

**Contribution of miombo woodlands to household
economy and socio-economic determinants of
woodland use: The case of Mozambique**

Progress Report

**Submitted to the
Centre for International Forestry Research**

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Contributions of miombo woodlands to household economy and socio-economic determinants of woodland use: The case of Mozambique¹

Introduction

Forests provide a wide variety of products for the benefit of mankind. Past research on tropical forests has provided very useful insights on the roles forests play in supporting the local livelihoods in the forest margins, such as provision of a variety of non-timber forest products (NTFPs) for subsistence use and cash income; and vital safety nets in the times of need ((Hegde et al. 1996, Hegde and Enters 2000); (Byron and Arnold 1999); (Godoy et al. 2000); (Pattanayak and Sills 2001)). While there is a wealth of literature on the contribution of tropical forests elsewhere, relatively less is known about miombo woodlands which are known to make significant contribution to both the communities and national exchequer throughout the miombo region. Particularly, quantitative analysis of household use of miombo resources is scanty.

Given that forests represent a basket of highly differentiated goods and services, more empirical evidence examining forest dependence, in a robust analytical framework, is necessary (Cavendish 1998). This part of research aims to (a) assess the contribution of miombo woodlands to household economy; and (b) identify the socio-economic determinants of woodland dependence, in Mozambique.

The study was undertaken in Chicale *Regulado*², located in the buffer zone of the Gorongosa National Park (GNP) in the Sofala Province, Mozambique (Fig. 1). The choice of this area was guided by several factors including CIFOR's past research and continued research interests in the region, and an ongoing community level agro-forestry based carbon project that provides incentives³ to smallholders to conserve miombo woodlands.

¹ This is one of the chapters in the PhD dissertation, entitled "*Payments for Environmental Services and Rural Household Behavior: The Case of Carbon in Mozambique's Agro-forests*", under preparation by the author. Funding from the CIFOR/World Bank Miombo Project is gratefully acknowledged.

² Traditional authority.

³ The project provides cash payments to farmers who commit themselves to long term sustainable land use by planting and maintaining trees on their farm, and abandoning their traditional slash-and-burn agriculture.

Fig. 1: Map showing the location of Gorongosa National Park, Mozambique



Chicale *Regulado* covers a total of 40 km² area, with nearly 1,100 households spread over five villages, namely Nhambita, Bue Maria, Munhanganha, Pungue and Mbulawa. Nhambita village, where the *Regulo* Chicale family resides, is considered as the centre of the study area. Of the five villages, four are located within the GNP buffer zone, while one village (Mbulawa) is outside the Park boundary.

Brief historical background

The Nhambita community land was legalized in 2003 after a claim was made under the new Land Act (no. 19/97) which permits communities' ownership of their ancestral land and management of its resources for the benefit of the entire community as per a pre-approved management plan. Part of the community land was taken over by the National Park Authority when the then Hunting Reserve was upgraded to the National Park in 1965. To minimize the poaching pressures inside the GNP during its rehabilitation, a buffer zone strategy was used that envisaged involvement of local community in the management of the GNP (Zolho 2005).

Climate and geography

The climate is subtropical with alternating cool and dry winters (April-October) and hot wet summers (November-March), with May being the coolest and October being the hottest month. The area lies within the rainfall isohyets of 600 mm and 800 mm per year, and is generally influenced by the Gorongosa Mountain. Most of the rain is received between November to March, with July to September being the driest months (Zolho 2005).

Geographically, the land in Gorongosa consists of eroded surfaces of granite and basaltic gneiss complex of Precambrian times, which, after heavy weathering, resulting in sandy soils that are generally unsuitable for any form of intensive farming (Tinley 1977). The vegetation is dry miombo, interspersed with evergreen thickets on the deeper alluvial sands. There are few narrow patches of thick riverine forest along the seasonal streams such as Lupice and river Pungue (Zolho 2005).

Land use

Land use in GNP consists of three types: protected area; buffer zone and community land. The protected area is under the State administration. The buffer zone, land immediately adjacent to the GNP boundary, is jointly managed by the government, communities and other stakeholders. While subsistence farming is allowed in the buffer zone, no other commercial activity including hunting or extraction of forest products for commercial production is allowed. The community land is managed by the communities under the Land Act. Activities in the community land include subsistence farming, charcoal production, fishing, hunting, etc.

Research design

The study used cross-sectional data at the household and community levels. A sample of 330 households was randomly selected. With a view to capturing the variations in resource use caused by seasonal patterns, quarterly household surveys were used over a 12-month period.

Quarterly household surveys

Questionnaire based quarterly household surveys were the main method of collecting data. Use of surveys in economic research was first suggested by (Ciriacy-Wantrup 1947). Household surveys provide a rich source of information at the household level, and its relationship with policy (Deaton 1997). Since official household census is not likely to be available in rural Africa, one way to proceed is to prepare a household roster with village headmen by listing all households under their responsibility (Cavendish 2000), and then randomly select the required number of households.

Quarterly surveys are helpful in two ways. First, studies have demonstrated that accuracy will increase significantly when recall period is shortened, particularly for irregular income sources such as forests and woodlands. Second, there are high seasonal variations both in availability of resources as well as in agricultural harvests, which cause sharp

differences in earnings and access to food {(Cavendish 2000); (Simler et al. 2004)⁴} which can be captured by quarterly surveys.

Questionnaires developed by the CIFOR-PEN⁵ were adapted and expanded to suit the objectives of the research. In addition to the four quarterly surveys, there were two annual surveys – one at the beginning of the research and one at the end – were undertaken as per the PEN research methodology. While the two surveys provided information on demography, land use, and any changes in the 12-month period, the quarterly surveys were helpful in capturing information on the types and quantities of forest products collected from the miombo woodlands; their consumption and sale along with prices and revenue received; household consumption patterns; quantities of farm inputs used and crop yields obtained; off-farm employment and income earned.

Community surveys and focus groups

Focus group discussions involving key informants served two purposes. First, it helped understand the community demography, livelihoods, etc. and thereby address household sampling issues in consultation with communities, and second, it allowed the researcher to get acquainted with broader resource management issues at the community level.

Data collection

Field work was undertaken from end of January to end of December, 2006. Eight enumerators were recruited and trained who carried out the interviews in the local language, under the supervision of the researcher. Four rounds of quarterly surveys were held in March-April (1st round), June-July (2nd round), September-October (3rd round) and December (final round). The first and the final rounds of quarterly surveys were preceded by annual and village surveys.

⁴ This work is specific to Mozambique, and relates to some of the past research.

⁵ The author is a member of the Poverty Environment Network (PEN) housed in CIFOR. Details can be seen at (<http://www.cifor.cgiar.org/pen/ref/home/index.htm>).

At the beginning of the field work, discussions were held with key informants and other members in each of the five villages. A list of all the crops grown and forest products collected, including fish and non-environmental environmental products, in the village was prepared, which was used to adapt and augment the PEN-questionnaire. An updated household list was obtained from the village chiefs (*Nfumo*) in each village, which was used to prepare the sample frame. A sample of 330 households was randomly selected from the five villages (accounting for one third of the total). It is important to have a sample size that is adequate for a statistical testing. (Singleton et al. 1993) observed that sample size would depend on population heterogeneity, required level of precision and availability of resources. Considering the population heterogeneity, it was decided to draw a larger sample.

Each enumerator was given the responsibility of 40 households either in his native village or in the neighboring village, with the survey supervisor and the researcher choosing to do both interviews of 40 households as well as monitoring and quality checking of remaining interviews (which included both 'surprise' visits to the interviews being done by enumerators, post-interview cross checks with the respondents and regular questionnaire scrutiny). The advantage of placing the enumerator in his own village (or neighboring village) was that it helped build the trust with the households which in turn helped obtain information that otherwise would be difficult to collect by an outsider.

Enumerators went through an intensive 2-week training which included (front to back) review of the questionnaires, in-class demonstration and mock interviews and actual interviews in a phased manner, which helped address many inconsistencies in phrasing questions and recording responses.

The first round of surveys required about a month, while the subsequent rounds were completed in about three weeks.

Current status

The field work was completed at the end of December 2006. The data is currently being entered in a database (MS Access based; developed by PEN). For the purpose of this report, an attempt was made to produce summary statistics related to some basic information.

Preliminary results⁶

Socio-economic status

Summary statistics related to general socio-economic information are provided in Table 1. On an average, each household consisted of 6 members (5.87 ± 2.53), with a household of 62% (61.85 ± 23.2). On average, each household was formed about 20 years ago, an indication of the old aging population, and about 86% of the household heads were born outside the *regulado*.

Average size of land area cultivated by household was about 2.2 ha (2.2 ± 1.9 ha). On average, about 60% of the total land area was cultivated in the survey year, with the remaining 40% kept under fallow.

Intensity of miombo resource use by households

Information related to household participation in miombo resource extraction, in different periods of the year, is provided in Table 2. The table provides some interesting insights on the seasonal variations in the miombo resource use.

In the first quarter (December-February), which captures the hot and wet summer months and agriculturally lean period, representing the month (Feb-March) just prior to the onset of farm harvest, all households collected miombo products, with an average of 8 products (8 ± 5) per household. The number of forest products collected declined slightly to 6 per household (6 ± 3) in the second quarter (March-May), which is the beginning of dry winter season, which further declined to 5 in the third quarter (June-August). However,

⁶ Much of the data is still in raw form, and the estimates are preliminary.

the number of products collected rose to about 6 in the final quarter⁷. About 97% of households still collected fruits and tubers in the second quarter, which declined to 56% in the third quarter, but rose to 94% by the last quarter.

About 98% of households collected fruits and tubers and 38% of households collected products of animal origin (which included mammals, birds and insects) in the first quarter. The proportion of households that collected products of plant origin remained more or less uniform (around 94-98%) except in the third quarters when the forest was dry. On the other hand, the fraction of households that collected products of animal origin rose from 38% in the first quarter to 42% in the second quarter, which further rose to 56% in the third quarter to 77% in the final quarter. It may be noted that in the drier season many of the animals come out in the open and are trapped. There were some instances of human induced fire, understandably, for hunting and/or trapping animals. There are restrictions on hunting using guns within the buffer zone, while hunting through bow and arrow is permissible. Therefore, it is also possible that in the beginning of the survey, there was a lack of trust between the respondents and survey crew which resulted in underreporting; as the survey advanced, increased trust level resulted in higher reporting. In the drier season, on the other hand, the amount of leafy biomass and roots and tubers available is also less, which may be a reason for the relative decline in the collection of plant products.

It may be noted that plant and animal based products were collected from both woodlands and farm and fallow lands.

Although still provisional, the estimates are possible pointers to the links between miombo resource use and farm harvest. If established, this linkage implies that miombo woodlands provide safety nets to households during income shortfalls.

⁷ The information pertaining to the final round is still incomplete at this stage.

Next steps

Computerization of the remaining data will continue, following which data cleaning will be taken up. Once the data is fully organized, analysis, interpretation and writing up will be undertaken.

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Table 1: General socio-economic information

S.N.	Variable	Mean	SD
1	Household size	5.87	2.53
2	Household literacy (%)	61.58	23.20
3	Number of years of household formation (years)	21.03	14.95
4	Fraction of household heads born outside the <i>regulado</i> (%)	86.06	-
5	Cultivated land area (ha)	2.21	1.94
6	Fraction of cultivated to total land area	60.84	22.42
7	Fraction of fallow to total land area	39.16	22.42

Table 2: Intensity of miombo resource use

S.N.	Variables	Q I	Q II	Q III	Q IV*
	Period of data collection	Mar-Apr	Jun-Jul	Sept-Oct	Dec
1	# Households collecting miombo products	329	327	318	122
2	Households collecting animal based products (%)	37.99	42.20	56.29	73.77
3	Households collecting fruits, tubers and plants (%)	97.57	96.94	56.29	94.26
4	Average # products collected per household	7.9 (5.0)	6.28 (3.17)	5.30 (2.53)	5.57 (2.04)

(Note: * Incomplete information) Figures in parenthesis indicate standard deviation.