Trees, Forests and People 2 (2020) 100022

Contents lists available at ScienceDirect

Trees, Forests and People

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

Dependency of rural communities on non-timber forest products in the dry lands of southern Africa: A case of Mukwe Constituency, Kavango East Region, Namibia

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ARTICLE INFO

Keywords:
Mukwe
NTFPs
Dependency
Livelihood
Socio-economic
Demographic factors

ABSTRACT

This paper examines the relationship between socio-economic and demographic factors and Non-Timber Forest Products (NTFPs) dependency among the rural communities of the Mukwe Constituency, Kavango East Region, Namibia. The study employed interviews of households using semi-structured questionnaires and personal observations during July 2019 covering 102 respondents. The data was analyzed using descriptive statistics and the Chi-Square (X^2) to test the association between socio-economic and demographic factors with NTFPs dependency. Results showed that wild-fruits, mushroom, honey-bees, mopane worms, insects, medicinal plants, wild meat, ropes, reeds, thatching grasses and devil's claw were the NTFPs prevalent in the study area. The results further showed that 71 % of the respondents were reliant on NTFPs for their diverse livelihoods. The Chi-square revealed no significant association between age, gender, marital status, number of people in the households and NTFPs dependency ($P>0.05$). However, a significant association was found between NTFPs reliance and occupation, number of years in the village, number of people employed in the household, highest qualification and employment status ($P<0.05$). The intra-community differentiation in the reliance on NTFPs, as revealed in this study, enables more effective targeting of forest management interventions and informs efforts to reconcile the goals of poverty reduction and sustainable forest management in Namibia and other countries with similar socio-economic and environmental conditions.

Introduction

Non-Timber Forest Products (NTFPs) play a significant and crucial role in improving the livelihoods of many rural people around the globe (Shackleton and Shackleton, 2004, Balama et al., 2016). The majority of people living in rural areas, especially in developing countries, collect these products on a day-to-day basis for their livelihood and some of them sell the products for them to earn a living and to supplement other income activities or as a primary means of income generation (Pandey et al., 2016). The NTFPs refers to any resources or products that are collected from the forest ecosystem to be used at the household level or marketed, and some of them are deemed important for social, religious and cultural purposes (Pandey et al., 2016). In essence, NTFPs are specifically defined as wild animal and plant products that are harvested from forests such as animals, birds, insects, and fish for food, fur and feathers, wild fruits, vegetables, beverages, palm leaves, nuts, edible roots, medicinal plants, forage, fuel, medicine, poisons, fibres, biochemicals as well as their products such as honey, lac and silk, and bush meat for subsistence and commercial use (Van Andel, 2006).

The majority of the world's rural people are highly dependent on the use of natural resources and services for their livelihood (Johnson et al., 2013, Kamwi et al., 2015). Rural people are motivated to diversify their sources of food including NTFPs, which eventually assists in maintaining the biodiversity and ecosystem services. Thus, this reduces the dependency of rural people on timber resources only. A solemn interest in NTFPs started in the late 1980s and early 1990 for the purpose of addressing the escalation of global environmental issues and calling for the utilisation of forests on a sustainable manner for the benefit of the poor rural population and the broader society at large, with a main emphasis on the concerns of sustainable development (Belcher et al., 2005). Currently, the interest in NTFPs is focussed on new products, and as such, the development of improved markets for NTFPs should be discovered so that dryland forests can be protected and conserved. There is also a perception that communities will take care of forests by conserving and protecting them once they realise the tangible benefits from sustainably managed forests (Matsvange et al., 2016). The latter is ev-

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https://doi.org/10.1016/j.tfp.2020.100022
Received 25 February 2020; Received in revised form 4 August 2020; Accepted 8 August 2020
Available online 12 August 2020

ident, for example, in cases where rural people are harvesting devil's claw (*Harpagophytum procumbens* (Burch.) DC. ex Meisn. and *Harpagophytum zeyheri* Decne) in a sustainable manner in Namibia by leaving and closing some of the tubers for them to reproduce again. In addition, people who are harvesting *Ximenia americana* L. fruits for oil are only harvesting them from the plants and fruits which are mature and mostly from fruits which have fallen from the tree (Mallet and Saskia den Adel-Sheehama, 2014).

Although the importance of NTFPs to millions of rural households is increasingly being acknowledged, research regarding the impact of socio-economic factors on forest use shows mixed evidence (Gupta, 1994). In addition, information on the actual production for the majority of products and reliable data on the value of NTFPs used domestically does not exist (Phounvisouk et al., 2013). NTFPs play an important role in the day-to-day lives of many rural households in Namibia through their contribution to the improvement of rural livelihoods through the provision of food, nutrition and medicine, and by creating job opportunities and as sources of income and also for earning foreign exchanges (Bekele and Chakanga, 2003). Because of their economic and nutritional values, NTFPs are traded in formal as well as informal markets and the products include fruits and their by-products and also mopane worms, grass, marula oil and devil's claw (Bekele and Chakanga, 2003).

The Resource Use Theory proposed by Firey, as quoted in (Suleiman et al., 2016), was used as a framework to guide this study. The theory recognises that "people who depend over a given resource is a function of ecological, economic, and cultural factors that interacts with each other and plays a role through the definition of the level of interdependence amongst the people and their environment". Generally, households adjacent to forests usually depend on forest resources for employment and to supplement their households with income (Jimoh et al., 2013). Several studies have been carried out on the available NTFPs in Namibia (Barnes et al., 2010). However, these studies are limited in scope and do not provide information on the contribution of NTFPs to rural livelihoods in Namibia and the relationship that exists between rural livelihoods and NTFPs, especially in the Kavango East region. Therefore, the present study aimed to determine the relationship between socio-economic and demographic factors with NTFPs dependency in rural livelihoods of the Kavango East region. This information can help to formulate policies which may ensure that forest resources are sustainably managed and promoted to increase their socio-economic values, and to identify which NTFPs are more vital to the livelihood of rural communities.

Materials and methods

Study area

The study was conducted in the Mukwe constituency of the Kavango East region (Fig. 1). The Kavango region is located in the north-eastern part of Namibia, bordered by Cuando Cubango Province of Angola in the north, Otjozondjupa in the southwest, Kavango West in the west and Zambezi region in the east, covering 23,989 km^2 (Ministry of Land and Resettlement 2015). The Kavango East region was selected on the basis of its ecological settings, evidence of the use of dry land agro-ecosystems, similarities in socio-economic activities and livelihood activities, and high poverty levels among households, which may drive communities to depend on the forest resources (Ministry of Land and Resettlement 2015). The region has 27,690 inhabitants comprising of 4,511 households (National Planning Commission Namibia Poverty Mapping 2019). Generally, the Kavango East region has flat terrain falls from 1200 m above sea level to below 100 m, with an annual rainfall range between 450 and 600 mm, which falls nearly entirely in summer. The region is generally dry between May and September. The Kavango East region is known for warm to hot temperatures with average maximum temperatures above 30°C and average minimum temperatures below 10°C during the coolest months of June to August (Ministry of Land and Resettlement 2015). The most noticeable and significant feature in the region is the perennial Kavango River, covering 350 km of Namibia's northern border before leaving the region and crossing into Botswana. The region is characterised by fairly homogenous Kalahari woodland that comprise of broad-leafed deciduous woodlands varying according to the topography and soil type of the area. The existence of large trees such as *Baikaea plurijuga* Harms, *Pterocarpus angolensis* DC. *Terminalia sericea* Burch. ex DC. and *Burkea africana* Hook signify the importance of the region based on the tree's value as a resource for the extraction of timber that is used in furniture production, construction, carvings and fuelwood (Kamwi et al., 2015). A number of species significantly contribute to food security in the form of fruits, such as *Schinziophyton rautanenii* (Schinz) Radcl.-Sm. *Guibourtia coleosperma* (Benth.) J. Léonard and *Strychnos cocculoides* Baker and these are vital resources for rural livelihoods (Kamwi et al., 2015).

Data collection and sampling framework

The study used semi-structured questionnaires with open and closed-ended questions in order to collect socio-economic data. The household questionnaire provided information on the use of NTFPs in livelihood portfolios. The questionnaire was useful in standardising the questions and this ensured that they were the same for each respondent and also many respondents could be reached with limited resources such as time and transport (Namibia Statistics Agency Namibia Population and Housing Census 2011). The questionnaire included sections covering livelihood activities and the consumption and sale of NTFPs. Specifically, the questionnaire constituted of four components for consideration, which are namely: Social component, Human component, Natural resources component and Financial component. These components were meant to collect data associated with the dependency of the respondents on NTFPs and the importance of NTFPs to rural people and their livelihoods and the impact that is made by NTFPs to their livelihoods.

Field observations also were used as a means of triangulating the data collected (Bertrams and Christiance, 2014; Creswell, 2017). Each interview lasted for 50 min. The household was considered as a basic unit for the survey with the unit of observation being the head of the households. The sample size was determined using the formula by (Krejcie and Morgan, 1970). Data on the income generated from the sale of NTFPs were representative of cash income from the previous 5 years as reported by the household. Respondents were requested to list the types of NTFPs they had used in the last 5 years and to rank them based on their utilisation frequencies. In this study, the household income reported for livelihood activities was a self-reported value for net benefits (income minus production costs). The reliability of the forest income data was enhanced by the fact that most of the forest products are sold during the rainy season when the survey was conducted. Three focus group discussions were held (one in each village) with 7–15 discussants, which included males, females, and youths that were involved in different NTFPs activities. The meetings discussed topics such as the use of NTFPs and the influence of socio-demographical factors to NTFPs. The focus group meetings were facilitated by the researchers, and they lasted about 60 min. The focus group discussions were useful in triangulating the household questionnaires and in-depth interviews, and a broader understanding of NTFPs usage at the village level.

Data analysis

Data from the questionnaires were statistically analysed using the Statistical Package for the Social Sciences (SPSS), version 26 and Microsoft excel 2019. The chi-square test for independence was used to determine the associations between categorical variables.

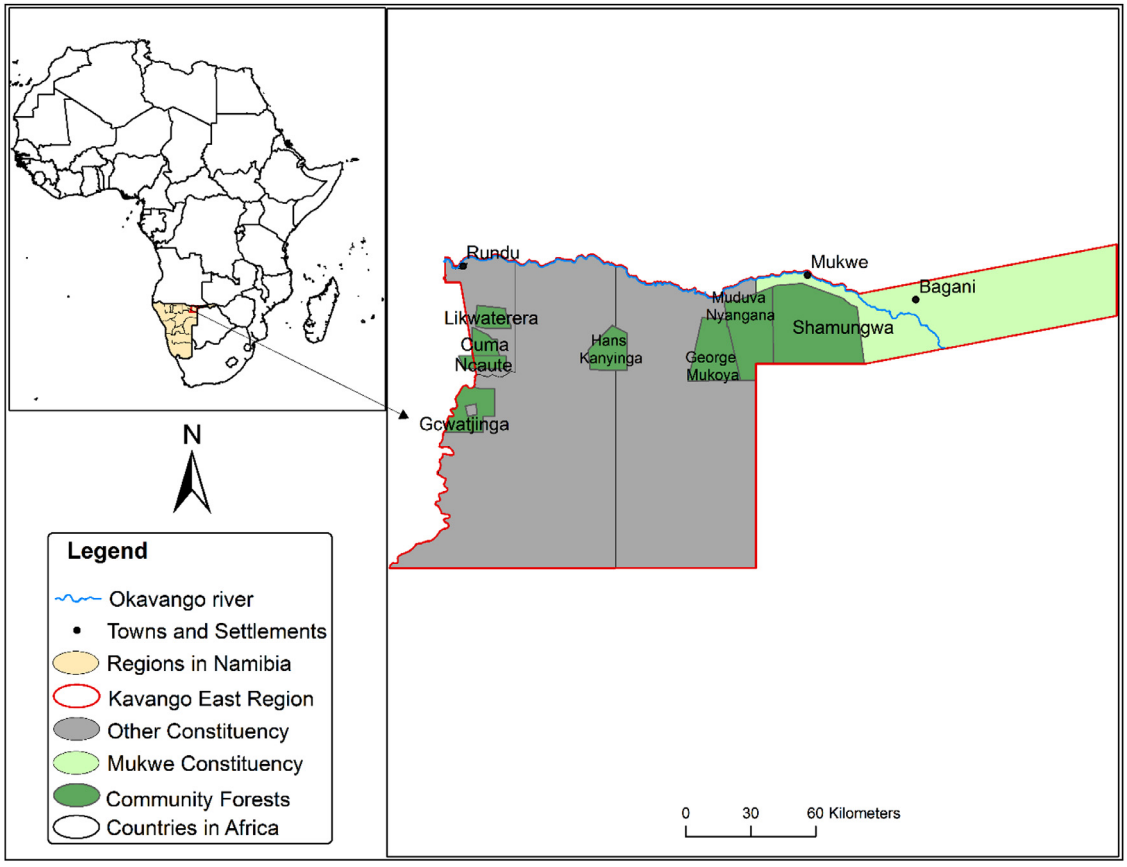

Fig. 1. Location of the study area.

Results

Socio-economic and demographic characteristics

A total of 102 household heads were interviewed. Based on the socio-economic and demographic characteristics of the households, the results indicated that 45.1% (*n*=46) respondents were males, while 54.9% (n=56) were females. Moreover, 57.8% (*n*=59) of the total respondents were heads of the houses while 42.2% (*n*=43) were not head of the houses, but they met the interview criteria. According to the marital status, 22.5% (*n*=23) were single, 5.9% (*n*=6) were widowed or separated and 8.8 % (*n*=9) were staying together, while 62.7 % (64) were married. Among the respondents, 17.6% (*n*=18) of the respondents attended adult education and 20.6% (*n*=21) attended school up to grades 1 to 7. In addition, 22.5% (*n*=23) attended school up to grades 8 to 12, whilst 13.7% (*n*=14) attended tertiary education institutions, which is an indication that a considerable number of literates in the area participated in the study. On the other hand, 25.5% (*n*=26) of the respondents where illiterate with no form of educational attendance. In terms of employment, the study found a high number of unemployed respondents of about 80.4% (*n*=82), full employment of 9.8% (*n*=10) and 2.9% (*n*=3) part-time employed, while 6.9% (*n*=7) were self-employed (doing piecework), 5.9% (*n*=6) were small business entrepreneurs and 81.4% (*n*=83) were peasant farmers (agricultural farmers).

Sources of income

With regards to the sources of income, NTFPs were ranked the most important source of income in the study area, with a mean rank (MR) of 1.75 (Fig. 2). Agriculture was the second highest ranked income source (1.36 MR). Social grant was ranked as the third most essential income source (1.3). Piece work had a mean rank of 0.83, with formal employment and other sources such as *cuca-shops* had a mean rank of 0.31 and 0.14 respectively.

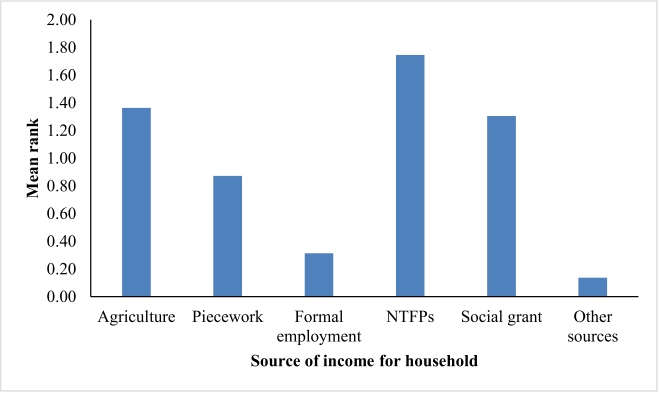

Fig. 2. Sources of income.

Major NTFPs and income derived from NTFPs by households during the past 5 years

With regards to the major NTFPs and income, results showed that thatch grass (Fig. 3) was the most frequently utilised NTFPs with the mean rank of 1.91, followed by rope (1.54) and wild-fruits (1.42).

Despite using the NTFPs for household sustenance, some respondents also indicated that they sell some of the NTFPs to financially improve their livelihoods. About 77.5% of the respondents sell NTFPs thereby earning an income per month though this varied among the

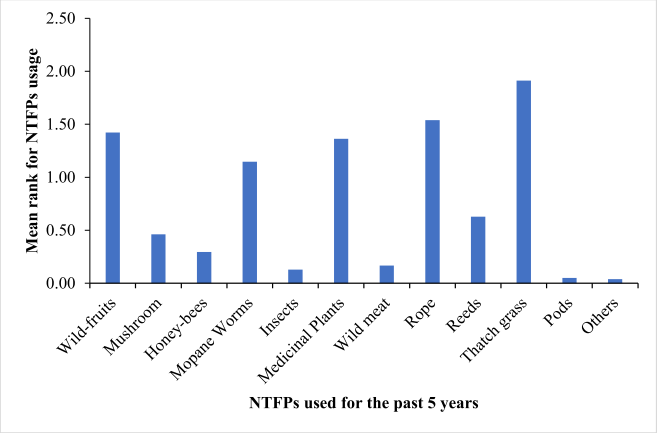

Fig. 3. Most utilised NTFPs in the study area.

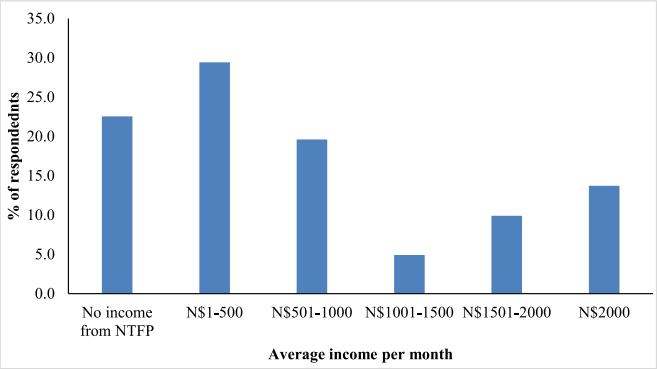

Fig. 4. The average monthly income per household.

households. Only 22.5% of the households indicated that they do not sell NTFPs. Fig. 4 shows the average incomes per month earned from different households, with the highest number of respondents indicating incomes ranging between 1 and 500 Namibia Dollars (N$) and the least number of respondents indicating incomes between N$1001 and N$1500 during different seasons.

The most sold NTFPs were thatch grass, constituting 32% as calculated from the mean rank (Fig. 5). The second most selling NTFPs was wild fruits (31%), followed by ropes (10%), medicinal plants (7%), others (devil's claw) and mopane worms (6%), reeds (5%), pods (2%) and honey (1%) respectively.

The study revealed that those selling NTFPs as represented by 17.6% (n=18) of the respondents, sold at the informal market (at *cuca-shops* and main roadsides), whereas 6.9% (n=7) were selling at the formal market, while the majority, constituting 52.9% (n=54) sold at the village level. Respondents indicated that out of the income generated, 46% is spent on education and 46% is spent on household needs, with 8% spent on social activities such as entertainment and leisure.

Livelihood coping strategies in the absence of NTFPs

In the absence of NTFPs, the most prominent livelihood coping strategy was by engaging in agricultural crops and vegetables (n = 57), which was identified as other means in the questionnaire. Timber selling from the forest (n= 28) was also identified as a strategy for livelihood and the last was to borrow food (n=11), with the rest (n=15) having no means of survival or doing nothing at all.

Table 1
Associations between socio-demographic and NTFPs dependency.

Socio-demographic factors	X^2(P-value)
Gender	0.817
Age	0.730
Education	0.004
Marital status	0.824
Number of people employed in the household	0.000
Employment status	0.000
Years in village	0.025
Occupation	0.000

Trends of NTFPs availability during the past 5 years

For the past 5 years, about 96 % (n=98) of respondents observed a reduction in the quantity of NTFPs, with 2% (n=2) observing a constant, while 2% (n=2) indicating that they did not know. Recommendations were collected on what to do when it was established that a high number of the respondents had observed the decrease in the NTFPs, of which awareness creation was the most prominent strategy (n=79) as a way to sensitise the community about the sustainable utilisation of NTFPs. A total of 54 respondents recommended strict law-enforcement and 37 advocated for tree planting. However, 3 respondents did not recommend anything to be done and three did not know what needs to be done. Based on the knowledge of the rules, policies and regulations guiding the NTFPs harvesting, 93.1% (n=95) of the respondents expressed that they are aware; however, 6.9% (n=7) professed that they are not aware of any rules or regulations or policies regulating the harvesting of NTFPs. The mostly known rules are community by-laws (n=69), followed by the Forest Act of 2001 and the Amended Forest Act of 15 of 2005 (n=65), and also Nature Conservation Ordinances (n=38).

Degree of NTFPs dependency and associated socio-economic and demographic factors

Out of 102 respondents in the study, 70.6% (n=72) of the rural community depended on NTFPs for their livelihood and for income generation, with 29.4% (n=30) not dependent on NTFPs in the Mukwe constituency. The following ranking on the status of dependency was recorded: High dependency consists of 31.4% (n=32), followed by very high dependency representing 19.6% (n=20), 14.7% (n=15) for moderate and 4.9% (n=5) for low dependency, which was the least in the ranking.

The analysis of the association between socio and demographic factors revealed no significant association between the dependency of rural communities on NTFPs and gender, age range, marital status, the number of people in the house, and the head of the house (p>0.05) (Table 1). However, significant associations were found between NTFPs' dependency and occupation (p<0.05). The significant associations existed between NTFPs dependency and the number of years in the village (p<0.05). A significant association between the number of people employed in the household was also found (p<0.05). Dependency on NTFPs was more prominent in households comprising of unemployed members (60.8%) compared to households with employed members. Significant associations were observed between NTFPs dependency and education (p<0.05) and those who did not have any education were the most predominant dependents of NTFPs (22.5%).

Discussion

Socio-economic and demographic factors

NTFPs play an important role in the livelihood of rural people by providing subsistence and commercial benefits (Shackleton and Shackleton, 2004), therefore, their contribution to rural people's livelihood

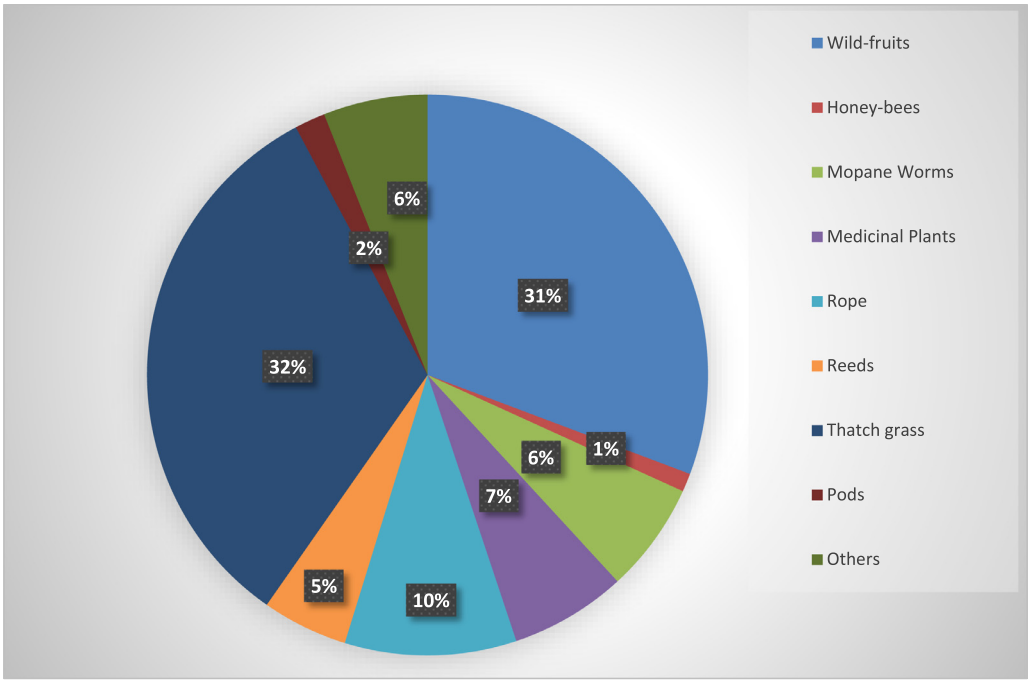

Fig. 5. Shares of NTFPs sold in Mukwe constituency.

should be analysed in terms of socio-economic and demographic factors to ascertain their impact on rural people's livelihood. The study analysed the association between NTFPs dependency with age, gender, marital status, number of people in the household, number of people employed in the household, occupation, employment status and education level of the head of the household. The Chi-square results indicated that there were no significant associations between age, gender, marital status and number of people in the household. However, a significant association was found between NTFPs dependency and occupation, education qualification and employment status. In terms of occupation, full-time employed heads of households were less dependent on NTFPs compared to their unemployed counterparts. This is due to the fact that employed heads of households have alternative means of livelihoods such as salaries. The more years people reside in the area/village (>16 years), the higher the dependency on NTFPs (37 %) because they feel settled, they become familiar with the area and they have established ownership of the land and its resources. The more the people employed in the household and higher educational levels lead to less dependency on NTFPs. Therefore, higher educational levels lead to the diversity of opportunities, thus leading to green pastures and the availability of more options for livelihood. Therefore, the high NTFPs dependency of rural people is a result of unemployment and poverty.

Source of income for household and contribution to livelihood

Forests support many rural households for their livelihoods through subsistence and income generation, especially poor people (Rasmusssen et al., 2017). There are also several sources of income for rural livelihoods such as agriculture, piece-work, NTFPs, social grants and formal employment. However, the study found that NTFPs are the main source of income in the Mukwe area, contributing to and supporting the livelihoods of rural households. They earn income by selling the NTFPs at the formal, informal and village levels. The most used and sold NTFPs identified were thatch grasses. Based on observations in the field, thatch grass was found in abundance in the Mukwe area, hence it was one of the most selling products. The income generated from NTFPs can be as far as N$2000 per month but the most dominant average income is N$500. The income generated is used to support the household needs as well as basic school needs, whereas some little money is spent on leisure.

Livelihood coping strategy in the absence of NTFPs

In the absence of NTFPs, the most prominent livelihood coping strategy was by engaging in agriculture. Timber selling from the forest was also identified as a strategy for livelihood and the last was to borrow food. Kavango East region has high rainfall compared to many of the regions in Namibia, therefore people grow crops as an alternative when NTFPs are unavailable (Ministry of Land and Resettlement 2015). The area is also constituted by high-value timber tree species such as *Pterocarpus angolensis* where people can harvest timber and sell it to improve their livelihoods.

Challenges associated with NTFPs utilisation

There are several problems which hinder the utilisation of NTFPs that were identified during the study. The main problem was the lack of designated areas to sell NTFPs. In the absence of centralised marketing areas, the community members find it difficult to sell their products, hence the majority sell their products at the village level at low prices. Another challenge is the loss of NTFPs due to the disappearing of the forest cover through illegal logging and the illegal harvesting of timber which has a high value compared to NTFPs. The policy behind this dramatic increase for the Directorate Forestry is to deter communities from exporting unprocessed raw wood products. They want to encourage communities to create employment opportunities before the products leaves the country through value addition.

Conclusion

The present study analysed the contribution and dependency on NTFPs by rural people from communities in the Mukwe constituency in Kavango East, Namibia. The study concluded that NTFPs play an important role among the rural people of Mukwe constituency, thereby contributing to their livelihood through subsistence and income benefits. The study found that thatch grass is one of the most important NTFPs in

the Mukwe constituency. The study concluded that mechanisms need to be pursued to make forest management economically feasible, such as by combining it with conservancies and growing knowledge of timber and NTFPs domestic interest.

Recommendations

In order to realise the importance and contribution of NTFPs in the livelihood of the rural people, the state should promote the sustainable management and utilisation of NTFPs through awareness creation and making sound decisions to enhance socio-economic development within the rural areas. In addition, it is imperative to conduct a study that explores the domestication and marketing opportunities for NTFPs. Furthermore, it is important to establish a market group in order to form an association for the community members to market their products.

Declaration of Competing Interest

There are no conflicts of interest to declare.

Acknowledgments

Thanks are due to the communities of the Mukwe Constituency in the Kavango East region for sharing their livelihood experiences with us. This research was supported by the Ministry of Agriculture, Water and Forestry in Namibia.

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