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The bush mango value chain in South West Cameroon: Governance, sustainability and emerging opportunities

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ABSTRACT

Non-Timber Forest Products (NTFPs) play critical roles in conservation, poverty reduction and local subsistence across the Congo Basin. Bush mango (*Irvingia gabonensis* and *Irvingia wombolu*) represents one of Central Africa's most commercially significant forest resources. This study examined the bush mango value chain in Meme and Manyu Divisions of Cameroon's South West Region, analysing trade volumes, profit margins, livelihood contributions, governance arrangements and sustainability challenges. Primary data were collected through semi-structured interviews with 47 value chain actors across harvesting villages, collection points and markets in Kumba and Eyumojock between 2022 and 2024. Data were analysed using content analysis and descriptive statistics. Results showed that trade in bush mango continue to expand despite security challenges, with wholesalers dominating the chain while harvesters capture limited benefits. Women dominate harvesting (75%) and local retailing (70%) but are excluded from export activities. The governance landscape comprises a complex bricolage of statutory, customary, market and corruption elements. Ecological sustainability concerns include low tree densities (1.35 stems/ha), poor natural regeneration, collapse of seed dispersal mechanisms and climate-induced shifts in fruiting seasons. Emerging opportunities include growing international demand from nutraceutical and cosmetic markets. The study concludes that realising these opportunities requires strengthened governance, equitable benefit distribution and strategic investments in domestication.

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INTRODUCTION

Non-Timber Forest Products have become an increased focus for research as they are seen as effective measures to achieve beneficial outcomes in conservation, poverty alleviation and subsistence use for local communities (Ros-Tonen and Wiersum, 2003). Value chain analysis of NTFPs allows researchers to examine the balancing of different aims, including ecological and conservation goals alongside development, food security and poverty reduction objectives (Paudel *et al.*, 2010; Ingram and Tieguhong, 2013). A particularly compelling case for such analysis concerns *Irvingia* spp., commonly known as bush mango, in Cameroon.

Bush mango refers to two primary species: *Irvingia gabonensis* (Aubry-Lecomte ex O'Rorke) Baill., the wet season fruiting variety which is more commercialised, and *Irvingia wombolu* Vermoesen, which produces in the dry season (Clark and Sunderland, 2004). The oil-rich kernels are used as a popular condiment and sauce thickener across Central Africa. The kernels have multiple medicinal uses and the timber is used for construction (Clark and Sunderland, 2004). This NTFP holds significant cultural importance, nutritional value and income potential for forest communities (Iponga *et al.*, 2018).

Despite widespread use and trade, comprehensive data on the bush mango value chain remains fragmented. Most existing research dates back over a decade, with particular gaps concerning the main harvest regions (Ndoye *et al.*, 1998). This paucity of information hinders sustainable governance of the chain, particularly given that poverty reduction and food security are key elements in Cameroon's forestry policies. Furthermore, growing international demand driven by nutraceutical and cosmetic industries places new pressures on wild populations and existing governance arrangements.

The governance of bush mango access and trade in Cameroon is enacted through a bricolage of systems

(Cleaver, 2002; Laird *et al.*, 2011). This bricolage is predominantly a function of customary systems that regulate access to wild resources as communal property. However, due to demographic pressure and urbanisation, customary systems are weakening (Laird *et al.*, 2011). Statutory systems including permits, waybills and land tenure laws are often seen as ineffective due to complicated colonial history (Laird *et al.*, 2011). Market mechanisms and corruption also form part of this governance assemblage (van Alphen, 2023).

Cameroon's legal framework for NTFPs includes the 1974 Land Ordinance, the 1994 Forestry Law (Law No 94-01), and Decree No 95/531/PM of 1995. Decision No. 0209 of 2019 classified NTFPs into categories A, B and C based on economic value, socio-cultural importance and ecological sustainability. Bush mango is in Category C (non-threatened), requiring Collection Authorisation for commercial harvest beyond subsistence and Waybills for transport with a regeneration tax of 10 FCFA per kg. Decision No 0034 of 2020 introduced the Agroforestry Notebook programme for domesticated tree registration.

The Nagoya Protocol on Access and Benefit Sharing, to which Cameroon is party, aims to ensure fair and equitable sharing of benefits from genetic resource utilisation (Buck and Hamilton, 2011). This framework is relevant given growing international interest in bush mango.

Ecological sustainability indicators for NTFPs include species abundance and distribution (Ticktin, 2004), population structure (Belcher *et al.*, 2005) and regeneration rates (Ticktin, 2004). For bush mango, low tree densities (1.35 stems/ha) and weak natural regeneration have been documented (Fongnzossie *et al.*, 2010; Hirai, 2014; Fongnzossie *et al.*, 2014).

Livelihood sustainability indicators include household income contribution (Belcher *et al.*, 2005) and maintenance of access (Ingram and Bongers, 2009). Bush mango contributes 18-33% of household income in harvest areas (Ndumbe *et al.*, 2022).

This study focuses on Meme Division (Kumba) and Manyu Division (Eyumojock) in Cameroon's Southwest Region. The objectives were: (1) to estimate current volume and monetary value of bush mango trade; (2) to assess profit margins and livelihood contributions; (3) to identify sustainability challenges and emerging opportunities; and (4) to examine implications for research, policy and practice.

MATERIALS AND METHODS

Study area

The research was conducted in Meme Division (centred on Kumba, 4°38'N 9°26'E) and Manyu Division (centred on Eyumojock, 5°46'N 8°59'E) in Cameroon's South West region.

Kumba functions as a major urban market and wholesale hub, while Eyumojock and surrounding villages represent primary harvest areas. The Southwest Region is characterised by humid lowland forest with mean annual rainfall of 2,500-4,000 mm and temperatures ranging from 22-28°C. The region has faced ongoing security challenges related to the Anglophone Crisis since 2016 (Bang and Balgah, 2022) (Fig. 1).



Fig. 1. Map of the South West region of Cameroon

Data collection

Primary data collection was conducted in two phases: Meme Division in 2022 and Manyu Division in 2024. Due to insecurity, field data were complemented with secondary data from literature review, web searches and government statistics.

Semi-structured interviews were conducted using a value chain framework (Kaplinsky and Morris, 2001), employing purposeful and snowball sampling. Respondents included direct value chain actors (farmers/collectors, traders, retailers, wholesalers, exporters) and indirect actors (regulators, service providers). A total of 47 interviews were conducted (Table 1). The interview guide covered economic aspects (volumes, prices, seasonal fluctuations), governance (rules, changes, power dynamics, corruption) and sustainability (resource availability, ecological concerns, livelihood impacts). Gender-disaggregated data were collected.

Table 1. Distribution of interviews by actor category and division

Actor category	Division		Total
	Meme (2022)	Manyu (2024)	
Harvesters/collectors	8	12	20
Village traders	5	4	9
Wholesalers	4	2	6
Retailers	3	3	6
Exporters	2	0	2
Regulators/officials	2	2	4
Total	24	23	47

Data analysis

Data were analysed using content analysis. For governance analysis, codes were developed for statutory systems (regulations, authorisation, waybill), customary systems (community, traditional, village), market mechanisms (contract, privatisation, price) and corruption (informal payment, bribe, roadblock). Quantitative data were analysed using descriptive statistics (means, standard deviations). Profit margins were calculated as revenue minus costs (excluding unpaid family labour). Volume estimates were triangulated with secondary sources where possible.

Limitations

Security concerns prevented access to some harvest villages, potentially introducing sampling bias. The informal nature of much trade means reported volumes and values are likely underestimates. Research was conducted outside peak harvest seasons, limiting observation of harvesting activities.

RESULTS

Value chain structure and actor characteristics

The bush mango value chain comprises four levels:

Level 1: harvesters and primary processors (n= 20), predominantly women (75%), mean age 42 years (SD= 11), mean harvesting experience 15 years (SD= 8), mean distance travelled to forest 4.2 km (SD= 2.1).

Level 2: village traders (n= 9), predominantly men (89%), mean travel distance 22 km (SD=8).

Level 3: wholesalers (n= 6) operating from urban centres.

Level 4: international buyers and processors in Nigeria, Europe, China and USA.

Gender dimensions

Women dominate local-level activities (Table 2). In Meme Division, women comprise 75% of harvesters, 70% of retailers and 60% of wholesalers. Exporting is exclusively male. Factors cited by women included

lack of capital (82%), limited business networks (71%), household responsibilities (65%) and legal barriers (53%).

Trade volumes and profit margins

Annual volumes per actor type in Meme showed significant variation (Table 3). Harvesters handled 50-500 kg (mean= 150 kg, SD= 85). Village traders handled 500-3,000 kg (mean= 1,200 kg, SD= 420). Wholesalers handled 3,000-20,000 kg (mean= 8,500 kg, SD= 3,200). Exporters handled 5,000-50,000 kg (mean= 15,000 kg, SD= 8,500).

Profit margins varied along the chain (Table 3). Harvesters earned 200-500 FCFA/kg (mean= 350). Village traders earned 100-300 FCFA/kg (mean=250). Wholesalers captured 300-800 FCFA/kg (mean= 450). Exporters earned 500-1,500 FCFA/kg (mean= 1,150). Most trade remained unrecorded in official statistics.

Table 2. Gender distribution across value chain stages

Chain stage	% Female	% Male
Harvesting/collection	75	25
Village-level trading	11	89
Wholesaling	60	40
Retailing	70	30
Exporting	0	100

Table 3. Annual trade volumes and profit margins (Meme Division, 2022)

Actor category	Mean volume (kg/year)	Mean purchase price (FCFA/kg)	Mean selling price (FCFA/kg)	Mean profit (FCFA/kg)
Harvesters	150 (85)	-	350 (120)	350 (120)
Village traders	1,200 (420)	350 (120)	600 (150)	250 (80)
Wholesalers	8,500 (3,200)	600 (150)	1,050 (200)	450 (120)
Exporters	15,000 (8,500)	1,050 (200)	2,200 (350)	1,150 (250)

Values in parentheses are standard deviations. 1 USD \approx 500 FCFA.

Table 4. Livelihood contributions by actor category (Manyu Division, 2024)

Actor category	Mean annual income (FCFA)	% of total household income
Harvesters	145,000 (65,000)	22 (8)
Village traders	850,000 (320,000)	45 (15)
Wholesalers	4,200,000 (1,800,000)	60 (18)
Retailers	280,000 (95,000)	57 (14)

Livelihood contributions

In Manyu Division, most harvesters earned less than 200,000 FCFA annually from bush mango, representing 15-30% of total household income (mean=22%, SD=8) (Table 4). The top 10% of traders

earned approximately 70% of total chain value. Harvesters commercialised 65% of harvest, retaining 35% for household consumption. Income was used primarily for education (35%), household needs (33%), healthcare (20%), food (19%) and clothing

(14%). Traders spent proportionally more on transport (22%) and land (11%).

Governance arrangements

Statutory governance

Only 2 of 20 harvesters (10%) were aware of Collection Authorisation requirements, and none possessed a valid authorisation. All exporters claimed to possess waybills but reported transporting 5-30% over specified quantities. Only 6% of respondents were aware of the 2019 Category C classification. Awareness of the Agroforestry Notebook programme was 2%, with no participants.

Customary governance

Access to wild trees operated on first-come, first-served basis (85% of harvesters). Families harvested the same areas annually (72%). Outsiders paid fees to traditional authorities (2,000-5,000 FCFA/season). Weakening of customary systems was attributed to migration (68%), weakening traditional authority (62%) and resource competition (55%).

Market governance

Privatisation was reported by 28% of harvesters in high-density areas. Information asymmetry affected 85% of harvesters, who relied solely on buyer offers.

Corruption

Collectors paid 4,000-5,000 FCFA per trip at roadblocks, compared to <1,000 FCFA previously (78% of experienced traders). Small collectors lost 10-15% of margins to informal payments. Exporters paid 50,000-100,000 FCFA per shipment.

Sustainability issues

Ecological sustainability

Tree densities averaged 1.35 stems/ha. Regeneration index was low-medium (0.2-0.4). Elephant seed dispersers are critically endangered. Deforestation rate is 0.1% annually. Climate effects were reported by 78% of harvesters, with shifting fruiting seasons. Despite concerns, 65% of harvesters did not perceive sustainability as an issue.

Livelihood sustainability

Bush mango contributed 22% of harvester household income. Only 15% of harvesters had market information access. Access restrictions were reported by 35% of harvesters. Only 12% of women reported any land rights.

Institutional sustainability

Only 25% of respondents expressed confidence in formal institutions. Community forests showed mixed success, with single-community management more effective than multi-community arrangements.

DISCUSSION

Institutional bricolage in bush mango governance

The governance landscape for bush mango exemplifies institutional bricolage (Clever, 2002): an evolving assemblage of statutory, customary, market and corruption elements. Statutory systems function poorly, with 90% non-compliance for Collection Authorisations.

This aligns with observations that low compliance reflects mismatches between formal rules and local social norms (van Alphen, 2023). Customary systems are weakening due to migration, urbanisation and commercialisation (Ribot *et al.*, 2006; Agrawal and Ostrom, 2006), creating governance gaps. Market mechanisms and corruption increasingly fill these gaps, with privatisation and informal payments rising (van Alphen, 2023). The resulting bricolage creates confusion and leaves producers at the mercy of enforcement authorities (Ingram *et al.*, 2015).

Power asymmetries and benefit distribution

Significant power imbalances shape benefit distribution. The top 10% of traders capture approximately 70% of chain value, consistent with earlier studies (Ingram *et al.*, 2017; van Alphen, 2023). Power manifests through economic capital, market information, regulatory knowledge and social capital (Clever, 2012). Nigerian market actors exercise particular power as price-setters (van Alphen, 2023). Gender power dynamics exclude

women from high-value stages, consistent with previous findings (Ewane *et al.*, 2009).

Conservation through commercialisation

Commercialisation has increased perceived tree value, potentially incentivising cultivation. Domestication rates are higher in the South West region (65%) than in the East Region (5%) (Ewane *et al.*, 2009). However, commercialisation has also intensified pressure on wild populations. The 2019 reclassification removed harvest limits when demand is increasing. Commercialisation benefits have not been equitably distributed, with women and remote communities capturing minimal benefits (Shackleton *et al.*, 2011; Laird *et al.*, 2010).

Domestication barriers

Domestication faces significant barriers. The 7-15 year maturity period deters farmers (cited by 72% of non-planters). The Agroforestry Notebook programme remains unknown to 98% of respondents. The legal framework does not clearly distinguish domesticated from wild products (van Alphen, 2023). Without secure rights and reliable benefits, farmers lack incentives to invest (Foundjem-Tita *et al.*, 2012).

Emerging opportunities

International demand is growing across Nigerian, nutraceutical and cosmetic markets (van Alphen, 2023). The global nutraceutical market for bush mango is estimated at \$100 million annually (Persistence Market Research, 2018). New applications include cocoa butter substitutes (Yamoneka *et al.*, 2018), bio-diesel (Bello *et al.*, 2011) and medical products (Okolo *et al.*, 1995). However, the nutraceutical market is under-regulated with significant fraud risk (Sun and Chen, 2012). Cameroon's ABS framework provides mechanisms for benefit-sharing but requires implementation (Buck and Hamilton, 2011).

CONCLUSION

This study examined the bush mango value chain in Meme and Manyu Divisions. Trade continues to expand, with wholesalers dominating while harvesters capture limited benefits. Women dominate harvesting and

retailing but are excluded from export. Governance comprises a bricolage of statutory, customary, market and corruption elements. Ecological sustainability concerns include low tree densities, poor regeneration, dispersal collapse and climate effects. Emerging opportunities include growing international demand and new applications, but realising these requires strengthened governance and equitable benefit distribution.

RECOMMENDATIONS

Policy: Simplify and digitise permit processes; establish clear subsistence/commercial thresholds; recognise customary tenure; simplify tree registration; strengthen women's land rights; implement ABS frameworks.

Practice: Strengthen harvester organisations; provide market information via mobile platforms; support local processing; engage communities in domestication programmes.

Research: Conduct national resource inventories; study market information system effects; research climate change impacts; investigate gender dynamics in value chains.

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