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Utilization of *Doum Palm* (*Hyphaene* Species) Leaves in Sudan Savanna Ecological Zone of Nigeria

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Abstract

The study was carried out to assess the utilization of *Hyphaene* species leaves (*Doum palm*) in Birnin Kebbi Local Government Area of Kebbi State, Nigeria. Four Districts were purposely selected for the study, from the four purposely selected districts; three villages were randomly selected each giving a total of twelve villages. A structured questionnaire was used to obtained information from randomly selected 15 respondents in each of the villages. A total of 180 questionnaires were administered. Results showed that majority (86.1%) of the respondents were females. The average age of the respondents was between 30 - 60 years accounting to (55.6%). Majorities (90.0%) of the respondents were married. The products made from *Doum palm* leaves identified in the study include mats, ropes, hats and hand fans. Mats' weaving was the major product produced from the *Doum palm* leaves (54.4%). The result also revealed that utilization of *Doum palm* leaves was very important to the rural economy through the sales of its products. It was found out that the respondents realized between N1, 000toN15, 000 per month from the sales of *Doum palm*leaves products and the money generated were used for household feeding, purchased of farm inputs, health care and paying of children school fees. Overgrazing, other anthropogenic factors destroying the species, low price of the products and in-ability of the products to compete favourably with similar synthetic products made from rubber were identified as major problems faced by the local industry utilizing doum palm leaves in the study area. Government should put in place relevant laws/regulations guiding the conservation of Non-Timber Forest Products (NTFPs) species for the roles they play in rural livelihood activities; also government should provide modern technology to develop the local *Doum palm* leaves industry for the role it plays in the rural economy.

Keywords:
Utilization,
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Background to the Study

Hyphaene is a genus of palms native to Africa, the Middle East and the Indian subcontinent. The genus includes the Doum palm *(Hyphaene thebaica, Hyphaene compressa, Hyphaene coriacea, Hyphaene Petersiana, Hypahaene dichotoma, Hyphaene guineensis, Hyphaene macrosperma and Hyphaene reptans*). They are un-usual among palms in having regular naturally branched trunks; most other palms are single stemmed from the ground (Govaerts and Dransfield, 2005). This fruit tree is widespread all over semi-arid sahelian zone of West Africa. It is commonly found in the northern part of Nigeria (Sokoto, Kebbi, Kano, Zamfara, Katsina, Jigawa, Borno, Yobe, Bauchi, and Gombe States) and the fruits are usually consumed by children in this part of the country just like the way almond is consumed by children in the Western part of Nigeria (Moussa et al., 1998; Orwa et al., 2009).

Male and female flowers are produced on separate tree. The inflorescences are similar in general appearance up to about 1.2 metres long, branching irregularly and with two or three spikes arising from each branchlet. Female trees produce large woody fruits, each containing a single seed, that remain on the tree for a long period. It dislikes water logged soils and is very resistant to destruction by bush fires (Agroforestry Tree Database, 2014).

Doumpalm leaves is common to most African countries and play a significant role in the rural economy. The leaves locally known as Kaba, have a wide range of application ranging from common household utensils to Agricultural implements and fishing gears. The doum palm tree is threatened and facing extinction by many anthropogenic and climatic factors; deforestation, over-grazing, agricultural expansion, bush fire e.t.c. The products derived from the leaves (Kaba) are also being replaced by synthetic similar products. Despite these problems, the doum palm leaves still provide a source of living to many people in the rural communities. This study therefore, intended to bring to the fore, the significance of the palm leaves mostly in the rural area which should necessitate the conservation and management of the species in their natural range.

Although, we are in the changing world where most renewable natural resources especially trees in our forest are faced by forces of climate change and anthropogenic factors, however, a good number of them remain and play a significant role in the rural economy and their products persist. One of these trees is *Hyphaene* species. The leaves of this tree play a significant role in the rural economy through provision of different products that are still in use. This study provides information regarding the status of *Hyphaene* species and products derived from them over time. The main objective of the study is to assess the utilization doum palm leaves (*Hyphaene* species) in Birnin Kebbi Local Government Area, Kebbi State, Nigeria.

Materials and Methods

Study was carried out in Birnin Kebbi Local Government Areas of Kebbi State, located between latitude $12^0$27'14" Nand longitude $4^0$11'51" E. The minimum and maximum Temperatures are 19^0C and 34^0C respectively with mean annual temperature of 27^0C and relative humidity of 52% to 55%.

Sampling Techniques and Sample Size
Four (4) Districts were purposely selected for the study,three (3) Villages were randomly selected from each District and fifteen (15) respondents were randomly selected to formone hundred and eighty (180) sample size. The Districts purposely selected are; Ambursa, Zauro, Kardi and Makera.

Data Collection Procedure
Data was collected through interview schedule with the aid of a pre-tested structured questionnaire. Information collected during the interview include socio-economic characteristics of the respondents; products made from doum palmleaves; category of people involved in harvesting; processing and utilization of kaba leaves; places where *Hyphaene* species leaves were found and the major problems encountered in the business.

Data Analysis
The data collected were analyzed with the help of descriptive statistics such as percentages and frequencies.

Results
Demographic Information of the Respondents
Table 1 below present the result of the socio-economic characteristics of the respondents, Result revealed that out of one hundred and eighty (180) respondents, sixty-eight (68) respondents were less than thirty (<30) years; one hundred (100) were within the range of thirty to sixty (30-60) years and twelve (12) were more than sixty (>60) years of age. The result also revealed that out of one hundred and eighty (180) respondents, twenty-five (25) were males and one hundred and fifty-five (155) were females. One hundred and sixty-two (162) were married, two (2) were single and sixteen (16) were widows. The result further revealed that respondents involved weaving of Mat were 54.5%, hand fan were 21.7%, rope 0.6%, hat were 10.0%. Farmers were 12.8% and civil servant was0.6% respectively. On the level of education,94.4%of respondents attended adult/Qur'anic school and only 0.6% of respondent attended post-secondary school's education.

Table 1: Distribution of Respondents according to their Demographic Information

Demographic characteristics	Frequency	Percentage (%)
Age		
<30 years	68	37.7
30-60 years	100	55.6
>60 years	12	6.7
Total	**180**	**100.00**
Sex		
Male	25	13.9
Female	155	86.1
Total	**180**	**100.00**
Marital Status		
Married	162	90.0
Single	2	1.1
Divorced	0	0.0
Widow	16	8.9
Total	**180**	**100.00**
Occupation		
Weaving mat	98	54.4
Weaving hand fan	39	21.7
Weaving rope	1	0.6
Farming	23	12.8
Civil Servant	1	0.6
Weaving hat	18	10.0
Total	**180**	**100.00**
Level of Education		
Adult/Qur'anic	179	99.4
Primary	0	0.0
Secondary	0	0.0
Post-Secondary	1	0.6
Total	**180**	**100.00**

Source: Field Survey (2017)

Estimated Quantity in Kg of Doum palm Leaves Harvested in the Study Area per Season

Estimated Quantity (Kg) of Doum palm leaves Harvested from January to April is presented in table 2. Seventy-six percent (75.6%) of the respondents harvested 13 Kg, 16.1% harvested8 Kg while 8.3% harvested 3 Kg respectively.

Table 2: Distribution of the Respondents according to the Average Quantity (Kg) Harvested from January to April

Months	Quantity (Kg)	Percentage (%)
January	3	8.3
February	8	16.1
April	13	75.6
Total	**180**	**100.0**

Source: Field Survey (2017)

Estimated Quantity (Kg) of doum palm Leaves Harvested from May to August.
Table 3below present the result of quantities in Kg of doum palm leaves harvested by the respondents from May to August. The result revealed that 51.1% of the respondents harvested/bought 11Kg of doum palm leaves, 43.9% harvested/bought 6 – 10kg while 5.0% of the respondents harvested/bought 11 – 15 kg of doum palm leaves.

Table 3: Distribution of the Respondents according to the Quantity (Kg) Harvested from May to August

Months	Quantity (Kg)	Percentage (%)
May	11	51.1
June	5	43.9
August	3	5.0
Total	**180**	**100.0**

Source: Field Survey (2017)

Estimated Quantity (Kg) of doum palm Leaves Harvested from September to December
The result (table 4) shows the quantities (Kg) of doum palm leaves harvested by the respondents from September to December. 36.7% of the respondents harvested 1 Kg, 43.9% harvested3Kg while 19.4% of the respondents harvested 5 Kg of doum palm leaves.

Table 4: Distribution of the Respondents according to the Quantity (Kg) Harvested from September to December

Months	Quantity (Kg)	Percentage (%)
September	1	36.7
October	3	43.9
December	5	19.4
Total	**180**	**100.0**

Source: Field Survey (2017)

Reasons for Low Yield of doum palm Leaves in the study Areas
The result (table 5) shows various reasons responsible for declined in doum palmleaves (kaba) in the study areas. Fourty one percent (41.0%) of the respondents attributed decline

of *Hyphaene* species leaves in the study areas to land clearing for agricultural purposes, 37.1% of the respondents said decline of doum palm leaves occurred due to animal grazing while 21.9% of the respondents attributed it to insufficient rainfall.

Table 5: Distribution of the Respondents according to their Reasons for Low Yield of doum palm Leaves in the study Area.

Reasons	*Frequency	Percentage (%)
Land clearing for agriculture	180	41.0
Animal grazing	163	37.1
Insufficient rainfall	96	21.9
Total	***439**	**100.0**

Source: Field Survey (2017)
*Multiple Responds

Products made from doum palm Leaves (Kaba) in the Study Area
The result (table 6) revealed the different products made from *Hyphaene* species leaves (kaba) in the study area. The result indicated that 47.6% of the respondents used *Hyphaene*species leaves to make mats, 9.8% used it to make ropes, and 15.9% used it to make hats while 26.7% used it to make hand fans.

Table 6: Distribution of the respondents according to the products made from doum palm Leaves (Kaba) in the study Area

Products	*Frequency	Percentage
Mat	150	47.6
Ropes	31	9.8
Hats	50	15.9
Hand Fan	84	26.7
Total	***315**	**100.0**

Source: Field survey (2017)
*Multiple responds

3.5 Estimated Revenue from the Sales of doum palm Leaves Products in the Study Area
The results (table 7) show the amount of money realized by the respondents from the sales of *Hyphaene* species leaves (Kaba) products. About sixty six percent (65.5%) of the respondents realized between N11, 000toN15, 000 per month from the sales of *Hyphaene* species leaves products during off-farm season between Januarys to April; 31.7% of the respondents realized N6, 000 toN10, 000 per month during the onset of farming season (May to September); while 2.8% of the respondents realized N1, 000toN5, 000 per month (September to December) from the sales of *Hyphaene* species leaves products.

Table 7: Distribution of the Respondents according to the Estimated Revenue from the Sales of Hyphaene Leaves Products per Month

Months	Amount	Percentage (%)
January to April	₦11,000 – ₦15,000	65.5
May to August	₦6,000 – ₦10,000	31.7
September to December	₦1,000 – ₦5,000	2.8
Total	**180**	**100.0**

Source: Field survey (2017)

Uses of the Money from the Sales of doum palm Leaves Products in the Study Area
Table 8 revealed uses of the money realized by the respondents. It was revealed that 43.1% used the money for household feeding; 6.9% used the money to buy farm inputs; 27.6% used the money for health care and 22.4% used the money to pay children school fees.

Table 8: Distribution of the Respondents according to the Uses of the Money Realized from the Sales of doum palm Leaves (Kaba) Products

Uses	*Frequency	Percentage (%)
Household feeding	156	43.1
Farm inputs	25	6.9
Healthcare	100	27.6
Paying school fees	81	22.4
Total	***362**	**100.0**

Source: Field survey (2017)
*multiple respondents

Problems of doum palm Leaves (Kaba) Business in the Study Area
Table 9 presented the result of the problems encountered by the respondents in the study area in the *Hyphaene* species leaves business. The result revealed that 19.6% of the respondents lack adequate harvesting and processing facilities, 35.3% lamented failure of the products to compete with synthetic similar products, 35.3% indicated low price of the products, while 9.8% of the respondents indicated high cost of *Hyphaene* leaves as their problem.

Table 9: Problems encountered in the *Hyphaene* species leaves business

Problems	*Frequency	Percentage (%)
In-adequate harvesting and processing facilities	100	19.6
competition with synthetic similar ones	180	35.3
Low price of the products	180	35.3
High cost of the leaves	50	9.8
Total	***510**	**100.00**

Source: Field survey (2017)
*multiple responds

Discussion

Demographic Information of the Respondents

The study revealed that respondents aged between 30-60 years constitute the highest percentage (55.6%) involved in the utilization of doum palm Leaves in the study area (Table 1). This indicated that population is within the prime age of active socio-economic activities. The findings also indicated that Female (86.1%) ranked highest among the respondents engaged in the *Hyphaene* leaves utilization (table 1), this finding agreed with that of Amwatta (2004) who said that in Turkana, Kenya a Woman's Cooperative Society were involved more in the collection and the sales of crafts made from *Hyphaene* species leaves. The marital status of the respondents indicated that 90% are married, 1.1% are single while 8.9% are widows. The educational status of the respondents indicated that only 0.6% attended post-secondary education while 99.4%attended Adult/Qur'anic education.

Estimated Quantity (Kg) of doum palm Leaves Harvested in the study Area

The result of this study shows that an average of 3kg, 5kg and 13kg of *Hyphaene* species leaves were collected per household in the months of January, February and April respectively. This indicated more and more people (8 to 75%) were involved in the collection of *Hyphaene* species leaves as an off-farm season activity. The quantity harvested declined progressively (1 to 5 kg) as the farming season starts from May to December. This finding agreed with many researchers such as (Kamara, 1986; Faure, J and J. Viven, 190; Okigbo, B.N, 1986).

Reasons for Low Yield of doum palm Leaves in the study Areas

The result revealed that 41.0% of the respondents (tables 5) indicated low yield of the *Hyphaene* species leaves due to land clearing for agricultural purpose, 37. 1% said that animal grazing also contributed to the low yield of Hyphaene species leaves in the study area. This result agreed with that of Adamou (1993), Brah (1995) and Harouna (2005) who's reported that leaves of *Hyphaene* species serve as green fodder for cattle in the dry season. 21.9% of the respondents said that low yield of *Hyphaene* species leaves in the study area is due to bush burning, insufficient rainfall and fuel. According to Wikipedia, (2010) leaves may be used as fuel, setting of fire by the hunters especially in the dry season, and insufficient rainfall are alllimiting factors.

Different Products made from *Hyphaene* Species Leaves in the study Area

The result (Table 6) shows different product made from *Hyphaene* species leaves (Kaba) according to respondents in the study area. 47.6% of the respondents used *Hyphaene* species leaves to make mats, 26.7% used it to make hand fans, while 15.9% used it to make hats while 9.8% of the respondents used *Hyphaene* species leaves to make ropes of different strength, size and length. This finding agreed with that of Bonde, *et al*. (1990) which revealed that the bundles of leaves are purchased by craftswomen to make mats, hand fan, ropes of different sizes and tomake the walls and roofs of dwellings.

Estimated Revenue from the Sales of Hyphaene Leaves Products in the Study Area

The results (table 7) shows the amount of money realized by the respondents from the sales of *Hyphaene* species leaves (Kaba) products. 65.5% of the respondents realized between N11, 000 to N15, 000 per month from the sales of *Hyphaene* species leaves products during off-farm season between Januarys to April. 31.7% of the respondents realized N6, 000 to N10, 000 per month during the onset of farming season (May to September), while 2.8% of the respondents realized N1, 000 to N5, 000 per month (September to December) from the sales of *Hyphaene* species leaves products. The result indicated that respondents generated more money from the sale of *Hyphaene* species leaves (Kaba) products during the off-farm season. This could be attributed to the fact that they are less busy on the farm and NTFPs can sustain and serve as source of income to rural dwellers. This finding agreed with Amwatta (2004), who reported that, weaved products from *Hyphaene* leaves are sold and traded at local and international markets as source of income. According to Famuyide and Oguntala (2000), small forest based gathering and processing enterprises provide one of the largest source of non-agricultural employment and income to rural people at a time when rural households have to look to non-farm employment and income for a growing share of their total livelihood. For example, in Sierra Leone and Jamaica, forest – based, small – scale enterprises account for more than one - fifth and one – third of off-farm respectively, of total employment in the small-scale enterprise sector (FAO, 1998).

Uses of the Money from the Sales of *Hyphaene* Species Products in the Study Area

Table 8 revealed various uses of the money realized by the respondents. It was indicated that 43.1% of the respondents used money for household feeding, 6.9% used the money to buy farm inputs, and 27.6% used the money for health care while 22.4% of the respondents used the money to pay children school fees. This finding agreed with that of Amwatta (2004) which revealed that the presence of the *Hyphaenecompressa* (East African Doum Palm) has increased living standard in rural communities in which the fruits, leaves and stems are monetarily valuable. He further pointed out that the East African Doum Palm has created a source of income for local peoples.

Problems of *Hyphaene* Species Leaves (Kaba) Business in the Study Area

Table 9 presented the result of the problems encountered during Hyphaene species leaves business in the study aea. The result revealed that 19.6% of the respondents lack adequate harvesting and processing facilities, his finding conformed with findings of Orwa *et al*. 2009), who said in Dolol Bosso Region (Niger Re-public), women complained of injuring and burning their hand in the process of cutting leaves and mixing and boiling chemicals locally for dyeing leaves. The failure of the products to compete with the synthetic ones and high cost of raw materials may be attributed to the level of technology as most of the local industries lack technical know-how and diminishing availability of the forest resources (Falconer and Arnold, 1988).

Summary, Conclusion and Recommendations

Summary

This research work was conducted in Birnin Kebbi Local Government Area of Kebbi State, Nigeria, to assess the utilization of doum palm (*Hyphaene)* leaves (Kaba) in the area. Four (4) Districts were purposely selected and three (3) villages were randomly selected from each of the four Districts giving a total of twelve (12) villages. Also from each of the twelve (12) villages, fifteen (15) respondents were randomly chosen to give a total number of one hundred and eighty (180) respondents as sample size.

Data was collected through interview schedule with the aid of a structured questionnaire. Information collected during the interview include socio-economic characteristics of the respondents, products made from doum palm (*Hyphaene)* leaves, important of doum palm (*Hyphaene)* leaves to the rural economy, problems encountered by the respondents etc. The data collected were analyzed with the help of descriptive statistics such as percentages and frequencies.

The analyzed data shows that, doum palm (*Hyphaene)* leaves contribute to incomes earnings of the entire respondent interviewed. The result further revealed that 47.6, 9.8, 15.9 and 27.6% of the respondents were engaged in the production of mats, ropes, hats and hand fans respectively. Lack of in-adequate harvesting and processing facilities (19.6%), in-ability of the products to compete with synthetic ones (35.3%), low price of the products (35.3%) and high cost of the leaves (9.8 %) were identified as the major problems faced by the respondents in the study area.

Conclusion

During off-farm season most households collect and sale *Doum palm* species leaves and products as part of the livelihood Port-folio to enhance income and reduce the levels of poverty in the area. Products such as Mats, Hand Fans, and Ropes etc. are some of products made from doum palm (*Hyphaene)* leaves. Climate change, deforestation, high cost of *Doum palm* species leaves and competition with the synthetic products are some of the challenges faced by rural dwellers involved in the business.

Recommendations

Based on the contributions of *Doum palm* leaves to the rural economy in terms of income generation and the problems faced by the users of doum palm (*Hyphaene)* leaves in the study area, the following recommendations are made:

1. Government should put in place relevant laws/regulations regarding the conservation of Non-Timber Forest Products (NTFPS) species for the roles they play in rural livelihood activities.
2. Efforts should be directed towards propagation and domestication of doum palm (*Hyphaene)* trees to avoid its scarcity and rescue them from becoming extinction.
3. Government should provide modern technology to the users of *Doum palm* leaves so as to improve the quality of their products to be able compete favourably with synthetic ones.

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