

Analysis of Actors Involved in the Bamboo Value Chain and Strategies for the Development of the Bamboo Sector in the Menoua Division, West Region of Cameroon

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Abstract

Bamboo is an important non-timber forest product owing to its multipurpose nature. In Cameroon, bamboo has always been neglected and seen as worthless by many communities. However, in recent years, bamboo has received renewed attention which has made many communities and different stakeholders to gain interest in the resource. This study which was carried out in the Menoua division, West region of Cameroon between February to July 2021 sought to identify and characterise the actors involved in the bamboo sector, and assess the different strategies that could be employed to develop the bamboo sector. Data were collected using quantitative and qualitative methods in 6 sub-divisions in Menoua division (Dschang, Santchou, Fongo Tongo, Fokoué, Penka Michel and Nkong-Ni). For the selection of study sites, the criterion used was the proximity of households to the area where the bamboo resource is found. Using the simple random sampling method, 53 households were surveyed across the Menoua division. Key informant and expert interviews were also conducted with mayors, traditional chiefs, heads of forestry posts, heads of research institutions/structures and craftsmen involved in the bamboo sector. Using SPHINX software version 5, a survey form was designed. The data collected was coded and analysed using EXCEL 2010 and SPSS. Map data was analysed using ARCGIS version 2.18. Results indicated that there were two main groups of actors: direct actors (collectors, collectors/transporters, producers/collectors, producers/collectors/transporters, collectors/traders) and indirect actors (Municipal Councils, Decentralized Services of the Ministry of Forestry and Wildlife—MINFOF, Development

partners like INBAR, Research Institutions like the Institute of Agricultural Research for Development—IRAD, and academic institutions like the University of Dschang). The direct actors are directly linked to the bamboo value chain while the indirect actors are those whose decisions influence the sector (e.g. MINFOF) or those who provide financial and technical support (Municipal Councils, INBAR; IRAD, the University of Dschang). The main strategies proposed by the local population for the development of the bamboo sector were regular sensitization campaigns on the benefits of bamboo (92%) and the provision of technical, material and financial support to bamboo producers (41%). Key informants/experts proposed the following in order to ensure the development of the bamboo sector in the Menoua division: raising awareness about bamboo, its different varieties and benefits; creating bamboo plantations (with varieties adapted to the agro-ecological zone i.e. the western highlands) in order to reduce the pressure on other resources; setting up support mechanisms for producers and other actors in the bamboo value chain; allocating land/agricultural areas for bamboo plantations as there is land scarcity in the Menoua division. Based on the strategic framework developed from this study, in order to ensure an adequate and effective development of the bamboo sector in the Menoua division, there should be among others: multiplication of awareness-raising and training programmes for farmers on bamboo production techniques; more support for smallholder farmers by providing them bamboo plants in quality and quantity; production of bamboo stems in quality and quantity; more awareness campaigns for young craftsmen on the advantages of the bamboo craft sector; more training campaigns for craftsmen on modern bamboo processing techniques; and the establishment of a well-developed and sustainable bamboo-based craft sector.

Keywords

Bamboo, Bamboo Vulgarization, Strategic Framework, Actors, Menoua Division, Cameroon

1. Introduction

Environmental protection and biodiversity conservation issues have become major topics of concern to the global community. They have become more acute since the onset of climate change, one of the main causes of which is forest degradation and deforestation (Hansen, 2005). In Africa, more than 60% - 80% of the needs of poor people depend directly on natural resources (Fisher et al., 2005).

The tropical forests of Central Africa cover nearly 235 million hectares and, in addition to timber, have great Non-Timber Forest Products (NTFPs) potential for the well-being of the people of the sub-region. About 80% of the population in Central Africa use these resources on a daily basis to meet their subsistence needs and as a source of income and employment (Nfornkah et al., 2021c). At local, national, regional and international levels, NTFPs provide food, medicinal plants, ornamental plants, energy, building materials, fishing equipment, goods

and utensils to the populations. They also have a great socio-cultural and religious value in the sub-region. As such, NTFPs contribute to both food security and the general well-being of the populations in Central Africa (FAO, 2011). Non-timber forest products have been of increasing interest worldwide in recent years due to their contribution to household economy, food security and environmental conservation (Apema et al., 2010). Among non-timber forest products, bamboo occupies an important place. It is presented as a resource that alleviates many social and environmental problems. It is the common term applied to a general group of large woody herbs generally varying from 10 cm to 40 m in height (Scurlock et al., 2000). According to Bystriakova et al. (2004), half of Malagasy households use bamboo in their daily lives for construction, handicrafts or as an energy source.

Bamboos are grasses of the Bambusoideae subfamily, growing mainly in the hot and humid areas of Asia, America, Africa and Oceania. The resource is highly variable in terms of climate, relief, vegetation and soils in the respective sites. In this respect, the work of its recognition reveals the existence of nearly 1200 species and varieties of bamboo identified throughout the world. Bamboo has a strong capacity to adapt to the conditions of different environments (Nfornkah et al., 2020b). It is considered one of the most valuable and important non-timber forest products in the world with an estimated annual export cost of raw bamboo in Asia of US\$8.9 billion which makes Asia the highest bamboo producing region in the world (Yang et al., 2004; Agnihotri and Nandi, 2009; Nongdam and Tikendra, 2014; Mishra, 2015; Yi, 2018).

Bamboo forests cover nearly 37 million hectares worldwide, representing 3.2% of the world's forest area, of which 65% is in Asia (mainly India, with 11.4 million hectares, and China with 5.4 million), 28% in the Americas and 7% in Africa. Bamboo areas exceed one million hectares in Brazil, Indonesia, Laos and Nigeria. It exceeds 800,000 ha in Myanmar, Chile, Ethiopia and Vietnam. Most of the bamboo harvested for trade comes from natural forests, although plantations have increased significantly in recent years. It is estimated that globally, natural forests account for more than 75% of bamboo forests. In Asia, about 30% of the bamboo area is planted. Over the past 15 years, the area of bamboo has increased by 10% in this part of the world, mainly due to large-scale plantations in China and, to a lesser extent, in India (25% of the bamboo area is planted there, i.e. nearly three million hectares) (Seethala et al., 1998; Wong, 2004; Patrice et al., 2016). Among African countries, Madagascar has the greatest diversity of bamboo, with 11 genera and nearly 40 species, 35 of which are endemic (Bystriakova et al., 2004).

In Cameroon, bamboo is distributed across the five agro-ecological zones namely the Sudano-Sahelian zone (Agroecological zone 1—AEZ 1), the High Savannah Zone (AEZ 2), the Western Highlands (AEZ 3), The Monomodal forest zone (AEZ 4) and the Bimodal forest zone (AEZ 5) (Nfornkah et al., 2020a; Nfornkah et al., 2020c; Nfornkah et al., 2021a; Nfornkah et al., 2021b; Nfornkah et al., 2021c; Chimi et al., 2021). Although bamboo is fairly distributed across the different regions of Cameroon, many actors see bamboo as an invasive species

worth destroying. However, in recent years there has been more interest directed towards bamboo by different actors owing to the multipurpose nature and the fast growth rate of the plant. This study was therefore undertaken to examine the different actors involved in the bamboo value chain as well as assess the different strategies to adequately develop bamboo in the Menoua division, west region of Cameroon.

2. Materials and Methods

2.1. Description of the Study Area

Menoua is a division in Cameroon located in the west region. Its capital is Dschang. It covers an area of 138,000 ha, i.e. 1380 km² and has six (06) sub-divisions which are Dschang, Santchou, Fongo Tongo, Fokoué, Penka Michel and Nkong-Ni (Figure 1). Its population is estimated at 372,244 inhabitants (2001 estimate) with a population density of 270 inhabitants/km². The climate is the tropical highland climate characterized by two seasons which are the rainy season and the dry season. Temperature is highly moderated by relief which explains the usually cool nature of the entire Menoua division except for Santchou which is found in the humid zone. The Mamy Wata waterfalls and the Ndem Mvoh caves

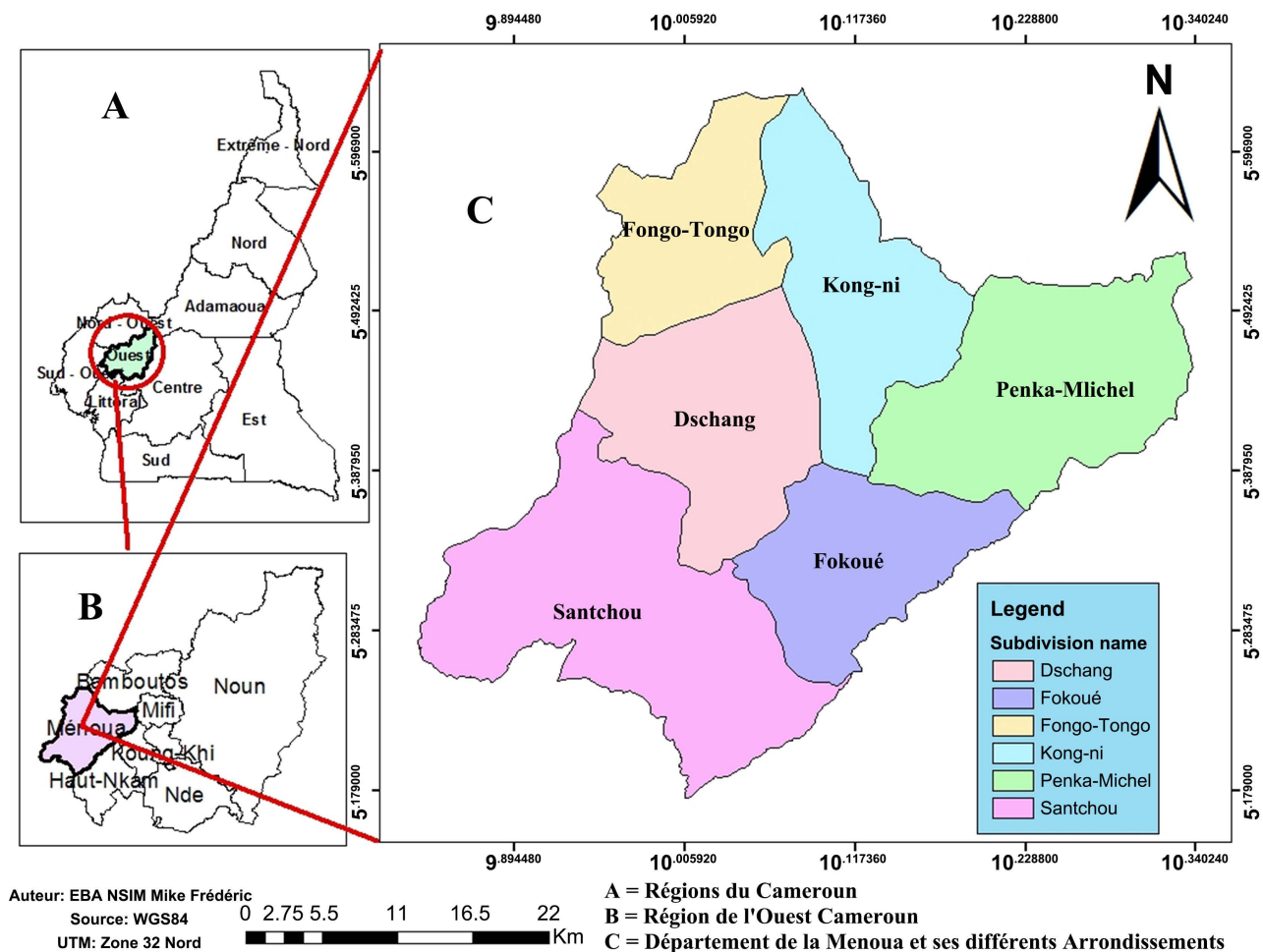


Figure 1. Map of Menoua division, west region of Cameroon.

are some of the division's attractions. In addition, the division is home to one of the largest universities in Central Africa (the University of Dschang) with old Faculties such as the Faculty of Agronomy and Agricultural Sciences (FASA) and the recently created Faculty of Medicine and Biomedical Sciences.

The main economic activities in the Menoua division are agriculture, hunting, sand exploitation, logging, trade and hunting. Agriculture remains a favourite activity for the population (PCD-Dschang, 2011; PCD-Fongo-Tongo, 2011; PCD-Fokoue, 2013; PCD-Santchou, 2015). It is practiced both in the rural areas and in the peri-urban areas. The production systems are still small-scale and are characterized by the practice mixed cropping especially the association of food crops and perennial crops (Arabica coffee, plantain, beans, maize, cassava, macabo, taro, etc.) on the same piece of land. Peri-urban agriculture is increasingly developed with the rise of market gardening crops such as tomatoes and cabbage. Off-season maize is also grown. Although sufficiently practiced, peri-urban agriculture is hampered by the problem of surface area; it is practiced in specific areas, namely the lowlands and areas close to the city pending urbanization. These areas are quickly swallowed up by urban expansion. Peri-urban agriculture is practiced intensively, but the techniques remain archaic due to the under-use of inputs whose costs are prohibitive, which does not ensure optimal yields. It is nevertheless true that this agriculture provides employment and is quite prosperous because its production is essentially intended to satisfy the immediate needs of the city. Rural agriculture however remains the main sector of activity and occupies more than 70% of the active population. The main food crops grown are maize, beans, plantain and sugar cane are grown on relatively small areas. As with peri-urban agriculture, cultivation techniques remain archaic and yields are below expectations due to the high cost of inputs.

Livestock is also reared and there are two systems (extensive and semi-intensive) for raising cattle, poultry, pigs and small ruminants. The sector faces the problems of non-demarcation of grazing areas causing agro-pastoral conflicts, insufficient technical supervision despite the presence of the delegation of livestock, fisheries and animal husbandry and the zootechnical and veterinary centre; the absence of livestock markets, and the absence of slaughterhouses and butchers.

2.2. Sampling Technique

For the selection of villages in the different districts of Menoua, the purposive sampling technique (Tassiamba, 2019) was adopted as the villages to be sampled were based on their proximity to the bamboo forests.

In each sampled village, the same sampling technique was applied. Thus a minimum total of 05 households per village were set in order to obtain at least 50 households surveyed in the whole of the Menoua Division, for the data to be statistically acceptable.

For the purpose of administering the questionnaires, the unit of analysis was considered to be any person of 15 years of age or older, which we divided into

seven age groups, namely: 15 - 20 years, 20 - 30 years and 30 - 40 years, 40 - 50 years, 50 - 60 years, 60 - 70 years and 70 - 80 years. This was organised in such a way as to ensure that all categories (young, adult or elderly) were involved in the process. In order to take gender into account, at least 20% of the respondents were women (Lemofack, 2020).

2.3. Data Collection

Both secondary and primary data were collected during the course of this study:

2.3.1. Secondary Data

These are all the data extracted from similar studies carried out either in Cameroon or elsewhere. Thus, the data collected comes from the archives of the Department of Forestry, Faculty of Agronomy and Agricultural Sciences (DEPFOR-FASA) dealing with similar issues to this study, and also from internet searches. Much of the documentation comes from archived publications published by INBAR.

2.3.2. Primary Data

This are the data collected in the field. The first stage consisted of a preliminary visit to the study site (the six districts) in order to gain an understanding of the physical environment. This phase took an average of 6 days. During this preliminary stage, it was a question of familiarizing ourselves with the environment by making contact with the different categories of actors selected for our study (households in direct or indirect contact with the bamboo resource, bamboo collectors and craftsmen and finally, public (MINFOF Menoua) and private (NGOs such as FODER and INBAR) services dealing with the regulation and promotion of the said resource within the Menoua Division, including research institutions (DEPFOR-FASA; IRAD) dealing with the issue). This contact allowed us to have basic information on the behaviour of the different targeted actors concerning the issue of the development and promotion of bamboo in their locality. In addition, contacts were made with several trusted people in the area who acted as field informants to facilitate data collection.

Then, over a period of 20 days, the actual data collection was carried out in accordance with the objectives set. This data collection targeted only the different types of actors retained for this study through open-ended and close-ended questions. A semi-structured survey form was drawn up using Sphinx software version 5. Data collection was also carried out using a field computer and a notebook for collecting information. A camera was also used for the acquisition of field images. In addition, GPS coordinates of the various points and villages surveyed were taken in order to locate them on a map.

1) Identifying and characterizing actors involved in the bamboo sector in the Menoua division

This involved identifying the different actors and the data concerning them, including their general characteristics (location, number, main activity, level of

education, function in the bamboo production chain, marital status, etc.). This was done through survey forms, and interviews.

2) Identifying strategies for the development and development of the bamboo sector in the Menoua division

The aim of study was to highlight the problems that undermine the bamboo sector in the Menoua division. The problems identified and analysed made it possible to propose a strategy for the development of the sector, summarized in a strategy framework and logical framework. This was always done through individual interviews with state (MINFOF) and private (NGOs) actors, populations living near bamboo resources, economic operators, as well as research structures involved in the sector (IRAD, University of Dschang).

2.4. Data Processing and Analysis

The questionnaires were analysed and coded using Sphinx plus version 5, the software that was used to create the questionnaire and to collect the numerical data (Tassiamba, 2019). The data obtained were jointly analysed using the Excel 2010 spreadsheet and SPSS statistical software. The Excel spreadsheet was used to develop all the graphs.

The SPSS software was used to perform all statistical analyses (Chi-square tests, in particular), as the sample data was greater than 30 (a total of 53 households surveyed were sampled according to their proximity and interactions with the resource) and therefore the distribution followed the normal distribution. The location maps of the points representing the different villages surveyed within the division were drawn up using ARCGIS version 2.18 software. The Chi-square test is a test of the independence of two variables, and it allowed us to conclude whether two variables were dependent on each other at a significance level of 95% with a significance level of $\alpha = 0.05$. The two variables measured were said to be independent when there was no statistical link between them. In terms of P -value, the null hypothesis was rejected when calculated $P(P_{cal}) \leq 0.05$.

3. Results and Discussion

3.1. Results

3.1.1. Socio-Economic/Demographic Characteristics of Direct Actors Involved in the Bamboo Value Chain in Menoua Division

With respect to age, it was noticed that the producer-collectors were adults (age range 40 - 70 years with a percentage of 8% - 34%), the collectors are represented in all age groups of the survey (20 - 80 years with a percentage of 65% - 100%) and the collector-traders are represented exclusively in the age group 20 - 30 years with a percentage of about 10%.

Concerning income generating activities, about 99.8% of the sampled population in the villages of Bandoum and Fottcheufeu (Fokoue sub-division) practices agriculture, which is therefore the main income-generating activity in these localities; the same observation is made in the village of Fomepia (Fokoué) with

68.5% of the sampled population practicing agriculture, but this time associated with other activities such as trade, which is only slightly represented (18.6%). The same observation is made in the rest of the villages in the division, with agriculture predominating.

When asked whether their main income generating activity was related to bamboo production or exploitation, about 99.8% of the local population sampled in Bandom village (Fokoue) responded with a Negative. In the rest of the sampled villages, on average more than 73.5% of the sampled population always responded with a Negative and only less than 30% on average had a Positive response. This indicates that overall, the sampled populations would know about bamboo but would have little interest. The Chi-square test (**Table 1**) confirms these observations by testing the dependence or otherwise between the main income generating activity and the production/exploitation of bamboo.

From the total population sampled and asked if they had ever heard of Bamboo, 75% (representing males) had a positive response as did the remaining 25% of respondents (representing females). Following this question, we asked them if there were any bamboo plantations in their locality, about 89.5% of men and 76.9% of women respectively responded in the affirmative; on the other hand, about 10.5% of men and 23.10% of women responded with a No. However, it is important to note that these plantations, even when they exist in these villages, are in low concentration and in a dilapidated state, according to our interviews with most of the respondents.

3.1.2. Direct Actors Involved in the Bamboo Sector in the Menoua Division

The surveys carried out in the Menoua division as part of this study showed that the bamboo sector in the division is still informal, both in terms of harvesting the resource and processing it. The sector is essentially reduced to three activities, namely: the collection of bamboo, the craft industry (poorly represented), and the use and/or local sale of the raw product or craft products concerned.

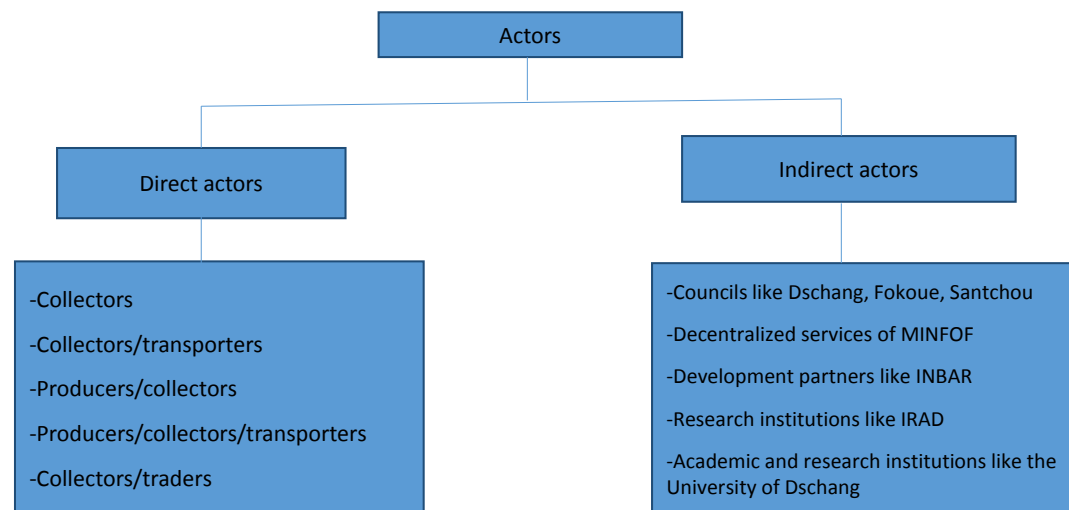
Thus, the actors directly involved in the process are: bamboo producers and collectors (12%), collectors and transporters (2%), collectors and traders (2%), producers, collectors and transporters (2%) and collectors (82%) (**Table 2** and **Figure 2**). This makes us understand that in reality there are rather more bamboo collectors than producers. It is important to underline that the bamboo artisanal sector in the division is almost non-existent or is in extreme decline. Women are recruited in small proportions in production and collection.

Table 1. Result of the Chi-square test at 95% threshold.

| Alpha = 0.05 | Value | Degree of freedom (df) | p-level |
|------------------------------|-------|------------------------|---------|
| Pearson Chi-square | 0.196 | 4 | 0.996 |
| Likelihood ratio | 0.182 | 4 | 0.996 |
| Number of valid observations | | 53 | |

Table 2. Classes of direct actors involved in the bamboo sector in the Menoua division.

| Direct actors | Number of respondents | Percentage (%) |
|-----------------------------------|-----------------------|----------------|
| Collectors | 43 | 82 |
| Collectors/transporters | 1 | 2 |
| Producers/collectors | 6 | 12 |
| Producers/collectors/transporters | 1 | 2 |
| Collectors/traders | 1 | 2 |
| Total | 52 | 100 |

**Figure 2.** Actors involved in the bamboo value chain in the Menoua division.

It is important to note that this first category of actors are directly linked to the development of bamboo in this division; next to them, we have another category of actors who are indirectly linked to the process of development of the resource; these are the state structures represented here by the decentralized services of the Ministry of Forestry and Wildlife (MINFOF Menoua) and the Municipal Councils constituting the 2nd category of actors who can take decisions regarding the functioning of the sector, although they are not directly attached to it; the development partners (such as the International Bamboo and Rattan Organization—INBAR, the International Fund for Agricultural Development—IFAD, etc.) and the academic and research structures (Department of Forestry of the Faculty of Agronomy and Agricultural Sciences of the University of Dschang—DEPFOR-FASA-UDs, and the Institute of Agricultural Research for Development—IRAD) which constitute the 3rd category that accompany the first two categories of actors in the development process through financing and capacity building.) and the academic and research structures (DEPFOR-FASA-UDs.) which constitute the third category that accompany the first two categories of actors in the process of development through financing and technical capacity building for a better production and transformation of the bamboo

resource.

3.1.3. Indirect Actors Involved in the Bamboo Value Chain in the Menoua Division

The main indirect actors involved in the bamboo value chain in the Menoua division include Municipal Councils, decentralized services of MINFOF, development partners (INBAR) and research structures (DEPFOR-FASA-UDs; IRAD etc.).

1) Involvement of Municipal Councils in the process of developing the bamboo sector

During field surveys, we had the opportunity to talk with some Council officials such as the Mayor of the Fokoue Council, the Secretary General of the Santchou Council, the 1st Deputy Mayor of Nkong-Zem and the 3rd Deputy Mayor of the Dschang Council. From these discussions, a lot was gathered concerning the development of the bamboo sector in these municipalities.

a) Fokoué Council

According to the mayor of the Fokoué Council, in collaboration with the local population of her constituency, bamboo has been planted along the margins of certain roads located on the edge of ravines/steep slopes; this is to stabilize the structure of its soils in order to avoid erosion and degradation. This can be seen along the roads between Fottcheufeu-Bandoum-Fomepia. In addition, it is recommended to these populations to avoid cutting down the bamboo planted along the roads because their role in stabilizing the soil cannot be taken for granted. According to the Mayor, this roadside bamboo planting activity will be extended to all the villages in her jurisdiction that have these high-risk areas. In addition, discussions are underway within the municipality for a better development of the bamboo sector in collaboration with research institutes such as the University of Dschang through DEPFOR-FASA for the benefit of local populations.

b) Santchou Council

According to the interview held with the Secretary General (SG) of the Santchou Council, there is not yet a real policy of bamboo development in his jurisdiction, due to the lack of knowledge of the benefits of this resource and therefore there is a pressing need to sensitize the local population on the benefits and advantages that can be obtained from the production, exploitation and production of bamboo, while providing financial and technical assistance.

c) Nkong-Zem Council (Nkong-Ni sub-division)

According to the 1st Deputy Mayor of the Nkong-Zem Council, local people know about bamboo but do not pay particular attention to it yet due to lack of knowledge of the bamboo resource. They just use it for handicraft purposes as well as other needs such as crop supports/staking (plantain, market gardening), supports/poles for electricity lines, in construction (scaffolding), water pipes in some private plantations. The artisanal sector of the locality is much more focused on the transformation of wood and rattan for the moment, but there are

nevertheless small forests of bamboo that had been planted by the local populations a long time ago. The local people just go there to extract the bamboo when needed. This confirms the fact that these plantations, even when they exist, are not maintained and have been designed in an anarchical way.

d) Dschang Council

From the interview held with the 3rd Deputy Mayor of the Dschang Council, the issues related to the development of bamboo within his constituency are topical. This is thanks to a partnership that exists between the Department of Forestry of the Faculty of Agronomy and Agricultural Sciences of the University of Dschang (DEPFOR-FASA-UDs) and the Dschang Council through the project “One Citizen One Tree” launched on August 8, 2020 by the creation of a botanical garden within the university campus and for which a site of more than 13 hectares was offered by the rector of the University of Dschang. More than 1500 plants of various species including bamboo have been planted on the site. But, according to Mayor, it is still necessary to go towards the local population in order to sensitize them more on the advantages which can be gotten from the production and transformation of bamboo, because the craft industry in Dschang and its surrounding villages just like everywhere in the Menoua division focuses more on the transformation of raffia and wood, characterized by a tremendous shortage of supply from the wild.

2) Involvement of the decentralized services of the Ministry of Forestry and Wildlife (MINFOF Menoua) in the process of developing the bamboo sector

The Ministry of Forestry and Wildlife (MINFOF), through its decentralized services deployed within the division, plays an appreciable role in the policy of development of the bamboo sector in the sense that it already ensures, according to its competence, the preservation/conservation of the bamboo resource within the Menoua division (it is forbidden to cut bamboo stems on the Foreke-Dschang escarpment. According to an eco-guard working in the Santchou wildlife sanctuary, serious legal action is taken against anyone who harvests bamboo in and around the Foreke-Dschang escarpment). Furthermore, MINFOF accompanies the University of Dschang (DEPFOR-FASA) in all the development initiatives of the bamboo sector within the division (One Citizen–One Tree Project; Training workshop for small farmers in the West Region of Cameroon in bamboo propagation techniques; bamboo cultivation and management of bamboo-based agroforestry ecosystems).

3) Involvement of development partners (like the International Bamboo and Rattan Organization—INBAR) and research/academic structures (DEPFOR-FASA-UDs; IRAD etc.) in the development of the bamboo sector

a) Involvement of INBAR in the development process of the bamboo sector

Since the official opening of its regional office for Central Africa in Cameroon (Yaoundé) in 2019 (INBAR, 2019), INBAR has been asserting itself throughout

the country and especially in the West region through sensitization, studies of the state of the bamboo resource and its local uses, and its inter-African development programme on means of subsistence of small-scale farmers in Africa; all this in close collaboration with the University of Dschang through the Laboratory of Environmental Geomatics of the Department of Forestry. Through this partnership, the following have been accomplished: A nursery was created with various agroforestry tree seedlings including bamboo; and students (students studying Water resources, as well as Forestry and wildlife) were introduced to the techniques of vegetative propagation of bamboo and its cultivation.

b) Involvement of the Institute of Agricultural Research for Development—IRAD (Dschang station) in the development of the bamboo sector

From our interview with the Agroforestry expert of IRAD (Dschang station), it appears that IRAD has not yet integrated the notion of bamboo cultivation in its agroforestry programme in the Menoua division. We therefore took the opportunity to educate IRAD on the importance and necessity of integrating bamboo into its development programme, given that they are closer to farmers practicing agriculture and have the advantage of being close to the University of Dschang. It is therefore wise for IRAD Dschang to work closely together to facilitate the popularization of bamboo cultivation in the Menoua division, which will be the starting point for a more sustainable development.

c) Involvement of the University of Dschang (Department of Forestry of the Faculty of Agronomy and Agricultural Sciences/DEPFOR—FASA) in the development process

The University of Dschang being a centre of research and innovation par excellence; through its dynamic Department of Forestry headed by Prof. Martin TCHAMBA and in collaboration with INBAR, MINFOF and other development partners, has initiated thanks to the project “One Citizen One Tree” various activities and trainings for the development of the bamboo sector within the West Region in general, and the Menoua division in particular.

Research topics (for Thesis, Master of Science, and Professional Masters) have been assigned to the different students in the Department of Forestry in order to enable them deepen research and knowledge on bamboo. Young students in the department of Forestry of the Faculty of Agronomy and Agricultural Sciences, University of Dschang are trained in vegetative propagation techniques of bamboo.

Within the framework of local development support, the University of Dschang through the Laboratory of Environmental Geomatics of the Department of Forestry has initiated the training of small-scale farmers in the West Region of Cameroon in vegetative propagation techniques of bamboo, its cultivation and the management of bamboo-based agroforestry systems.

3.1.4. Strategy for the Development of the Bamboo Sector in the Menoua Division

1) Perception/proposal made by the populations surveyed

In response to the question “What should be done to improve the bamboo

value chain in the Menoua division, west region of Cameroon?” The respondents’ answers were varied: More than half of the respondents (92%) believe that farmers should be made aware of the benefits of bamboo and its products; 41% believe that, in addition to this awareness-raising, small farmers/producers should be supported technically, financially and materially in order to improve the quality of production of the raw material; still others believe that, in addition to all of the above, local people/farmers/craftsmen should be trained in the techniques of multiplication, production and processing of the resource (16%) (Figure 3).

2) Perceptions/Proposals of key informants/experts (Heads of forestry posts, Council and Traditional authorities) for the development of the bamboo sector in the Menoua division

According to key informants/experts, the main ways to be used in adequately developing the bamboo sector are: raising awareness of farmers on bamboo, its different varieties and virtues/benefits; creating bamboo plantations (varieties adapted to the agro-ecological zone) in order to reduce the pressure on other resources such as raffia, which plays an essential role in the preservation of fragile ecosystems (rivers, etc.); setting up support mechanisms for producers and other actors in the bamboo value chain; allocating land/agricultural areas for bamboo plantations as there is a real land problem in the area; construction of roads for the transportation of the bamboo resource and products from remote areas to cities.

3) Strategic framework for the development of the Bamboo Sector in the Menoua division

In order to develop the strategy, several problems were identified and summarized. These were 3 major problems that could limit the development of the bamboo sector in the Menoua Division which were inadequate bamboo stems in quality and quantity, poorly developed bamboo artisanal sector; and absence of an internal market for bamboo and bamboo products. Based on these problems, objectives were set which led to the crafting of the different strategies for bamboo development in the Menoua division (Figure 4).

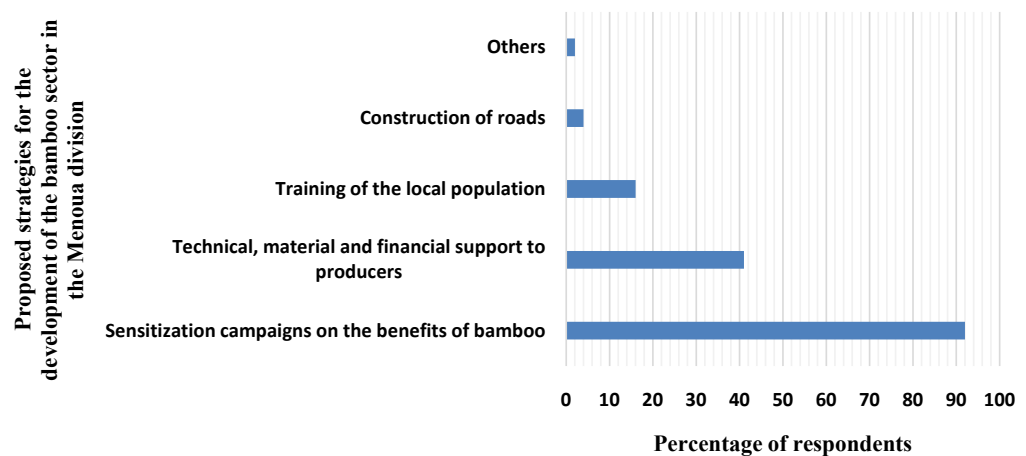


Figure 3. Farmers’ perception of bamboo development strategies.

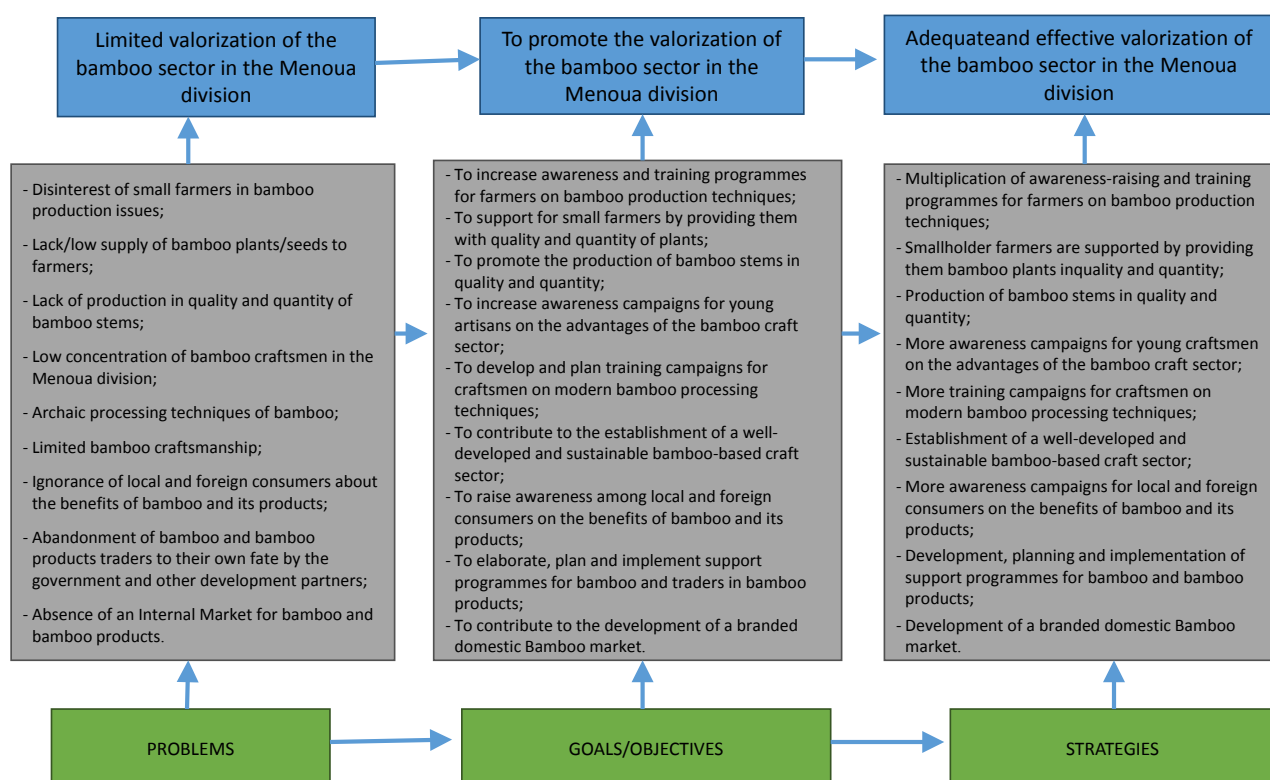


Figure 4. Operational strategic framework for the development of the bamboo sector in the Menoua division.

Thus, in line with the problems uncovered and the objectives set, a strategic framework for the development of the Bamboo Sector in the Menoua division was crafted. The main objective of this strategic framework was to facilitate the putting in place of policies for the development of the bamboo sector in Menoua division in particular and Cameroon in general.

4) Logical framework for the development of the bamboo sector in the Menoua division

The logical framework was developed with objective being to ensure better training of farmers on the techniques of production and multiplication of bamboo; to promote further processing of bamboo into various products; improve the sales channels (sales) of products resulting from the processing of bamboo (Internal Bamboo Market). The logical framework (Table 3) was set up with 03 expected results, 08 activities, 05 objectively verifiable indicators and 6 means of verification.

3.2. Discussions

3.2.1. Actors Involved in the Bamboo Sector in the Menoua Division

The results obtained at this level seem to be identical to those obtained by MINFOF (2016), during inventories of the bamboo sector carried out in the South, Centre, South-West and Littoral Regions respectively for the PND-FBC project, which identified bamboo producers (28.3%), collectors (18.3%), craftsmen-collectors and craftsmen (53.3%) as direct actors in the said sector. The difference is that in

Table 3. Logical framework of the strategy for the development of the Bamboo Sector in the Menoua Division.

| Expected results | Activities | Objectively verifiable indicators | Sources and means of verification |
|---|--|---|--|
| 1. Smallholder farmers in the Menoua division are trained on the techniques of production and propagation of bamboo | 1.1. Organization of training workshops for smallholder farmers on bamboo propagation techniques; 1.2. Sensitization of farmers on Agroforestry techniques using bamboo. 1.3. Supply of seedlings in sufficient quantities to farmers. | 1.1.1. Professionalism in the performance of tasks by farmers; 1.1.2. Increase of bamboo nurseries and plantations within the division. | - Report on training and sensitization of direct actors involved in bamboo production; - Direct observations in the field |
| 2. Bamboo processing techniques are more advanced and mastered by Menoua craftsmen | 2.1. Sensitization of the craftsmen on the benefits and advantages of the transformation of bamboo; 2.2. Organisation of training workshops for the said craftsmen on the techniques of transforming bamboo into various valuable products. 2.3. Supply of branded bamboo processing materials and equipment to the craftsmen. | 2.1.1. Multiplication of bamboo-based craft sectors in the division and its environs; 2.2.1. More advanced and modern processing techniques of bamboo. | - Activity reports; - Direct observations in the field |
| 3. The flow of products from the processing of bamboo is strengthened and multiplied. | 3.1. Organisation of awareness campaigns for the population of Menoua and its environs on the advantages of using bamboo products; 3.2. Bring more tourists to the division and encourage them to visit the bamboo-based craft sector. | 3.1.1. Increase the demand for bamboo products by local and foreign consumers. | - Activity reports; - Direct observations in the field. |

this case, the artisanal sector was actually represented in these areas but in the west region, the artisanal bamboo sector is almost absent. This difference could be explained by the fact that the artisanal sector in the Menoua division focuses more on the transformation of wood (from regions such as the Centre, Littoral and South-West) and the transformation of raffia bamboo, which is strongly represented in the agro-ecological zone; in addition, the few craftsmen surveyed said that they did not have a mastery of the advanced transformation techniques of bamboo. During these surveys, we had the opportunity to meet a former collector/craftsman in Bansa (Penka-Michel sub-division) who told us that he had stopped his activities because of the drastic drop in income due to the COVID-19 pandemic, and that he had preferred to fall back on subsistence farming and petty trade. We had the chance to meet two other bamboo craftsmen in Dschang (Marché A), who told us that the bamboo artisanal sector is in sharp decline because tourists (who often visited their sector of activity during the Christmas holidays and during funeral periods) are no longer coming since the start of the COVID-19 pandemic and that they often received some support from the Dschang Municipal Council which used to grant them subsidies but since the COVID-19 crisis started, they no longer received any subsidies. At present, the

only visits are those of the state agents of the Ministry of Trade and the Directorate of Taxes who control prices and request for the payment of taxes which is difficult for the bamboo craftsmen to pay because they are making very little financial benefit for the sale of bamboo products. These results do not really corroborate with those of Bidobo et al. (2017) in Côte d'Ivoire who obtained the following results: producers (20.8%), wholesalers (7.6%), collectors (38.8%), transporters (4.8%) and users (13.8%). This may confirm the fact that the bamboo sector in the Menoua division still lacks real support and is therefore developing in an anarchical manner.

These results corroborate with those of Ingram et al. (2010), Ingram and Tieguhong (2012), Nfornkah et al. (2020b) who found that there were three groups of stakeholders in the bamboo sector in Cameroon; namely: primary (those directly involved in bamboo related activities, e.g. craftsmen), secondary (not directly involved but can make and influence decisions in the sector, e.g. state institutions) and tertiary (cannot make decisions but can influence them, e.g. development partners). Sengchaleun et al. (2021) in a study conducted in Laos, found that different actors play a role in the emergence of the national nutrition policy in the country, with external actors playing the major role.

3.2.2. Strategic and Logical Framework for the Development of the Bamboo Sector in the Menoua Division

The operational strategic framework generated by this study showed that three main problems hinder the development of the bamboo sector in the Menoua division i.e. inadequate bamboo stems in both quality and quantity; poorly developed bamboo artisanal sector; and the lack of an internal market for bamboo and its products. Thus to ensure an adequate and effective development of the bamboo sector in the Menoua division, there should be among others: multiplication of awareness-raising and training programmes for farmers on bamboo production techniques; more support for smallholder farmers by providing them bamboo plants in quality and quantity; production of bamboo stems in quality and quantity; more awareness campaigns for young craftsmen on the advantages of the bamboo craft sector; More training campaigns for craftsmen on modern bamboo processing techniques; establishment of a well-developed and sustainable bamboo-based craft sector. Studies have shown that, for the bamboo value chain in particular and NTFPs in general to be well developed, there should be a favourable legal, policy and institutional environment (Ministère de l'Environnement et des Forêts, 2009; MINFOF, 2012; Sven and Mbala, 2012; Tahiana et al., 2016; MINFOF, 2018; Randrianoandro, 2018).

From the logical framework of the study, it was found that to ensure an adequate and effective development of the bamboo sector, there should be better training of farmers on the techniques of production and multiplication of bamboo; processing of bamboo into various products; improvement in the sales channels (sales) of products resulting from the processing of bamboo (Internal Bamboo Market).

The strategic and logical frameworks of this study could therefore help in the development of favourable policies which will go a long way to promote the development of the bamboo sector in the Menoua division in particular and Cameroon in general.

4. Conclusion

This study focused on the different actors and strategies that can be put in place to ensure the sustainable development of the Bamboo Sector in the Menoua division, west region of Cameroon. To achieve this, surveys and interviews were carried out in the various districts of Menoua. The surveys were carried out using semi-structured survey forms drawn up and administered to farmers living near the resource. Interviews were conducted with traditional, administrative and communal authorities and other officials of research structures such as IRAD, DEPFOR-FASA-UDs in order to obtain their perception of the issue of the development of this sector within the division.

Direct actors in the sector do not receive subsidies/support for the promotion of their activities. There are no CIGs/Cooperatives for the production and sale of bamboo products or resources. The majority of Municipal Councils do not have any real programmes for the development or promotion of this sector within their area of competence. Poor road networks in most of the areas with bamboo resources makes collection very difficult and the harvesting techniques used by the farmers are rudimentary, destructive and difficult (use of machetes instead of saws for example). The means of transporting the harvested stems are poor (hand-push trucks, on the head, motorbikes, small vehicles); the quantity of harvested stems is low overall, which leads to the ageing of the potential bamboo plantations/stems present in the forests of the Menoua division. The potential in terms of species that predominate in the agro-ecological zone (western highlands) in general is low (*Phyllostachys* sp., *B. vulgaris* and *Yushana alpina*) and farmers are not aware of their benefits.

Nevertheless, there is reason to be hopeful because the political will of the state to promote the bamboo sector has led it to sign a cooperation agreement with certain development partners such as INBAR, which has been promoting the sector for several years in many countries around the world. Thus, since its establishment in Cameroon (in 2019), this organisation has opted for sensitization, training and support of potential Cameroonian populations wishing to improve their living conditions through the production and/or sale of products from bamboo. Thus, in the west region in general and Menoua division in particular, working in collaboration with the decentralized services of MINFOF and the University of Dschang (especially the Department of Forestry—DEPFOR), INBAR has launched a vast programme aimed at training young learners (students in the divisions of water resources; forestry and wildlife), farmers (small-holder farmers and craftsmen) on the techniques of conservation, multiplication, production and processing of the bamboo resource. However much remains to

be done for a real take-off of the bamboo sector in the Menoua division in particular and the west region in general.

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Conflicts of Interest

Authors declare that there are no competing interests.

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