

## Production, Marketing and Economic Importance of *Mnazi* and Other Coconut-based Products in Kenya

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**Abstract:** Study on production and marketing of palm wine (mnazi) and other coconut-based products was conducted at the coastal region of Kenya between June 2002 and April 2003. Both stratified and area-sampling methods were employed using two questionnaires; one for the tappers and the other one for the farmers. A total of 9,155 coconut tree farmers and 2,814 mnazi tappers from six geographical districts in the Kenyan coastal province were interviewed. From the production results coconut, copra, "makuti", "fagio" and "madafu" were the main coconut based products. According to the study, there were 4.84 million coconut trees, out of which only 2% were tapped producing 4.95 million decalitres of mnazi per year. The yearly copra production was 48,402 metric tonnes per year. Tappers own 35.5 % of the trees tapped while farmers owned the remaining 64.5 %. The yearly income generated from the sale of mnazi wine was Kshs.367.83 million (\$471,579), while other coconut-based products generated Kshs.856.01 million (\$1.10 million) per year. The average income per tapper per year was estimated at Kshs.63.80 thousand (\$818), while farmers earned Kshs.41.12 thousand (\$527) per year. The study indicated the need for proper government policy through the establishment of coconut boards so as to monitor production, processing and marketing of the coconut-based products.

**Key words:** mnazi, Kenya, farmers, tappers, production, marketing, palm wine

### INTRODUCTION

In Kenya, coconut products are sold with little or no value addition. This makes the prices of such products too low for farmers to break even. Currently, there are only three copra-milling companies operational, situated in Mombasa, Malindi and Lamu respectively. The extracted oil from copra is used in soap industries and candle manufacturing. However, the oil can be further refined into cooking fat and oil. Conversely, it is worthy noting that, technologies developed in other parts of the world have seen countries like Malaysia taking a leading role in the processing of products like pared kernel, desiccated coconut, coconut cream, coconut shell, coconut flour, and activated carbon through the SMEs and large industries<sup>[8]</sup>. In Thailand, where the coconut industry is well developed, the fruit of the coconut palm is the main source of many food products such as coconut milk/cream, desiccated coconut, coconut chip, coconut water, nata de coco, coconut oil, copra plasticizers, resins, non-soap detergents, food preparations and confectioneries, handicraft, vinegar and alcoholic beverages, culture media and others such as carpets and rugs. The tapped palm sap (*mnazi*) is used for sugar production and making of toddy beverages<sup>[8]</sup>.

Recent research carried by Crabbe *et al.*<sup>[1]</sup> has shown that bio-diesel can be generated from palm oils, with an aim of substituting N0.2 diesel fuel. This fuel is environmental friendly because there is substantial reduction of unburned hydrocarbons, Carbon Monoxide (CO) and particulate matter emission when it is used in conventional diesel engines<sup>[9]</sup>. Moreover, it contains no sulphur, so the sulphate fraction in the fuel is eliminated and since the oil originates from vegetable matter, the CO<sub>2</sub> produced is sequestered and the net CO<sub>2</sub> released into the atmosphere would be reduced greatly.

Based on the fact that there are many different categories of products that can be derived from the coconut tree, the crop can therefore be regarded as one of the high value cash crop with the potential for intensification. Despite this, coconut farmers in Kenya are suffering due to low farm productivity, unstable and poorly developed markets for their products. Evidence from other parts of Africa, indicates that farm incomes and productivity can benefit from engaging in cash crops with well-developed channels for procuring inputs on credit and marketing the crop<sup>[2, 6]</sup>.

Economists have long advocated for specialization and commercialization as part of a broader strategy of comparative advantage. The underlying premise is that

markets allow households to increase their incomes by producing that which provides the highest returns to the land and labour, and the using cash to buy household consumption items, rather than being constrained to produce all various goods needed for consumption<sup>[10]</sup>. With proper policy and management of the sub-sector, coconut farming should be considered for the comparative advantage strategy, considering the fact that coconut does well in soils where other food crops perform poorly. It is important to note that cash-generating crops can help farmers overcome capital constraints on the purchase of lumpy assets and inputs, which can be used to expand food crops as well as cash crop production<sup>[11]</sup>. Coconut as a cash generating crop can play this role if well promoted with proper marketing channels.

## MATERIALS AND METHODS

**Research Design:** Methodology used in this study was largely quantitative. However, participatory approaches were used for gathering information that was used in guiding the survey and enriching analysis and interpretation of the survey results. Both cases were simultaneously and sequentially utilized to collect the required information. A simple cross-section survey design was applied to collect the data, where households of the farmers and tappers in the projected areas (all the six districts) were given an equal chance of being selected for the survey.

**Population:** According to the population census of Kenya (1999), the six survey districts had 469,792 number of households out of which only 208,362 were indicated as farmers' households. Since not all the farmers' households were involved in coconut production. The survey targeted households in areas with high concentration of coconut population whereas areas with no or little activities were isolated from the survey. This exercise of area identification was done with the help of local provincial administration (Sub-chiefs) together with area staff from the Ministry of Agriculture (MoA). Survey targeted all the heads of households practicing coconut farming while the questionnaire for tappers targeted the individual tappers in the selected areas. For families living in homesteads, it was the homestead head that was targeted, since according to *Mijikenda* customs/traditions it is the homestead head that can claim ownership of all the coconut trees owned by members of his homestead. This trend is passed from generation to generation.

**Sample:** The survey was conducted in the Coastal region of Kenya between June 2002 and April 2003 by trained enumerators. The survey covered 6 districts of

the coast province of Kenya namely; Kwale, Mombasa, Kilifi, Malindi, Tana River and Lamu, with major focus on coconut growing areas. The focal point was sub location. However, areas with no coconut farming or very little of it were left out the survey.

During the survey a total of 2,814 tappers and 9,155 heads of household/homestead were interviewed based on areas with significant concentration of coconut farming across the region.

**Sampling Method:** Both the stratified and area-sampling methods were employed for the purpose of this survey. First the population was divided into homogeneous sub-parts (strata), which were mainly the tappers and coconut farmers. Area sampling then followed in which the project area (coast province) was divided into small administrative areas (districts). The districts were further sub-divided into divisions and locations. This method assisted in identifying the exact locations/sub-locations where the actual survey was to be conducted. In the selected areas, all the farmers and tappers were then interviewed.

**Data Collection Tool:** The main tool used for the survey was a questionnaire. Primary data was collected from both farmers and tappers using two-structured questionnaires. One questionnaire was designed specifically for farmers while the other targeted tappers only. The study was conducted in local language (Giriama) and Kiswahili. The tappers and farmers were probed through simple questions found in the questionnaires. Information sought under these instruments related to annual production of various coconut-based products as well as earnings from these products, prices and quantities of mnazi tapped at low and high season as well as ownership of trees being tapped. The secondary sources of information were informal list of tappers and coconut farmers obtained from the local chiefs' offices and that from local extension workers working with the Ministry of Agriculture.

**Pre-testing of the Data Collection Tool:** The appropriateness of the data collection tool(s) was studied during stakeholders seminar held at the Jomo Kenyatta University of Agriculture and Technology (JKUAT) where 26 participants participated in this exercise. Out of the 26 participants, 6 of them were enumerators picked from all the six districts where survey was to be conducted. The main aim of the seminar was to refine the instrument and improve in overall planning process. After the seminar the 6 enumerators undertook the actual pre-testing exercise in 5 days at the following sites- Mombasa- Kisauni, Kilifi-Mtwapa, Kwale-Matuga, Malindi- Gede, Lamu- within the island, and

Tana River-Kipini. After the pre-testing, the data from the six sites was analyzed with the major focus on problems encountered in getting information from the respondents and the ability to achieve the set goals. Finally all the questions that proved difficult to administer were revised accordingly in line with the findings of the pre-testing exercise while important information that was not captured in the pre-tested survey questionnaire(s) was included in the revised version.

**Data Collection:** The data collection exercise was carried out by a team of over 700 enumerators identified at the sub-location level with the help of both provincial administration and extension workers of the ministry of agriculture. This method of selection was done to make sure each enumerator had full knowledge of the areas of interest and was acceptable to all farmers and tappers in the area. The Principal Investigator trained each team over a 1day period on the survey approach and how to accurately administer the questionnaires to the respondents. In the actual implementation of the data collection exercise, each team of enumerators was supervised on a day-to-day basis by the Principal Investigator assisted by his two assistant and the MoA staff based at divisional level. To authenticate and cross check quality of work done by the enumerators, the supervisors made frequent spot checks among farmers and tappers alike. This was done to ensure all the tappers and farmers in the selected areas were visited and the information given was correct. The spot check was done on randomly selected zone of each sub-location on 10 farmers and 10 tappers in a row. All the questions in the questionnaires were asked in local language (Giriama) and Kiswahili.

**Data Processing:** Data entry, processing and analysis were done using SPSS for Windows (Version 8.0) spreadsheet program and Microsoft Excel 2000. Descriptive statistics (frequencies, scores, mean, maximum, minimum) were determined. A team of trained data input and coding clerks managed the whole exercise of data processing. The actual processing and analysis started with data cleaning to remove the gaps and ensure consistency.

## RESULTS AND DISCUSSIONS

**Production and Marketing:** According to the survey a total of 41.9 million units of coconuts were produced annual. Kilifi district was leading with a production of 24.3 million units, followed by Kwale (9 million units) and Malindi (4.4 million units). The least was Tana River with 0.68 million units followed by Mombasa and Lamu with 1 million and 2.4 million units respectively.

The copra production was 14 million metric tons. Kilifi was leading with 12.2 million metric tons followed by Malindi (0.9 million metric tons) and Kwale (0.55 million metric tons), the least being Tana River with 31 thousand metric tons. The results for other products are as provided in Table 4.1.

According to the survey a total of KES405 million (US\$ 5.2 million) was earned The highest earnings were realised from the sale of copra, followed by coconut, *makuti*, *kanja*, *fagio* and *madafu* (Table 4.2).

According to survey findings, a total of 44,663 trees were tapped, out of which 15,839 were owned by the tappers while the remaining 28,824 were owned by farmers. Kilifi district had the highest number of trees tapped (26,858), followed by Malindi (7,878), Mombasa (6,080), Kwale (3,350), Tana River (470) and Lamu 27 trees. On average 35.5% of the coconut tapped were owned by the tappers while the remaining 64.5% were owned by the farmers (Table 4.3).

During low season, the mean prices of *mnazi* per litre ranged from KES15.2 to KES25.0, while the prices at high season ranged from KES8.0 to KES20.0. Kilifi district recorded highest quantities of *mnazi* both during low and high seasons (26,666.3 and 52,281.7 litres/day, respectively). During low season, a total of 9.2 million litres, while 13 million litres were realized during high season (Table 4.4).

Percentage survey coverage in Kwale, Kilifi, Malindi and Lamu districts were 29.68, 52.53, 45.29 and 85.75%, respectively. However the coverage in Mombasa and Tana River districts were more than 3 times the acreage provided by the ministry of Agriculture (304.38 and 491.41%, respectively). Since the acreage covered in Mombasa and Tana River districts were higher than that documented by the ministry of agriculture (Table 4.5).

For economic analysis purposes, the percentage coverage in these two districts was therefore estimated based on survey data only while that provided by the ministry of agriculture was ignored. From Table 4.5, the estimated number of coconut trees was therefore found to be 4.62 million. According to Table 4.5, Kilifi is leading with 2.32 million trees, followed by Kwale with 1.35 million trees. Others were Malindi (0.58 million trees), Mombasa (0.24 million trees), Lamu (0.11 million trees) and Tana River (15 thousand trees).

**Economic Analysis of Coconut-based Products:** Using the values of the annual earnings per district provided in Tables 4.2 and 4.6, the income from coconut-based products per farmer was calculated by taking the annual earnings divided by the percentage acreage covered during the survey all divided by the estimated total number of farmers in the district. These results are provided in Table 4.6. Table 4.6 therefore shows the

**Table 4.1:** Annual production of coconut-based products per district ('000 units)

Districts covered during the survey							
Products	Kilifi	Kwale	Malindi	Mombasa	Lamu	Tana River	Totals
Coconut	24,344.85	8,973.75	4,419.83	1,038.58	2,405.69	684.73	41,867.43
Copra <sup>a</sup>	12,240.12	551.89	915.99	133.52	140.34	31.09	14,012.95
<i>Makuti</i>	11,671.38	2,558.37	6,602.51	440.93	253.43	562.45	22,089.07
<i>Kanja</i>	7,585.33	974.39	207.88	85.09	12.55	na	8,865.24
<i>Fagio</i>	2,809.15	55.38	159.41	20.43	2.86	0.64	3,047.87
<i>Madafu</i>	1,009.55	325.68	730.92	144.14	115.56	93.01	2,418.86
Shell	14,634.77	2,263.99	444.01	470.65	0.75	23.49	17,837.66
Tree trunk	5.65	5.95	1.03	2.03	13.01	0.06	27.73
Totals	74,300.80	15,709.40	13,481.58	2,335.37	2,944.19	1,395.47	110,166.81

<sup>a</sup> Figures in metric tons

**Table 4.2:** Annual earnings from coconut-based products per district (Kshs '000)<sup>1</sup>

Districts covered during the survey							
Products	Kilifi	Kwale	Malindi	Mombasa	Lamu	Tana River	Totals
Coconuts	65,731.10	20,190.94	14,452.84	4,060.85	5,581.20	2,862.17	112,879.10
Copra	109,449.07	6,418.48	9,196.54	1,295.14	1,206.92	274.14	127,840.29
<i>Makuti</i>	43,650.96	17,703.92	32,022.17	2,654.40	1,272.22	3,384.45	100,688.12
<i>Kanja</i>	22,452.58	3,030.35	463.57	262.08	50.20	na	26,258.78
<i>Fagio</i>	16,208.80	493.44	1,753.51	174.88	18.39	0.32	18,649.34
<i>Madafu</i>	6,582.27	1,465.56	3,391.47	699.08	486.51	651.07	13,275.96
Shells	947.20	161.62	18.34	156.88	0.25	na	1,284.29
Trunks	203.68	209.02	2,994.77	62.46	607.18	na	4,077.11
TOTALS	265,225.66	49,673.33	64,293.21	9,365.77	9,222.87	7,172.15	404,952.99

na, data not available because production was not for sale but for home use

<sup>1</sup>values obtained from annual production multiplied by mean prices (US\$1= KES70)

**Table 4.3:** Number of coconut trees tapped and percentage ownership per district

District	Trees tapped	Trees tapped (owned by tappers)	Trees tapped (owned by farmers)	Trees tapped (%) (owned by tappers)	Trees tapped (%) (owned by farmers)
Kilifi	26,858	11,652	15,206	43.4	56.6
Kwale	3,350	378	2,972	11.3	88.7
Lamu	27	na	27	na	100
Malindi	7,878	1,070	6,808	13.6	86.4
Mombasa	6,080	2,637	3,443	43.4	56.6
Tana River	470	102	368	21.7	78.3
Totals	44,663	15,839	28,824	35.5 <sup>a</sup>	64.5 <sup>a</sup>

<sup>a</sup> Overall percentage in all the six districts

**Table 4.4:** Prices and quantities of *mnazi* tapped during low and high seasons of the year per district

District	Low season <sup>1</sup>				High season <sup>1</sup>			
	Quantity / Day (litres)	Quantity/ Season (litres) <sup>a</sup>	Mode price/ litre (Kshs)	Mean price/ litre (Kshs)	Quantity / Day (litres)	Quantity/ Season (litres) <sup>a</sup>	Mode price/ litre (Kshs)	Mean price/ litre (Kshs)
Kilifi	26,666.30	5,706,588	15	15.2	52,281.70	7,894,537	8	10
Kwale	3,573.00	764,622	10	16.8	7,300.50	1,102,376	9.4	10
Lamu	42	8,988	25	25	135	20,385	20	20
Malindi	7,915.50	1,693,917	15	17	14,808.00	2,236,008	9.2	10
Mombasa	4,008.80	857,883	20	23.2	9,509.00	1,435,859	15.8	15
Tana River	950	203,300	20	19	1,842.00	278,142	13.3	15
Total	43,155.60	9,235,298			85,876.20	12,967,307		

<sup>1</sup>Low season: March to October( 214 days), High season: November to February (151 days)

<sup>a</sup>Figures obtained by multiplying quantity per day by the number of days in the respective season

**Table 4.5:** Number of coconut trees based on acreage covered during the survey per district

District	Survey coverage (%)	Acreage <sup>1</sup>	Acreage <sup>2</sup>	No. coconut trees	No. coconut trees (estimated) <sup>b</sup>
Kilifi	52.53	44,288.60	23,263.56	1,220,172	2,322,810
Kwale	29.68	44,768.51	13,285.92	401,158	1,351,611
Malindi	45.29	10,531.62	4,770.23	264,262	583,489
Mombasa	304.38 <sup>a</sup>	1,786.82	5,430.50	236,399	236,399
Lamu	85.72	6,102.75	5,231.49	94,090	109,764
Tana River	491.41 <sup>a</sup>	506.57	2,489.50	15,503	15,503
Totals		107,984.87	42,514.20	2,231,584	4,619,576

<sup>1</sup> Source: Ministry of Agriculture, Kenya 1999

<sup>2</sup> Source: Survey conducted in this study

<sup>a</sup> Figures higher than those provided by the Ministry of Agriculture  
Ministry value converted into acres using : 1 Hectares = 2.47105 acres

**Table 4.6:** Annual income from coconut-based products per farmer (For conversion US\$1=KES78 as at April, 2003)

District	Survey coverage (%)	No. farmers <sup>a</sup>	Products earnings (KES) <sup>b</sup>	Total annual earnings (KES) per district <sup>c</sup>	Annual Income/ household (Kshs) <sup>d</sup>
Kwale	29.68	8,652	49,673,330	167,362,972	19,344
Kilifi	52.53	7,885	265,225,660	504,903,217	64,033
Malindi	45.29	1,713	64,293,210	141,958,953	82,872
Mombasa	304.38 <sup>1</sup>	1,414	9,365,770	9,365,770	12,421
Lamu	85.72	923	9,222,870	10,759,298	11,657
Tana River	491.41 <sup>1</sup>	233	7,172,150	7,172,150	57,840
Totals		20,820	404,952,990	832,156,590	

<sup>a</sup>Figures obtained by dividing the number of farmers interviewed divide by survey coverage (%)

<sup>b</sup>Survey values obtained from Table4.2

<sup>c</sup>Figures calculated by taking products earnings divided by the survey coverage (%) given in Table4.6

<sup>d</sup>Values calculated by dividing the total annual earnings with the number of farmers/district

<sup>1</sup>Since the percentage coverage were too high they were ignored during calculation of estimates

**Table 4.7:** Annual incomes from *mnazi* per tapper per district

District	Coverage (%)	Annual Production (litres) <sup>a</sup>	Mean Price (KES)	Estimated Annual Earnings (KES) <sup>b</sup>	Tappers Interviewed (estimated) <sup>c</sup>	Annual Income/tapper <sup>d</sup>
Kwale	29.68	1,866,998	16.8	105,679,132	755	139,972
Kilifi	52.53	13,601,125	15.2	393,560,061	3,396	115,889
Malindi	45.29	3,929,925	17.0	147,513,193	691	213,478
Mombasa	304.38 <sup>1</sup>	2,293,742	23.2	53,214,814	435	122,333
Lamu	85.72	29,373	25.0	856,655	2	428,328
Tana-River	491.41 <sup>1</sup>	481,442	19.0	9,147,398	56	163,346
Total		22,202,605		709,971,254	5,765	

<sup>a</sup>Values are sum of quantities produced during low and high season.

<sup>b</sup>Values calculated by multiplying annual production with mean prices divided by the fraction of survey coverage

<sup>c</sup>Values calculated by dividing tappers interviewed (survey) by survey coverage (%)

<sup>d</sup>Values calculated by dividing from annual earnings divided by number of tappers interviewed (estimated)

<sup>1</sup>Since the percentage coverage were too high they were ignored during calculation of estimates

annual income from coconut-based products per household. Malindi recorded the highest annual income/household of followed by Kilifi, Tana-River, Kwale, Mombasa and Lamu. A total of KES832 million was realized from the sale of coconut-based products. Kilifi led followed by Kwale, Malindi, Lamu, Mombasa.

**Economic Analysis of *Mnazi*:** The annual income from *mnazi* per tapper per district is provided in Table 4.7 below. The annual production was calculated by adding the total quantities of *mnazi* produced during low and high season. The overall mean price per litre of *mnazi* was calculated by finding the mean prices during low season and high season. Finally the Annual incomes were calculated by taking the annual production multiplied by the mean prices. Incomes per tapper were calculated by taking the annual earnings divided by the number of tappers per district. The results show that a total of 22 million litres were produced annual (Table 4.7), while KES710 million was earned annual through the tapping of *mnazi*. Kilifi recorded the highest production (13 million litres). Second in production was Malindi (4 million litres) followed by Mombasa (3 million litres) and Kwale (1.9million litres). In terms of earnings, Kilifi led with KES 393 million while Malindi was second followed by Kwale, Mombasa, Tana River and Lamu (KES147.5; 105.7; 53.2; 9.1 and 856.6 million respectively) as shown in Table 4.7.

Coconut tree, despite being an economically important cash crop at the Coastal region of Kenya (tree of life), there has been very little effort to maximize the production and use of coconut-based-products, for both domestic and industrial applications due to poor government policy and lack of incentives. From the results (Tables 4.1 and 4.2), coconut, copra, *makuti*, *kanja*, *fagio* and *madafu* are the main coconut-based products produced in large quantities at the farm gate. These products are generating more income than other coconut-based products. In Malindi the top income earners were *makuti* and *madafu* as opposed to the other districts in which coconut, copra and *makuti* are taking

leading role in quantities produced and incomes generated. This is attributed to the fact that Malindi is one of the leading tourist towns in the region hence the high demand of thatching material (*makuti*) for the tourist hotels, villas and resorts as well as the tender nuts (*madafu*) by tourists. *Madafu* are consumed because of their natural sweet water. At the industrial level, there are only three copra-milling companies that are operational, situated in Mombasa, Malindi and Lamu respectively while the two coir fibre factories which used to make fibre from husks (one in Kwale and the other in Kilifi) have closed down. This showed that the coconut industry was being operated below the expected capacity in terms of development of the crop in the areas of production, processing, marketing, research and development. Lack of small and medium scale enterprises (SMEs) and large-scale industries to process coconut-based products, has contributed greatly to the under development of the coconut industry in Kenya. For Kenya to take her position in terms of production, processing, marketing and research of coconut-based products, the government should come up with an appropriate strategy for the development of coconut sub-sector through the newly established Kenya Coconut Development Authority. Since coconut has a vital role to play in rural development of the Coastal region of Kenya, any development and exploitation of other economic uses of coconut-based products will not only benefit the Coastal communities but also the Kenyan government through saving of the foreign exchange that the country spends annually on the importation of vegetable oils and fats. The country currently imports 95% of its edible oil requirements (250,000 metric tonnes) at an estimated cost of KES11.1 billion (US\$14.23 million). About 30% of the total import (75,000 metric tonnes) is used annually in the manufacture of soap. Since the extracted oil from copra can be used in soap industries, candle manufacturing and in some cases the oil can be further refined for making cooking fat and oil <sup>[7]</sup>, with proper policy therefore, the country can cut down its oil imports through substitution of some of its imported oil with

coconut oil. Apart from coconut palm, Kenya is suitable for the growth of wild palm (*Phoenix reclinata*) and Malaysian palm (*Elaeis guineensis*). Initial research trials have confirmed that Malaysian palm can grow in the coast and western regions of Kenya. Although the crop is doing very well in western Kenya, trials at the coast show that it is not doing all that well at the coast as expected due to inadequate rainfall. However, with irrigation using Ramisi, Tana and the Athi rivers, Kwale and Tana River districts could serve as the major producers of Malaysian Palm in Kenya.

Most of the trees tapped are owned by the farmers (64.5%) while the tappers themselves owned the remaining 35.5%. In Lamu district, only two tappers were interviewed, however the number is suspected to be even much higher. It was reported by the research assistants that, most tappers declined to be interviewed because tapping and drinking of any alcoholic beverage were considered as being against the Islamic teachings and principles. Most of the people living in Lamu district are Muslims (over 90%), so these results were justifiable. The fact that people in Lamu drink sweet coconut toddy (*tembo tamu*), which is a non-alcoholic drink from fresh *mnazi* before active fermentation commences, confirms the fact that tapping of coconut toddy takes place in Lamu. Out of 2,231,584 trees counted (Table 4.5) only 44,663 trees were being tapped (Table 3); this gives a mere 2% of the number of trees tapped in the region. According to <sup>[3]</sup> some of the constraints faced by tappers and farmers were based on lack of proper incentives. Once a permanent solution is found to these constraints tappers could easily find themselves doubling the production of *mnazi* from the current projected figure of 22.2 million litres to 44.4 million litres.

Generally, it is believed that coconut trees used for *mnazi* production cannot be used for nut production, but research strongly shows that it is practical, feasible and economically viable to produce both *mnazi* and nuts in the same spathes/spadices of coconut through a sequential *mnazi* tapping and nut production scheme (SMWTNP). This technique involves the taping for sap (*mnazi*) during the first half of the spathe, followed by allowing the remaining half to develop normally producing mature nuts <sup>[4, 5]</sup>. Tapping and consumption of *mnazi* when well controlled under proper government policy, may lead to the production of cheap and high quality traditional alcoholic beverage that may serve as an alternative drink to the clear beers such as lager beers. The fact that many Kenyans are dying due to consumption of "illicit brews" with others being inflicted with permanent injuries such as loss of sight, show the need for safe and cheap alcoholic drink that will cater for the low income earners, who go for the illicit brews because they cannot afford the lager beers.

The surveyed area in Mombasa and Tana River districts is far much bigger than that estimated by the Ministry of Agriculture. The higher Figures could have been attributed to the fact that the survey covered parts that had been omitted by the Ministry of Agriculture officials. Some of the constraints faced by extension officers on the ground that impacted negatively on service delivery and data collection were given as: under staffing, lack of adequate financial allocation and means of transport. The fact that local research assistants were engaged in this study made it possible to cover areas that could not be reached by the Agricultural Extension Officers. In Mombasa district for example the survey covered fifteen (15) different sub-locations, while in Tana River district, a total of four (4) sub locations were covered.. In addition most officers regard Tana River district as a security risk district. This makes most of them being confined to their offices with little activity on the ground. The officers therefore were unable to give accurate statistical estimates on coconut-based products. For our study however, local research assistants were engaged hence we were able to cover areas that could not be covered by the Agricultural Extension Officers (AEOs) on the ground.

During the survey it was established that most beach hotels and holiday resorts at the Coastal region of Kenya utilized various coconut-based products such as *madafu*, coconut, shell and leaves for various uses. *Madafu* drinks for example are used to welcome tourists on arrival. They are also used to make drinks such as Pina Colada commonly known as *nazi* milk juice during international cocktails. The coconut shells are used as decoration in hotels. They are also used to make serving spoons (*upawa*) and other products such as bangles, beads and combs. The coconut branches are weaved for decorations inside the hotels. The coconut branches (*makumbi*) are used for fencing and partitioning. Finally the trees apart from providing beauty (scenario) they also serve as a windbreaker.

The results show that *mnazi* earnings are higher than those from other coconut-based products except in Kilifi district where other coconut-based products fetched more money than *mnazi*. These earnings could even triple with value addition.

From this study, it is clear that coconut farming in Kenya requires to be transformed from semi-subsistence, low-input, low-productivity system into a full-fledged commercial cash crop. To achieve this objective, both the government and the private sector should come with a strategy of supporting the sub-sector.

**Conclusion:** In Kenya, the need to transform coconut farming from semi-subsistence, low-input, low-productivity system into a full-fledged commercial cash crop requires proper policy on production, processing,

marketing, trading and warehousing of coconut-based products including *mnazi*. Among the coconut based-products, *mnazi* has more annual income than other coconut-based products. Value addition is therefore required for better utilization and marketing hence increased income.

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