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Challenges to governing sustainable forest food: *Irvingia* spp. from southern Cameroon☆

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ABSTRACT

Across the Congo Basin, bush mango (*Irvingia* spp.) nuts have been harvested from forest landscapes for consumption, sold as a foodstuff and for medicine for centuries. Data on this trade however are sparse. A value chain approach was used to gather information on stakeholders in the chain from the harvesters in three major production areas in Cameroon to traders in Cameroon, Nigeria, and Equatorial Guinea, the socio-economic values, environmental sustainability and governance. Around 5190 people work in the complex chain in Cameroon with an estimated 4109 tons harvested on average annually in the period 2007 to 2010. Bush mango incomes contribute on average to 31% of harvester's annual incomes and dependence increases for those further from the forest. Customary rules govern access to resources. Although regulations exist, most trade is illegal, with corruption and collective action governing access to markets. The majority of nuts harvested are sustainably collected. Although 51% of the harvest is sourced from the forest, trees are also managed on cultivated land. Forest degradation and deforestation threaten the species. Policy measures such as linking stakeholders, promoting cultivation, pragmatic regulation, and supporting processer groups may make trade in this forest food more sustainable.

1. Introduction

Cameroon has persistently had a low level of development and gender equality (UNDP, 2013). Almost half of the population lives in rural areas and around 40% of land area is covered by dense humid lowland forest, which covers southern Cameroon (de Wasseige et al., 2012) In this context, 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). In 1997 over 1100 traders were involved in the trade of NTFPs from the humid forest zone valued US$ 1.75 million (Ndoye, Pérez and Eyebe, 1997/98). In 1998, NTFPs in Southwest and Northwest of Cameroon were valued at US$ 19 million (CERUT-AIDEnvironment, 1999) and in 2009, five NTFPs traded in the humid zone were worth US$ 54 million, employing 45,000 people (Ingram et al., 2010; Ingram, 2014a; Awono et al., 2016). More people are engaged in NTFP trade than in the formal and informal timber sector (Lescuyer et al., 2011). Although harvesting and trading NTFPs in Cameroon is largely informal and small scale (Eba'a Atyi et al., 2013), interest in NTFPs has increased due to their role in poverty reduction, conservation, and food security (Sunderland et al., 2013). Achieving and balancing these objectives is however extremely difficult (Kusters, 2009). Growing demand has led to a number of high volume and value NTFP markets. However wild harvests can intensify stress on wild populations, increasing the possibility of over-exploitation and possible local extinction (Clark and Sunderland, 2004). Wild populations are also threatened by continued high rates of deforestation and degradation (0.1% and 0.6% respectively per annum for the decade to 2010) (de Wasseige et al., 2016).

Such pressures are illustrated by the use and trade of products known collectively as *bush mango* in the Southwest region, *mangue sauvage*, *ndo'o*, and *andok* in Centre, South and Littoral regions, and *peké* in the East Region of Cameroon. These products originate from two species: *Irvingia gabonensis*, a tree bearing fruits with fragrant, juicy flesh and sweet juice, and *Irvingia wombolu* (also known as dry season mango), a similar tree with smaller, bitter fruit (Tchoundjeu and Atangana, 2007; Oyen, 2007), Both species grow to between 25 m to 40 m tall and co-exist in the lowland tropical humid forests across Central Africa, with the range of *Irvingia wombolu* extending further east and west (Clark and Sunderland, 2004). The trees are also semi-cultivated, maintained in farms and fallows. Bush mango has ranked among the 10 most economically important NTFPs in Congo Basin countries, and has long been one of the most used and valued NTFPs in Cameroon (Ingram et al., 2010; Clark and Sunderland, 2004). *Irvingia gabonensis* is IUCN Red List classified as lower risk/near threatened (needing updating) and *Irvingia wombolu* is not listed (IUCN, 2013). Although no range-wide

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inventories have been carried out, the 1998 IUCN Red List risk assessment is based on a perception of declining populations due to logging operations, the expansion of human settlements and poor natural regeneration (IUCN, 2013). Across Central Africa, products from *Irvingia* spp. have multiple uses. The oil-rich nuts are used as a popular condiment and sauce thickener. Cooking oil is also extracted from the nut, the juice is used in cooking and wine, the pulp as a dye, the bark and kernels have multiple medicinal uses, and the timber is used for construction. The kernels have been traded profitably since at least the 1970s in Cameroon, when it was estimated to be worth 50 million US$, and have been exported, notably to Nigeria, Gabon, and Equatorial Guinea, and onwards in West and Central Africa (Ingram et al., 2010; Clark and Sunderland, 2004), In the last decade, the nuts have been increasingly processed in the USA and Europe as the active ingredient in herbal, weight-loss health supplements and cosmetics (Sun and Chen, 2012).

A value chain denotes how often economic and financial values change and increase with the activities involved in bringing a product from the forest, through processing and production, to delivery to final consumers (Kaplinsky and Morris, 2000). When NTFPs move from subsistence use to commercialization, the livelihoods of rural and urban, Central African and global stakeholders involved, such as harvesters, processors, traders and consumers, become interlinked through demand and supply value chain interactions. Concerns have been raised about the sustainability of the specie's trade and need for species and ecosystem conservation, particularly to conserve genetic variation (Ainge and Brown, 2004).

Despite the ubiquitous use of bush mango products in Cameroon and the Central Africa region, much of the information on *Irvingia* spp. harvest, use, and trade concerns only parts of the value chain. Data focuses on specific geographical areas, with in particular, gaps concerning the main harvest regions (Ndoye et al., 1998). Most data on the species and trade is now over two decades old. The importance of *Irvingia* spp. to the Cameroonian economy and its environmental and social value for all stakeholders in the chain has not been fully elaborated. This paucity of information hinders sustainable governance of the chain, particularly given that poverty reduction, sustainable livelihoods, and food security are key elements in Cameroon's forestry and poverty reduction policies. This study aims to fill these gaps by identifying the activities and stakeholders in the bush mango chain from the humid lowland forest zone of southern Cameroon; analysing the economic, social and environmental aspects of the chain; and examining how governance of the chain affects its sustainability.

2. Methods

To contribute to the understanding of the bush mango value chain, a review of the literature, as well as of government trade and permit data, and internet trading websites, were conducted. A situation analysis was conducted based on meetings with research organisations, government agents, an NGO, and two NTFP trader associations. This led to 47 villages being selected in the Southwest, South, and East regions as the three main regions where bush mango is harvested for commercialisation in Cameroon. Fieldwork was conducted in between September 2007 and July 2010. First, rapid field assessments were conducted in each village to determine if there were harvester organisations in the village and the number of members, of which a proportion were randomly selected for interview. An equivalent number of harvesters who were not members of a group were also interviewed, or if no organisations were present, a sample aiming at 15% of the harvester population in that village was interviewed. Due to the combination of rapid assessment and snowballing technique used, sometimes the total sample was revised and was smaller or larger depending upon availability of harvesters in the time period. This strategy resulted in 282 harvesters being interviewed, shown Table 1. Nineteen focus group meetings were held in selected harvesting villages, to generate additional socio-economic information. Harvesting and processing activities were observed and used to verify interview data. One tree nursery manager was interviewed in the Southwest.

Table 1
Villages and bush mango harvesters interviewed.

Region	Sub division	Village	Number of harvesters interviewed	Sample as % of households in village
East	Messock	Moange le Bosquet	19	21
		Koungoulou	18	26
	Ngoyla	Nkolndong	7	39
		Messok – Messok	5	25
	Yokadouma	Bandekok	6	26
	Central	Polidort		
		Landjoue I	7	23
	Subtotal	6	62	26
Southwest	Ekondo Titi	Massore – Balue	6	25
		Funge	5	25
	Mundemba	Meka Ngolo	5	8
	Central	Besingi	6	15
	Bamusso	Ekombe Moffako	3	30
		Ekombe Liongo	5	20
	Mamfe Central	Besongabang	7	10
		Egbekaw	11	8
	Akwaya	Takpwe	3	25
		Bache	3	15
		Matene	4	4
		Mbilishie	5	9
		Basho 1	8	25
		Obonyi 1	13	19
		Assam	8	24
		Kajifu	2	2
		Bodam	2	2
		Nyang	7	6
		Mukonyong	6	8
	Eyumojock	Ayaoke	6	6
		Kembong	7	6
	Upper Banyang	Bachuo Akagbe	3	4
		Etuko	3	5
	Nguti	Mungondor	3	8
		Ekenge	3	6
	Subtotal	25	**134**	13
South	Meyomessala	Nkolenyeng	8	9
		Mengon	4	5
	Djoum	Minko'o	4	5
		Endengue	4	5
		Melan	3	3
		Miatta	3	3
		Minkom	3	3
	Bengbis	Bengbis	4	5
		Yemedang	3	3
	Biwong Bulu	Endameyos	13	15
		Nkengou	13	15
	Mvangan	Mvangan Ville	2	2
		Zoe Befam	7	8
	Biwong Bane	Biwong-Bane Centre	3	3
	Ngoulemakong	Mvanda	6	7
	Zoétélé	Ebamina I	6	7
	Subtotal	16	**86**	**6**
Total		**47**	**282**	**15**

The chain was then traced further to markets in the Southwest, Littoral, Centre, and Eastern regions of Cameroon, and border markets in Gabon, Nigeria, and Equatorial Guinea. Adapting Ruiz Pérez et al.'s (2000) market typology (Wiersum et al., 2014), 31 markets were identified and selected, shown in Table 2. These represent a mix of small, local markets, close to supply zone (type I), medium sized markets of regional importance (type II), large urban markets with national projection (type III), frontier markets (type IV), and