Journal of Rural Studies 50 (2017) 12–29

Contents lists available at ScienceDirect

Journal of Rural Studies

journal homepage: www.elsevier.com/locate/jrurstud

Do livelihood typologies influence local perceptions of forest cover change? Evidence from a tropical forested and non-forested rural landscape in western Uganda

Ronald Twongyirwe [a, b, *], Mike Bithell [a], Keith S. Richards [a], W.G. Rees [a, c]

[a] Department of Geography, University of Cambridge, Downing Place, Cambridge CB2 3EN, England, United Kingdom
[b] Department of Environment and Livelihoods Support Systems, Institute of Interdisciplinary Training and Research, Mbarara University of Science and Technology, PO. Box 1410, Mbarara, Uganda
[c] Scott Polar Research Institute, University of Cambridge, Lensfield Road, Cambridge CB2 1ER, England, United Kingdom

ARTICLE INFO

Article history:
Received 3 May 2016
Received in revised form
6 December 2016
Accepted 22 December 2016

Keywords:
Household demographics
Time- and Labour-Budgets
Energy use
Cropping and livestock husbandry
Agro-ecological zones
Perceptions
Albertine rift landscape

ABSTRACT

Validation of scientific findings from satellite remote sensing against local ecological knowledge could make the interpretation of forest cover patterns more robust. In this paper, we examine local perceptions of forest cover change in parishes around Budongo and Bugoma for a 30-year period (1985–2014), compare the results with those obtained from remote sensing (Twongyirwe et al., 2015), and interrogate whether the perceptions could be related to livelihood typologies. First, we characterise household strategies for the entire landscape to place livelihood strategies of communities in deforestated areas in a broader local context. An in-depth questionnaire was administered to 706 households in 13 parishes situated in 4 Agro-Ecological Zones (AEZs). The data included household demographic characteristics, energy use, cropping and livestock husbandry, and seasonal time- and labour-budgets. Principal Components Analysis (PCA) and Cluster Analysis (CA) were employed to help identify dominant structures in the data. Secondly, the 375 households in 7 parishes around Budongo and Bugoma forests (part of the 706) responded to additional questions that sought their perceptions on the forest cover trend. The PCA results for the entire landscape show that significant variation amongst households is mainly related to the cultivation time input, on-farm income particularly from cropping activities, livestock husbandry, demographic characteristics, agricultural extension activities, and cultivation labour input. Hierarchical CA shows that households at the landscape level fall into about nine different types, with variation in spatial distribution. The analysis suggests that poor households do live near forested regions, and that the rural poor are more reliant on forest products than peri-urban populations. Regarding perceptions of forest cover change, the majority (70.1%: n = 375) of the respondents in the parishes think that there has been a decline in forest cover, and this percentage is larger than the percentage of non-respondents (18.9%), those that thought it had increased (5.6%), not changed (3.7%), and those that did not know (1.6%). In addition, perceptions on forest change were significantly related to the household livelihood typologies ($X^2 = 623.4$, df = 4, p = 0.000): respondents who perceived forest cover as having declined and those that provided no response belonged to cluster 2 ("low income mixed farming households"), which is also the dominant livelihood typology around these forests. While the data largely suggest that there is a remarkable agreement between remote sensing results and local knowledge on forest change, and that local people may play a big role in filling data gaps where a dearth of information is prevalent (or where remote sensing evidence is fuzzy), there is a clear signal that people in different social classes and age groups can have very different views on what the change in forest cover might be despite what the remote sensing data show. This might have policy implications if decision makers tend to come from the groups that are not likely to have perceived forest cover change, or base their judgement on views from certain social classes. This implies that it is important to have the remote sensing data available as a counter balance to local perception (and vice versa) and therefore these data should be considered concurrently.

* Corresponding author. Department of Environment and Livelihoods Support Systems, Institute of Interdisciplinary Training and Research, Mbarara University of Science and Technology, PO. Box 1410, Mbarara, Uganda.
E-mail address: twongyirwe@gmail.com (R. Twongyirwe).

http://dx.doi.org/10.1016/j.jrurstud.2016.12.009
0743-0167/

1. Introduction

Local perceptions of the historical and current status of forest cover can shed light on deforestation, forest gain and forest stability (Sheil and Wunder, 2002; Sunderlin et al., 2005; Agrawal, 2007). Local perceptions are often context–specific in nature, enhanced by individual and group interaction with their socio-ecological settings, and are often based on a need for rural survival (Dei, 1993). Local perceptions of forest dynamics form a critical knowledge base that is especially beneficial in under–researched areas (Chalmers and Fabricius, 2007), for instance in the region around Bugoma Agro-ecological Zone (AEZ), and where evidence from scientific techniques such as remote sensing produces imprecise results (Hansen et al., 2013; Tropek et al., 2014). A combination of remote sensing data, GIS and local knowledge is ubiquitous in the literature (Lykke, 2000; Southworth and Tucker, 2001; Yiran et al., 2012; Shackleton et al., 2013; Sulieman and Ahmed, 2013). Whilst remote sensing can provide quantities of forest cover change (useful in informing management strategies) (Lambin, 2002; Twongyirwe et al., 2011, 2015; Hansen et al., 2013), we cannot obtain causal information and processes from these data (Chalmers and Fabricius, 2007). Such information can be revealed through interviews with local people (e.g. in Dalle et al., 2006; Chalmers and Fabricius, 2007; Shackleton et al., 2013). However, local people's perceptions of forest cover change could be influenced by livelihood conditions particularly if forests contribute to their survival (Dei, 1993). For instance, while on– and off–farm incomes and related on– and off–farm activities may be indicators of rural people's dependence on forests to meet their day-to-day needs, the age of a respondent will affect trends that have been witnessed/recollected/perceived over the last 30 years (revealed by this study). Perceptions of forest cover change are therefore examined below in the light of rural livelihood characterisation.

Agriculture is the backbone of Uganda's economy (Fan and Zhang, 2008), and the agricultural sector continues to be viewed as a vehicle through which economic growth and development can be achieved, as stipulated in the National Development Plan in the Uganda Vision 2040 (G.o.U, 2012). Most agricultural production is associated with poor rural farmers who account for over 85% of the total population (UBOS, 2007). Rural livelihoods are embedded in complex agro-ecological systems, and are dependent on natural resources (e.g. forests, savanna grasslands). Farmers seek to maximise agricultural production, maintain a healthy household, cope with seasonal fluctuations, exploit market opportunities, manage risk through diversification to other economic activities, and accumulate wealth for their welfare (Bogdanov et al., 2008; Tesfaye et al., 2011; Chilongo, 2014). The majority must exploit the natural resource base to practice their livelihoods, resulting in land cover changes (De Sherbinin et al., 2008). These changes may include deforestation in some parts of the country. In order to illuminate the key drivers of deforestation it will be important to understand the livelihood characteristics of households where dramatic deforestation has occurred (e.g. Budongo and Bugoma Agro-Ecological Zones [AEZs]; Twongyirwe et al., 2015), and contrast them with regions without forest (e.g. the semi-arid and the peri-urban AEZs in this study).

There is a general lack of empirical understanding about how households in the Northern Albertine Rift Landscape use their resources in the face of changing economic and social conditions, yet this is critical for policy development, especially for designing sound agricultural and forestry policies (Pacini et al., 2014). Uganda's national censuses are conducted every decade, but they do not ask relevant questions for this purpose, and the raw data are unavailable for ethical reasons. This study therefore provides data for characterising rural livelihoods drawn from a new survey of households, including wide-ranging questions about household demographic characteristics, cropping and livestock husbandry, energy use, seasonal time and labour budgets.

The focus of the research is at the parish scale (each of which includes two to four villages, see Table 2) for two main reasons. 1) Local people's day-to-day activities are often place–specific (Ostrom and Nagendra, 2006); they may therefore be knowledgeable of events that occurred within their parish, but not at a larger 'regional scale' (which is > 5 times the size of their parishes). 2) Parish–scale analysis is considered as the finest resolution to represent local heterogeneity and has been used as a unit of sampling by similar forest cover change studies in Uganda (e.g. Sassen et al., 2013). Villages tend to have few clustered households, and may therefore not provide representative data to understand the heterogeneity of local–scale processes. Details of sampling are provided in the methods section.

The overarching objective is to construct settlement and activity patterns (livelihood typologies) across the landscape with a view to understand potential factors contributing to forest loss outside the protected forest estate, on privately-owned landscapes, and to shed light on people's perceptions of forest cover change with a view to establishing whether these are related to their livelihood typologies. Specific research questions addressed include:

1. What are the key discriminators of livelihood characteristics in the landscape?
2. Are there distinctive household types, based on socio-economic characteristics in the region?
3. Are there identifiable spatial relationships of the household types to the AEZs?
4. What are local people's perceptions on forest cover patterns in their parishes?
5. Are local people's perceptions on forest change influenced by their age and livelihood typology?
6. How do local people's perceptions on forest change compare with changes reconstructed using satellite remote sensing for the 30-year period?

For the purpose of this paper, a household is defined as a primary unit of domestic production, reproduction and decision-making (De Sherbinin et al., 2008). Typically, it consists of a

Table 1
Description and characteristics of the Agro-Ecological Zones.

Agro-Ecological Zone (AEZ)	Major food crops	Major cash crops	Mean annual rainfall (mm)[a]	Mean annual temperature (°C)[b]	Elevation (m)[c]	Districts
Budongo	Cassava, maize, sweet potatoes, beans	Sugarcane	1397–1524	23-29 (min), 29–32 (max)	914–1097	Masindi and Buliisa
Bugoma	Cassava, maize, beans	Rice, tobacco	1100–1350	16-18 (min), 28–29 (max)	1200–1350	Hoima
Semi-arid	Cassava, beans	Cassava, cotton	800–1000	22-25 (min), 26–32 (max)	600–700	Buliisa
Peri-urban	Cassava, maize, beans	Tobacco	1000–1250	13-16 (min), 18–30 (max)	1120–1150	Hoima and Masindi

[a], [b] and [c] are extracted from unpublished district reports and forest management plans. The rest is extracted from household data.