Assessment of community dependency on forest resources and their roles in Sustainable Forest Management: A case of Kavango West region in Namibia

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Thesis submitted in partial fulfillment of the requirements for the degree of Master of Natural Resources Management (09MNRM) at the Namibia University of Science and Technology

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Declaration

I, Mirjam Ngowina Natanael, hereby declare that the work contained in the thesis entitled: Analysis of communities' dependency on forest resources and the roles in Sustainable Forest Management: A case of Kavango West region, Namibia is my own original work and that I have not previously in its entirety or in part submitted at any university or higher education or institution for the award of a degree.

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Table of Contents

List of Figures

List of Tables

List of Acronyms

CBNRM	Community-Based Natural Resource Management
CF	Community Forests
DoF	Directorate of Forestry
FR	Forest Resources
GDP	Gross Domestic Products
MAWF	Ministry of Agriculture, Water and Forestry
NTFP	Non-Timber Forest Products
PRA	Participatory Rural Appraisal
SFM	Sustainable Forest Management
SLA	Sustainable Livelihoods Approach

Definitions

The keywords used in this study are defined for better understanding of the readers. The terms such as sustainable forest management, forest resources, community forests, dependency, and perception.

Sustainable forest management is a process of controlling forests to achieve sustainable principles by benefiting people and not depleting the resources.

Forest resources refers to natural resources or products from the forest. This includes firewood, timber, wild fruits, and fodder.

Community forest refers to an area in rural or communal area that is entitled for local people to obtain rights to forest resources to improve their livelihoods.

Dependency implies community reliance on forest resources.

Perception refers to the opinions of communities toward sustainable forest management.

Acknowledgements

First and foremost, I would like to thank the Almighty for making it possible to carry out this study through different constraints. I would like to acknowledge my supervisor Dr. Jonathan Mutau Kamwi for his timeless efforts, commitment, support, and critical review on this thesis. I would also like to acknowledge my co-supervisor Mr. Tendai Mzuma for his support. Finally, I would like to thank the community of Ncamagoro and Ncuncuni constituencies for their cooperation during the survey.

Dedication

Firstly, I dedicate this thesis to all dendrophiles around the globe: continue to conserve the trees on this planet.

Secondly, I dedicate this document to the people of Ncamagoro and Ncuncuni Constituencies in Namibia.

Thirdly, I dedicate this thesis to my late father Natanael Sakaria Haukongo, the legacy he left behind is extraordinary. My lovely mother Martha Gabriel, your prayers kept me going strong.

Lastly, I dedicate this thesis to all rural communities in Namibia and afar.

Abstract

This study examines the dependency of rural communities on forest resources and their perceptions towards Sustainable Forest Management (SFM) in the Kavango West region of Namibia. The study also investigated the roles of communities in SFM. The study further examined the socioeconomic factors that influenced communities' participation in SFM. Structured questionnaires were used to collect data from 239 randomly selected households in January and February 2019. The data collected was analysed through descriptive statistics, Chi-square test and binary logistic regression. The study found that communities significantly depend more on forest resources ($p = 0.000$). Rural community plays role in SFM ($p = 0.010$). The results further show that employment status ($p = 0.002$) and types of farming activities ($p = 0.040$) significantly influence community participation in SFM. Activities which should be carried by community to increase their participation in SFM include tree planting, harvesting of forest resources, fire suppressing and prevention, decision making and policing. The study concluded that consideration to socioeconomic characteristics of households living around the forest is essential in SFM. Therefore, policy measures that aim at increasing forestry income and generating non-forest opportunities for rural communities are important to reduce forest dependency and enhance conservation.

Keywords: Community forests, Forest resources, Sustainable Forest Management, Dependency, Perceptions, and Kavango West

CHAPTER 1: General Introduction

1.1 Background to the study

Forests are the lungs of the earth (Gamfeldt *et al.*, 2013). Forests provide about 5,000 commercially traded products including pharmaceuticals and clothing (Groot, 2019). Seventy (70%) of world population, are poor people living in rural areas and depend on biodiversity for survival and wellbeing (World Bank, 2004). However, the increase in the population puts pressure on forests in terms of wood for fuel, housing, fencing and other resources from the forests. As a result, deforestation not only forfeits the resources used for human needs, it also results in desertification and extreme deterioration of the land (Kamwi *et al.*, 2015).

In 2005, nearly 7.7 million hectares of Namibia was covered by forests, but this was reduced to 7.3 million hectares in 2010 (Ruppel & Ruppel-Schlichting, 2016). Most Namibia's forests are found in the north and north-eastern part of the country (Palmer & MacGregor, 2009). Forests in Namibia is characterized as dry, half-open to open woodlands. Kavango has an estimated of 125 trees per hectare. The rate of deforestation in Namibia is increasing annually. According to Food and Agriculture Organization (FAO, 2016), Namibia forest decreases at an average of 0.8% per annum. This is due to clearing land for agricultural purpose, fuel wood for energy, timber production, wood carvings, veldfires and logging.

Forest management in Namibia is outlined in the Constitution, Article 95(I), which state sustainable use of natural resources for the benefit of all people. Namibia has in place programmes such as community forestry that aims at assisting and authorizing rural communities to have rights to manage forest resources. Sustainable Forest Management (SFM) has been

introduced to ensure forest activities deliver social, environmental and economic benefits, balance competing needs, maintain and enhance forest functions now and in the future. Specifically, SFM has been localized in gazetted community forests, even though the duty of rural people in SFM is not well defined. Community engagement in conservation takes place through activities such as tree planting, patrols in the forest, income generation, wildfire prevention and suppression, and soil conservation (Ouko, 2018).

In Namibia, the forestry policy of 1998 was introduced, it aims to reconcile rural development with biodiversity conservation. Forest Act No. 12 of 2001 was also formulated around the tenets of sustainable management of forests, and the purpose for which forest resources are managed and developed. Dependency on forest resources varies depending on the prevailing socio-economic and environmental factors (Pröpper & Vollan, 2013). Little is known about the dependency of rural communities on forest resources and their perceptions towards SFM in Kavango West region (Pröpper & Vollan, 2013). In addition, little is known about the roles of the rural communities as a function of SFM in the Kavango West region, although the region is one of the most favourable for forests in Namibia. Local governance over forest resources is still very poor and the local community have not received significant decision-making power. The Forest Act has not given the local people ownership right over forest resources. As a result, the forest is treated as public or state owned with the consequences of over-exploitation and degradation. These major issues of forest management are the basis on which this research is based on. Several studies have been carried out to determine the livelihood diversification activities pursued by rural communities in Namibia (Ban & Coomes, 2004; Ellis & Freeman, 2004). However, these studies are limited in scope because they have not looked at factors

influencing forest dependency, perceptions towards SFM and the roles of communities in SFM. For instance, Ashley & LaFranchi (1997) carried out assessment of livelihood strategies of rural households in the Zambezi region and their implications for conservancies and natural resource management. Hosking *et al.* (2002) carried out a study on the livelihood's strategies of communities in eastern Zambezi to develop plans and proposals for interventions in the rural environment.

The information on forest dependency, perceptions towards SFM and the roles of the rural community in SFM is particularly important for the design of effective adoption of sustainable livelihood strategies and for assisting communities to manage their forests sustainably. Therefore, this study contributes by providing insights for the state and other actors in promoting more sustainable natural resource usage in Kavango West region of Namibia and other areas with a similar set of socio-economic and environmental conditions.

1.2 Research objectives

The main objective of the study was to analyse the communities' roles in SFM to influence or increase their responsibility as managers in the Kavango West region of Namibia.

1.2.1 Specific objectives

(a) To describe the rural community's role in sustainable forest management in the Kavango West region of Namibia.

(b) To describe the community's dependence on forest resources and their perception on sustainable forest management in the Kavango West region of Namibia.

(c) To identify factors that influences the participation of the community in sustainable forest management in the Kavango West region of Namibia; and

(d) To identify activities which should be carried out by communities to increase their involvement in sustainable forest management.

1.3 Research questions

(a) What are the roles and responsibilities of the rural community in sustainable forest management in the Kavango West region of Namibia?

(b) How do rural communities in the Kavango West region of Namibia depend on forest resources and what are their perceptions on sustainable forest management?

(c) What are the factors that influence the community's participation in sustainable forest management in the Kavango West region of Namibia?

(d) Which activities should be carried out by communities to increase their involvement in sustainable forest management?

1.4 Hypothesis

H_o: Rural community do not play role in sustainable forest management in Kavango West region.

H_o: Rural communities in the Kavango West region of Namibia do not depend on forest resources.

H_o: Socio-economic factors do not influence the participation of the rural community in sustainable forest management.

1.5 Conceptual Framework

To facilitate understanding of the conceptual framework of the study (Figure 1), it explained how sustainable forest management can be achieved among the communities. Factors that influence the community participation in SFM denote that there is deliberate inclusion of community members in certain management tasks that would benefit the community. Rural communities need to play a role on the sustainability of forest resources to ensure the continuity of benefits for the livelihood of the community (Benkenstein *et al*., 2014).

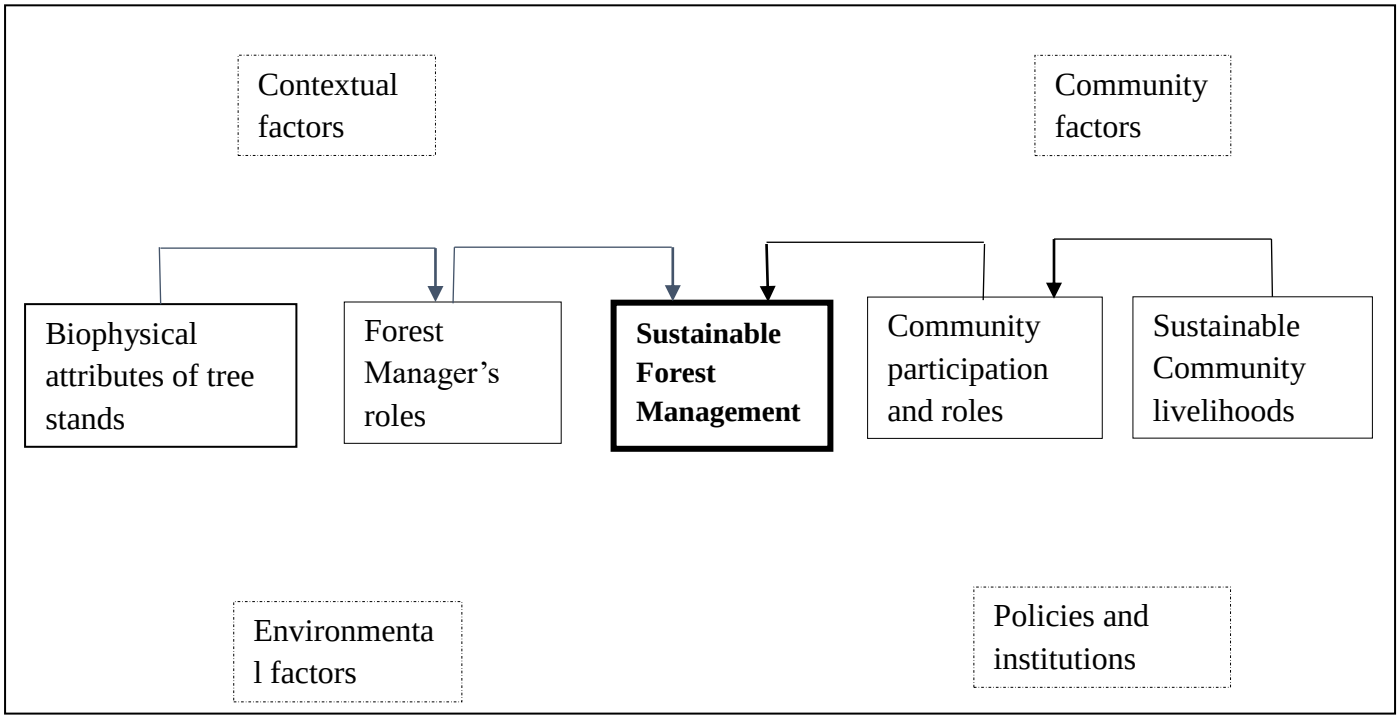

Figure 1: The conceptual framework of the study

Environmental factors: The community forest is characterised by environmental variables such as physical size of the forest; the plenty and nature of the resources it has. These environmental variables can be affected by the climatic conditions such as poor rainfall and high temperature. These decrease the volume and value of forest resources, and reduce community's benefits.

Policies and institutions: Common property studies is characterised by three institutions of community forest management which have proven how resource management is enhanced. First, there are two reasons why tenancy security for a certain group is important: it supports the sustainability by providing rules and management plans; it also provides a legitimate basis that can be devoted in sustainability of resources. Second, local people should create their own rules that they understand, able to be handled and enforced. Lastly, both users and officials must be accountable for penalties and conflict resolution (Ostrom, 1990; McKean, 1992; Dietz *et al*., 2003) .

Contextual factors: Communities and community centres clearly determined by ethic, technological, demographic and trade related factors such as environment of nation firms, NGOs and global sponsors. The trade forces, demographic changes, technological changes and nation strategies are the most variables that regulate the management of forest resources by the community. If the government is involved in assisting the community, the community would be successful in forest management (Agrawal, 2001).

Biophysical attributes of tree stands: The forest land is distinguished by the tangible scattering of different tree species, which is classified by uncommon to rare, occasional or common to abundant. The biophysical attributes of tree stand further characterised by canopy density, canopy diameter, and tree height. This information is vital to forest managers for the estimation of forest volume (Barnes, 2010).

Forest managers' roles: forest managers have roles to manage the designated forest areas by conservation (to preserve and protect forests). Forest managers have responsibility to carry out sustainable management by advising members of the community on how to utilise the forest resource without endanger the ecosystem. Forest users and forest can be identified by their size, the power of social and human capital such as local skills and experience toward forest management. Some studies indicate that communities that are small or medium are interdependent, relatively better-off, have enough technical and institutional potential (Agrawal, 2001).

Sustainable forest management: sustainable forest management emphasises the kind of development that ensures it encounters the needs of the current without compromising the ability of upcoming cohorts to succeed their own needs. Sustainable forest management can be characterised by the economic, cultural, ecological, and social aspects (Benkenstein *et al*., 2014). Communities around the forests should understand that their participation in forest management influence the use of forest resources in a sustainable way.

Community participation and roles: community participation can be characterised by the interaction of group of people to take care of their forest resource, make decision on how to utilise the resources in a sustainable manner. The communities' role is to get involved in the management activities, so they learn innovation and techniques about forest resource management from different stakeholders. The local populace should safeguard the resources to succeed in forest resource management. Communities depend on forest for their existence;

therefore, they can be able to identify the factors that influence their participation in sustainable forest management (Eshun, 2008).

Sustainable community livelihoods: community residing near forest resources depends on them for their livelihoods. Community utilise forest resources at household level such as firewood on daily basis. Community also generate income through selling of forest products such as woodcarvings and poles. Communities should be involved in the management activities, guiding principles and the right to use information that would increase knowledge to manage forest resources in a way that would improve community living standard (Palmer & MacGregor, 2009).

CHAPTER 2

2. Literature Review

2.1 Communities' role in sustainable forest management

The sustainability of forest resources can be regulated by ensuring legal harvesting by community members (Sserubidde, 2019). Sustainable development and sustainable woodland management are important concepts that need to be maintained by applying the most satisfactory techniques to monitor the Namibia's forests. SFM is a practice that supports the forest ecosystems nourishing with prominence on ecological, social and economic deliberations. (Monsi, 2014) declared that it is not possible to get forest ecosystems preserved without the economic and social needs of the local people being consolidated in the safeguarding processes.

Through localization, local people are entitled to manage the forest in proximity. According to Benkenstein *et al*. (2014), rural communities have been given the opportunity to reclaim their rights towards forest resources which were taken away from them during colonial era. Community forestry can be a success once community members are involved in forest management (Benkenstein *et al*., 2014). Communities form up Forest User Groups (FUGs) to manage their forests. Local forest user groups were given responsibilities to protect the community forest and the forestry staff play role of supervision (Anup, 2017).

Similarly, (Pröpper & Vollan, 2013) highlights that communities can register Community Forests (CF) through the Namibian minister of Ministry of Agriculture, Water and Forestry. Local communities raise self-governance and ownership of forest resources within their

registered CF. Rural communities have authority to manage and utilise the forest resources and natural resource in that certain CF.

According to Matsvange *et al.* (2016), communities plant exotic trees and take care of them to benefit from them in various ways. The same author further stated that, some communities use other alternative sources of energy instead of fuel wood, to conserve the forest.

Communities play role in forest management to make sure that deforestation and forest degradation are avoided. Therefore, local people get involved in forest protection and management (Anup, 2017). Policy makers put more effort on forest protection and restoration: by increasing tree cover for food security and income generation.

2.2 Community's dependence on forest resources and their perception on SFM

The records showed that, about more than half of the wood supplied was used as for fuel wood worldwide (Anup, 2017). Conservation forests were mainly degraded by the rural people by collecting firewood. Rural communities in developing countries prioritise fuel wood, fodder and non-wood forest products from the forests (Anup, 2017). Similarly, communities in Namibia depend on CF by acquiring fuel wood, timber, building materials, medicinal plants, and graze for livestock. Through the process of acquiring forest resources; communities significantly generate income through selling forest products to alleviate poverty (Benkenstein *et al*., 2014). Most of the harvesters in Namibia live in rural areas; earn cash from selling forest resources for their livelihoods (Benkenstein *et al*., 2014). According to Pröpper & Vollan (2013), awareness among rural communities is in shortage in term of ecological aspects and economic value; thus limiting SFM by community on resources they depend on.

According to Turpie *et al.* (2015), forest contributed to economic growth, create employment opportunities, provide income, provide foreign currency through export, provide clean water, tourism attraction and building materials. Value added products such as charcoal, pulp and paper contributed to Gross Domestic Products (GDP). The economic rate of the woodland wealth is forcing people to over-utilize the forest through collecting firewood, logging (legal and illegal), clearing land for agricultural purposes, and hunting which causes veld fire (Monsi, 2014). Forests benefit communities by control soil erosion, stabilize climate change, and filtrate water. Forests play important role in carbon cycle and water cycle that benefit the communities. Forest products in developing countries are recommended to generate revenue. Policymakers should consider rural communities' basic needs in the aspects of social, economic and environmental thought of sustainable forest management (Anup, 2017).

Communities' perceptions on SFM support significance for the plan of sustainable strategies and policies to address their assumptions. If communities' perceptions and notions are known, biodiversity conservation can be a success. Understanding livelihood threats toward SFM is crucial for the protection of forest resources. However, the differences in views and hope between rural communities affect the success of participatory practice. A study by Akyol *et al.* (2017) stated that communities have negative perceptions on absence of information sharing about decision making on SFM. The same study discovered that factors such as gatherings, information sharing, experiences were essential for understanding communities' perceptions on resource management.

2.3 Factors that influence the participation of the community in SFM

According to Musyoki *et al*. (2016), factor that influence the participation of the community in SFM is high level of dependency on forest resources that benefit community members (this include direct and indirect benefits). Community participates more when the level of dependency on forest is high. Local farmers who benefited from fodder for their animals through grazing in community forest and forest resources such as firewood participated more (Htun *et al*., 2017). Community who generate income through selling forest products observed participated in SFM.

A study by Musyoki *et al*. (2016) revealed that the middle income user group likely to participate more because they have knowledge of the results of deforestation. Male household heads have better opportunity to participate in SFM than female heads of households. Community with primary education are more likely to participate in SFM because they are aware of the benefits received from forest that is properly managed. The wellbeing of community members has influence on their participation, whereby, well off community with more benefits anticipated from the forest. Policy makers put more effort on forest protection and restoration by increasing tree cover for food security and income generation.

2.4 Activities which should be carried out by communities to increase their involvement in SFM

Successful forest conservation depends on communities' participation. Communities can work together with forestry stakeholders to increase their participation in forest management. Through education, communities trained about forest activities such as beekeeping. Farmers can generate income through honey selling. Communities familiarize the importance of protecting the forest from veld fires and deforestation (Matsvange *et al.*, 2016). According to Wambugu *et al.* (2017),

activities such as tree planting, harvesting of forest resources, fire suppressing and prevention, decision making and policing increase community participation in SFM.

Communities can be involved in SFM through involving in executive committee. Communities should prepare its own constitution and operational plan to guide them when extracting resources from the forest. Communities should have legitimate rights toward forest management. Communities should form a forest management body that should not be more than 20 members (Forest Act, 2001). Communities should attend meetings and review forest management plans. Communities should be involved in inventories, pre-harvest planning, forest protection and monitoring, and fire management (Katerere *et al*., 1999).

Communities should define the social arrangements, responsibilities and rights of the group. Communities should attend trainings in participatory and local monitoring. Communities should control that forest management operations adhere to laws and regulations. Communities should choose activities that they prefer in term of proper SFM. Communities should attend meetings and review forest management plans.

2.5 Sustainable livelihood approach

The Sustainable Livelihoods Approach (SLA) is an approach which is mostly used to evaluate the rural livelihoods (Figure 2). The SLA consists of five dissimilar assets which are human assets, natural assets, financial assets, social assets and physical assets (Kamwi *et al*., 2015). A livelihood is evaluated using SLA based on natural resources.

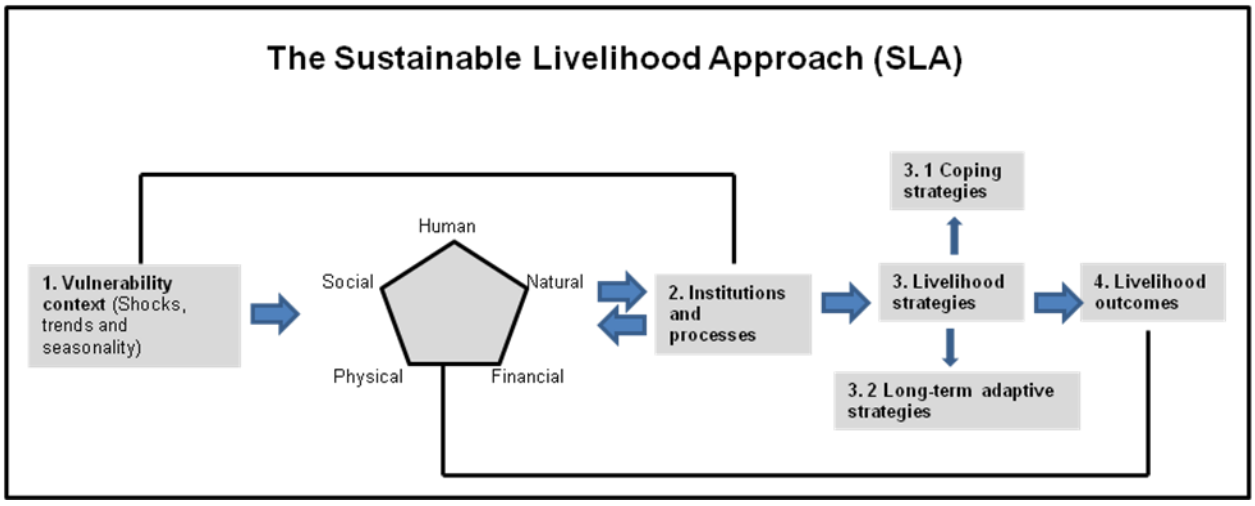

Figure 2: The Sustainable Livelihood Approach

Source: Kamwi, 2015

The SLA provides a framework to understand the important factors that affect people's livelihoods. In addition, and to elaborate, the SLA was chosen for the present study because it considers people and their practices, and by concentrating on what people have (livelihood assets); and it offers a salutogenic (factors that support human well-being) perspective (DFID, 1991). While social economic studies based merely on earning and expenditure data have been used in developing countries, these are not effectual measures of livelihoods in countries such as Namibia which is ranked among the top in income inequality (Werner & Odendaal, 2010).

CHAPTER 3: Methods

3.1 Study area

The study was carried out in the Kavango West region on Namibia, specifically in Ncamagoro and Ncuncuni Constituencies (figure 3). Kavango West is in the north-east of Namibia. The study area was chosen because of dense forests which support local community's needs. These communities involved in extracting forest resources and other natural resources from the forest of the study area. This improves the communities' living standard on daily basis.

According to Namibia Statistical Agency (NSA) (2013), Ncuncuni Constituency comprises of 8,541 inhabitants and 1,360 households. On the other hand, Ncamagoro Constituency comprises of 7,043 inhabitants and 1,134 households. The two constituencies are located south west of Rundu town along the Rundu-Grootfontein B8 road. The ethnic groups found in these constituencies include the Nyemba, Chokwe, San, Kwangali, Ovawambo, Sambyu and Chimbundu. The people living in these areas are subsistence farmers who are heavily dependent on crop production and livestock farming. Inhabitants also depend on forestry and agro-forestry, which stimulates furniture making and related industries.

The mean annual temperature in the study areas is more than 22± $^{\circ}$C. The mean annual rainfall ranges between 550-600 mm (NSA, 2013). The main vegetation types include open forest savannahs and dense woodlands. These are characterized by *Burkea africana, Baikiaea plurijuga, Guibourtia coleosperma, Terminalia sericea, Schinziophyton rautanenii, Combretum imberbe, Dialium englerianum* and *Pterocarpus angolensis.* The area consists of a high variety of very important (in terms of supporting community needs such as, used as traditional medicines, for building materials, and food) tree species (such as *Strychnos cocculoides* and

Strychnos pungens) and Non-Timber Forest Products (NTFPs) that are used traditionally for various purposes by the local people such as Kavangos. The area is characterized by deep Kalahari sandy soils. Donkey carts are the common mode of transportation in these areas and people use them to extract forest resources to the road for collection and marketing.

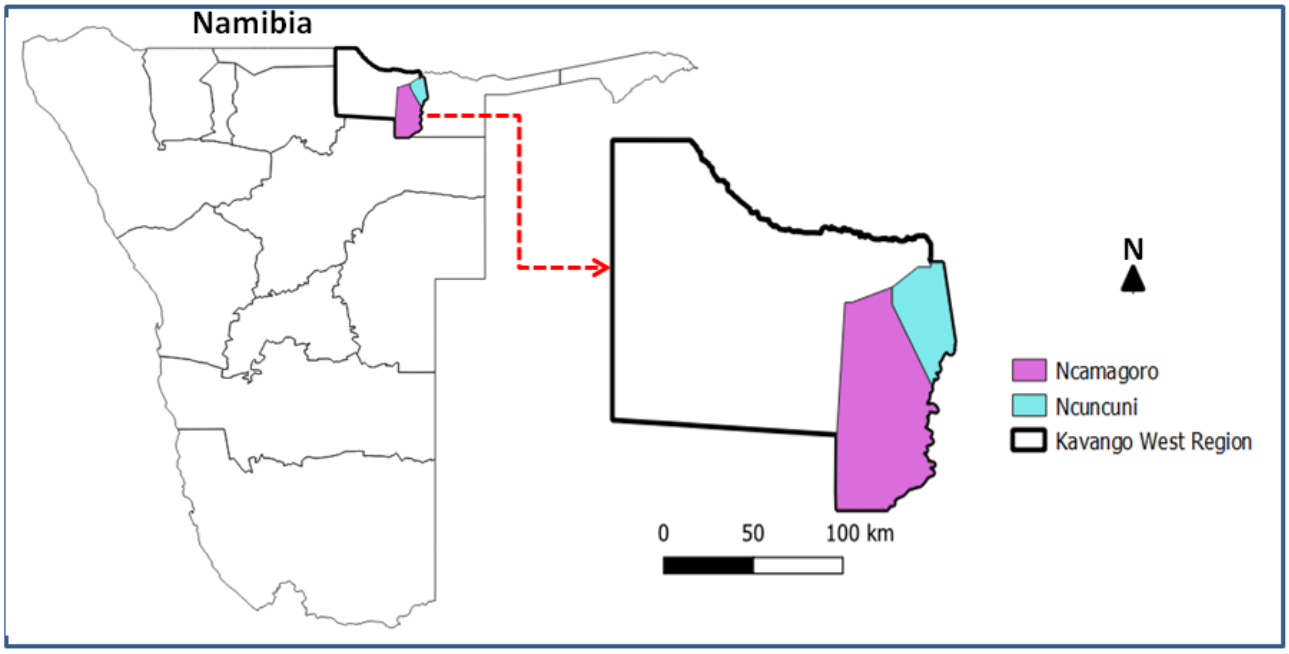

Figure 3: Location of the study area in Namibia

3.2 Socio-economic and livelihood assessment

The Sustainable Livelihood Approach (SLA) was applied in this study to assess the livelihoods of communities in relation to forest resource usage. The SLA indicates that the analysis of livelihoods based on natural resources is comprised of five different capitals or assets - human assets, natural assets, financial assets, social assets and physical assets. Assets provide information on household's structural income status and underlying welfare and are not subject to short-term fluctuations of income and consumption (Filmer & Pritchett, 2001).

3.3 Research design

This study applied a case study method, as the strength of case studies were the ability to explain the presumed causal links in complex phenomena's that were too complex to understand with experimental strategies (Yin, 2003). Applying a case study approach for this study was therefore argued to be useful for the communities' role in SFM in Ncuncuni and Ncamangoro constituencies. The research was designed to capture quantitative information. The structured questionnaire on Epicollect5 app was used through the cross-sectional survey to collect data from the communities. Epicollet5 is a tool that enables collection of data through survey using a phone. A questionnaire is typed on the app; the data can be viewed, and exported to Statistical Package for the Social Sciences (SPSS) and Microsoft Excel for analysis.

The questionnaire consisted of closed and open-ended quantitative questions, which addressed the issues of sustainable forest management, thus giving an insight on forest management roles and participation, and additional information which used to prove the reliability of the study. The

questions asked were related to resource use, perceptions, the demographic characteristics and household socioeconomic status.

3.4 Sample population

The two constituencies (Ncuncuni and Ncamagoro) had 2,494 households of which 1,360 households were in Ncuncuni and 1,134 households were in Ncamagoro (NSA n.d). The household was the basic unit of the livelihood assessment in this study. According to the FAO (2010), a household refers to several people gather, sharing a same homestead and other necessities for living. The data were collected through a household survey that was conducted face to face. The household heads (or another senior household member in their absence) were interviewed to gather general household socioeconomic data (demographics and assets) and qualitative information about forest-use, shocks and vulnerability. Some family members present at the time of the interview were invited to participate in the interview to supplement the information provided by the main respondent.

In the constituencies, households were randomly selected to gives all households an equal chance to be selected (Gay *et al*., 2009). Based on the sample size equation (equation 1) given by (Turyahabwe & Banana, 2008) , a total of 333 were supposed to be interviewed.

$$S = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2 P(1-P)} \qquad \text{(Equation 1)}$$

S = Required Sample size
X = Z value (e.g. 1.96 for 95% confidence level)
N = Population size
P = Population proportion (expressed as decimal) assumed to 0.5 (50%)
d = Degree of accuracy (5%), expressed as a proportion (.05) it is margin of error

However, after taking logistical considerations including time and financial constraints into account, 239 households were interviewed. This sample size was regarded sufficient to provide insights on forest dependency and use in rural areas under the given socio-economic and practical conditions during the study period. The survey was administered during the period January to February 2019.

3.5 Data processing and analysis

The collected quantitative data were coded and analysed using Statistical Package for Social Science (*IBM SPSS Statistics* 2017) and Microsoft Excel 2010. Descriptive statistics were used to analyse socioeconomic variables. Data were displayed using percentages and frequencies presented in graphs, charts, tables, and figures. The Pearson's Chi Square was used to test the relationship between households' socioeconomic factors and SFM.

3.5.1 Specification of the binary logistic model

Binary logistic regression was used to determine the factors that influence community participation in SFM (equation 2).

$$\text{logit}\,(\pi_i) = \log\left(\frac{\pi_i}{1-\pi_i}\right) = \beta_0 + \beta_1 x_i = \beta_0 + \beta_1 x_{i1} + \cdots + \beta_k x_{ik},$$

(equation 2)

Where log is a target variable, Y_i = 1 if the trait is present in observation i, Y = 0 if the trait is not present in observation i, β_0 = intercept and β_1, β_2,…, β_k are the coefficients associated with each explanatory variable X_1, X_2, …, X_k. The observed value of the explanatory variables for observation i is denoted by X_i.

The dependent variables include the forest dependency and community participation in SFM which were used in the logistic regression model to describe data and the relationship between a dependent binary variable and more independent variables. The independent variables included were age, gender, marital status, household size, education level, employment status, housing type and farming activities.

3.5.2 Forest dependency model

Linear regression was run to identify which independent variable has influence on forest income. The forest income was regarded as dependent variable and socioeconomic such as age, gender, marital status, household size, education level, employment status, housing type and type of farming activities were considered as independent variables.

CHAPTER 4: Results

4.1 Demographic and socio-economic status of respondents

The age group of 60 years and above were the most respondents with 43.5% (n = 104), followed by age group 46-60 with 35.1% (n = 84), 36-45 age group with 11.7% (n = 28) and the least was 18-35 age group with 9.6% (n = 23). On gender, 59% (n = 141) were male and 41% (n = 98) females. Marital status indicated that most respondents were married 55.2% (n = 132), single with 23.8% (n = 57), widowed with 18.4% (n = 44) and the least were people who divorced 2.5% (n = 6). Most households consist of 6-10 people 41.8% (n = 100), next were 11-15 people 28.5% (n = 68), 16 people and above with 15.1% (n = 36), and the least were 1-5 people in a homestead 14.6% (n = 35). Most respondents had primary education 43.9% (n = 105), followed by those who never attended school 40.2% (n = 96), secondary education respondents were 15.5% (n = 37), and respondents with tertiary qualification were 0.4% (n = 1). The employment status revealed that most of the respondents were unemployed 89.1% (n = 213) and employed and self-employed both had 5.4% (n = 13) each. About 71.1% (n = 170) of the respondents were farming with crops and livestock, and 23.9% (n = 69) were farming with crops. The most housing type used were traditional houses 99.6% (n = 238), and only 1 was a modern house represented 0.4%.

4.2 Community roles in SFM

4.2.1 Roles and responsibility of community in conserving forests

Communities 65.7%, (n = 157) had a responsibilities of both (report illegal activities and prevent forest fires), 33.1% (n = 79) of respondents could prevent forest fires only, the least were respondents who could report illegal activities 1.3% (n = 3) (figure 4). The p-value = 0.010 indicates that community play role in conserving forests.

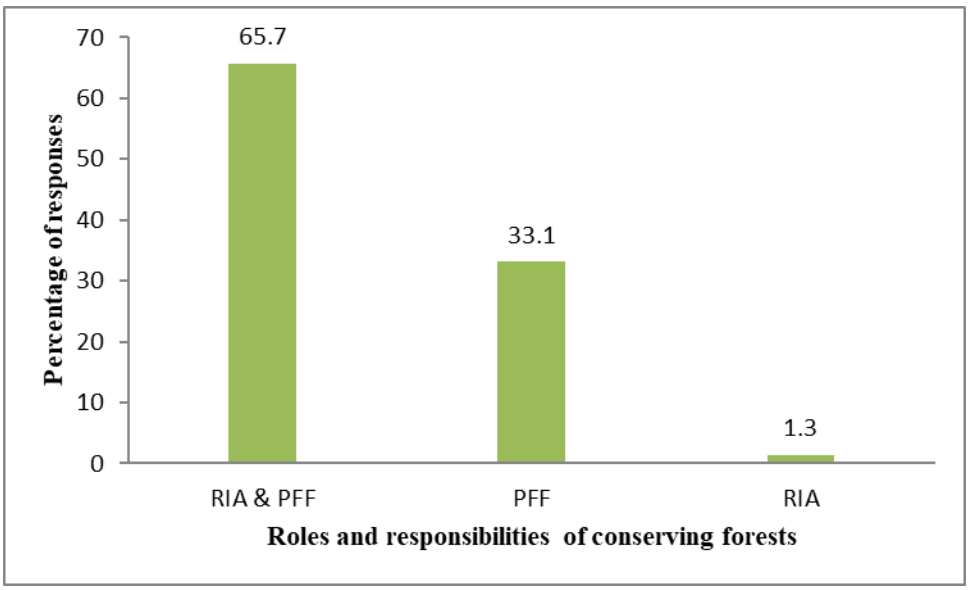

Figure 4: Roles and responsibilities of the community in conserving forests

(RIA = report illegal activities, *PFF* = prevent forest fire)

4.2.2 Community participation in decision making regarding SFM

The summary statistics of the logistic regression model revealed (Table 1) that after adjusting for the effect of the factors, there is no significant influence of all the factors for the community to participate in decision making on SFM ($p > 0.05$).

Table 1: Factors influencing community participation in decision making regarding SFM

	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	231.959[a]	.000	0	.
Age of respondents	233.469	1.509	3	.680
Gender	233.935	1.975	1	.160
Marital status	232.415	.455	3	.929
Household size	232.333	.373	3	.946
Education level	233.962	2.003	3	.572
Employment status	236.982	5.023	2	.081
Housing type	233.312	1.353	1	.245
Type of farming activities	232.552	.593	1	.441

4.2.3 Knowledge sharing and skills about SFM by the community

About 71.5% (n = 171) of the respondents indicated that they shared knowledge and skills about SFM with other community members and 29% (n = 68) indicated that they do not share knowledge and skills with others. The communities significantly share knowledge and skills about SFM (p = 0.030).

4.2.4 Knowledge of regulations that govern the protection of the natural resources

Seventy three percent (n = 175) of respondents revealed that they knew the regulations that govern the protection of natural resources which were Forest Act, Forest Policy and Nature Conservation Act, and (n = 64) 27% did not know what governs the protection of natural resources. The results showed that community significantly know the regulations that govern the protection of natural resources, p-value = 0.021.

4.2.5 Activities allowed in the forest

In terms of activities allowed in the forest, 98.7% (n = 236) of respondents indicated that clearing land for crop fields was permitted in the forest, 0.8% (n = 2) of respondents stated that hunting and clearing for crop fields was allowed in the forest, and 0.4% (n = 1) stated that hunting is allowed in the forest as indicated on figure 5; ($p > 0.05$).

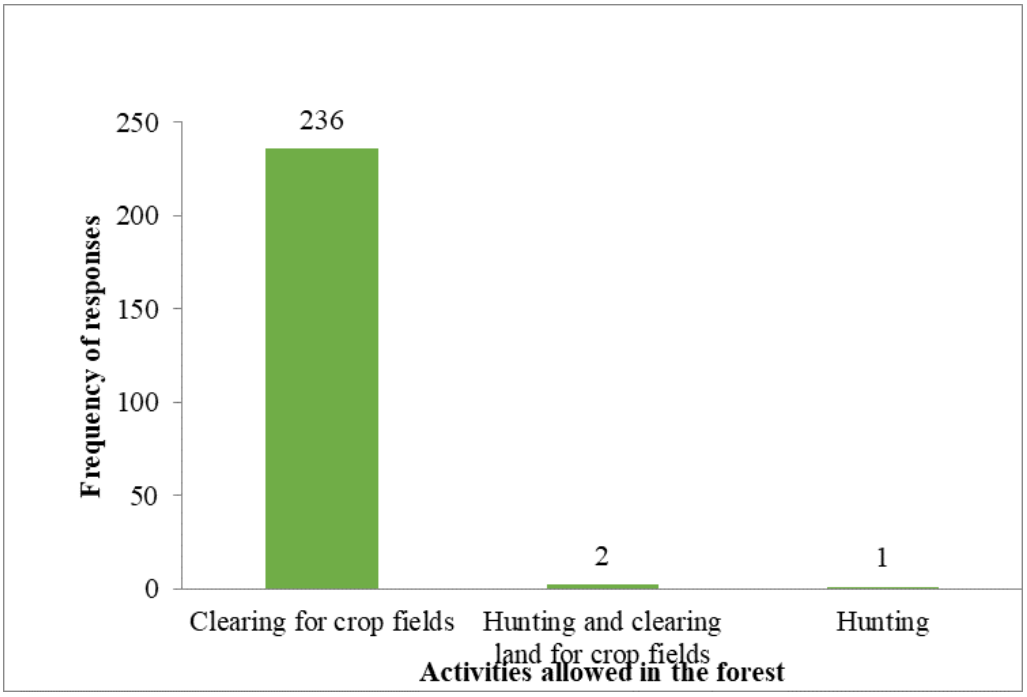

Figure 5: Activities which are allowed in the forest

4.2.6 The role of indigenous knowledge systems in the forest management and sustainability

The role of indigenous knowledge systems was important (99%) to the community interviewed and 1% of respondents indicated that indigenous knowledge systems were not important in forest management and sustainability as shown on figure 8. The p-value is 0.040 which indicated that there was a significant difference at 5% level of significance that indigenous knowledge may enhance forest management and sustainability.

4.3 Communities' dependence on forest resources and their perception on forest management and its sustainability

4.3.1 Main activities carried out in the forest

Many respondents carried out activities (collect firewood, thatch grass, and collect wild fruits). The survey indicated that all respondents collect firewood for household energy consumption and some use surplus for marketing purpose (figure 6).

Figure 6: Firewood loaded on the trailer to be transported for marketing

Respondents were asked to choose three main activities they carry out in the forest. However, 0.8% of respondents carried out only two activities (collect firewood, and thatch grass). Many respondents preferred (collet firewood, thatch grass, and collect wild fruits. Some respondents preferred activities (collect firewood, collect wild fruits and logging); the third highest activities carried in the forest were (collect firewood, logging, and thatch grass); the fourth highest

activities were (collect firewood, wood carvings, and thatch grass), and the least activities carried out in the forest were (collect firewood, and thatch grass) as illustrated in (figure 7).

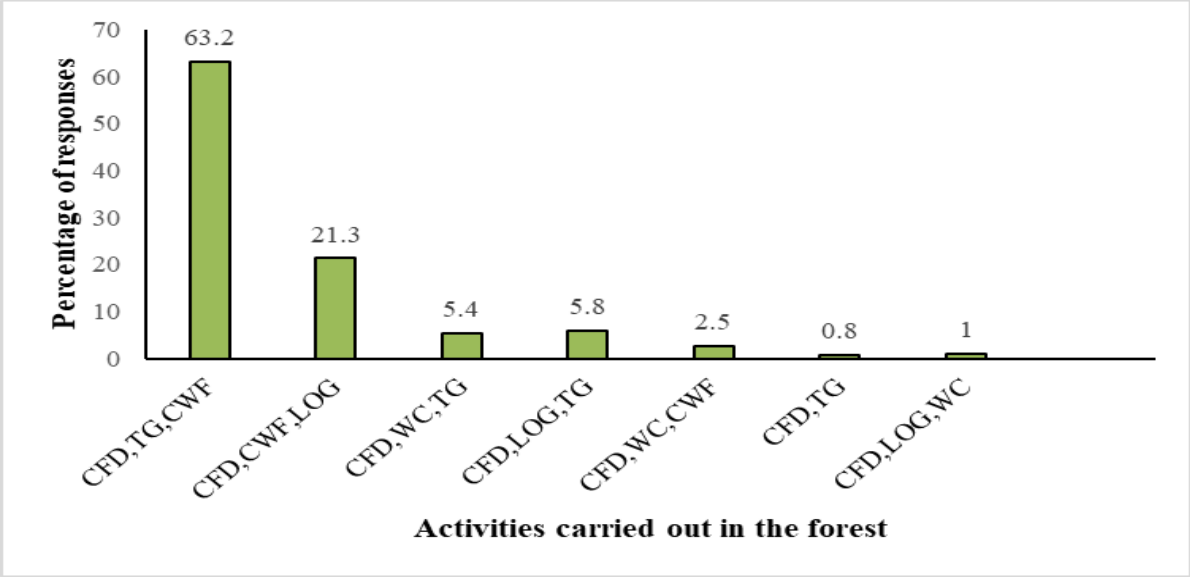

Figure 7: Activities carried out in the forest

CFD = *collect firewood,* WC = *wooden carvings,* TG = *thatch grass,* CWF = *collect wild fruits, and* LOG = *logging*

4.3.2 Sources of annual income by gender

The results revealed that women rely more on pension than men. On the other hand, men made more income from forest resources (Figure 9) than women. Women staying with vulnerable children rely on social grants more than men. However, men generate more income from agriculture compared to women. 8.2% of female respondents had salary as a source of income while men represented 6.4%. Remittances represented low source of income by 0.7% by male only (Figure 8).

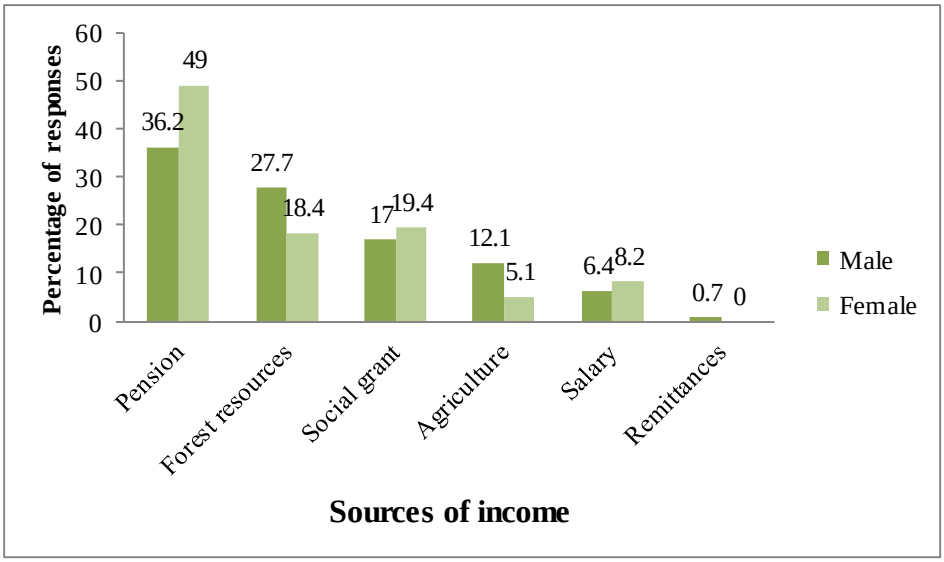

Figure 8: Sources of annual income by gender

Figure 9: A community member preparing mortars from *Pterocarpus angolensis*

Source: MN Natanael

4.3.3 Dependency of communities on forest resources

In this analysis, independent variables have no effect on forest dependency except age of respondents (p = 0.000), (table 2).

Table 2: Linear regression output on forest income against independent variables

	B	Std. Error	Beta	T	Sig.
(Constant)	9.074	3.627		2.502	0.013
Age of respondents	-1.019	0.133	-0.49	-7.64	**0.000**
Gender	-0.477	0.261	-0.118	-1.831	0.068
Marital status	-0.059	0.137	-0.029	-0.431	0.667
Household size	0.077	0.129	0.035	0.6	0.549
Education level	0.007	0.086	0.005	0.08	0.936
Employment status	0.468	0.241	0.116	1.942	0.053
Housing type	-1.776	1.764	-0.057	-1.007	0.315
Type of farming activities	-0.067	0.129	-0.03	-0.515	0.607

4.3.4 Utilization of forest resources by community

In the study area, 39.3% of respondents believed that they were utilizing forest resources in sustainable way and 60.7% of respondents thought the community was not utilizing the forest resources in sustainable way as illustrated in figure 14. The p-value = 0.000 which shows that the communities believed that they are managing forest resources sustainably.

4.3.5 Perception on SFM avoids community to benefit from forest resources

About 82% of the respondents indicated that SFM does not avoid community to benefit from forest resources. On contrary, 18% of respondents indicated that SFM diminishes the benefits accrued from the forests (figure 15). The p-value is 0.001 which is statistically significant at 5% level of significance and shows that community believed SFM does not avoid them to benefit from forest resources.

4.3.6 Community perception on forest cover change during the past 10 years

About 70% of respondents thought the forest cover major decline, 54 respondents thought it was minor declined, 9 respondents thought no change on forest cover, 6 respondents had no idea, 3 respondents thought the forest cover minor increased, and the least, 1 respondent thought the forest cover had major increased (figure 10). The p-value = 0.026 which indicated statistically significant difference at 5% level of significance of forest cover change.

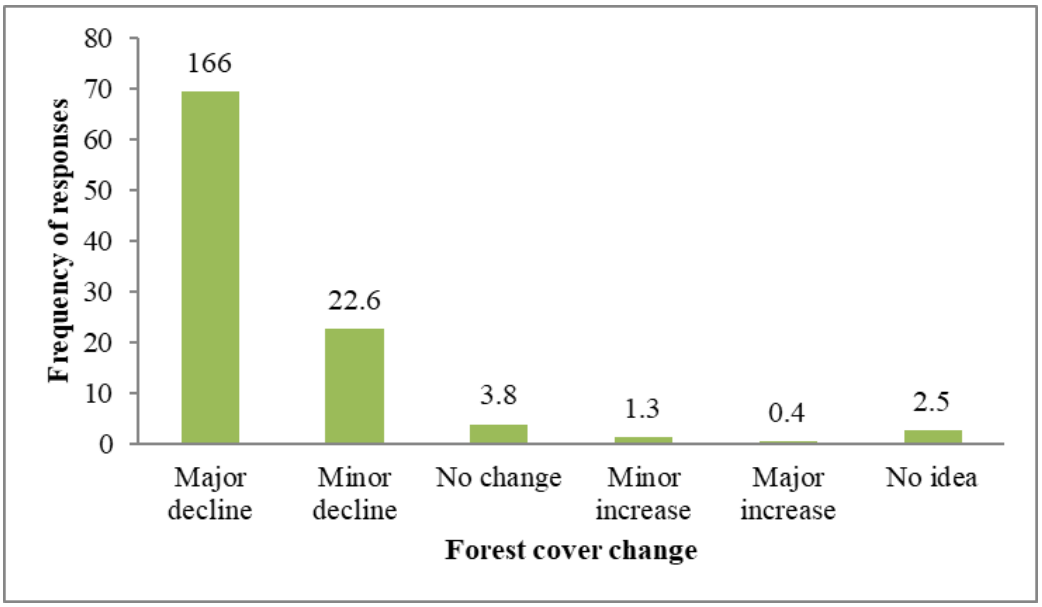

Figure 10: Perceptions on the forest cover change during the past 10 years

4.3.7 Perception on the rate of cutting down trees

The most respondents indicated that the rate of cutting trees was increasing in the study area (figure 11). The second highest were 36 respondents that indicated the rate of cutting trees was constant. The third highest were respondents who revealed that they did not know about the rate of cutting down trees. The least were 2 who respondents indicated that the rate of cutting trees was decreasing. The p-value = 0.701 indicated that there is no statistically significant difference at 5% level of significance at the rate of cutting down trees.

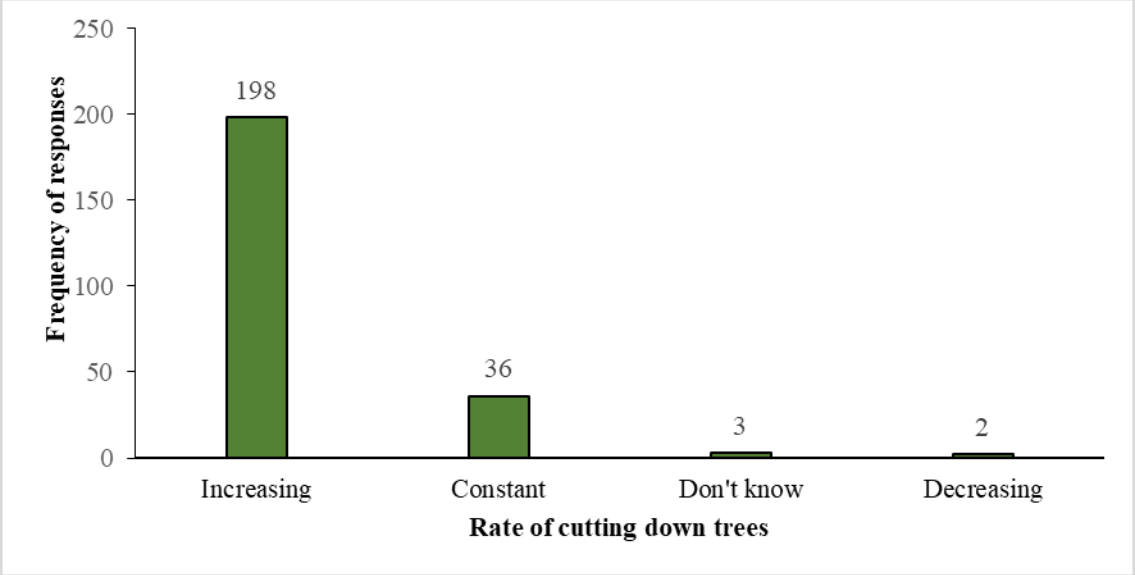

Figure 11: Perceptions on the rate of cutting down trees

4.3.8 Perception on depletion of forest resources in the study area

Accordingly, 77% of the respondents indicated that if they continue to practice SFM, the forest would not be depleted whereas 23% of respondents thought that forest resources would be depleted if they continue to practice SFM. The P-value = 0.000 which indicates strong evidence that forest resources were depleting in the study area.

4.3.9 Community benefit from forest resources

The respondents (99%) benefited from forest resources because they utilize forest resources such as firewood, wild fruits and thatch grass for subsistence purpose at no cost. On one hand, 1% of respondents revealed that community was not benefiting from forest resources because they believed they do not sell forest products to generate income. Communities significantly benefit from forest resources ($p = 0.001$).

4.3.10 Perception on the improvement of livelihood using forest resources

In terms of community perception on forest resources improve livelihood, (96%) of respondents interviewed believed that forest resources improved their livelihood, on one hand, 4% of the respondents indicated that forest resources did not improve the livelihood of community.

4.3.11 Perception on sharing of forest resources among community members

The 66% of the respondents perceived that forest resources were well shared among the community members. However, 34% indicated that forest resources were not shared well to community members.

4.4 Factors that influence community participation in SFM

The results of the logistic regression analysis of the socioeconomic factors that influence the participation of the community in SFM are provided in Table 3. Among the socio-economic factors: employment status (p-value = 0.002) and type of farming activities (0.040) significantly influence community participation in SFM. The variables such as age, gender, household size,

educational level and housing type had no influence on community participation on SFM (p > 0.05).

Table 3: Binary logistic regression of community participation or play role on SFM

	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	156.658[a]	.000	0	.
Age of respondents	158.024	1.366	3	.713
Gender	156.737	.079	1	.778
Household size	158.541	1.884	3	.597
Education level	158.854	2.196	3	.533
Employment status	169.550	12.892	2	**.002**
Housing type	156.365	1.562	3	.473
Type of farming activities	169.051	8.729	2	**.040**

4.5 Challenges experienced toward SFM in the study area

4.5.1 Occurrence of veld fire in study area

Clearly, 78% (n = 186) of respondents indicated that veld fire occurred in their area yearly or after one or two years, although, 22% (n = 53) of respondents indicated that veld fire did not occur in their area.

4.5.2 Awareness on veld fire in study area

Respondents were asked if they have received veld fire awareness training in their area. Obviously, 67% (n = 161) of respondents indicated that they did not receive awareness on veld fires. On the other hand, and 33% (n = 78) received awareness on veld fire.

4.5.3 Illegal harvesting within the study area

About 80.3% (n = 192) of respondents indicated that there had been illegal harvesting in their area. On contrary, 19.7% (n = 47) respondents denied that there was illegal harvesting in their area.

4.5.4 Lack of finance to carry out patrols within the study area

Evidently, 98.3% (n = 235) of the respondents stated that they experienced lack of finance to carry out patrols in the forest to control illegal harvesting, whereas 1.7% (n = 4) stated that they did not lack finance to carry out patrols.

4.5.5 Training of the community on SFM by DoF

The respondents 79% (n = 188) indicated that DoF did not train them on SFM, and 21% (n = 51) were trained on SFM. The community emphasized that even though they used traditional knowledge to sustainably manage the forest; they would like to be trained on how to manage the forest in a modern way so they can combine traditional understandings and modern ways of SFM.

6.5.6 Distance to collect the forest products from homesteads

Clearly, 76.2% (n = 182) of respondents indicated that the distance to collect forest products from their homesteads increased very much, on the other hand 19.6% (n = 47) of respondents thought the distance increased. However, 4.2% (n = 10) of respondents indicated that the distance was constant (figure 12).

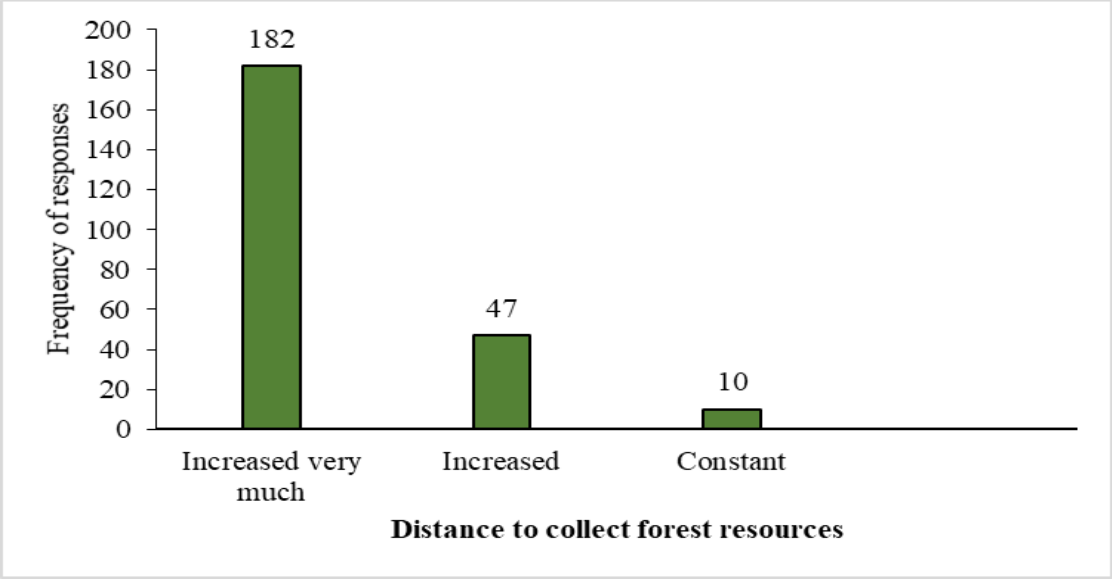

Figure 12: Distance to collect forest products from homesteads

CHAPTER 5: Discussion

5.1 Communities' roles in SFM

The communities have responsibility in conserving the forests by reporting illegal activities such as (illegal harvesting) to the heads of the villages, DoF officials, and police stations. Communities prevent forest fires by making sure not burning when it is windy and hot. Anup, (2017) reported that rural people protect and manage forests to mitigate deforestation and forest degradation. Communities also help DoF to suppress fire when it occurs in the forest as they believed they are the custodians of forests and must save the forest for future generations to benefit. The study of (Matsvange *et al*., 2016) stated that community gets involved in forest protection by avoiding forest fires and deforestation; to increase the benefits they get from forest for their livelihoods. The role of indigenous knowledge systems in the forest management and sustainability is important. A study by Anup (2017) and Matsvange *et al*. (2016) stated that communities do apply their indigenous knowledge to preserve and control forest for attaining their fundamental needs which are main targets of CF. Community participates in decision making through meetings held at their villages. This enhances their involvement in SFM.

5.2 Community dependence on forest resources and perception on SFM

Communities depend more on firewood, thatch grass, and wild fruits. According to (Htun *et al*., 2017), most important forest products are fuel wood, wild fruits and medicinal plants. As a result, fuel wood has been the source of energy in rural areas, for cooking twice or three times a day. Thatch grass is used as building material for traditional hats. Collecting wild fruits was common because people used them for consumption, and some sold for income.

Community benefits from forest resources through access to firewood on daily basis, poles and droppers for building their homesteads and fencing up. Community also benefit from thatch grass and wild fruits. Benkenstein *et al*., (2014) found the same that community benefit from forest products. Community revealed that *Guibourtia coleosperma* and *Schinziophyton rautanenii* are of high economic value as seeds utilized as relish, and inner kernel as soup or cooking oil.

Forest resources improve the livelihood of community as they sell forest products to earn income. The generated income used to buy food, stationaries and uniforms for school children, clothes and blankets, and transport money to hospitals. Respondents emphasized that thatch grass was vital for their livelihoods because their livestock depend on it as feed. Tree species such as *Pterocarpus angolensis* and *Guibourtia coleosperma* were used for timber production. Inhabitants explain that they use planks to make their beds, doors, chairs and tables for household purpose. Some cavers were doing it for business purpose and generate income (figure 13). Forest resources contributed to income generation, subsequently rural people were residing in the forest and forest resources were easily accessible. Vrabcová *et al*. (2019) stated that most

rural communities were harvesting forest resources illegal to give rise to revenue and strengthen their livelihood.

Community perceived that they were not utilizing the forest resources in a sustainable way, as some used to extract forest resources during nights because they did not have permits from DoF. Some communities revealed that Chinese were seen in their forest and were harvesting more than what was indicated on their permits.

Figure 13: Woman preparing inner kernel from *Schinziophyton rautanenni*

5.3 Factors that influence the participation of community in SFM

Employment status significantly influence participation in SFM. Hence, most of the respondents were unemployed and likely means they had enough time to participate in SFM, and the level of

dependency on forest resources is high. According to Musyoki *et al*. (2016), community members participate more on SFM when they benefit more on forest for the livelihood. Musyoki *et al*. (2016) further stated that communities with more land for farming participated more on SFM because their livestock depend on fodder in the forest. A study by Wambugu *et al*. (2017) revealed that factors that influence community involvement in SFM may differ according to socioeconomic and demographic backgrounds of different community member.

A study by Wambugu *et al*. (2017) stated that socioeconomic factors such as farm size, economic importance of the forest ecosystem, and household size significantly influence community participation in SFM. Communities who are close to the forest resources do participate more compared to those who stay far. According to Mwangi *et al.* (2011), women participated less than men because most of activities carried in the forest are believed to be meant for men. Men do the harvesting of timber and are responsible for marketing them.

5.4 Activities which should be carried out by communities to increase their involvement in SFM

Community can increase their involvement in SFM by formulating their needs from the forest. Communities can design a management plan to sustainably utilize the forest resources. Communities can be part of management plan meetings to share their views. Community can avoid harvesting live trees, and instead harvest dead trees. Katerere *et al.* (1999) stated that for community-based forest management; households are not permitted to harvest live trees. This is important to secure live trees for future generations. Government has role to enforce forest rules, therefore, community should be part of monitoring and policing of forest. Katerere *et al*. (1999) revealed that households find it simple to guide the forest resources near their homesteads. This

is because local people target forest resources within their boundaries to avoid walking long distances to collect forest products. Communities should be involved in inventories, pre-harvest planning, forest protection and monitoring, and fire management (Katerere *et al*., 1999).

A study by Anup (2017) highlighted that community awareness has a significant influence on community participation in SFM. If communities have benefits from forests, they will spend more time and effort in forest conservation to increase the benefits from forest products.

This study provides information about community roles in SFM and dependency on forest resources, and the activities carried in the forest. Community plays roles in conserving forests by reporting illegal activities and prevents forest fires. Community members share knowledge and skills about SFM. Community roles and participation in SFM may vary in different geographical constituencies or regions. Therefore, further studies in other areas may prevail.

CHAPTER 6: Conclusion and Recommendations

6.1 Conclusion

This study highlighted the rural community role in SFM, how rural community depends on forest resources and benefit for their livelihood. The study enlightened the community perception on SFM, communities who are employed influence participation in SFM. The activities (inventories, pre-harvest planning, forest protection and monitoring, and fire management) should be carried out by community to increase their participation in SFM.

Rural community significantly play a role in forest conservation by report illegal activities and prevent forest fires. The indigenous knowledge system significantly enhances forest management and sustainability which considered as vital approach to mitigate forest degradation. The communities applied traditional knowledge to manage the forest. Community form joint management to share knowledge and skills on SFM. The study concluded that age significantly influence community dependency on forest resources. Community forestry meets the basic needs of rural communities and creates the opportunity of income generation through selling of forest products. Forest income generated from selling woodcarvings, firewood, poles, planks and thatch grass. Moreover, forest resources improve the livelihood of communities. Communities utilize forest resources such as firewood as source of energy on daily basis. Forest products such as poles are used for constructing community's homesteads and fences. Timber is harvested for making furniture. Forest has abundance of wild fruits that are utilized for human consumption and contribute to food security. According to the study results, pension, forest resources and social grants are the main sources of income to the local community of the study area. However, males make more income from forest resources than females.

Employment status significantly influence community participation in SFM. The community members have been involved in SFM because they know their needs from the forest and able to determine the problems that obstruct forest management and rectify them. More awareness on forest conservation is relevant to increase community participation in forest management. Through education, most of the communities can encounter the importance of forest conservation. This would enhance community understanding to take precaution toward forest. Communities take control of forest resources within their areas and regard them as their properties. If communities have responsibilities to take of the forest resources, SFM could be achieved.

Veld fires occurred in the study area and cause depletion of forest resources such as thatch grass and wild fruits. Most of the community did not receive awareness on veld fire. Illegal harvesting has been observed in the study area by respondents. The study reveals that the distance to collect forest products has increased. This is caused by increase in adjacent agricultural activities, increase in population, demand for forest resources and forest fires. The more people in a local area, the more forest will be destroyed to make ways for crop fields. Agricultural land is significant to local people.

6.2 Recommendations

- ✓ DoF should do more awareness about forest conservation through different media such as radio, newspapers and through community meetings. If community gets to know the importance of conserving the forest, success about SFM could be reached among the local communities.

- ✓ Community should be involved in decision making regarding SFM. Local communities could be empowered as owner-managers of forest resources. Community should be engaged in the planning process so that their interest and needs be considered.

- ✓ Community should be involved in income generating activities, such as bee keeping and crafting to create more chance to participate in SFM. If communities are involved in beekeeping, income could be generated without endanger any tree species. Through beekeeping, employment opportunities are created that could be taken up by the local people.

- ✓ Community should have equal opportunities to utilize the forest resources. All local communities should have rights to forest resources. There should be no discrimination among community members regarding their gender, health status, marital status, employment status, educational level, religion etc. Rules should be taken into consideration when a community member wants to extract resources from the forest.

- ✓ Communities should be involved in patrols in the forest. Communities should form up teams which could be carrying out patrols in the forest. Patrols should be done frequently to prevent illegal logging. In some case, DoF should provide transport to community to reach parts that are distance away where local people are residing.

- ✓ Community should report any illegal activities occurring in the forest. Community should be motivated to report illegal activities to their headmen or headwomen of their villages, chiefs of traditional authorities, DoF officials, constituency council offices, or either to the nearest police station.
- ✓ Communities should carryout inventories with the help of forestry officials to help them to develop forest management plans. The resources present in a certain forest should be known for proper management. Community should plan on how much to be harvested if the quantity is known.
- ✓ Community should form committee to do inspection on those who are harvesting trees with permits, instead of waiting for forestry officials. There should be committee trained, to make sure what is applied on the permit is what to be harvested. Consideration should include the tree species, product and quantity indicated on the permit.
- ✓ Employment opportunities should be created. If local communities have other means of sources of income, the pressure toward forest would be reduced.
- ✓ Communities need to be provided with other alternative sources of energy to reduce the use of firewood.

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Appendices

Appendix 1 Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.463	.426	39

Item Statistics

	Mean	Std. Deviation	N
Age of respondents	3.13	.962	239
Gender	1.41	.493	239
Marital status	2.15	.990	239
Household size	2.44	.919	239
Education level	2.37	1.387	239
Employment status	2.84	.496	239
Housing type	2.00	.065	239
Type of farming activities	2.42	.908	239
Activities carried out in the forest	3.02	1.988	239
Poles important for the livelihood	3.89	.378	239
Timber important for the livelihood	2.97	1.137	239
Devils claw important for the livelihood	2.09	1.245	239
Wild fruits important for the livelihood	3.98	.193	239
Medicine important for the livelihood	3.25	.997	239
Honey important for the livelihood	2.69	.936	239
Forage important for the livelihood	3.36	.797	239
Tree barks important for the livelihood	2.90	1.022	239
Sources of your annual income	2.92	1.998	239
Perception on Namibia Forest Act	1.26	.442	239
Perception on SFM	1.20	.401	239
Perception on utilizing the forest resources	1.61	.490	239
Perception on benefit from forest resources?	1.82	.385	239
Do you participate or play role on SFM?	1.41	.492	239
Perception on depletion of forest resources	1.77	.419	239

Forest cover	1.48	.978	239
Cutting down of trees	1.35	.778	239
Reason OF cutting down trees	2.65	2.343	239
Reduce the rates of deforestation	2.45	2.731	239
Indigenous knowledge systems	1.01	.112	239
Perception on SFM decision making	1.38	.486	239
Share knowledge and skill about SFM	1.28	.452	239
Woodland management	1.19	.395	239
Community benefits from forest resources	1.01	.112	239
Forest resources improve the livelihood	1.04	.191	239
Forest resources sharing	1.34	.476	239
Veld fire occurrence	1.22	.416	239
Awareness on veld fire	1.67	.470	239
Illegal harvesting	1.20	.398	239
Lack of finance to carry out patrols	1.02	.129	239
DoF train the community on SFM?	1.79	.411	239

Appendix 2: Binary regression logistics

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	14.224	8	.076
	Block	14.224	8	.076
	Model	14.224	8	.076

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	308.577[a]	.058	.078

Classification Table[a]

			Predicted		
			Do you participate or play role on SFM?		
	Observed		Yes	No	Percentage Correct
Step 1	Do you participate or play role on SFM?	Yes	123	19	86.6
		No	62	35	36.1
	Overall Percentage				66.1

Appendix 3: Chi-square test

Do you participate or play role on SFM? * Employment status

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.955[a]	2	.002
Likelihood Ratio	14.365	2	.001
Linear-by-Linear Association	1.884	1	.170
N of Valid Cases	239		

Appendix 4: Consent letter

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The Ministry of Agriculture, Water and Forestry
Directorate of Forestry

20 November 2018

Dear Sir/Madam,

SUBJECT: REQUEST FOR STUDY LEAVE: MIRJAM NGOWINA NATANAEL, 07 JANUARY - 15 FEBRUARY 2019

As you may be aware, Ms. Mirjam Ngowina Natanael, (Student number: 200929925) is a Master student at the Namibia University of Science and Technology (NUST) in the Faculty of Natural Resources and Spatial Sciences: Department of Agriculture and Natural Resources Sciences for the 2018 academic year. Her research topic is titled "Analysis of the communities' role in Sustainable Forest Management in Namibia: Managers or Spectators? a case of Kavango West Region". I am glad to inform you that she is making steady progress towards her studies.

As a research requirement by NUST, Ms. Natanael is expected to conduct a survey in her study area (Ncuncuni and Ncamagoro constituencies - Kavango West region). The survey is scheduled to take place from 07 January to 15 February 2019 covering over 200 households. The survey data is important to test some of the hypothesis of her study.

I therefore request your esteemed office to favourably grant an appropriate leave to enable Ms. Ngowina to collect her field data. Please feel free to contact me directly for additional information or clarification at email: jkamwi@nust.na; tel: 0612072568.

Your sincerely,

Dr Jonathan M. Kamwi
Lecturer - Supervisor

NAMIBIA UNIVERSITY OF SCIENCE AND TECHNOLOGY
P/Bag 13388
Windhoek
NAMIBIA
2018 -11- 20
FACULTY OF NATURAL RESOURCES AND SPATIAL SCIENCES
Department: Agriculture and Natural Resources Sciences

Appendix 4: Questionnaire

Analysis of the Communities' Role in Sustainable Forest Management in Namibia: Managers or Spectators?

I am Mirjam N. Natanael a master student studying Natural Resources Management at Namibia University of Science and Technology (NUST). As a partial fulfilment of my study, I am required to conduct an academic research project, to better understand the role of rural communities in sustainable forest management of Kavango west region in Namibia. It is in this regard that I ask for your assistance to answer these questions fairly. Trust that the information provided will only be used for the purpose of this research and would be treated confidential. Your commitment would be highly appreciated.

Part 1: Socioeconomic status

1. **Age** of respondent (18-35 = 1; 36- 45 = 2; 46-60 = 3; more than 60 = 4)

18-35		36- 45		46-60		more than 60	

2. **Gender** (male =1; female = 2)

Male		Female	

3. **Marital status**: (single =1; married = 2; divorced = 3; widowed = 4)

Single		Married		Divorced		Widowed	

4. **Household size**: (1-5 = 1; 6-10 = 2; 11-15 = 3; 16 and above = 4)

1-5		6-10		11-15		16 and above	

5. **Educational level**: (primary level = 1; secondary level = 2; tertiary level = 3; none = 4)

Primary level		Secondary level		Tertiary level		None	

6. **Employment status**: (employed = 1; self-employed = 2; unemployed = 3)

Employed		Self-employed		Unemployed	

7. **Housing type**: (modern house = 1; traditional house = 2)

modern house		traditional house	

8. Type of farming activities: (Cattle = 1; sheep = 2; goat = 3; donkey = 4; crop = 5; crop & livestock = 6)

Crops	
Livestock	
Crops & livestock	

Part 2: Communities' dependence on forest resources

1. What are the 3 main activities carried out in the forest? (Collect firewood = 1; wooden carvings = 2; loggings = 3; thatch grass = 4; collect wild fruits = 5)

Collect firewood		Thatch grass		Loggings	
Wooden carvings		Collect wild fruits			

2. What are the most important forest products for the livelihood in your household and rank them (1= not important, 2 = least important, 3 = important, 4 = most important, ...)? (DO NOT READ THE RESPONSES)

Product	**Tick Product**	**Degree of importance**
Firewood		
Poles		
Timber		
Devils claw		
Wild fruits		
Medicine		
Honey		
Forage from the forest		
Grass / Reeds		
Tree barks		
None		

3. What is the main source of your annual income?

Sources of income	
Pension	
Salary	
Social grant	
Agriculture	
Remittances	

Forest resources	

Part 3: Community perception regarding forest management and its sustainability

1. Are you aware of Namibia Forest Act? (yes = 1; no = 0)

Yes		No	

2. Are you aware of sustainable forest management? (yes = 1; no = 0)

Yes		No	

3. Do you think the community is utilizing the forest resources in a sustainable way? (yes = 1; no = 0)

Yes		No	

4. Do you think SFM avoids community to benefit from forest resources? (yes = 1; no = 0)

Yes		No	

5. Do you participate or play role on SFM? (yes = 1; no = 0)

Yes		No	

6. Do you think forest resources would be depleted if community continue to practice SFM? (yes = 1; no = 0)

Yes		No	

7. How has the forest cover in your village changed during the past 10 years? (CHECK 1 RESPONSE)

Major decline	
Minor decline	

No change	
Minor increase	
Major increase	
No idea	

8. Do you think cutting down of trees is? (CHECK 1 RESPONSE)

Increasing		Decreasing		Constant		Don't know	

8.1 Give reasons if there is an increase in cutting down trees and rank them (1= most important, 2 = second most important, 3 = third most important)? (DO NOT READ THE RESPONSES)

Reason	**Degree of importance**	**Comment**
Too many people		
Agricultural expansion		
Increase in demand for wood		
Government rules		
Illegal logging		
Don't know		
Other (specify)		

9. What do you think should be done to reduce the rates of deforestation (1= most important, 2 = second most important, 3 = third most important, …..))? (DO NOT READ THE RESPONSES)

Action	Degree of importance	Comment
Better protection of forests / permits / awareness		
Better skills on how to collect/use the resources		
Tree planting		
Control of forest fires		
Wildlife control		
None		
Other (specify)		

10. Is the role of indigenous knowledge systems in the forest management and sustainability important?

Yes		No	

Part 4: Community role in SFM

1. Do you participate in decision making regarding SFM? (yes = 1; no = 0)

Yes		No	

2. Are you a manager or spectator of SFM? (manager = 1; spectator = 2)

Manager		Spectator	

3. Do you share knowledge and skill about SFM with others? (yes = 1; no = 0)

Yes		No	

11. Do you know how the woodland from which you get your products is managed?

Yes (1)	
No (0)	

4.1 If yes, what type of management is applied? (CHECK ALL THAT APPLIES)

Government	
Community participation	
Joint management	
Traditional	
Don't know	

12. Do you know the regulations that govern the protection of the natural resources around you? (Yes = 1, No = 0)

Yes	
No	

5.1 If yes, mention them (CHECK ALL THAT APPLIES)

Forest Act	
Forest Policy	
Nature Conservation Act	
Other (specify)	

13. What activities are allowed in the forest? (CHECK ALL THAT APPLIES)

Illegal logging	
Hunting	
Clearing for crop fields	
Starting open fires	
Other (specify)	

14. What are your roles and responsibilities in conserving these forests? (CHECK ALL THAT APPLIES)

Report illegal activities	
Prevent forest fires	
Other (specify)	

Part 5: Benefit obtained from community forest

1. Does the community benefits from forest resources? (yes = 1; no = 0)

Yes		No	

2. If yes, explain how you benefit?

……

……

3. Do the forest resources improve the livelihood of community members? (yes = 1; no = 0)

Yes		No	

4. Do the resources well shared to community member? (yes = 1; no = 0)

Yes		No	

Part 6: Challenges experienced

1. Does veld fire occur in your area? (yes = 1; no = 0)

Yes		No	

2. Have you receive any awareness on veld fire? (yes = 1; no = 0)

Yes		No	

3. Is there illegal harvesting happening in your area? (yes = 1; no = 0)

Yes		No	

4. Do you experience lack of finance to carry out patrols in your area? (yes = 1; no = 0)

Yes		No	

5. Does DoF train the community on SFM? (yes = 1; no = 0)

Yes		No	

6. If yes, explain how DoF train the community?

……

……

7. Has the distance to collect the forest products increased over the years?

Yes (1)	
No (0)	

7.1 If yes, what are the reasons and rank them (1= most important, 2 = second most important, 3 = third most important, ...)? (DO NOT READ THE RESPONSES)

Reason	**Degree of importance**	**Comment**
Increase in adjacent agricultural activities		
Increase in population		
Demand for resources		
Damage by wild mammals		
Forest fires		
None		
Other (specify)		

THE END

THANK YOU FOR YOUR TIME AND COOPERATION