ASSESSMENT OF THE CONTRIBUTION OF NON TIMBER FOREST PRODUCTS TO THE IMPROVEMENT OF LOCAL PEOPLE'S LIVELIHOOD IN KINIGI SECTOR, MUSANZE DISTRICT, RWANDA

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Abstract

The purpose of this study was to assess the contribution of Non Timber Forest Products (NTFPs) to the improvement of livelihood of local communities in Kinigi Sector in Musanze District, Northern Province of Rwanda. This study was conducted from August, 2011 to February, 2012. The problem related to the use of Non Timber Forest Products in this area was that their contribution to the improvement of local communities' livelihood has been ignored or undervalued. Data were collected by conducting a survey through a semi- structured questionnaire. Purposive, simple random, stratified and proportionate allocation sampling methods were used to collect data from 67 households. Data was analyzed using Statistical Package for Social Sciences (SPSS) software version 16 where Friedman test and descriptive statistical methods were applied. The results showed that all respondents have the knowledge about NTFPs and they all use wood as a source of cooking energy. Only 44.8 % use bamboo stems to make chairs whereas 43.3 % of respondents benefit from beekeeping while 34.3 % harvest medicinal plants used in traditional medicine. Money earned from NTFPs is used to buy food, to purchase agriculture inputs, to get access to medical services, to get school fees, to buy clothes and then to build the houses. People living in Kinigi Sector know the importance and values of Non Timber Forest Products such as the provision of traditional human and veterinary medicine, honey, energy and artcraft. Local communities should be grouped into cooperatives in order to get the bank loan for enhancing the domestication of medicinal plants, planting bamboo and boosting beekeeping activity.

Keywords: *Non Timber Forest Products, livelihood, people, Kinigi, Rwanda*

Introduction

Non Timber Forest Products (NTFPs) are defined as wild plant and animal products harvested from forests, such as wild fruits, vegetables, nuts, edible roots and mushrooms, honey, palm leaves, medicinal plants, poison and bush meat. This definition includes also the use of wood for canoes, woodcarvings, local house construction, fencing materials and firewood, but excludes industrial timber (Andel, 2006; FAO, 1998). According to Chikamai and Tchatat (2004), Leakey *et al*., (1996) and FAO (1995), the NTFPs are defined as all biological materials other than industrially exploited timber, sawn timber and pulp that may be extracted from natural ecosystems, other wooded land and trees outside the forests.

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In Rwanda, Non Timber Forest Products (NTFPs) are commonly found in the following categories: plants used in traditional human and veterinary medicine, fodder, honey and melliferous plants, fruits, tree seeds, essential oils, handicraft material, mushrooms, ornamental plants, fish and ecotourism. NTFPs have long been an important component of the livelihood of people living in or adjacent to forest areas (Younping *et al.,* 2006). Local communities around Volcanoes National Park specifically in Kinigi Sector make vast and varied use of forest resources not only wood resources but also other products called Non Timber Forest Products. NTFPs usually provide different essential services such as firewood, food and medicine, fodder and related domestic requirements like Basketry (trays, beehive, baskets and stretchers) and decoration to make

houses more attractive and beautiful. They are also used during special occasions to add beauty to rural populations as well as urban consumers (Chikamai and Tchatat, 2004). NTFPs contribute substantially to national economic growth and international trade as they have potential of being marketed and thus providing rural people with cash income without the needs of clearing the forest. Traded products contribute to the fulfillment of daily needs and provide employment as well as income, particularly to rural people and especially women. A significant source of income supports community welfare (FAO, 2000; Leakey *et al*., 1996). Sustainable harvesting of NTFPs is seen as an effective management approach that allows local people to meet and sustain their livelihoods while contributing to forest conservation. The problem related NTFPs in Kinigi sector is that their contribution on the improvement of local communities' livelihood has been ignored at all levels. This is due to the fact that small importance was given to them. Therefore, this study is an attempt to evaluate the input of NTFPs in improving local communities' livelihood around Volcanoes National Park. This study will also help improve the knowledge of how the local people utilize NTFPs and how they contribute to the increase of their income.

Material and Methods

Study Area Description

This study was conducted in Kinigi Sector, Musanze District of the Northern Province, Rwanda. The region is prone to soil erosion due to steep slopes and high rainfall (Kiyiapi and Hitimana, 2006). The area has a moderate and humid climate due to its high altitude and abundant rainfall, the annual temperature and rainfall average 16^{o}C and 1400 mm respectively while the maximum rainfall is 2,000 mm. The altitude of Kinigi ranges between 2000 and 3000 m. Below and above this altitude, the rainfall intensity decreases with the altitude.

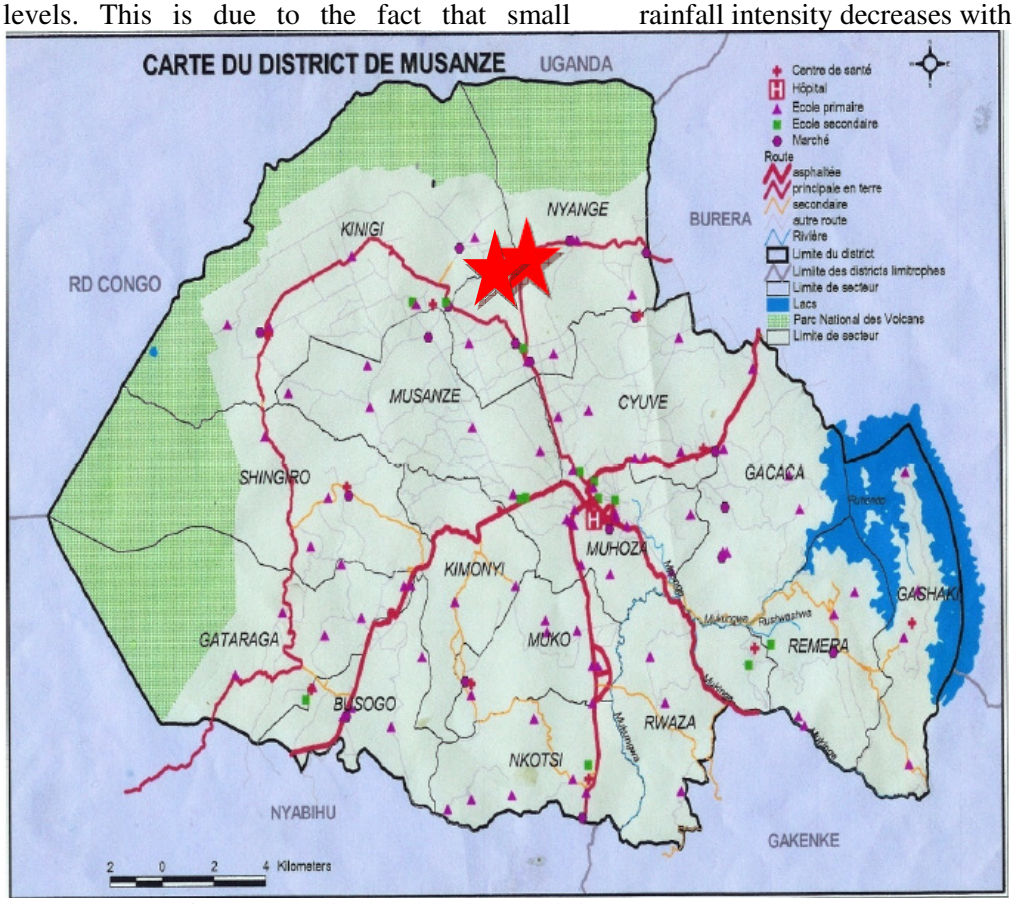

Figure 1 Map of Musanze district showing Kinigi sector

There is rainfall throughout the year but with two heavy rain seasons; the longest being from February to June with a peak in April while the shortest is from September to December with a peak in November. This pattern of rainfall is characteristic of the Intertropical Convergence Zone known to be ideal for agricultural activities (Kiyiapi and Hitimana, 2006).

Kinigi area has 20 % of organic volcanic soils. These soils are generally fertile (high moisture, rich in organic matter, high pH levels, high cation exchange capacity and phosphorus absorption) (Kiyiapi and Hitimana, 2006). The vegetation of Kinigi Sector is similar to what is found in Volcanoes National Park at the lowest altitude and it is not evenly distributed in the whole sector. The landscape is mainly covered with food crops, pyrethrum, large tree plantations, small private woodlots, scattered trees and bamboo (*Arundinaria alpina*).

Sampling Method

The sample size was taken in all five cells of Kinigi Sector such as Kampanga, Nyonirima, Kaguhu, Nyabigoma and Bisoke. Kinigi Sector was purposively chosen because it is located nearby Volcanoes National Park. As this park has been reduced in size due to anthropogenic activities, the non timber forest products found in VNP are likely to be found in Kinigi Sector. The stratified sampling method was used based on characteristics of the population (farmers, leaders and staff) such as age, sex, education and economic information. There are different ways to estimate a representative sample. In this study, the following formula was used:

$$n = \frac{z^2 \times p \times q \times N}{d^2(N-1) + z^2 \times p \times q}$$ (Kothari, 1985)

Where:
n = Sample size
N= Size of population
Z= Coefficient (normal distribution)
P= Probability of success
Q= Probability of failure
D= Margin error

The margin error varies between 5 % and 10 %. The margin error of 10 % is used, then the confidence level of 90 %, our probability of access is p= 0.5, failure probability of q= 0.5 as $Z_{0.25}$= 1.65; Then, the number of farmers to be interviewed at the sector level is:

$$n = \frac{(1.65^2) \times 0.5^2 \times 5{,}989}{(0.1^2) \times (5{,}989-1) + 1.65^2 \times 0.5^2} = 67$$

These 67 respondents were randomly selected from the population.

Determination of sample size at cell level

Proportionate allocation sampling method was used to determine the number of households to interview in each cell. For determining the sample size at cell level, the following formula has been used:

$$ni = \frac{Ni \times n}{N}$$

Where:
ni= the sample size proportion to be determined;
Ni= the population proportion in the stratum;
n= the sample size;
N= the total population.

Table 1 Proportion of the population in Cells

Sector	Cells	Number of households per Cell	Number of household interviewed
Kinigi	Kampanga	1,095	12
	Nyonirima	1,585	18
	Nyabigoma	1,026	11
	Kaguhu	1,307	15
	Bisoke	976	11
Total		5,989	67

Pretesting

This method enabled us to visit the study area in the purpose of knowing different activities related to the research to be conducted and discuss with the respondents the questionnaire to be used before realizing the final distribution to ensure communication facilities. For this issue, three randomly selected respondents were chosen in each cell.

Data Collection

To get the required information on this study, the main instrument used was the questionnaire where the interviewed farmers had to respond immediately. The survey questionnaire was established in English and Kinyarwanda for better communicating with the respondents. Apart from the questionnaire, we also conducted the direct dialogue with respondents. The formal and informal interviews have been conducted and open and closed ended questions were asked to respondents.

Data Analysis

The collected data were analyzed and presented in figures and tables by using the Microsoft Excel and SPSS 16.0 Windows© program (Statistical Packages for Social Sciences software). Friedman test was used to know if one or both of the variables are not assumed to be normally distributed. These variables are converted in ranks. The Friedman test gives us different levels of ranks and the smaller the mean, the most important is.

Results and Discussion

Identification of Respondents

Respondents have been identified according to their sex, age and education level.

Distribution of respondents according to their sex

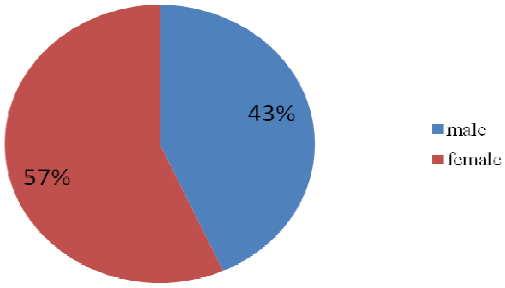

Figure 2 Sex

The above figure 2 shows that among 67 respondents surveyed in Kinigi Sector, the number of female dominates (57 %) the number of male (43 %). The women occupy the first place because they mostly participate in making NTFPs cooperatives for weaving and marketing their products. Others are involved in firewood collection. Women are also involved in informal small-scale income earning activities and handicraft production to supplement their household's income. Men are more involved in other activities such as honey collection and making sticks used in walking.

Age of Respondents

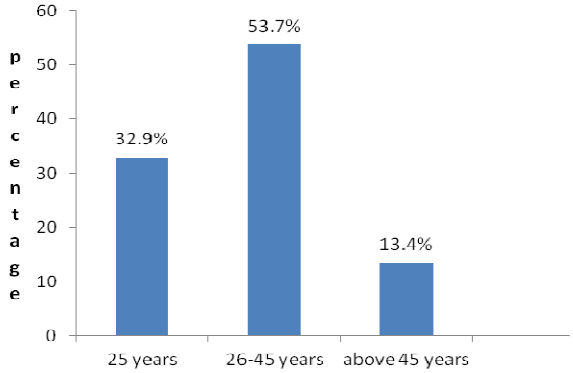

Figure 3 Age

The figure 3 above shows that the majority of respondents are mature persons where 53.7 % are between 26 and 45 years old. Different age groups undertake separate tasks. In Kinigi Sector, there is a high respect for older people where those who are above 45 years participate in making sticks used in walking and making beehives. Young people are more involved in NTFPs collection.

Education Level of Respondents

Figure 4 shows that the majority of respondents attended primary school (38.8 %) followed illiterate (25.4 %) and the lowest number corresponds to the university education level (7.5 %). The fact that there are some people who do not know to read nor to write (25%), this hinders the implementation of NTFPs conservation practices. Similarly, a study conducted by Niyom (2009) showed that the knowledge and skills are important to better manage NTFPs.

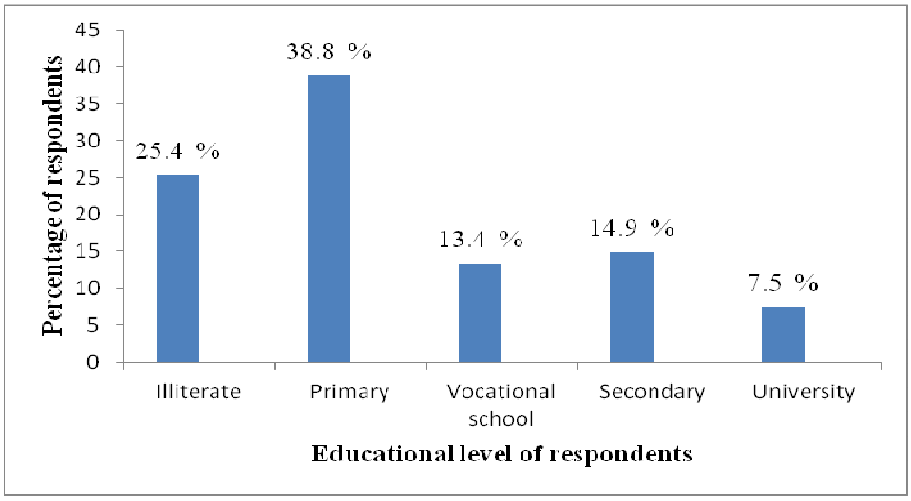

Figure 4 Educational level

Knowledge of Respondents on Non Timber Forest Products

Table 2 Knowledge on non timber forest products

Ranks	Mean Rank	Test Statistics	
Firewood	1.89	N	67
Beekeeping	3.63	Chi-square	129.278
Fodder	4.13	Degree of freedom	5
Medicinal	3.81	Asymptotic significance	.000
Wood carving	3.99		
Bamboo	3.54		

Friedman test was applied in order to rank different variables representing the views of local communities. The smallest mean rank corresponds to the strongest variable. Firewood is the main NTFPs with the lowest mean rank of 1.89 followed by bamboo with a rank of 3.54, beekeeping with a rank of 3.63, medicinal plants with a rank 3.81, wood carving with a rank of 3.99 and finally fodder with a rank 4.13. The results are statistically highly significant because the P-value of 0.000 is less than 0.05

Sources of NTFPs

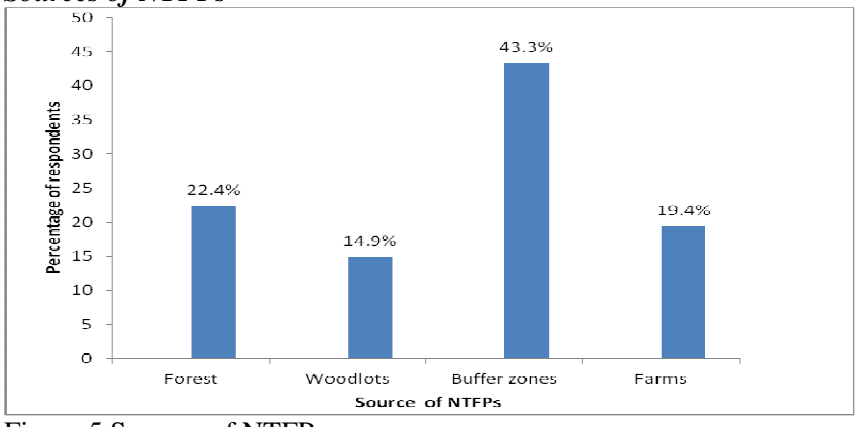

Figure 5 Sources of NTFPs

The figure 5 above shows different sources of NTFPs. Many NTFPs come from buffer zone (43.3 %) followed by 19.4 % from farmland and 14 % from woodlots. Buffer zone is more used for NTFPs than other sources because this place is protected against any human activity.

Use of NTFPs

All respondents use NTFPs to get firewood used as a source of energy for cooking. 20.9% of respondents use NTFPs in wood carving.

Economic input of NTFPs in household income

Importance of cash income from non timber forest products. The results in table 4 show that the money earned from NTFPs is used in self consumption at the mean rank of 3.20, purchasing agriculture inputs at the mean rank of 3.25, medical services at the mean rank of 3.51, houses construction at the mean of 3.65, school fees and buying clothes with mean rank of 3.69. As the statistical results are highly significant (p-value of 0.001< 0.05), the money earned from NTFPs is used to buy food and other domestic materials.

Throughout the world, NTFPs contribute to both the subsistence and cash incomes of many poor people. Some NTFPs generate large income and employment. Others are much more modest in the total value, but they can be critically important to people, for example as sources of food during hard times or as the main source of cash income.

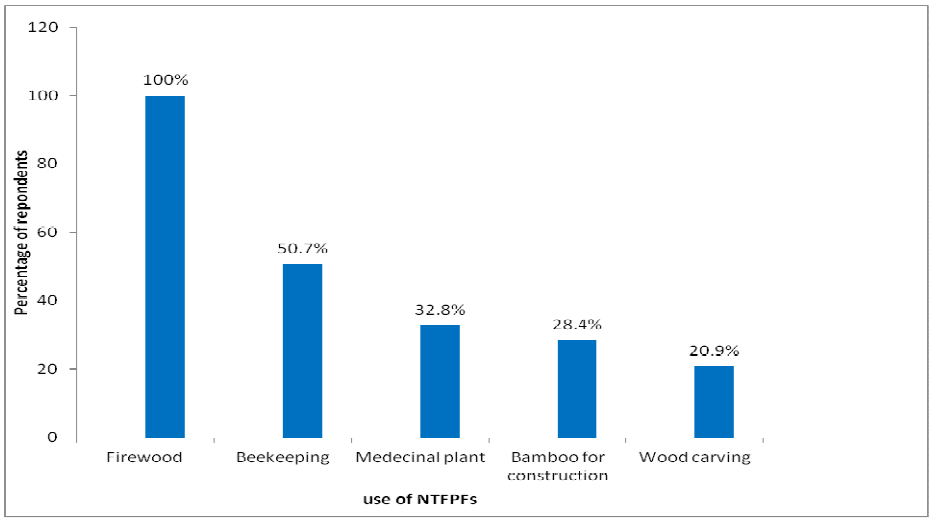

Figure 6 Use of NTFPs

Table 4 Use of cash income from non timber forest products

	Mean rank		Test statistics [a]
Self consumption	3.20	N	67
School fees	3.69		
Medical services	3.51	Chi-square	20.215
Purchasing agriculture input	3.25		
Constructing houses		Degree of freedom	5
Buying clothes	3.65		
	3.69	Asymptotic significance	.001

Market availability for non timber forest products

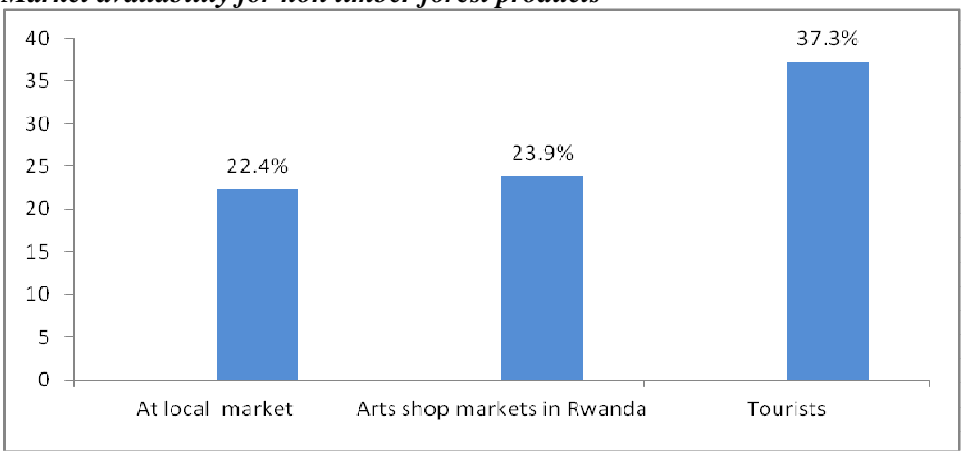

Figure 7 Market of non timber forest products

The figure 7 above shows that NTFPs are sold to tourists who mostly visit Volcanoes National Park. The chairs made from bamboo are also sold in nearest hotels in Kinigi and Musanze sectors.

The women were mostly involved in NTFPs marketing at the village market or roadsides close to their village while more men sold NTFPs at the more distant district market to take advantage of higher price and quick disposal of products owing to the higher number of buyers compared to the situation in the village market (Niyom, 2009).

Although the majority of the products never reach a marketplace, a small percentage is sold in local and regional markets offering an important source of cash income, as their commercial value is high. The extraction, processing, and trading of NTFPs is often the only employment available for the population in remote rural areas (Gapusi, 1999).

NTFPs' Values

The figure 8 shows that the chairs made from bamboo have the high value than others because making chairs from bamboo take a long time and the cost of raw materials is also high. Most of respondents prefer to use them in their houses rather than those made from other trees. Many hotels also use the chairs made from bamboo. Money from NTFPs increased in year 2011 because 1 kg of honey was 2800-3500Rwf, one bamboo chair was 3000- 50000 Rwf and one stick used in walking cost 2500-5000 Rwf.

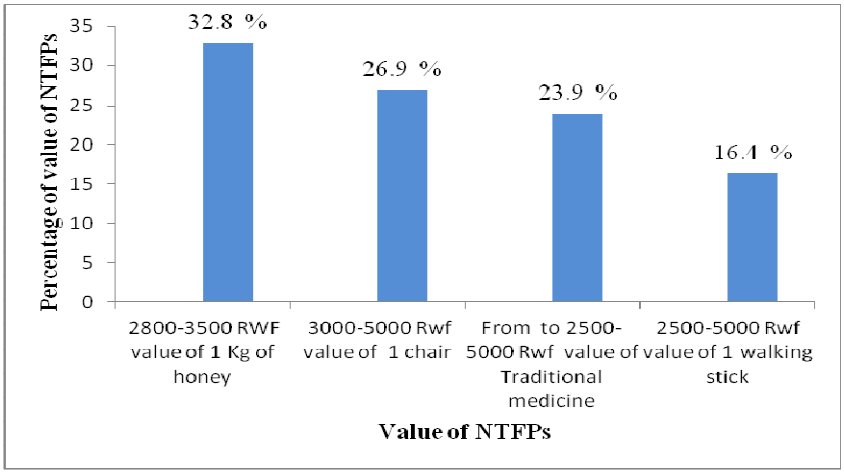

Figure 8 NTFPs' Value

Constraints on NTFPs' use

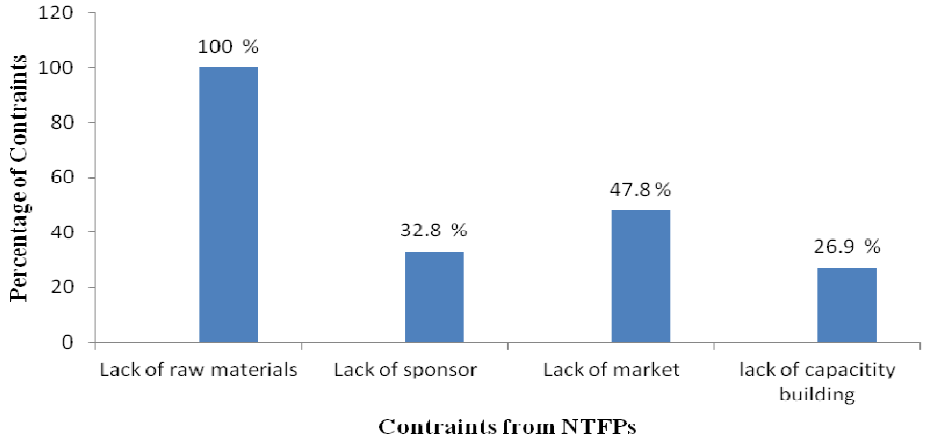

Figure 9 Constraints on non timber forest products uses

According to the above figure 9, lack of raw materials (100 % of respondents) and lack of market (47.8 %) are the main constraints related to the use of non timber forest products in Kinigi sector. 26.9 % of respondents lack trainings and exposure visit. According to Mafuru, (2010), the most important constraint to development and promotion of NTFPs in Africa is insecurity of resource base particularly tenure of land and the methods of extraction of most NTFPs are the same in most African regions where extraction is carried out without adequate knowledge about the resource base, silvicultural requirements and the seasonal variation in their productivity will result in resource depletion and severe environmental damage.

Suggestions for maintaining non timber forest products

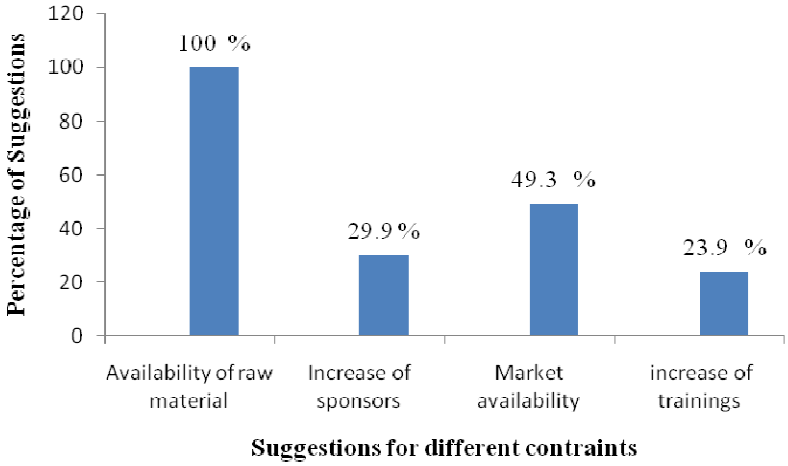

Figure 10 Suggestions for maintaining non timber forests products

The above figure 10 shows that 100 % of interviewed local communities suggest that the raw materials are often missing for getting many processed NTFPs. The market availability for those NTFPs is also another issue raised by 29.9 % of respondents. As reported by Leakey and Newton (1994), the capacity building (through training on how to make adequate extraction and processing of NTFPs) is important at different levels for a successful domestication and commercialization of NTFPs. Local communities need training in propagation techniques, business management and market information systems.

Conclusion

This study aimed at determining the contribution of NTFPs to the livelihood improvement of local people's livelihood in Kinigi Sector of Musanze District in Northern Province of Rwanda. It provided detailed information on commonly used NTFPs. It was found that non timber forest products have different contributions to the livelihood of local communities living in Kinigi sector. NTFPs are used to provide different services to local communities. 100% of respondents use NTFPs as energy production from firewood followed by chair making from bamboo stems, honey production from beekeeping activity, traditional medicine from medicinal plants and sticks used for walking. NTFPs increase cash income of local communities at p-value= 0.001 where people use it for buying food, purchasing agriculture input, accessing medical services, constructing houses, buying clothes and paying school fees. Both women and men contribute to the increase of cash income in the household by exploiting NTFPs. Non Timber Forest Products usually provide food, fodder, medicine and other goods to rural people living in Kinigi sector. However, due to overexploitation of non timber forest products, some of them disappeared. Therefore, appropriate conservation measures are needed.

Acknowledgements

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References

Andel, T.V. (2006), Non-timber forest products. The value of wild plants Agrodok 39. Agromisa Foundation and CTA, Wageningen, the Netherlands. 7-19p

Chikamai, B. and Tchatat, M. (2004), Forest management for Non-wood products and services in Africa. Lessons learnt on sustainable forest management in Africa. KSLA-AFORNET-FAO, Rome, Italy. Chinese and German Research Institutions. Sino-German Symposium. 1-6 pp

FAO (1995), Non-Wood Forest Products for rural income and sustainable forestry. NWFPs No. 7. FAO, Rome, Italy.

FAO (1998), FRA 2000: Terms and Definitions. Working paper 1. Forest Resources Assessment Programme 2000 (FRA 2000). Forestry Department, Rome. Retrieved from http: //www.fao.org/forestry/fo/index.jsp on 10, December, 2011

FAO (2000), Global forest resources assessment. Main report. FAO Forestry Paper 140. FAO, Rome, Italy.

Gapusi, R. J. (1999), Identification et analyse des options stratégiques pour la conservation de la biodiversité de la forêt de Nyungwe. Ministère de l'Agriculture, de l'Environnement et du Développement Rural, Kigali.

Kiyiapi, J. L. and Hitimana, J. (2006), Community-Based Natural Resource Management (CBNRM) Plan. Kinigi Area, 105P, IGCP/CARPE/AWF, Kigali-Rwanda.

Kothari, CR (1985), Research Methodology-Methods and Techniques, New Delhi, India.

Leakey, R.R.B., Temu, A.B., Melnyk, M. and Vantomme, P. (1996), Domestication and commercialization of Non-Timber Forest Products in agroforestry systems. FAO, Non-wood forest products, Italy. 9, 297p.

Leakey R.R.B. and Newton, A.C. (1994), Domestication of tropical trees for timber and non-timber products. MAB Digest 17. UNESCO, Paris. 94p.

Mafuru, C. (2010), Non-timber Forest Products and their Contribution to Poverty Alleviation and Forest Conservation in Mbulu and Babati Districts –Tanzania, Forestry Training Institute, Tanzania,75p.

Niyom, C. (2009), Thesis. Gender roles in utilization of non-timber forest products in NA MO village, Oudomxay Province, LAO PDR.116p.

Younping, Y, M., Stark, C. K. and Weyerhauser, H. (2006), Research on Non-Timber Forest Products: A Rewarding Subject for Joint Projects Between Peru. Berkeley, CA: University of California Press. 68p