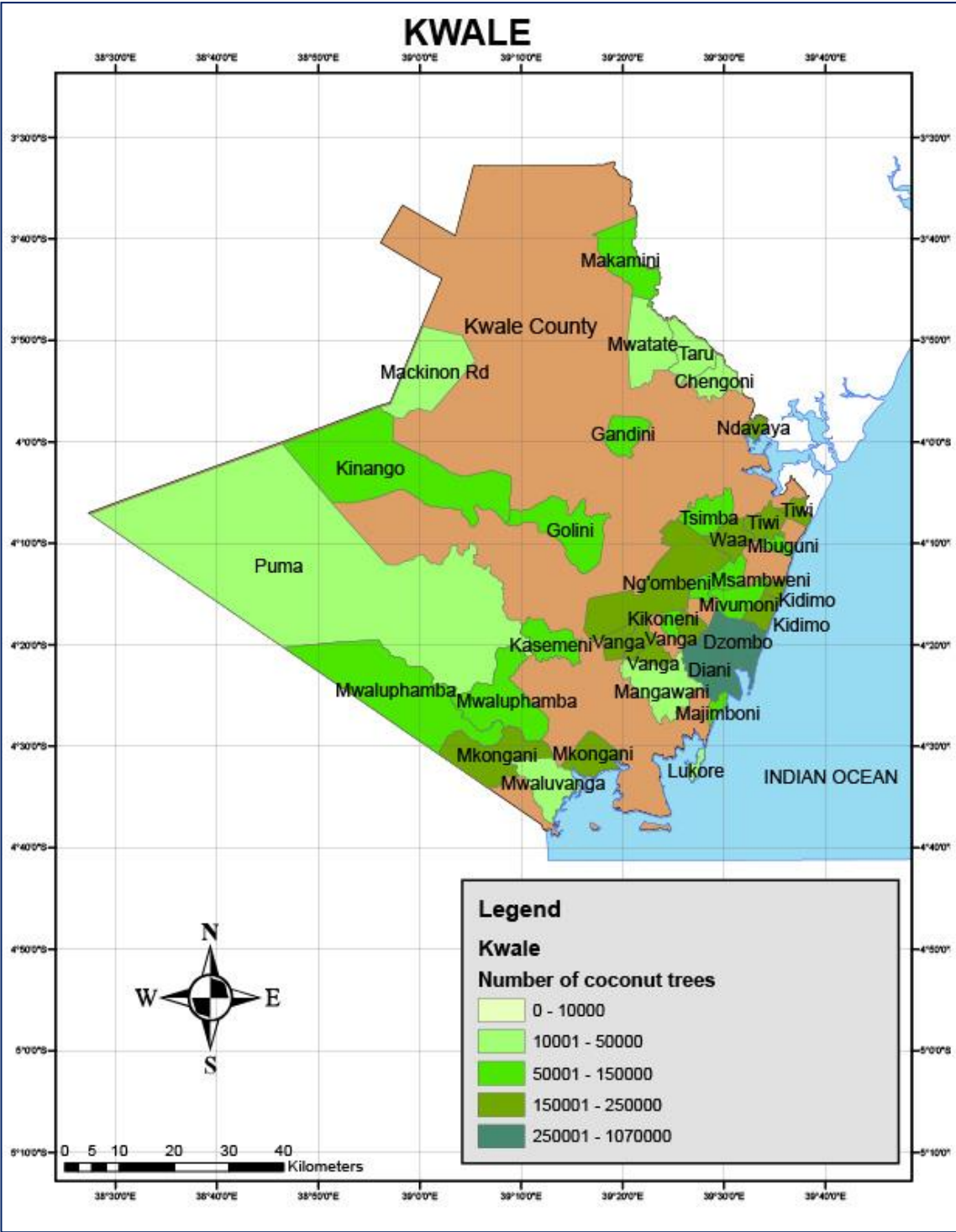
Maps No.	1.	2.	3.	4.	5.	6.	7.
County	Kilifi	Kwale	Lamu	Mombasa	Tana River	TaitaTaveta	Coast Region

Kilifi County

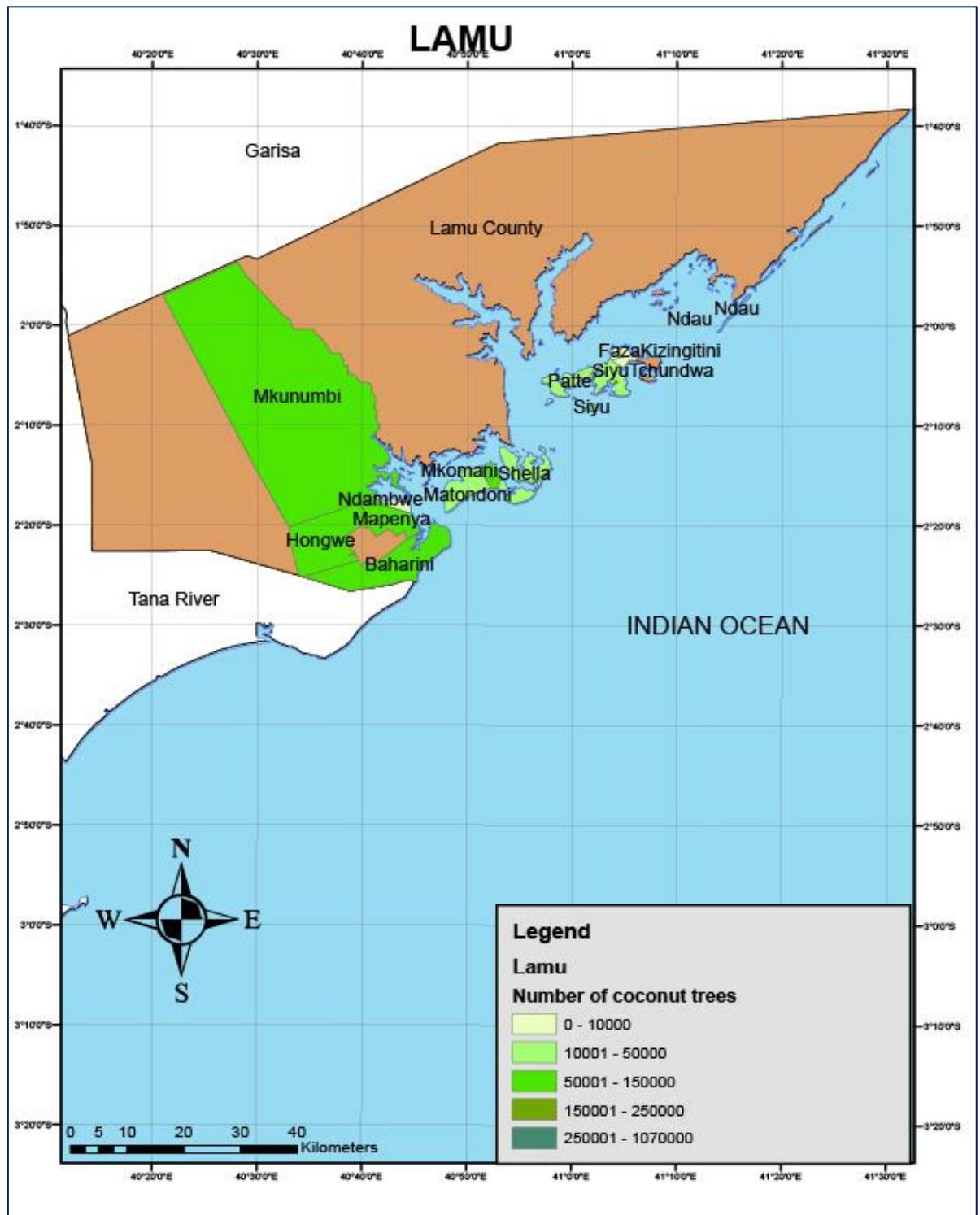


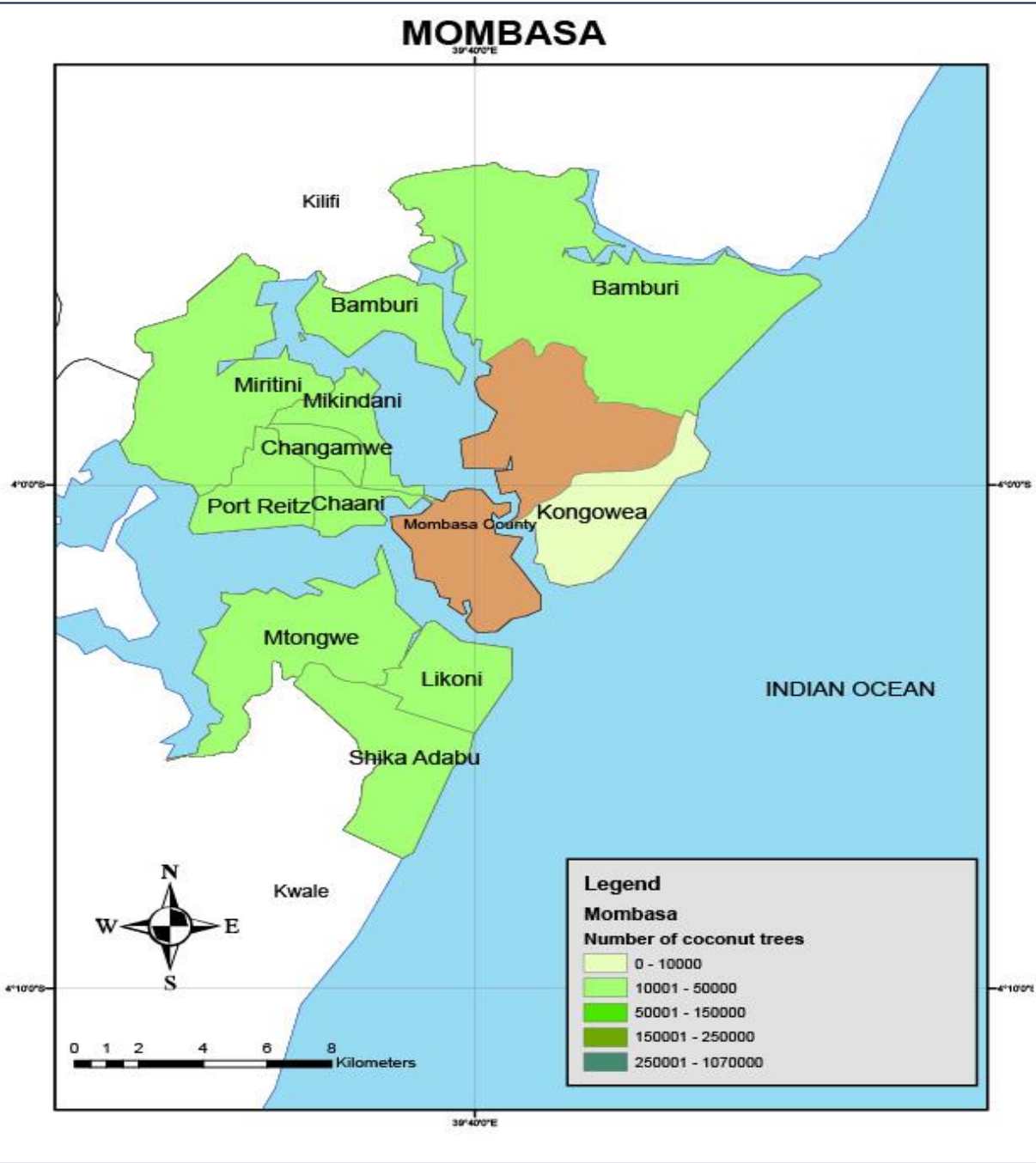
Locations which were unavailable in the Base map are Dida and Vyambani.

Kwale County

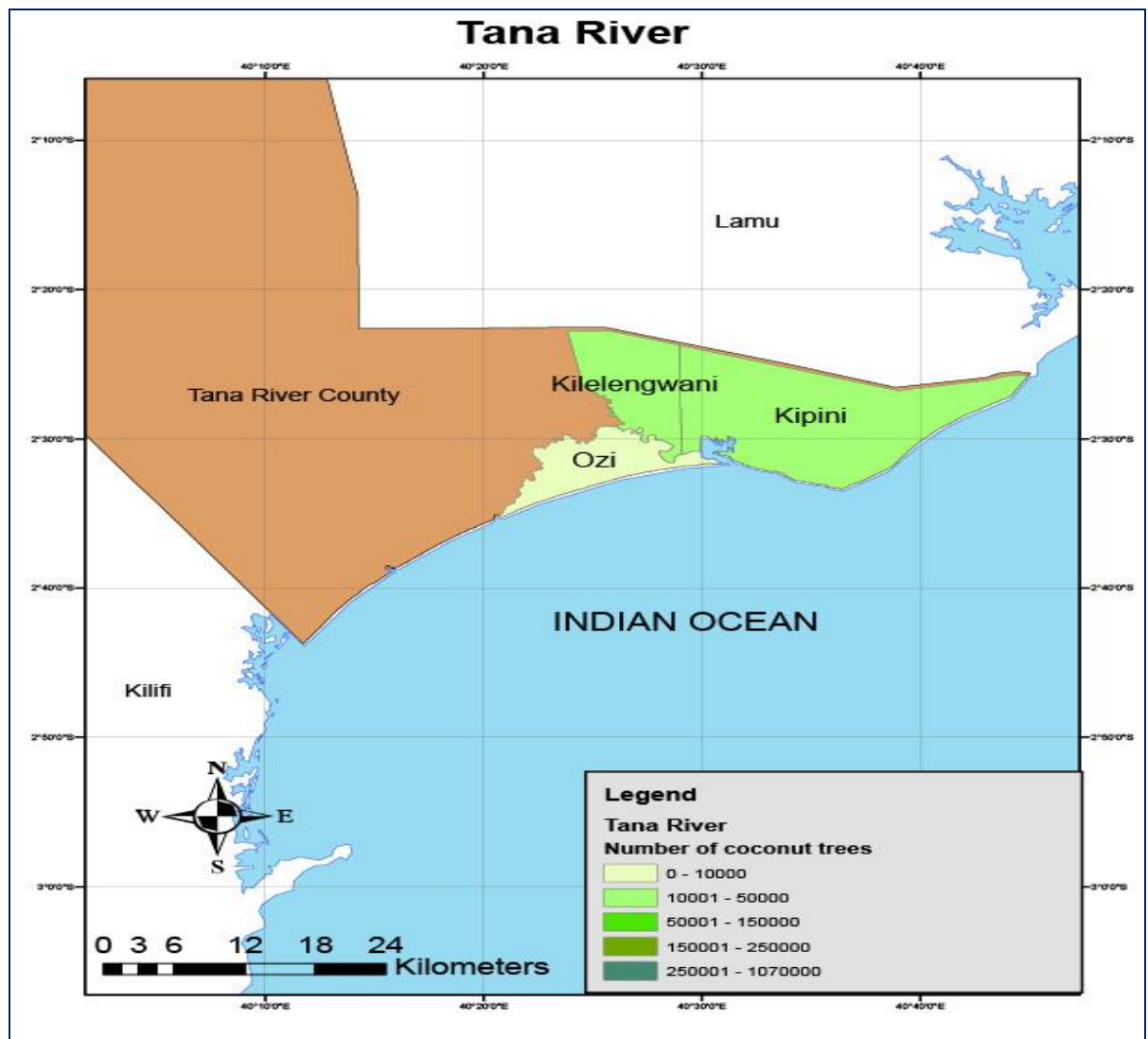


Location which was unavailable in the Base map is Samburu South.

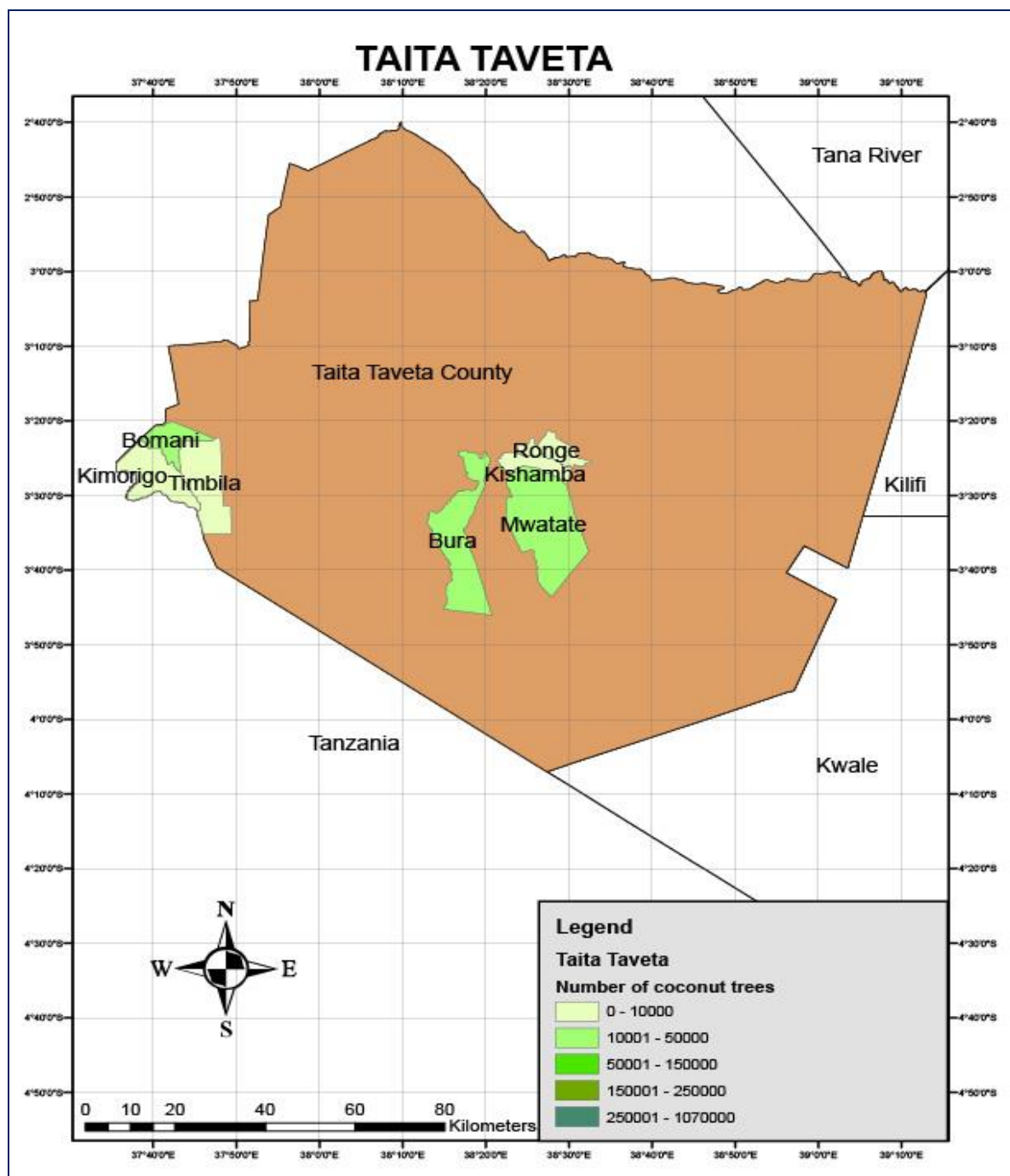


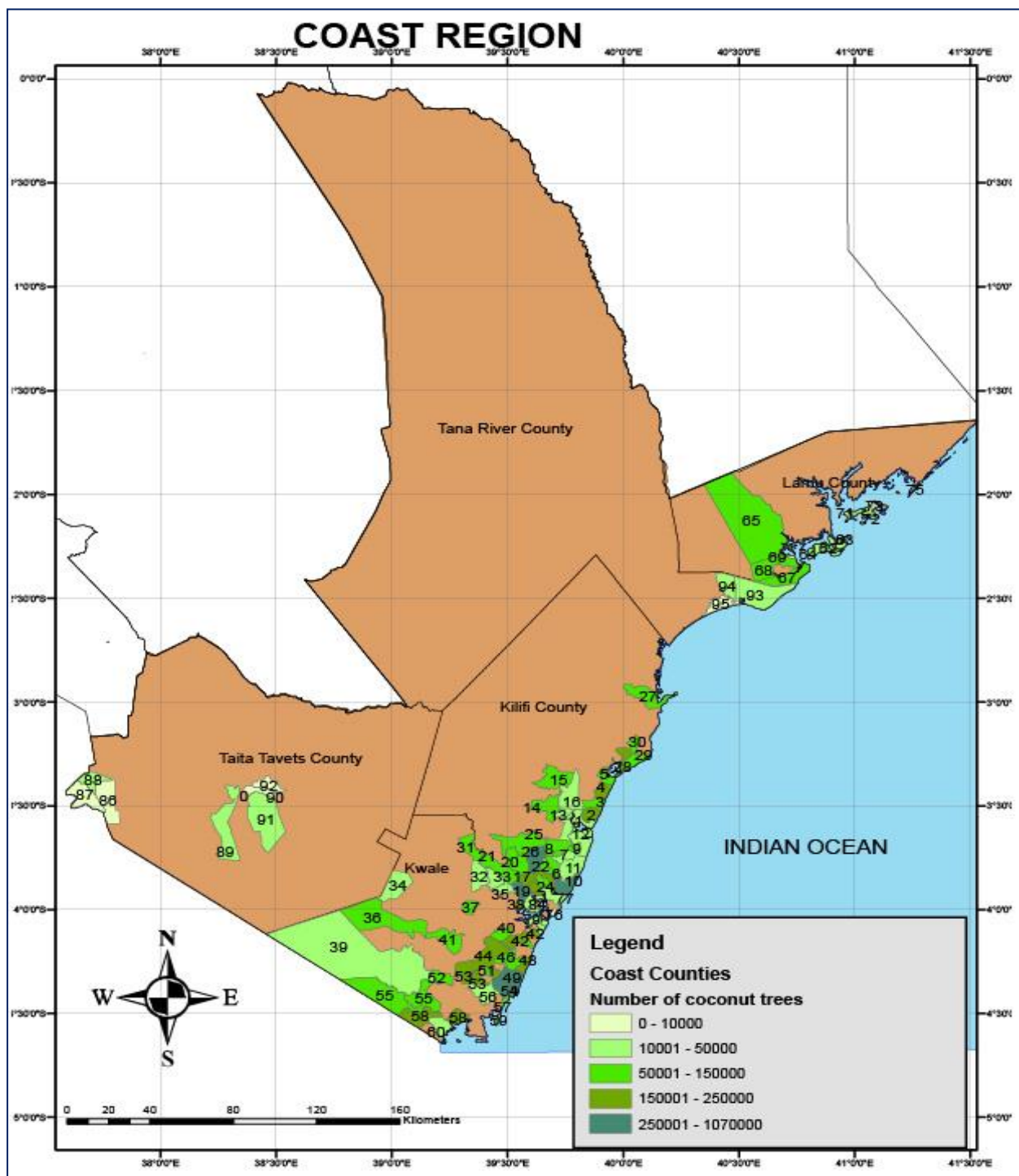


Tana River County



Taita Taveta County





Key Locations

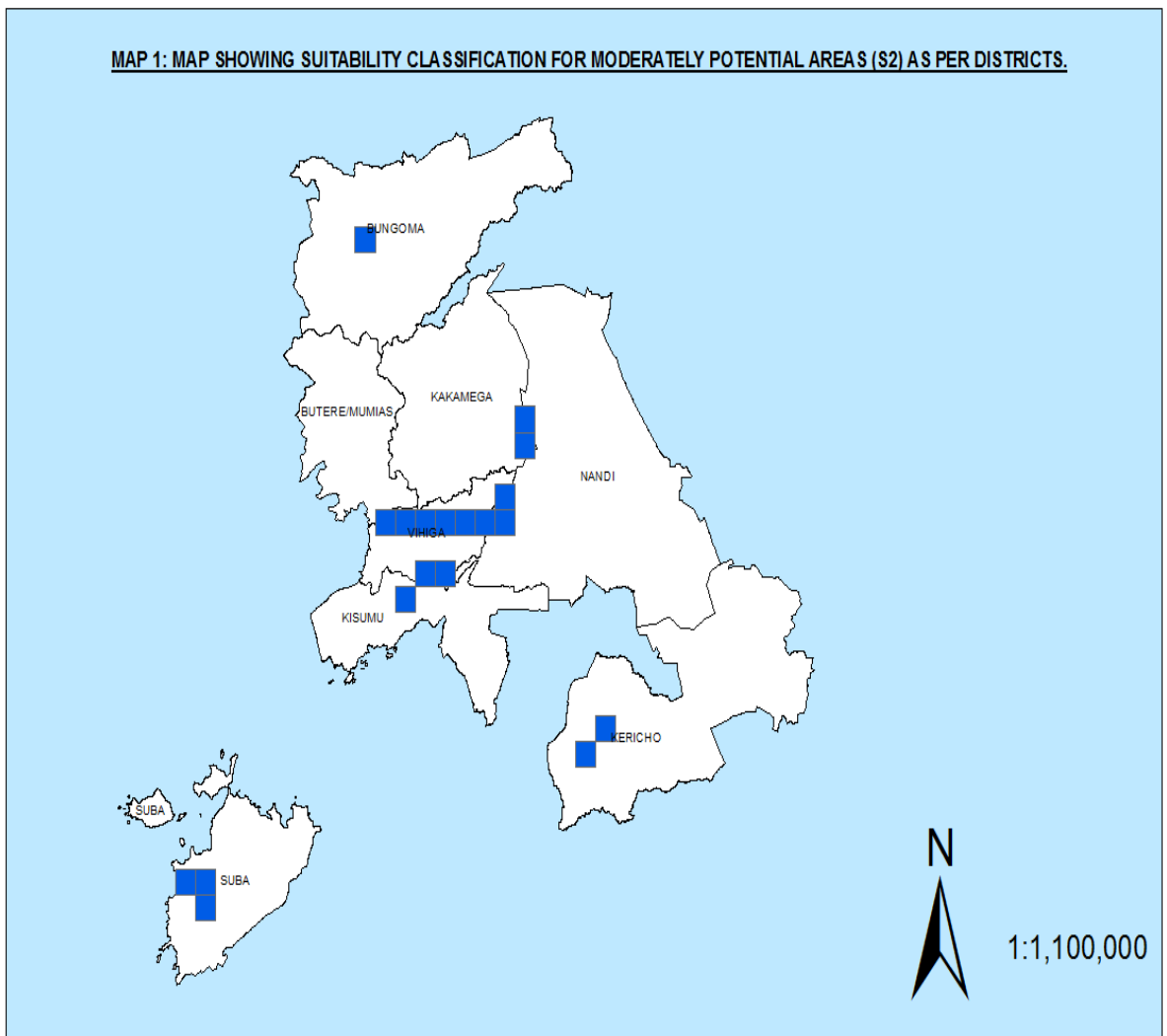
Locations Number							
1	Kilifi Township	25	Mwanamwinga	49	Dzombo	72	Siyu
2	Tezo	26	Kaloleni	50	Kikoneni	73	Tchundwa
3	Ngerenya	27	Gongoni	51	Mwereni	74	Kizingitini
4	Roka	28	Gede	52	Kasemeni	75	Ndau
5	Matsangoni	29	Watamu	53	Vanga	76	Kongowea
6	Mwarakaya	30	Ganda	54	Diani	77	Bamburi
7	Banda Ra Salama	31	Makamini	55	Mwaluphamba	78	Likoni
8	Chasimba	32	Mwatate	56	Mangawani	79	Mtongwe
9	Ziani	33	Taru	57	Majimboni	80	ShikaAdabu
10	Mtwapa	34	Mackinon Rd	58	Mkongani	81	Changamwe
11	Junju	35	Chengoni	58	Mkongani	82	Chaani
12	TakaunguMavueni	36	Kinango	59	Lukore	83	Port Reitz
13	Kauma	37	Gandini	60	Mwaluvanga	84	Mikindani
14	Ganze	38	Ndavaya	61	Mkomani	85	Miritini
15	Vitengeni	39	Puma	62	Langoni	86	Timbila
16	Soko	40	Tsimba	63	Shella	87	Kimorigo
17	Ruruma	41	Golini	64	Matondoni	88	Bomani
18	Mwawesa	42	Tiwi	65	Mkunumbi	89	Bura
19	Rabai	43	Waa	66	Ndambwe	90	Kishamba
20	Kayafungo	44	Ng'ombeni	67	Baharini	91	Mwatate
21	Mariakani	45	Mbuguni	68	Hongwe	92	Ronge
22	Jibana	46	Msambweni	69	Mapenya	93	Kipini
23	Kambe	47	Mivumoni	70	Faza	94	Kilelengwani
24	Ribe	48	Kidimo	71	Patte	95	Ozi

Appendix IV: National Coconut Survey Questionnaire

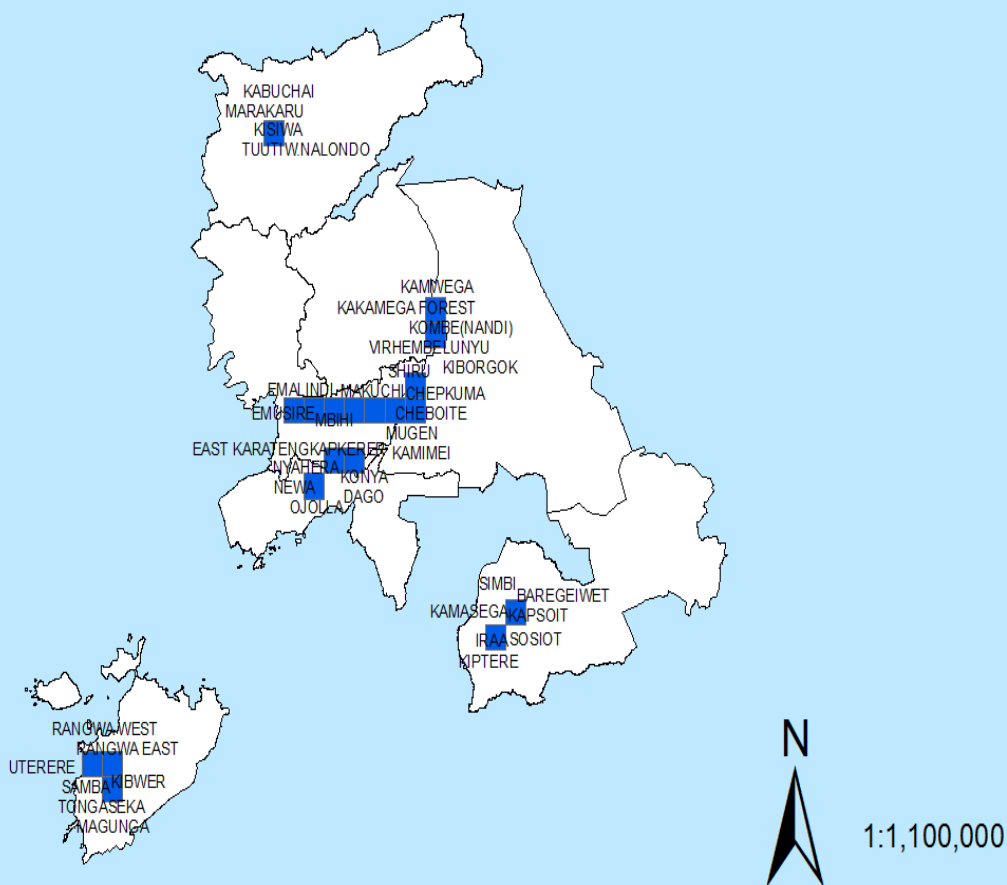
[illegible]

Appendix V: Agronomy Maps for Potential Coconut Growing Areas

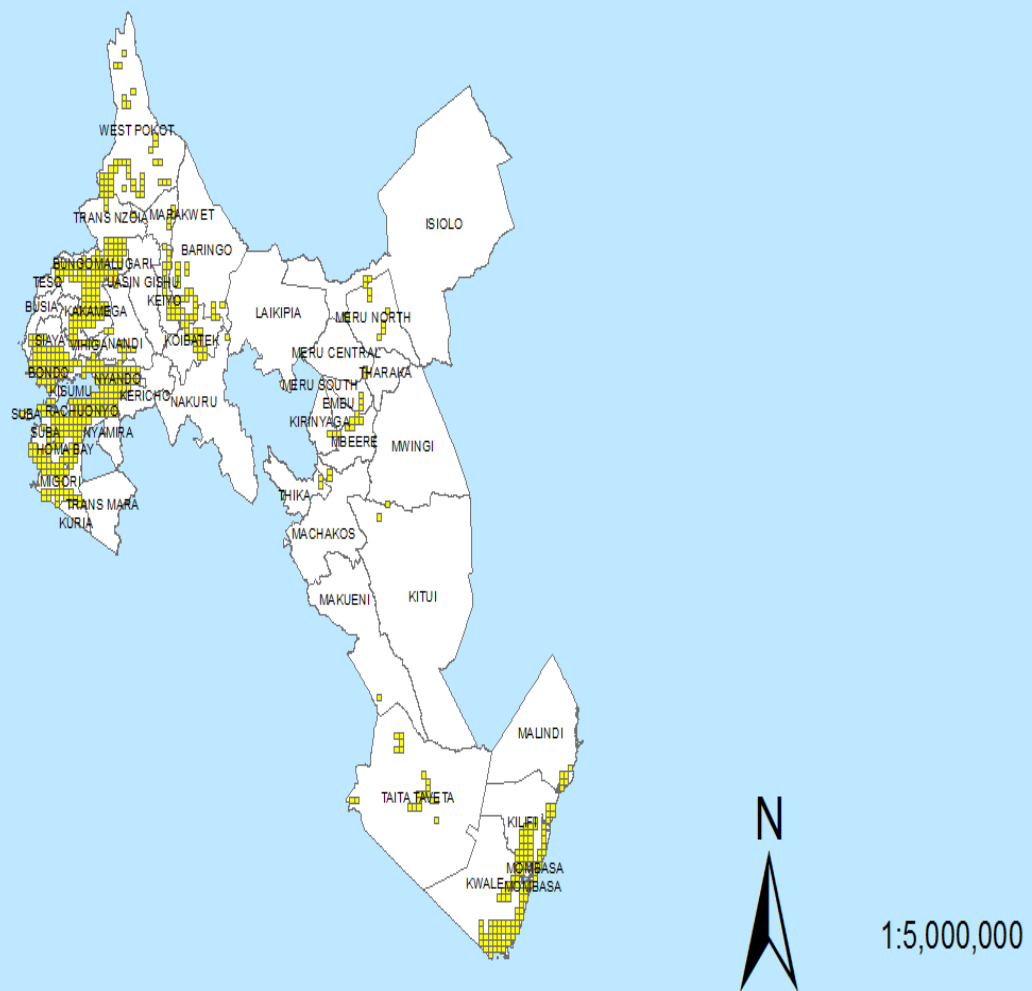
MAP 1: MAP SHOWING SUITABILITY CLASSIFICATION FOR MODERATELY POTENTIAL AREAS (S2) AS PER DISTRICTS.



MAP 2: MAP SHOWING SUITABILITY CLASSIFICATION FOR MODERATELY POTENTIAL AREAS (S2) AS PER SUBLOCATIONS.



MAP 3: MAP SHOWING SUITABILITY CLASSIFICATION FOR MARGINALLY POTENTIAL AREAS (S3) AS PER DISTRICTS.



MAP 4: MAP SHOWING SUITABILITY CLASSIFICATION FOR MARGINALLY POTENTIAL AREAS (S3) AS PER SUBLOCATIONS.

