

Full Length Research Paper

# Agricultural expansion and raffia palm destruction: the case of Bamunka, N.W. Cameroon

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The tropical location of Cameroon coupled with its elongated north to south stretch, lends it to a diversity of ecosystems. While the southern part is rainy and evergreen, the north is torrid and generally dry. An important ecosystem in the south is raffia palms, mostly located in wetland areas. Bamunka village is an example of a flood plain in Cameroon that contains a vast expanse of raffia bushes. Their existence over decades led to a symbiotic socio-economic and cultural relationship with the local residents. Resources exploited from this ecosystem played a vital economic role in this region until the arrival of a massive agro-industrial scheme (U.N.V.D.A) in the 1970's aimed at rice production. Their presence led to the destruction of vast areas of raffia. This research therefore sought to respond to the following question: How has agricultural expansion affected raffia bushes and what are the socio-economic and ecological implications? Mixed research methods involving quantitative and qualitative methods as well as consultation of secondary sources were used. Several resources were identified that stimulated socio-economic benefits for the local population through activities like: palm wine extraction, handicraft, hunting and fishing. However, raffia palm destruction has reduced the socio-economic and ecological potentials for the local population.

**Keywords:** *Raffia palms, ecosystem, socio-economic, Bamunka*

## INTRODUCTION

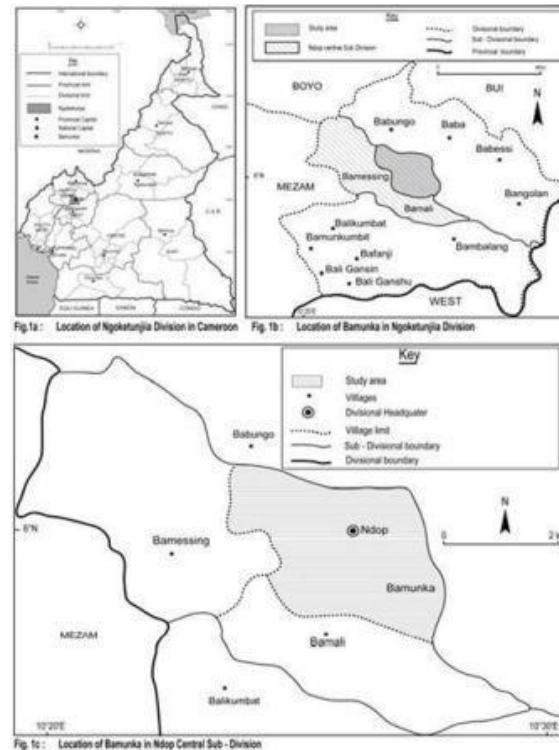
The tropical location of Cameroon coupled with its long North to South stretch lends it to a diversity of ecosystems (Verbelen, 1999) & (Biesrouck, 2000). There is an estimated 6 ecological zones starting from a greener south that progressively transitions into a torrid semi desert north. These regions are further divided into 11 sub regions as follow: The Mount Mandara, the Plains of the extreme North Region, the Benue Plain, the Adamawa Savanna, the low Savanna of the East and Center, the Tikar Plain, the High Plateau and Grassfields of the West and North West, the Marine Mangroves of the Littoral region, degraded forests of the Center and Littoral, and the dense rain forest of the South West and East. Bamunka is located in the Grassfield region of the

North West. With a flora cover estimated at 40,903, 825 hectares, Cameroon has a rich diversity of varied plant species (F.A.O, 2000). Amid this variety are raffia palms which are most often found growing in wetlands. Raffia palms have varied functions and values and maintain a diverse ecosystem of fauna and flora; hence their importance has often drawn the attention of several environmentalists (Pulgrove, 1990). This attention stems from the fact that wetlands in general and raffia palm bushes in particular are recently being over-exploited for agriculture, hunting, fishing, wine extraction, arts and craft materials. Demand for such products has increased, so too has been the destruction of raffia bushes in turn.

## Problem Statement

Bamunka village, located in the flood plains of Ndop in

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**Figure 1:** Location of Bamunka

the North West Region of Cameroon (between latitude  $5^{\circ}37' N$  and  $6^{\circ}14' N$  and between longitude  $10^{\circ}23' E$  to  $10^{\circ}28' E$ ), is a region that has a vast area of raffia palm bushes, estimated at 573 hectares (see figure 1 for location of Bamunka). The presence of these bushes over decades explains why raffia palm products are an integral part of the culture, traditions and values of the Bamunka people. Raffia bushes are exploited for palm wine, fiber (for weaving bags and clothes), their branches (as poles for fabrication of furniture), fishing and for a variety of fruits and vegetables.

Another important economic aspect of Bamunka is the fact that it is a major agricultural hub found within the Ndop Flood Plain (Nkwemoh, 1999). This region contains a vast expanse of wetlands, rich in alluvial soils (Nouvelot, 1971) hence making it an important agro-industrial rice production zone (Boutrais, 1974) & (Nkwemoh, 1999). In 1975, the Government embarked on extensive agro-industrial development in this region through the Upper Nun Development Authority (U.N.V.D.A). By 1977, over 824 hectares of swamps had already been transformed into rice fields, employing over 2500 locals. At the prime of the U.N.V.D.A, over 3000 hectares of flood plains had been transformed and over 7000 workers were employed, directly or indirectly (U.N.V.D.A, 2005).

The activities of the U.N.V.D.A added value to the economy of this region but the fate of raffia bushes

coupled with their ecological values and functions were severely hampered. The Bamunka people have over time lost interest in managing raffia palm bushes in place of agriculture (particularly rice production) which was economically more viable in the short run. Unfortunately, the dependence on agriculture alone presented several challenges due to external factors. For example Cameroon suffered from an economic crisis in 1992 which also affected the U.N.V.D.A to a point of near bankruptcy, leaving several farmers stranded. On the one hand raffia bushes have been destroyed in favor of agriculture and on the other hand, an uncertain agricultural dependence has made village communities vulnerable to external factors. This research therefore seeks to address the following question: How has agricultural expansion affected raffia bushes and what are the socio-economic and ecological implications?

## Literature review

Russel (1965), Dansfield, (1986), and Tuley (1995) in their studies, brought out a classification of African palms. They established the fact that similarities in African palms with those found in Asian and Latin American countries was a function of the similarities in climatic conditions found in these regions. These studies in addition to that by Cardon (1975), served as a foundation for identifying

raffia palm species found in Cameroon. From the latter, *Raphia farinifera* was identified as the dominant species in the Bameleke Region of West Cameroon, extending right to the North West, where Bamunka is found.

There were further studies into the micro-climatic conditions established due to the presence of raffia bushes found in the swampy areas of this region. In addition, a phyto-geographic study carried out by Letouzey (1968 & 1985), revealed a diverse vegetation map of Cameroon. A taxonomic classification of raffia palms as well as areas where they are generally found was also established based on these studies.

Raffia palms are currently experiencing a high rate of destruction in favor of other activities Earth Communication(1998). This has been the object of studies by Zona & Hendermson (1989). The latter's study revealed that the breakdown of some aspects of the raffia ecosystem could lead to their extinction e.g. the disappearance of rodents that initially played the role of seed dispersal agents when eliminated tends to limit the propagation of raffia seeds. Infrastructural development and agriculture were seen as other major agents of destruction of this ecosystem. In the same vein, Wabo (2004) established the fact that agriculture and other human practices were primarily responsible for raffia palm degradation and the outcome was being felt in aspects like a decrease in the biodiversity, lowered wind-breaking potentials and lower production of raw materials.

The values and functions of wetlands as well as the need to protect these ecosystems have been the object of several works in the likes of Mitsch & Grosselink (1986), the Ramsar Convention on Wetlands ([www.ramsar.org](http://www.ramsar.org)[2015]), WWF report (2004), Forpah (2004) and Koghan (2004). In this vein, some authors have identified raffia palms as an important wetland resource and carried out further research on some of its potentials. For example, Bergeret (1957) and Emo (1987) studied the importance of the wine extracted from palms across local communities in Cameroon and Nigeria respectively. In their works, both authors revealed an important socio-economic sector that functions based on the various processes involved in tapping palm wine right up selling it. In line with production and marketing, the major problem with palm wine is that it deteriorates (gets sour) within a day; hence the need for preservation strategies. By preserving it, Ghanara (1968) noted that it will boast its economic value for communities given that the chances of waste are limited and reaching out to a larger market was possible.

Some studies on raffia palms in Cameroon include that of Achidi (1999) in Santa Sub-Division in the North West Province. The latter opines that these palms have long played an important socio-economic role in the cultures and lives of the people in this region, but like Bamunka, there is a gradual abandonment of activities related to palm management in favor of agriculture. Knöpfler (2001)

also researched about palms in the North West Region of Cameroon. Focus was mainly on the fact that materials from palms were useful in the fabrication of materials like household utensils, baskets, granaries, bags, clothes and more. The later also focused on understanding the cultural significance of raffia palms to the people of this region.

There has sparingly been any research particularly focused on raffia palms in Bamunka. Studies have mostly focused on cultural dynamics within this village from past to present (Wana, 2003), Wetland degradation (Koghan, 2001) & (Nzembayie, 2007), innovations within the rice production sector (Ngwa, 1985) and on the activities of the U.N.V.D.A and consequent environmental problems (Pangmashi, 1999) and (Akendo, 1998). This study will therefore examine how agriculture expanded in Bamunka, how it impacted raffia bushes and subsequent socio-economic and environmental problems that accrued.

## METHODOLOGY

This study relied on a pragmatic case study approach for data collection (Yin, 2014). Hence qualitative and quantitative data was collected based on different methods that are detailed below.

### Qualitative data

In order to obtain data on agricultural activities carried out in this region, field observations as well as secondary sources from the U.N.V.D.A. records were consulted. Information on the various socio-economic benefits related to raffia palm management was obtained through observations on the field and from interviews with those directly concerned. A questionnaire was addressed to 20 local residents and the selection of the respondents was guided by the choice of only those who lived in Bamunka before 1975 (i.e. before agricultural expansion started with the U.N.V.D.A) and are still resident there. The aim was to obtain information on values and functions of raffia palms and how these changed over time. It was also in a bid to assess to what extent agriculture transformed perceptions and the economy of Bamunka.

### Quantitative data

Quantitative assessments involved a diachronic analysis of the Bamunka landscape using Aerial photographs of 1963 and satellite images (Landsat 5TM, of 1988 and Landsat 7ETM+ of 2002). The approach aimed at obtaining cartography of spatial changes that occurred in this region prior to and after the U.N.V.D.A's activities and rapid urbanization in recent years. Aerial



**Photo 1 A and B: Raffia fiber bags and raffia leaf roofing material** Source: Mphoweh (2007)

photographs were combined in a mosaic that covered the study area and georeferenced in MapInfo software.

The same was done for satellite images. Field work, comprising of collection of GPS points and observation of spatial phenomena aided the treatment of these images. This analysis also enabled an understanding of the extent to which raffia bushes had been destroyed in this region. Triangulating quantitative and qualitative data (as suggested by Cresswell, 2005) from all sources aided better understanding of the phenomena under investigation.

## RESULTS

This section is divided in three parts. The first examines the socio-economic importance of raffia palms in Bamunka. The second assesses agricultural expansion (especially under the U.N.V.D.A) while the 3<sup>rd</sup> examines raffia palm bush destruction in this region and what implications this could have on Bamunka and similar communities.

### The socio-economic importance of raffia palms in Bamunka

#### Raffia palm wine

By now, a lot of socio-economic benefits of raffia palms have been mentioned throughout the text. Palm wine tapping is an activity that is practiced by over 27 % of the local population of Bamunka mostly as a part-time. About 10% of this population is involved as a full time activity. The process involves identifying a raffia plant of no less than 3 years old. A hole of about 3 cm wide is bored into the central base of the plant to a depth of about 8 cm.

This is covered with some soil for about a week and later cleaned up. Locally designed metal tools are used for this purpose. From a period of over a week, wine starts dripping from the hole. A pipe, sometimes made from Indian Bamboo is stuck to the hole and a receptacle, (often a calabash) is attached to it. At best, a palm could produce up to 10 liters of wine each day for over a period

of 3 months from when the output tends to drop. On average, over 3700 liters of wine are produced daily from this village and an estimated \$10 dollars (5000 FCFA) could be generated by each full time wine tapper.

The palm wine retail sector is also huge; wine tappers directly supply to retailers. About 150 wine drinking retail spots exist in Bamunka, generating employment for bartenders and small businessmen in the informal sector. Besides the modern approach of wine consumption (through wine bars), raffia wine also has cultural connotations during ceremonies like funerals, marriages and annual traditional dances. It is the wine of choice during such events and tends to be more appreciated for its taste and affordability. Palm wine is also used as an ingredient in the preparation of traditional medication, a raw material for brewing local whisky (*afoto*) and a symbol and medium for communicating with ancestors (according to local beliefs).

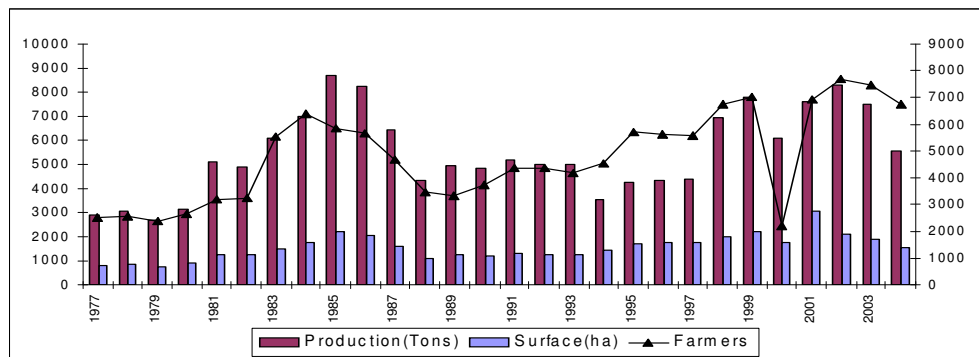
#### Raffia palm resources for household use / consumption

Another important resource from the raffia palm is its branches which the locals erroneously refer to as '*bamboo*'. This serves as a raw material for fabricating furniture and household equipments like: baskets, granaries, chairs, cooking pistils, fish traps, canoes, beds, tables etc. It also serves for several customized items used in many works of life e.g. for making packaging materials especially for vegetables (like tomatoes), cages for birds and transportation supports for farmers. In some cases, the branches serve as a source of fuel wood. In addition, children also tend to use them for fabrication of toys.

Raffia palm leaves are another important resource used for making roofing materials, extracting fiber for weaving bags and for making brooms from the leaf vein. A lot of local skills in handicraft have been developed in this sector and the knowledge has been handed down from generation to generation (see photo 1). In addition, raffia palm fruits are another highly consumed product



**Photo 2:** Tilapia sp. caught from raffia bush marshes  
Source: Mphoweh (2007)



**Figure 2:** Evolution of surface areas cultivated, rice production and farmers hired by the U.N.V.D.A. source: with Data from U.N.V.D.A. archives, 2004

of the raffia plant. The fruit have a hard external shell under which is a thin edible yellow skin. Processing the fruit involves boiling it with palm wine until the hard shell softens up and can be peeled off. The yellow skin is dried and eaten as an appetizer during ceremonies or while drinking palm wine in general. This practice is typical of this region. Some locals also commercialize the fruit after processing it. The young fruits are also used for decorative curtains on doors and windows

#### Other resources within the raffia palm ecosystem

Besides resources that are directly related to raffia palms, some other products are a function of the wetland raffia palm ecosystem and its unique characteristics. Zona & Henderson (1989) highlight the fact that raffia palms have rich fauna diversity. This is also corroborates studies by Akendo (1998) and Koghan(2001) & Koghan (2004) who opine that wetlands and their vegetation harbor diverse fish species. In Bamunka, *Tilapia sp.* and *Clarias sp.* are commonly trapped in such areas (see photo 2).

Fishing is an important income generating activity in this region and serves as an important source of protein intake for the local population. Hunting and gathering is

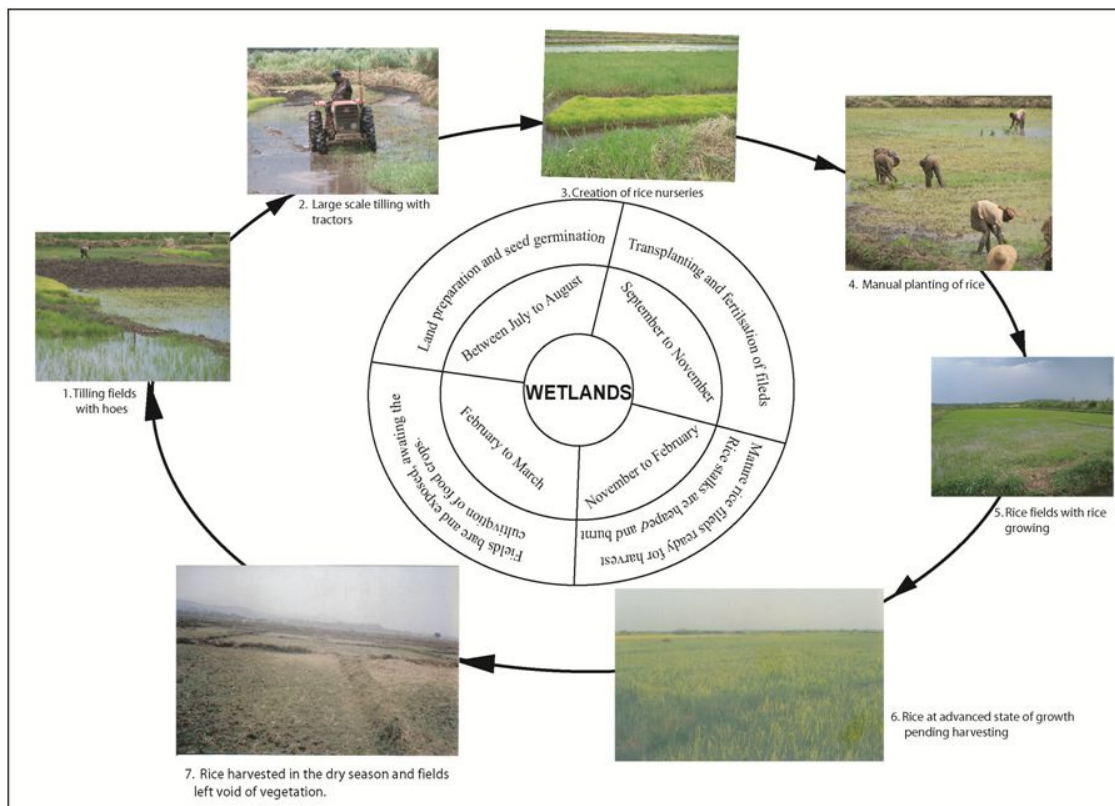
also common in raffia bushes since it is a habitat for several birds and rodents. Insects like palm beetles also lay their eggs in palm stems; later these develop in larvae which are also commonly gathered and cooked for eating. Furthermore, this ecosystem is also rich in *Afromomum sp.* which is a common packaging material for local meals. It serves as a wrapping material prior to cooking. From this section, it can be seen that raffia palms contain several resources which offer enormous socio-economic benefits to the local population of Bamunka.

#### Agricultural expansion and threat to raffia bushes in Bamunka

Agriculture is the main economic activity in Bamunka, employing over 68 % percent of the local population directly or indirectly (Nzembayie, 2007). However, the biggest player in the agricultural sector in this region is the Upper Nun Development Authority (U.N.V.D.A) that embarked on extensive rice cultivation in the wetlands as well as on agricultural innovations in production and processing. Figure 2 is a summary of the areas transformed into rice fields by the U.N.V.D.A and the number of farmers that got involved in this region. By



**Photo 3 A:** Mechanized Farming in the wetlands **3B:** Raffia palms at background and ricefields at foreground.  
 Source: Mphoweh (2007)



**Figure 3:** The wetlands of Bamunka under constant transformation from farming practices

1977, over 824 hectares of swamps had been transformed, employing over 2500 local workers.

The number increased steadily until 1985 when 6,400 workers got involved and over 1,753 hectares of farmland had been transformed. The economic crisis of the 1990's affected the activities of the U.N.V.D.A to near bankruptcy but areas transformed into rice fields continued to exist and were taken over by local farmers. At its prime, the U.N.V.D.A had transformed over 3,000 hectares of farmland and employed over 7,000 workers.

The U.N.V.D.A. applied mechanized farming techniques, using tractors that razed existing wetlands and raffia bushes to continuous expanses of rice fields (see photo 3 A and B).

In addition to rice cultivation in the rainy season, seasonal crop rotation with fast growing vegetables in the dry season is also a common practice. This leaves the wetlands of Bamunka under constant anthropogenic transformations from season to season (also see figure 3). The consequence is the loss of the regenerative

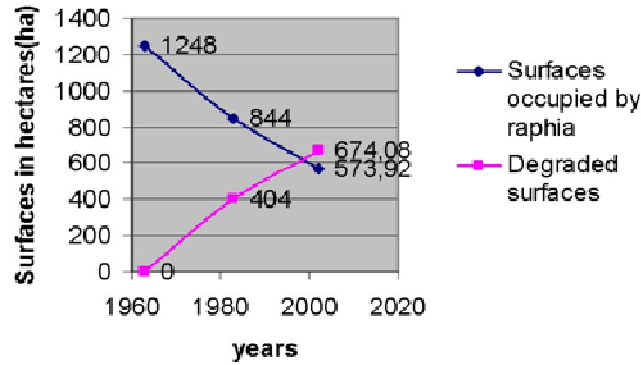


Figure 4: Raffia palm surface areas from 1960 to 2000

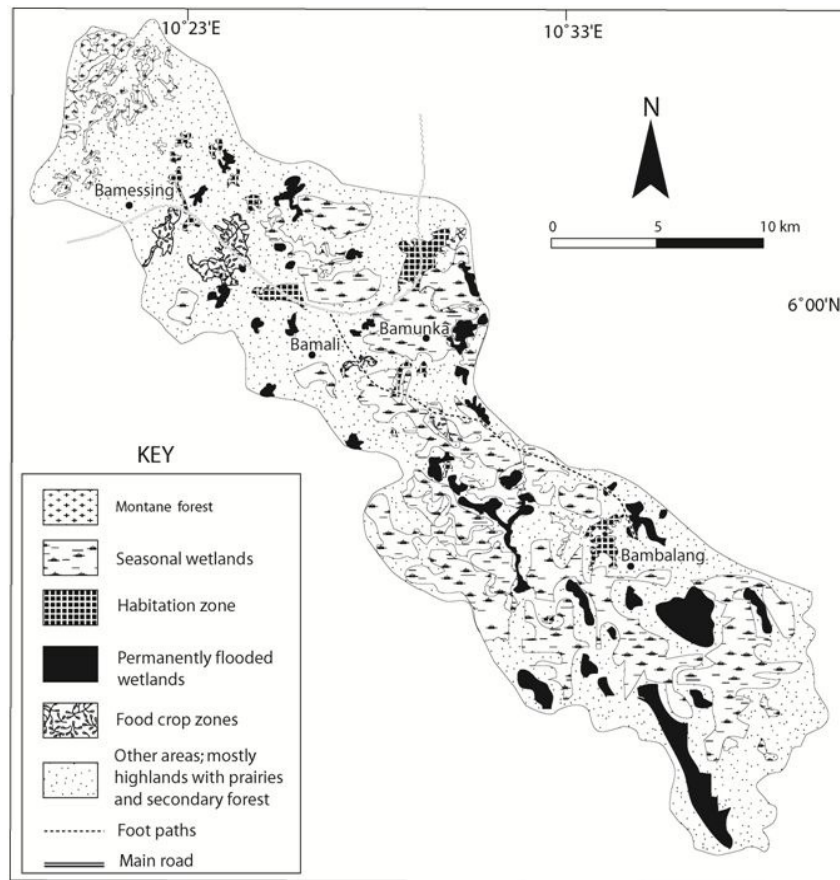
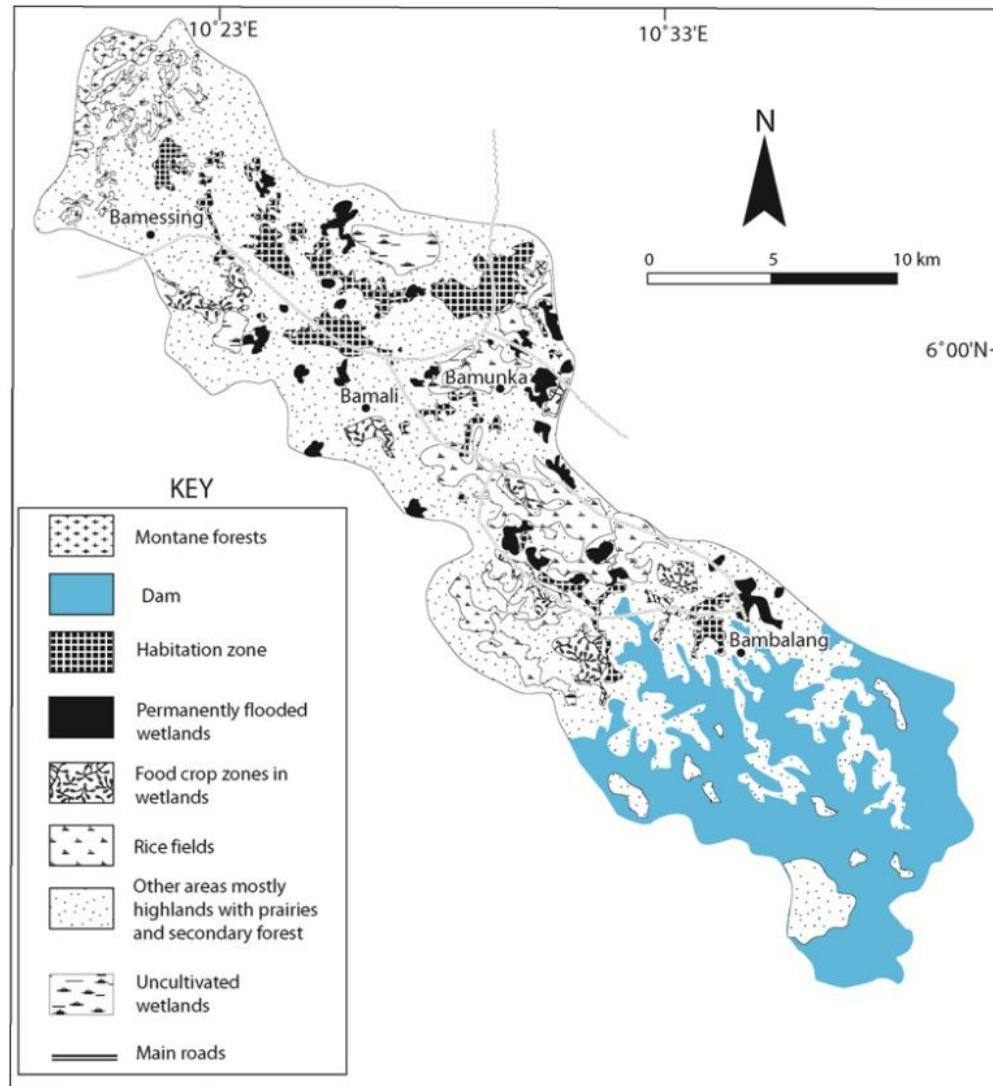


Figure 5a: Landuse pattern in N.C.S.D. in 1963

potentials of endemic plant species like the raffia. The outcome of mechanized farming has been the decrease in surface areas initially covered by raffia palms from about 1,248 hectares in 1963 to 573 hectares by the year 2000 (see figure 4).

In addition to agro-industrial rice expansion, other factors have had a contributing effect in the destruction of

raffia palms. Of importance is the fact that the population of Bamunka increased and triggered an urbanization wave. This led to competition for land, hence a lot of virgin areas were transformed for infrastructural development and farming (see figure 5). Another agent of transformation beginning from 1972 was the Bamenjin hydro-electric dam whose construction led to the flooding



**Figure 5b:** Landuse pattern in N.C.S.D. in 1988

of an area worth over 333 sq. km (see in blue on figure 5 a, b & c). A lot of wetland vegetation was lost during this period due to inundation by water from the created lake.

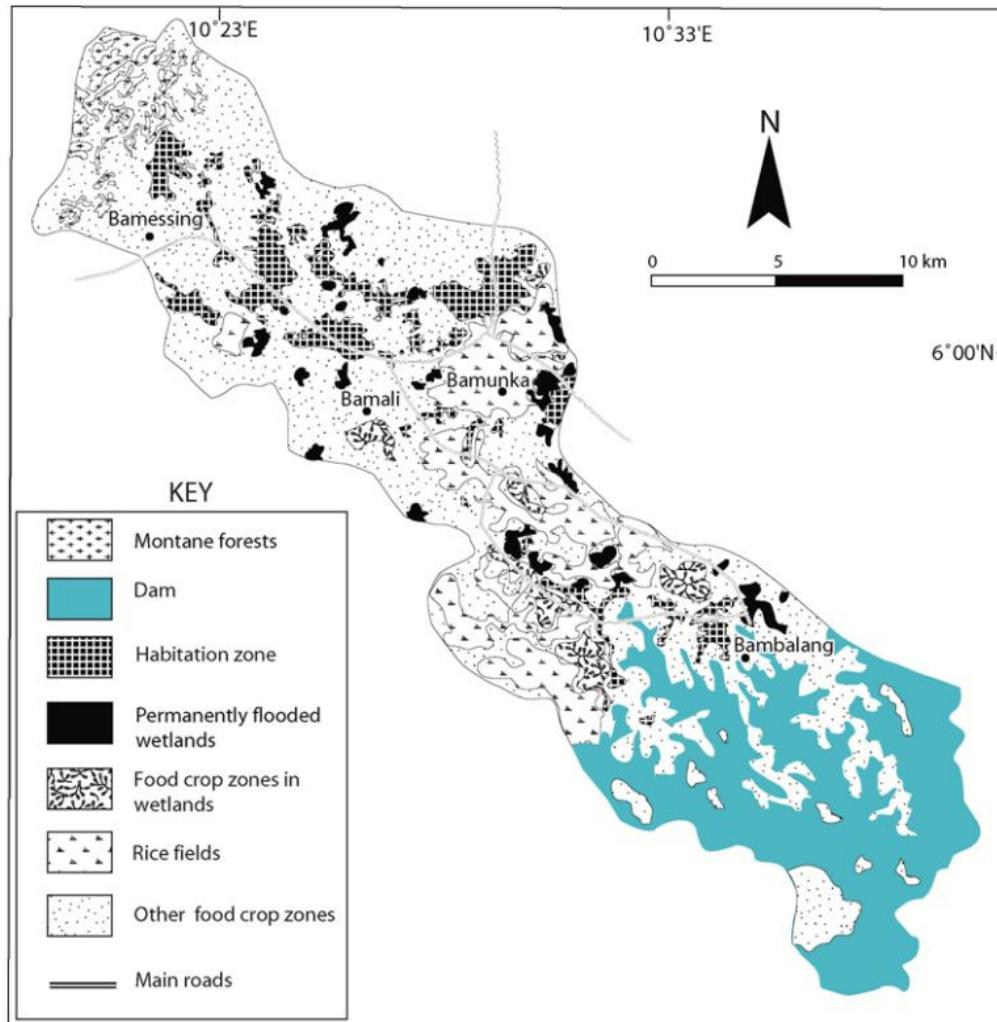
### **Socio-economic and ecological implications of raffia palm destruction in Bamunka**

Prior to and up to the 1970's Bamunka was a village that thrived in hunting, fishing, farming (on a small scale), and management of resources from its natural environment like raffia palms, gathering and more. This high dependence on the natural environment forged a man-environment relationship that built into the cultures and day-to-day life of the people. As seen earlier, raffia palm resources served in the fabrication of furniture and utensils, whilst other edible products of the plant became

indispensable for traditional rites. Another important aspect of raffia palm exploitation are the indigenous skills in handicraft and wine extraction that were developed and transmitted from one generation to another. In addition to skills transmitted, this served as an income generating sector for the local population who got involved in exploiting raffia bushes.

The lucrative nature of this sector was dwarfed by the activities of the U.N.V.D.A during its peak years which directly employed a lot of people and generated a lot more income. This initial boost in the local economy made many locals to abandon traditional skills and related economic activities. The major problem though, was that the U.N.V.D.A had to target external markets with its products and also partly depended on the government for subsidies. Both uncertainties led to vulnerabilities in which the Bamunka people had been





**Figure 5c:** Figure 5a: Landuse pattern in N.C.S.D. in 1963

drawn in. Unfortunately, withdrawing from this activity would have meant returning to prior activities, highly based on natural resource exploitation. But this is almost impossible since at some stage there was a rupture in the transmission of indigenous knowledge in several sectors of management of local resources. With several cultural values lost, there is also a loss in the natural resources that stirred this sector in favor of large expanses of homogenous rice fields.

In terms of the biodiversity, interviews with the local population revealed that transformations on the landscape and destruction of raffia bushes led to the extinction of several animal and plant species that once thrived in this region. For example date palm which was once very useful and commonly found growing in raffia bushes has become scarce; many birds (e.g. the partridge and wild ducks) that used to be hunted in the swamps of Bamunka have also become scarcer. Such transformations have in turn affected the functioning of the raffia ecosystem. For example, Zona & Henderson

(1989) as seen earlier opined that rodents in palm bushes were important elements of the ecosystem since they were primary agents of seed dispersal. Based on this argument it is logical think that this function has been diminished in Bamunka.

## DISCUSSION AND CONCLUSION

Raffia palms are an important wetland resource which serves local communities through the values and functions they offer the society and environment respectively. Socio- economic values derived from raffia bushes include: wine extraction, raw materials for furniture, fiber and customized products. In addition to products directly related to raffia palms, there are other resources within the ecosystem that have led to a gamut of socio-economic activities like fishing, hunting and gathering. However, like most natural resources, raffia palms across the world are being destroyed in favor of

agriculture and infrastructural development. Amongst others, the objective of the Ramsar Convention has been to promote the wise use of wetlands and their resources. Bamunka is a village located in the North West Region of Cameroon. The physical characteristics of this flood plain favor the growth of raffia palms. However, the introduction of large scale wetland rice cultivation through the patronage of the U.N.V.D.A led to the destruction of raffia bushes.

This change also started a gradual wave of transition of activities which existed and formed part of the cultures of the Bamunka people, to a scenario of more involvement with rice production which was more lucrative at the start. However, relying on agriculture turned out precarious during the 1990's when Cameroon suffered from an economic crisis and the U.N.V.D.A in turn suffered from a cut in subsidies by the government. This research therefore set forth to respond to following question: How has agricultural expansion affected raffia bushes and what are the socio-economic and ecological implications? To provide a response, this research relied on mixed methods involving questionnaires, interviews and cartographical analysis. It was observed thereof that raffia palms played a vital socio-economic role in Bamunka. Resources within the ecosystem also played a key role in some economic activities like hunting and fishing. However, large scale agricultural practices have transformed the landscape to a point where raffia bushes have been greatly destroyed.

Although raffia bushes continue to provide vital socio-cultural resources, it is has become a challenge to choose between sticking to agriculture (which is unstable) or continued reliance on raffia palm management which has become reduced due to limited palm bushes. In this study, the main challenge with the methodology was being able to identify people who resided long enough in Bamunka to understand the dynamics.

This limitation explains why the number of those interviewed was limited to 20. Interviewing a wider range of individuals could broaden understanding of the theme. Furthermore, this study showed that agriculture has been unstable and farmers can't rely entirely on it without seeking other alternatives.

However, since raffia palms too have been greatly destroyed, the argument is not only centered on the fact that farmers should abandon farming in favor of planting raffia palms. It rather ushers in thoughts of practicing both activities in a way that ensures sustainability development with socio-economic and environmental benefits in the short and long run.

## REFERENCES

Achidi BA (1999). *Raffia palm management in Santa Sub-Division, North West Province Cameroon*, D.I.P.E.S II, ENS Yaounde .103 pages  
Act. Editorial Board for Agricultural Series(1990):The raffia palm and its uses .Liberty Press.28 pages  
Akendo IN (1998).The environmental resources and associated development

Bande WN (1994). *The production and marketing of raffia wine in Batibo Sub-Division* . D.I.P.E.S. II Dissertation, E.N.S Yaounde 89 Page.  
Biesbrouck K (2000). *The social dimension of rainforest management in Cameroon : issues for co-management*. Tropenbos-Cameroon, series 4. 99pages  
Boutrais J (1974). *Etude d'une zone de transhumance :La Plain du Ndop(Cameroun)*.ORSTOM. 163 pages.  
Brian W (1997).*The terrestrial biosphere and global change: Implications for natural and managed ecosystems*.G.C.T.E, Sweden .32 pages.  
Cardon JP (1975). *Etude d'une Palmale :Raphia Farinifera (Gaerth Hylander)du plateau Bameleke-Cameroun*. Mémoire D.E.A Université des Sciences et technique de Lille .56 Pages  
Chi CH (1990).*The basis of a local wine Enterprise :A Synthesis* .MINAGRI, Yaounde,Cameroon. 35 Pages  
Cresswell JD, Cresswell JW (2005). Mixed methods research designs in counseling *drainage Basin-Upper Noun Valley-Cameroon*. D.E.A dissertation, University of Yaounde I. 98pages  
Duma FG (1999). *Agro-Pastoral activities :Their socio-economic and environmental impact in Balikumbat sub-Division (Ngoketunjia)* D.I.P.E.S II,University of yaounde I.172 pages  
Earth Communication (1998). *Les ennemis du Raphia* .WWF Avril-Mai .26 pages  
Eldon DE (2000).*Environmental science:A study of interrelations*.,Seventh edition,Delta College and Washington University.434 Pages  
FAO (2000).*State of the worlds forests*.Rome,6<sup>th</sup> edition .153 pages  
Fogwe ZN (1990). *The Ndop-Sabga great erosional Arc: physical milieu ,Land use and erosional risks*. Maîtrise dissertation,University of Yaounde I.125 pages  
Georges B (1961). *Faune Tropicale:oiseaux de l'Afrique Tropicale* .2<sup>eme</sup> partie .Librairie Larose, Paris. 309 pages.  
Ghanara E (1968). *The preservation of palm Wine. Federal Republic Of Nigeria*, Federal Institute of Industrial Research,Ibadan Nigeria. 75pages.  
Ghogomu AN (2000). *The exploitation of a natural resource :The case of fishing in Ndop-Central sud-Division*. D.I.P.E.S II dissertation,University of Yaounde I 121 pages  
Hawkins P, Brunt M (1965). *The soils and ecology of west Cameroon (with special refernce to the Bamenda Area)*, FAO, N°2083, Rome  
KnÖppli H (2001). *Baskets and calabashes palms and people ,crafts and technologies:Some traditional craftsmen and women of the western Grassfields of Cameroon*, Part 3,Bassel Mission, Switzerland. 156 pages  
Koghan SN (2001). *Change in ecological character of wetlands: the case of the Ber Plain in Bui Division*. Maitrise dissertation, University of Yaounde I. 146pages  
Koghan SN (2004). *Socio-economic and ecological implications of related land use practices on wetlands in the Ndop Flood Plain*  
Kuate WP (2004). *La dégradation des raphiales et ses conséquences dans la région de Bandjoun, Ouest Cameroun*. Maîtrise dissertation, University of Yaounde I. 102 pages  
Letouzey R (1968).*Etude Phytogéographique du Cameroun* ,Paris Ve,édition Paul Lechevalier .508 pages.  
Letouzey R (1985). *Notes phytoéographiques sur les palmiers du Cameroun*. 38 pages  
Masini J (1994). *Après le sommet de la Terre :Débats sur le développement durable*,PUF,Tome XXX-No.37,Revue Tiers-Monde .238 pages  
Mbanga LA (2002). *Local associations and rural development in Bamunka-Ndop Central sub-Division,North west Province, Cameroon*.Maîtrise dissertation, University of Yaounde I. 136 Pages  
Mbanga LA (2004). *Community participation In Rural Development:The case of Ngoketunjia Division, North West Province-Cameroon*. D.E.A dissertation, University of Yaounde I. 97 pages  
MINAGRI (1987). *Upper Noun Valley Development Authority (U.N.V.D.A) Ndop*. Report. 4pages.  
MINPAT (1991). *Etude socio-économiques Régionales au Cameroun :Province du Nord Ouest ;Eradication de la pauvreté-ameleoration*

- des données sociales* .DIRASSET-CIBLE,projet PNUD-OPS CMR/98/005/01/99.
- Ngwa NE (1979). *Swamp rice production in the North West Province of Cameroon: A case study of agricultural innovation diffusion among traditional agrarian communities*, Masters Thesis, University of Yaounde. 221pages
- Nkwemoh CA (1999). *The impact of agro-Pastoral activities on the physical environment of the Mezam-Ngoketunja area. Doctorate Thesis, University of Yaounde I.* 282pages
- Nouvelot JF (1971). *Hydrologie du Bassin supérieur du Noun*. ORSTOM, Yaoundé. 315pages
- Pangmashi RF (1999). *Agricultural activities and its impact on the environment: case study, Ndop-Ngoketunja Division (N.W.P)*. D.I.P.E.S II Dissertation, University of Yaounde I. 175pages
- problems of wetlands: A case study of Bamunka* . Bamenda, 35 pages
- psychology. *Journal of counseling psychology*, 52, 224-235.
- Pulgrove JW (1990). *The raffia palm and its issues*. agricultural series. 73pages
- Ruiz-Perez (2001). Bamboo forestry in China: towards environmentally friendly expansion, *Journal of Forestry*, 99(7). 22pages
- Russel TA (1965). *The raffia palms of West Africa* (New bulletin volume 1N<sup>o</sup>2)
- U.N.V.D.A (1973). *Etude de facilité pour passage à 3000ha de rizières dans la Haute- vallée du Noun*. Tome 2. Bamenda. 117pages
- Verbelen. F (1999). *L'Exploitation abusive des forêts Equatoriales du Cameroun*. Green Peace. Paris.49pages
- Wana GN (2003). *Bamunka past and present (13th Century to 21st Century)*. 3<sup>e</sup> Edition, Bamenda. 176pages
- Yin RK (2014). *Case study research: Designs and methods*, 4<sup>th</sup> edition, Sage