



Urban energy transitions and rural income generation: Sustainable opportunities for rural development through charcoal production



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ABSTRACT

Sub-Saharan Africa's charcoal sector is rarely considered a mechanism for rural development or poverty alleviation; instead, current regulations often marginalise rural producers. The development of a sustainable sector, that does not further marginalise rural populations, is restricted by limited understanding of these stakeholders. We assess the heterogeneity of rural producers supplying two differentially sized urban charcoal markets in Mozambique. Drawing on data from 767 household surveys, our findings suggest that the size of the urban market affects the type of rural producer and their scales of production. Overall household income of producers supplying the larger urban market were proportionally more dependent on charcoal for income generation; small-scale producers in particular relied most on charcoal income, contributing >95% of household incomes. In contrast, producers supplying the smaller market had more diversified incomes, and were thus less dependent on charcoal income. Larger-scale producers were generally wealthier; their absolute incomes were higher and they were proportionally the least dependent on charcoal income. Further findings suggest that rural charcoal production was not necessarily the domain of the poorest of the poor and the existence of producers trapped in small-scale production may be a consequence of larger urban markets, rather than an intrinsic characteristic of the sector. Predicted growth of smaller urban areas and associated higher demand for charcoal will provide substantial opportunities for rural income generation, most likely leading to shifts in producers and production scales. Rather than transferring existing formal approaches, which marginalise rural stakeholders, small urban areas provide opportunities to develop equitable production systems, with potential to deliver sustainable energy and rural development. The heterogeneity of rural producers calls for better-targeted interventions that incorporate the importance of charcoal production for rural livelihoods.

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1. Introduction

Urbanisation and economic growth across sub-Saharan Africa (SSA) are resulting in pronounced consumption shifts from fuelwood to charcoal (Girard, 2002), with rising demand for charcoal

in many cities directly linked to population growth (Chidumayo & Gumbo, 2013). There is a predicted 40% rise in biomass energy demand across Africa by 2040 (IEA, 2017). As large villages transform into secondary urban centres, 75% of urban growth across SSA is expected to occur in cities with populations of fewer than one million (UN-Habitat, 2014), thus small urban areas represent significant future charcoal consumption zones. Per terajoule of energy consumed, charcoal is estimated to create around 200–350 jobs, a figure triple that of electricity and 20 times that of kerosene (World Bank, 2005 as cited in Mugo and Ong, 2006). As a

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source of livelihoods this makes charcoal comparable in size to cash cropping in some countries (Matly, 2000). Despite the economic importance of charcoal for rural livelihoods in SSA (Zulu & Richardson, 2013), charcoal production is rarely considered a mechanism for rural development, in strong contrast to other sectors such as agriculture. Promoting the commercialisation of forest products is thus one mechanism for rural development (Belcher & Schreckenber, 2007; Shackleton & Pandey, 2014), and the anticipated demand for charcoal in small urban areas may provide substantial opportunities for rural income generation.

Charcoal has the potential to be a sustainable energy source (Iiyama et al., 2014), yet links between poorly regulated production practices and environmental degradation have led to restrictive management approaches that discourage the extraction of woodfuels (Mwampamba, Ghilardi, Sander, & Chaix, 2013). National charcoal policies need to reflect the importance of woodfuels in the energy sector (Dovie, Witkowski, & Shackleton, 2004), promote sustainability, ensure social equity, as well as being business-oriented (Neufeldt et al., 2015). Yet few countries have explicit legislation enabling such a sector (Mugo & Ong, 2006). Current policies are largely punitive, condemning millions of rural livelihoods to illegality (MacQueen & Korhaliller, 2011). As a result, the majority of trade in charcoal is informal (Wood & Garside, 2014).

The informality of charcoal markets is believed to be the key constraint to their sustainable management (FAO, 2007); building formal institutions is therefore considered the best way to improve sector sustainability (Schure, Ingram, Sakho-Jimbira, Levang, & Wiersum, 2013). However, current formal approaches to govern the charcoal sector in SSA, by and large, do not benefit rural producers (Schure, Ingram, Arts, Levang, & Mvula-Mampasi, 2015). Sustainable urban woodfuel sectors will be difficult to conceive and implement unless rural stakeholders receive tangible benefits (van der Plas & Abdel-Hamid, 2005), yet rural stakeholders are rarely represented in formal decision-making structures (Laird, Wynberg, & McLain, 2010). Formalisation processes create opportunities for corruption (Tsing, 2005; Zulu, 2010), and stricter rules drive stakeholders to more environmentally destructive practices outside the new system (Putzel, Kelly, Cerutti, & Artati, 2015; Speigel, 2012), leading to leakage. Under formal systems, rural producers are frequently exploited by organised 'urban elites' with access to power and capital needed to acquire licenses and transport (Ribot, 1998). In Mozambique for example, only 8% of the monetary benefits from licensed charcoal production remain in local communities, due to bureaucratic barriers in obtaining licenses and weak institutional capacity for resource governance (Baumert et al., 2016). Poor regulation, corruption, high competition, low farm gate prices and restrictive policies perpetuate this situation across much of SSA (Ndegwa, Anhuf, Nehren, Ghilardi, & Iiyama, 2016).

As urban populations grow, so too do their charcoal markets. Charcoal value chains transform to become more complex and typically longer as remaining forest resources are found at increasing distances from urban demand centres (Ahrends et al., 2010). As a result, the evolving composition of the charcoal value chain affects the distribution of benefits and profit margins amongst actors (Iiyama et al., 2017), leading to unequal benefit distributions favouring urban stakeholders (Agbugba & Obi, 2013; Baumert et al., 2016; Ribot, 1998). Furthermore, it becomes increasingly difficult to enact new laws when there are vested interests (Kweka et al., 2015). However, due to the lack of vested interest from 'urban elites' in the charcoal markets of smaller urban areas (Smith, Eigenbrod, Kafumbata, Hudson, & Schreckenber, 2015),¹ these areas may provide opportunities to introduce best-practice production methods and more

equitable governance approaches. Small cities are therefore at the frontier of charcoal sector formalisation, but despite their growing prominence across SSA, their charcoal markets and stakeholders remain understudied (Jones, Ryan, & Fisher, 2016; Smith et al., 2015). In general, there is limited systematic investigation into the heterogeneity of charcoal producers and implications for rural development (Ndegwa et al., 2016), despite growing evidence that producers are heterogeneous with respect to their motivations, demographics, market access, production scales and wellbeing outcomes (Ainembabazi, Shively, & Angelsen, 2013; Jones et al., 2016; Kambewa, Mataya, Sichinga, & Johnson, 2007; Ndegwa et al., 2016; Schure et al., 2013; Smith, Hudson, & Schreckenber, 2017; Vollmer et al., 2017). Nuanced understandings of charcoal participation and livelihood outcomes can aid better policy development (Smith et al., 2017), yet the lack of information about rural producers undermines attempts to successfully move towards sustainable production systems that do not further marginalise them (Schure et al., 2013).

This study contributes to the growing body of work which explores the potential of charcoal production to contribute to rural development in SSA (Arnold, Köhlin, & Persson, 2006; Guild & Shackleton, 2018; Khundi, Jagger, Shively, & Sserunkuuma, 2011; Ndegwa et al., 2016; Schure et al., 2013; Syampungani, Tigabu, Matakala, Handavu, & Oden, 2017; Vollmer et al., 2017; Zorrilla-Miras et al., 2018; Zulu & Richardson, 2013). Here, we assess how urban energy transitions affect opportunities for rural income generating, by comparing rural charcoal producers supplying two differentially sized urban charcoal markets: Maputo, the capital city of Mozambique, and Marrupa a much smaller urban area, and the principal town of Marrupa District, in Niassa Province, Mozambique. We examine differences in producers' production scales, dependence on charcoal production as an income generating activity (in relation to their overall household income), and producers' demographic characteristics. We end with a discussion of the implications for rural livelihoods and sector formalisation as urban demand for charcoal grows.

2. Methods

2.1. Study areas

Like many other countries in SSA, charcoal is the main domestic urban energy in Mozambique (Brouwer & Falcão, 2004; Cuvilas, Jirjis, & Lucas, 2010). It is an important source of income generation for about 5% of Mozambique's population and annual turnover is estimated at 250–300 million USD (van der Plas et al., 2012). Whilst a variety of laws apply to charcoal production in Mozambique, its governance mostly falls under the remit of the Forestry Department (van der Plas et al., 2012). The Forest Law (1999, and subsequent revisions in 2002 and 2012) defines two types of production license: Concession licenses, which can demarcate larger areas, are available to non-Mozambican nationals and are procedurally complex, in some circumstances requiring signing off at ministerial level. Simple licenses are only available to Mozambican nationals and require a less rigorous evidence-based management plan than the concession license (van der Plas et al., 2012). License application is patchy (German & Wertz-Kanounnikoff, 2012; Salomão & Matose, 2007; Siteo, Wertz-Kanounnikoff, Ribeiro, Guedes, & Givá, 2014) and consequently, informally produced charcoal is thought to account for 80–95% of annual consumption (Cuvilas et al., 2010; Del Gatto, 2003). When licensed, charcoal is primarily produced under the simple license.²

¹ Due to a combination of low market prices, shorter value chains with less opportunity for value addition, nearby access to resources and high competition with rural stakeholders.

² Charcoal production can be conducted under the larger concession licenses, but this is very rare and tends to be a side business of timber production. Under such circumstances special dispensation is given for charcoal production (Government of Mozambique, 1999).

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