

## Harvesting and Marketing of *Monodora myristica* and *Afrostyrax kamerunensis* in Wabane Sub-division in the South West Region of Cameroon.

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### ABSTRACT

Non-timber forest products (NTFPs) are an integral part of development and survival of people living in and around forests areas which constitutes a major livelihood activity for them. This study was carried out from April to July 2017, with main objective to determining how *Monodora myristica* and *Afrostyrax kamerunensis* are harvested and marketed in six selected villages of Wabane Sub-division which are Babong, Banteng, Bechati, Mbechoh, Talung and Tabot. *Monodora myristica* and *Afrostyrax kamerunensis* are popular spicing agent as well as aromatic stimulating additive to traditional medicine and also used in the preparation of traditional dishes in Cameroon. In order to meet the set objectives, participatory rural appraisal (PRA) tools were used to source information on the harvesting and marketing of *Monodora myristica* and *Afrostyrax kamerunensis* in the study area. Market prices were determined using questionnaires. The results showed that 50.05 tons and 25.7 tons of *Monodora myristica* and *Afrostyrax kamerunensis* were harvested respectively while 45 tons and 24.98 tons of *Monodora myristica* and *Afrostyrax kamerunensis* were sold respectively. The annual value of trade in *Monodora myristica* by harvesters was 40,228,600 FCFA and 44,378,000 FCFA for retailers while 22,375,160 FCFA and 25,788,000 FCFA were the annual values of trade in *Afrostyrax kamerunensis* by harvesters and retailers respectively. The results showed that, men were actively involved in the production of the studied NTFPs while women were mainly involved in the trading process. A bucket of 15litres (25kg) of *Monodora myristica* on an average cost 22,000 FCFA while that of *Afrostyrax kamerunensis* costs 25,000 FCFA. Market prices were found to be determined by the forces of demand and supply, rate of production and seasonal variations. The study concluded that *Monodora myristica* and *Afrostyrax kamerunensis* are important sources of income to the local communities making a significant contribution to their livelihoods.

**Key words:** *Monodora myristica*, *Afrostyrax kamerunensis*, harvesting, marketing, non-timber forest products.

### Introduction

Almost half of the population in Cameroon lives in rural areas and around 40% of land is covered by dense humid lowland forest, which covers Southern Cameroon (de Wasseige et al., 2012). Among the most important assets that rural populations have are resources from the farm, trees and natural forests (War, 2007). In a context of poverty, non-timber forest products (NTFPs) have been used for subsistence and trade for centuries (Reader, 1998), and their commerce appears to be increasing (Lescuyer et al., 2011). NTFPs include fruits, nuts, seeds, flowers, leaves, twigs, tree barks, stems, spices, medicinal plants, ornamental plants, bamboo, rattans, ropes, resins, oil, dyes, mushrooms and wildlife (Clark and Sunderland, 2004; Ndah et al., 2013). Globally, an estimated 350 million people mostly in developing countries depend on NTFPs as their primary source of income, food, nutrition, and medicine (UNDP, 2004; FAO, 2005). A large proportion of rural population earn their living from collection and sales of NTFPs, thereby improving their quality of life and standard of living (Agbogidi et al., 2003). In the local, urban, national and international markets, NTFPs contribute substantially to national economic growth (Hammet, 1999; Olumide, 2009). As a source of food, they provide income and employment for many

Comment [H2]: know the harvesting and marketing pattern of *Monodora myristica* and *Afrostyrax kamerunensis* in six selected villages namely Babong, Banteng, Bechati, Mbechoh, Talung and Tabot of Wabane Sub-division.

Comment [H3]: *Monodora myristica* and *Afrostyrax kamerunensis* are popular aromatic spices widely used in traditional system of medicines and also in preparation of traditional dishes in Cameroon.

Comment [H4]: pattern of selected species in the study area.

Comment [H5]: A questionnaire survey was conducted to investigate the harvesting pattern, marketing channels & price of *Monodora myristica* and *Afrostyrax kamerunensis*.

Comment [H6]: The annual trade value of *Monodora myristica* was observed to be 40,228,600 FCFA and 44,378,000 FCFA for harvesters and retailers, respectively. While, the values for *Afrostyrax kamerunensis* were 22,375,160 FCFA and 25,788,000 FCFA, respectively

Comment [H7]: It has been observed that men were actively engaged in production while women in trading process of selected NTFP's yielding tree species.

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rural communities. It is not surprising to see in recent years that governments and development partners have placed particular emphasis on their sustainable management. Cameroon is not left out, because the institutional framework has undergone certain improvements to the point where programmes for the domestication of certain NTFPs have emerged at the Ministry of Agriculture and Rural Development (MINADER). However, it is clear that some NTFPs which are the subject of increasing demand and importance are not valued enough. Indeed, almost all of the aforementioned research has mainly focused on high commercial value NTFPs such as *Gnetum africanum* (Ingram et al., 2012, Ndumbe, 2013), *Ricinodendron heudelottii* (Ndumbe et al., 2018), *Irvingia sp.* (Ingram et al., 2016) etc. The fact that some of these NTFPs such as *Monodora myristica* and *Afrostryax kamerunensis* are not recognized at the regional and national levels maybe attributed to the paucity of information about their exploitation and trade which is very critical if sustainable NTFP trade is to continue (Vantomme, 2003). *Monodora myristica* is a specie of calabash nutmeg, the edible seeds yield a nutmeg flavoured oil which is used in West Africa for cooking (Eggeling, 2002). Morphologically, it is a perennial edible plant of the Annonaceae family, a berry that grows wild in the evergreen forests of West Africa (Burubai et al., 2009). Traditionally, the plant is widely used specially to relieve toothache as well as in the treatment of dysentery. The seeds of *Monodora myristica* are also used for the treatment of constipation and as a stimulant (Irvine, 2000). In the same vein, *Afrostryax kamerunensis* is a spice used in the preparation of traditional meals in Cameroon such as yellow soup, 'ekwang', 'mbanga soup' and stews. It is used as an appetizer, pain killer, and a cure for rheumatism (Ndah et al., 2013). However, no information is available on the type and number of actors involve in the value chains of *Monodora myristica* and *Afrostryax kamerunensis* in the study area as well as how the NTFPs are harvested. There is also no information on the quantities of both NTFPs harvested and traded in the study area as well as the financial values of these NTFPs to the main stakeholders in the value chains. This study therefore has as objectives, to identify the main stakeholders in the value chain of *Monodora myristica* and *Afrostryax kamerunensis* in the study area including their trading channels; to know the harvesting techniques of *Monodora myristica* and *Afrostryax kamerunensis*; to estimate the quantities of *Monodora myristica* and *Afrostryax kamerunensis* harvested and marketed in the study area and; to evaluate the market values of *Monodora myristica* and *Afrostryax kamerunensis* in the study area.

## Materials and Methods

### Location

Wabane is located in the South West Region of Cameroon and it covers a total surface area of 1800 sq. km. It comprises Banteng, Mbechoh, Talung, Tabot, Bechati and Babong. It has an estimated population of 62,342 living in 40 administrative units known as villages (Wabane Council Logbook, 2012). It is bordered to the North by Batibo Sub-Division of Momo Division (North West Region), to the South by Upper Bayang Sub Division of Manyu Division, to the East by Mbouda-Bambotus (West Region) and to the West by Alou Sub-Division of Lebialem Division as illustrated on figure 1.

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**Comment [H14]:** *Monodora myristica* and *Afrostryax kamerunensis* are such important NTFPs yielding species which are not recognized at domestic as well as International level due to lack of information regarding their exploitation and trade pattern which is crucial for sustainable NTFPs trade (Vantomme, 2003).

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**Comment [H19]:** delete this paragraph and write Therefore the present study was undertaken with the objectives to identify the harvesting techniques, quantity sold, market channels and values of *Monodora myristica* and *Afrostryax kamerunensis*.

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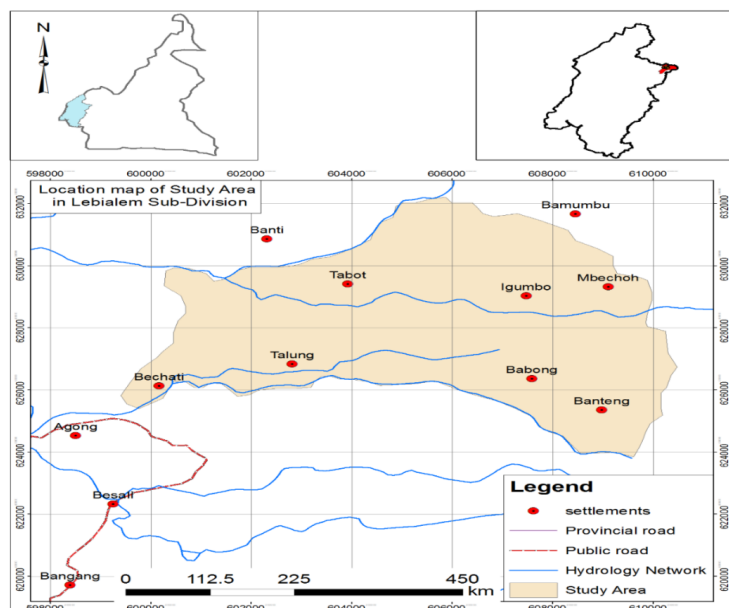


Figure 1: Map of Wabane

Source: (Wabane council Logbook, 2012)

The study area experiences two seasons – the dry season that begins in November and ends in March and the rainy season that commences in April and goes up to October. Here the temperatures can go below 18°C in the months of December to January. It has 3 ecological zones owing to the marked difference in topography and vegetation. The lower belt popularly called Lower Mundani has a characteristic hot temperature typical of a tropical forest zone. The middle belt has a higher altitude and the temperature is mild. The middle belt is suitable for the growth of *Monodora myristica*. The upper belt (North-West) is tropical savannah with an altitude of up to 2100m. (Wabane Council Logbook, 2012). The study area has given rise to different soil types due to the difference in altitude and vegetation types. Soils of the lower belt to parts of the middle belt can be described as sandy-loam to reddish alluvial (ferralsols). There is tropical forest vegetation in the lower parts from the villages of Nkong, Bangang through Besali to Egumbo; wooded savannah in the middle part (Talung, Alongnkong, Nchingang and Banteng and the tropical savannah vegetation at the higher altitudes of M'mouck Leteh to Magha. The difference in vegetation type equally gives rise to different biodiversities.

### Sampling Method and Data Analysis

A situational analysis, including a literature review and interviews with key informants (village chiefs, harvesters and traders) was used to determine the main harvest areas and markets for both NTFPs. Purposive sampling was then used to select the main harvest areas, resulting in six selected villages of Wabane Sub-division which are Babong, Banteng, Bechati, Mbechoh, Talung and Tabot. These villages were also selected based on their ease of access to markets due to their proximity to a major road or river, as access has been shown to be a factor influencing profits in NTFP commercialization and incomes (Ndoye et al. 1997). Individual respondents were selected using convenience sampling and snowball sampling. A total of 150 stakeholders were surveyed between April and July 2017, using a structured

**Comment [H21]:** Sampling was done in selected villages Banteng, Mbechoh, Talung, Tabot, Bechati and Babong of Wabane sub division.

questionnaire adapted to each stakeholder group, with questions focusing on the stakeholder's household demographics, socioeconomic and environmental aspects related to their activities in the value chain of the NTFPs under study. Interviews were conducted with 100 harvesters, representing an estimated 25% of the harvesters in each selected village. Recent census population statistics were not available for these villages, and thus estimates are based on village chief's estimates of total village population and the approximate number of harvesters. Focus group meetings were held in each village to obtain additional information about the community's socio-economic and environmental situation. Five markets in the study villages were selected based on their characteristics and importance defined according to Wiersum et al. (2014) market typology: four small, local markets, close to supply zone (type I) which includes Banteng, Babong, Bechati, and Mbechoh; and one medium-sized markets of regional importance (type II), Guzang. In these markets, interviews were conducted with 50 retailers representing about 25% of these target groups in the selected markets. The data collected was entered into SPSS (Statistical Package for Social Sciences) Version 21 was used for analysis. The income received was calculated using average prices multiplied by the total number of buckets sold per actor. The exchange rate in Euros at the time of the study was 1 € = 655 FCFA.

## Results

### 1. Main stakeholders and trade channels in the Market Chain of *Monodora myristica* and *Afrostryax kamerunensis*.

The main actors identified in the *Monodora myristica* and *Afrostryax kamerunensis* value chains in the study area included village harvesters, wholesalers, retailers and household consumers. Indirect actors identified included transporters, village traditional authorities, government officials, Wabane council members, agricultural staff, union presidents, members of Common Initiative Groups (CIGs), and the various Forest User Groups. There exist four marketing channels linking four actors for both NTFPs as indicated on Table 1. Men were more involved in the production of *Monodora myristica* while women were actively involved in picking. The percentage of men involved in harvesting *Monodora myristica* is 60% as opposed to 40% of women that harvest *Monodora myristica* while 45% of women were involved in the production of *Afrostryax kamerunensis*, as opposed to 55% of men. Retailers were also identified, the majority of which were women (77%) while men constitute 23%. The majority of traders were married men or women that have at least a First School Leaving Certificate. The women are very active in retailing *Monodora myristica* as compared to the men who are actively involved in its production.

**Table 1: Trade Channels and actors in the Value Chain**

Channels	Actors in the Chain			
1	Harvesters		Retailers	Consumers
2	Harvesters		Retailers	Consumers
3	Harvesters	Wholesalers	Retailers	Consumers
4	Harvesters		Retailers	Consumers

#### 1. Harvesting techniques for *Monodora myristica* and *Afrostryax kamerunensis*.

Harvesting of *Monodora myristica* is done using cutlasses and small locally made spears by harvesters. Harvesters use these crude tools in cutting *Monodora myristica* fruits above the breast height of the trees (that is 1.3m from the ground level). In most cases, *M. myristica* fruits are cut from the tree when they have become brown in colour. This brownish colour indicates that the fruits are mature. When the fruits are prematurely cut, the extracted seeds are tiny. Therefore, harvesters always ensure they cut the fruits when they are brown. After the fruits have been harvested, they are fragmented to extract the *Monodora*

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*myristica* seeds. The seeds are washed and the rinsed three times. Afterwards, the seeds are either dried using fire or using solar rays. After drying the seeds, they are put in bags and transported to their homes by head load for further transportation by bikes to the market centre. Here, the easy access zones were heavily exploited. There exists no organization in the area for the sensitization of villagers, harvesters and other stakeholders on the best harvesting methods that are ecosystem protective. On the other hand, *Afrostryrax kamerunensis* is picked on the floor and dried before being stored for sale.

## 2. Quantities harvested and value of *Monodora myristica* and *Afrostryrax kamerunensis* for harvesters

The major harvest zones in the study area were Talung and Tabot. An estimated 29.70 tons of *Monodora myristica* were harvested in Talung while 29.15 tons were sold. Tabot is the second major harvest zone with a total of 10.3 tons of *Monodora myristica* harvested followed by Bechati and Mbechoh with harvested quantities of 6.45 tons and 3.6 tons respectively. The average selling price of a 15litres (25kg) bucket of *Monodora myristica* in Talung, Tabot, Bechati, Mbechoh is 20,500FCFA, 19,200 FCFA, 20875 FCFA and 19,250 FCFA respectively. The total quantity of *Monodora myristica* sold in 2017 was 45 tons. Out of the total quantity of the *Monodora myristica* harvested, about 2% is consumed, 3% is given as gift to friends and relatives and 5% is lost during transportation from the forest. The annual value from the trade of *Monodora myristica* by harvesters in all of the villages was 40,228,600 FCFA. The total quantity of *Afrostryrax kamerunensis* harvested in 2017 was 25.7 tons. The major production zones in the study area were Talung and Tabot. Talung is the highest harvest area with approximately 11.85 tons of *Afrostryrax kamerunensis* harvested of which 11.13 tons were sold. Tabot is the second harvest zone with a total of 8.25 tons of *Afrostryrax kamerunensis* harvested followed by Bechati and Mbechoh with harvest quantities of 1.9 tons and 3.7 tons respectively in the year 2017. The annual value from the trade of *Afrostryrax kamerunensis* by harvesters in all villages was 22,375,160 FCFA.

### 2. Market Values of *Monodora myristica* and *Afrostryrax kamerunensis*

In the markets, the price of 15 litres (25kgs) of *Monodora myristica* range between 22,000-25,000 FCFA in Banteng, Bechati, Mbechoh, Babong and Guzang. The total value of trade in *Monodora myristica* for retailers in each market was 9,548,000 FCFA; 4,232,000 FCFA; 4,186,000 FCFA; 4,462,000 FCFA and 21,950,000 FCFA respectively. The total annual income received from the trade in *Monodora myristica* in all the markets was 44,378,000 FCFA. On the other hand, the price of 15 litres (25kgs) of *Afrostryrax kamerunensis* ranged between 25,000-27,000 FCFA in Banteng, Bechati, Mbechoh, Babong and Guzang. The total value of trade in *Afrostryrax kamerunensis* for retailers in each market was 4,475,000 FCFA; 5,980,000 FCFA; 2,150,000 FCFA; 1,600,000 FCFA and 11,583,000 FCFA respectively. The difference in prices depends on the quantity supplied, and the number of buyers present in the market. The total annual income received from the trade in *Afrostryrax kamerunensis* in all the markets was 25,788,000 FCFA.

**Table 2: Market values**

Markets	Type of Market	Total value of trade in <i>Monodora myristica</i> (FCFA)	Total value of trade in <i>Afrostryrax kamerunensis</i> (FCFA)
Banteng	I	9,548,000	4,475,000
Bechati	I	4,232,000	5,980,000
Mbechoh	I	4,186,000	2,150,000
Babong	I	4,462,000	1,600,000
Guzang	II	21,950,000	11,583,000

**Comment [H33]:** The seeds were washed three times and dried using either fire or solar rays. Thereafter, dried seeds were packed in bag and transported for sale to the nearest market centre.

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Market types as classified by Ruiz Perez et al., (2000)

Type I: small scale market

Type II: medium size market of regional importance

## Discussion

### 1. Actors Involved in the Value Chain of *Monodora myristica* and *Afrotyrax kamerunensis*

The NTFPs move from the harvesters to the wholesalers and to retailers before reaching the final consumers. They also move from the harvesters to wholesalers, to another wholesaler in a city before reaching the consumers. However, in most cases, the NTFPs leave directly from the harvesters to the retailers and to the final consumers. Men (79%) are mostly involved in the activities related to harvesting and storing *Monodora myristica* and 55% of men are involved in harvesting and storing *Afrotyrax kamerunensis*. They are often assisted by youths who transport the NTFPs from the forest and farmlands to their homes. This contrasts with the findings of Awono et al., (2013) in which they found many rural dwellers, especially women generating their income through the gathering of NTFP products from the nearby forest for sale. NTFPs may also have cultural significance and value (Cocks and Wiersum, 2003). Moreover, the Environment and Natural Resources Research (2013) advocated that different age groups of the rural dwellers participate in the harvesting of these forestry products which is noted to be dominated by female gatherers. Youths assist them in carrying out their tasks especially in the domain of transportation. The old are also involved, to a limited extent (5%), in the various NTFP exploitation activities because of the long distances that are involved for the exploitation of these NTFPs especially in difficult access villages. The indirect actors involved in the value chain were the Wabane council members, village traditional council members and the various forest user groups.

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### 2. Harvesting and Quantities of *Monodora myristica* and *Afrotyrax kamerunensis* harvested.

*Monodora myristica* is harvested and processed using crude tools such as cutlasses and spears. This unsustainable harvesting method results in poor quality of the product and resource degradation. in the case when it is poorly harvested, corroborating with Nkwatoh et al., (2011) in which harvesters were found to use these crude implements in cutting *M. acuminata* stems between 1.5 and 0.5 cm above ground level. In most cases, *M. acuminata* stems are cut below ground level making it difficult for the parent plant to initiate effective coppicing, leading to resource degradation.

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The annual quantity of *Monodora myristica* harvested was approximately 50.05 tons and 45 tons was sold while the annual quantity of *Afrotyrax kamerunensis* harvested were 25.7 tons with 25 tons traded. These annual quantities harvested are higher than the 65.8 tons of *Ricinodendron heudelotii* harvested in the South West Region from 2013 to 2015 of which 13.17 tons were traded in South West markets (Ndumbe et al., 2018). It is less than the average annual quantity of 113 tons of *Irvingia sp.* harvested in the South West region (Ingram et. al 2016). However, it should be noted that this quantity of *Irvingia sp.* represented total harvest in the entire South West Region whereas the quantities of *M. myristica* and *A. kamerunensis* in this study were harvested only in Wabane sub-division hence comparatively more significant than *Irvingia sp.* in terms of harvest in the South West Region. The harvesting and marketing of *Monodora myristica* involves several processes such as storage, transport and sale. The majority of the quantities of *Monodora myristica* and *Afrotyrax kamerunensis* harvested is sold. Only 2% of *Monodora myristica* is consumed, 3% is given as gift to friends and relatives and 5% is lost during transportation from the forest. This is in line with the findings of most NTFPs studies (Ingram et al., 2012, Ingram et al., 2016, Ndumbe et al., 2018) whereby some of the quantities harvested are used for direct household

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consumption while some are given out as gifts and a few is lost. Marcus et. al., (2009) found out that *Irvingia spp.* was given out significantly as gift and for barter, with almost one third given away by the households in the South West and 25% in the East in 2008. Losses are fairly high, with between 8 to 9% of the product perishing. These **uses** are slightly different from the ratios for the Centre, South and Littoral Regions (Mvila & Vallée du Ntem, Djoum and Sangmelima and in pygmy villages) where 58% was sold, 11% offered as gifts and 28% was consumed (Awono et al., 2009).

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### 3. The Market Value of *Monodora myristica* and *Afrostryax kamerunensis*.

The study revealed that 50.05 tons of *Monodora myristica* was sold constituting a market value of 40,228,600 FCFA for the harvesters and 44,378,000 FCFA for the retailers. Also, 25.4 tons of *Afrostryax kamerunensis* was sold with a market value of 22,375,160 FCFA for the harvesters and 25,788,000 FCFA for the retailers. The annual market values for both NTFPs in the Wabane sub-division alone **is** far more than the market value for *Ricinodendron heudelottii* harvested in the entire South West Region from 2013 – 2015 and estimated at 21,949,705 FCFA (€33,511) (Ndumbe et al., 2018). However, the market values for both NTFPs are lesser than that of *Irvingia spp.* of which, based on the average selling price of kernels, the value of trade for bush mango harvesters was estimated at 1,175,121,208 FCFA while the market value was estimated at 4,801,062,134 FCFA based on average market prices (Ingram et al., 2016). It should however be noted that the value of trade in bush mango for harvesters in the Ingram et al., (2016) study is larger because it was calculated for three broad Regions in Cameroon, namely, the East, South West and South Regions while our study focused only on the Wabane sub-division in the South West Region. Furthermore, the market value of 4,801,062,134 FCFA for bush mango (Ingram et al., 2016) covered traders in Cameroon, Nigeria and Equatorial Guinea. The major markets involved in trade of both NTFPs were Banteng, Bechati, Mbechoh, Babong, and Guzang. Guzang receives the largest share, about 70% of the total quantities of *Monodora myristica* and *Afrostryax kamerunensis* traded in the study area. This is because it has an in-flow of the major buyers that come from the North West, West, Littoral Regions and the city centers of Yaoundé. This is line with the findings of Ndoeye et al., (1998) in which a total of 36 tons of njansang (*Ricinodendron heudelottii*) representing a monetary value of 43,432,200 FCFA **was** sold in Yaoundé alone in 1995. This also corroborates with Ingram et al., (2012) in which 3,464 tons of *Gnetum* flowed annually through the main export market of Idenaua in the South West Region alone which is far more than the total quantity of 2,324 tons of *Gnetum* harvested in 18 villages in the South West Region from 2007-2009 (Ingram et al., 2012), indicative of the fact that the Idenau market receives traders not only from the South West Region but also from other Regions in Cameroon. At the level of the market, prices are determined by the bargaining power of harvesters, the quantity of NTFP available, the number of traders present at the market, and the actual marketing costs and the margins expected. Traders usually agree on a common price to sell the non-timber forest products in line with the findings of Ndumbe et al., (2009).

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## Conclusion

Men are actively involved in harvesting *Monodora myristica* and picking of *Afrostryax kamerunensis* while women are mostly concerned with their trade which involves four marketing channels linking four actors. *Monodora myristica* is harvested using crude tools such as cutlasses and spears. This leads to poor quality of the product in the case where it is poorly harvested. *Monodora myristica* and *Afrostryax kamerunensis* are mostly harvested for sale, little is consumed by harvesters. The quantities of *Monodora myristica* and *Afrostryax kamerunensis* harvested are significant compared to other popular NTFPs like

*Irvingia* sp., *Ricinodendron heudelotii*, *Gnetum* spp. that are harvested and traded in Cameroon. The market values of trade in both NTFPs for the main stakeholders (harvesters and retailers) are also more important compared to the more popular NTFPs in Cameroon. This study recommends that the government, non-governmental organisations and research development partners working in the NTFP sector in Cameroon should pay particular attention to the development of *Monodora myristica* and *Afrostyrax kamerunensis* value chains as these chains have potential for job creation, poverty reduction and food security. Furthermore, additional research is needed in the sector for the development of improved mechanised equipment that will reduce the time invested in harvesting these NTFPs as well to develop appropriate processing technologies. Finally, the government and development partners should encourage the cultivation and domestication of *Monodora myristica* and *Afrostyrax kamerunensis*, sustainable harvesting techniques and farming practices in order to prevent resource degradation in the long term.

**Comment [H67]:** Conclude the results in as per your objectives.

## References

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**Comment [H68]:** Check reference keenly. Few reference are missing here and some needs deletion. Follow same pattern for writing references.