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ARTICLE

Evaluating the Potential Contribution of Non-timber Forest Products (NTFPs) to Smallholder Farmers in Semi-arid and Arid Regions: A case of Chivi, Zimbabwe

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ARTICLE INFO

Article history
Received: 1 February 2021
Accepted: 19 March 2021
Published Online: 30 March 2021

Keywords:
Evaluating
Contribution
Non-timber
Forest
Products
Smallholder
Semi-arid

ABSTRACT

Food insecurity in most dry regions in Zimbabwe has taught many people a lesson of using non timber forest products (NTFPs) to reduce food insecurity and improve livelihoods as well as poverty alleviation. The aim of the study was to evaluate the potential contribution of non-timber forest products to smallholder farmers in arid and semi-arid regions. The research was carried out as a survey and data was collected using interviews, questionnaires and focus group discussion. Data was analysed for descriptive statistics using IBM SPSS version 25. Results indicated that 64 % were females and 36 % were males with the majority of participants being married (57.6 %) with only 8.8 % being widowed. Results show that all respondents (100%) indicated that they obtain fruits from the forests as a major source of food during winter and rain season. Vegetables (84.2 %), thatching grass (80.8%) and edible worms (62.5 %) were also major non-timber forest products obtained from the forests by participants. All participants (100%) indicated that income generation, firewood and source of heat for brick moulding were major benefits they obtain from forest with vegetables (74.2 %), brooms (91.7 %) and improved nutrition (85.0 %) being regarded as other important benefits enjoyed by local people from forests. Afforestation and reforestation were regarded as major sustainable forest management practices by all (100%) participants with agroforestry being indicated by only 12.5 % since people had no knowledge about it. NTFPs has capacity of improving food security, human livelihoods and alleviate poverty. People are encouraged to harvest NTFPs sustainably to allow future use. Use of agroforestry can be a best way for managing forests sustainably, improve food security, crop yield, poverty alleviation and climate change mitigation.

1. Introduction

Forests in Zimbabwe faced a major threat in the past decades due to economic crisis and over exploitation. Many forests in arid and semi-arid areas of Zimbabwe are composed of indigenous fruit trees such as *Adansonia digitata*, African snot, *Sclerocarya birrea, Uapaka kirkiana, Ziziphus mucronata* and many more which provides fruits to people. Most of these trees were underutilised with few people utilising them at full potential in the past two

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DOI: https://doi.org/10.30564/re.v3i1.2874

decades. Forests can be seen as one of the major poverty alleviation for smallholder farmers in many developing countries [1, 2]. Forests contribute towards human livelihoods directly and indirectly through various ways. Forests support smallholder people through subsistence use of products such as food (fruits, honey, and edible worms, mushroom), fodder and pastures for animals, medicinal plants and timber forest products [3].

Contribution of forests towards human livelihoods is more as compared to contributions from other sources but the problem is on the economic valuation of these resources by countries [4]. According to Agrawal *et al.*[4] forest products contribute more than US$250 billion to the developing world and it is between three to four times higher compared to other cash contributions brought by other resources. Forest products contribute more towards human livelihoods compared to gold and silver [3, 5]. Forests contribute in various ways such as safety nets, poverty reduction and human consumption. Forest products can be categorised into non timber forests products (NTFPs) and wood forest products (WFPs) [6]. Non timber forest products are those products such as fruits, edible worms, tannins, resins, medicinal, honey, mushroom and vegetables which do not have woody material. These products are mainly used for human consumption and are nutritious.

Wild fruits support food security and improved nutrition [7]. This has greater opportunity to people living near forests as they get wild herbs, green leafy vegetables, mushrooms, wild fruits, wild meat, snails and other edible products at low costs [8]. In Zimbabwe, most smallholder farmers living near forest are generating income through selling of NTFPs and WFPs in growth points, villages and urban areas. A lot of people favour natural food sources as they are nutritious and reduce chances of being infected with diseases that they boost immunity. This was also indicated by Shackleton *et al*. [9] who reported that about 91% of forest products extracted by people in South Africa are wild herbs and they are sold to generate income. The most common forests products extracted by people include fruits, medicinal plants, timber, resins and fodder with fruits being the most in rural areas where people can consume them as raw fruits, produce snacks, extract juice and even sell them. The commonest fruits are from *Adansonia digitata*, *Sclerocarya birrea* and *Ziziphus mucronata*. From all these trees, *Sclerocarya birrea* is the most important tree as the fruits produces juice which is fermented to wine, produce soda, butter and snacks [10, 11].

Most countries do not do valuation of forests products and their economic value is not included on the national Gross Domestic Product (GDP). It is paramount for countries for countries to value forest products and add their economic value to the GDP. There is limited documented information on contribution of forests products to smallholder farmers in semi-arid and arid regions in Zimbabwe. Therefore, the objective of the study was to evaluate the potential contribution of non-timber forest products in semi-arid and arid regions of Zimbabwe with a case of Chivi.

2. Methodology

2.1 Study Area

The study was carried out in Ward 32 of Chivi District in Masvingo Province. The area is located 120 km from Masvingo town. It is located within the latitude 20.3594º S and longitude 30.4358º E in the south eastern part of Zimbabwe. The area receives 450 mm to 500 mm rainfall per annum with the minimum temperature of 18 ºC and maximum temperature of 32 ºC. The soils in the area range from sandy loam soils to loam soils which are moderately fertile. The area is characterised with Miombo woodlands and Mopane woodlands in some parts of the district. Farmers in the area mainly grow crops such as maize, groundnuts, groundnuts and sorghum.

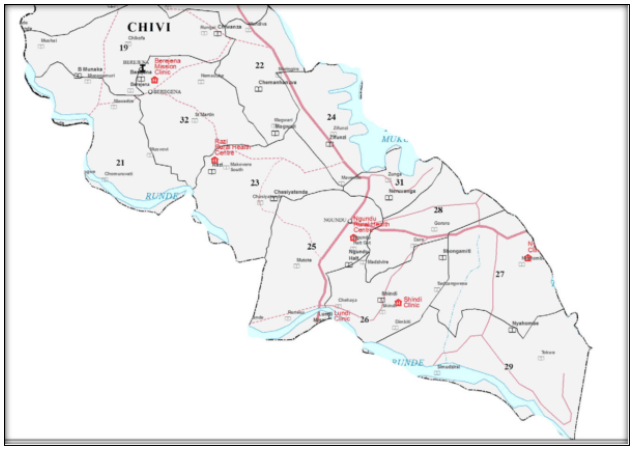

Figure 1. Map showing Chivi south with ward 32

Source: Chivi Rural District

2.2 Research Design

The study used a cross sectional design. It is a quantitative, descriptive and interpretive case study analysed through quantitative methods.

2.2.1 Sampling Procedure

Stratified random sampling was used to select participants from ward registers obtained from the councillor. Villages were put in stratum and selected randomly from

 DOI: https://doi.org/10.30564/re.v3i1.2874

each strata. The ward had an approximate population of 300 households. The author employed a standard of 40% sample size of the total population of 300 households to give a sample of 120 household heads/ participants. Five key informants were taken from five (5) Agritex officers which are employed in the ward. The sample size was 125 people, 120 were residents of ward 32, who were interviewed in five (5) different Focus Group Discussions (FGD) periods per village and five (5) were key informants from Agritex who work in the area. Questionnaires were distributed to 120 participants which were randomly chosen and 5 key informants.

2.2.2 Data Collection

Objectives of the study were introduced and explained to village heads to seek permission for data collection in their villages. After permission was granted, list of participants the ward was handed to ward councillor and respective village heads. To generate an in-depth insight into contribution of forests to smallholder farmers in Ward 32 of Chivi district, several methods of data collection were used and these include the use of questionnaires, key informant interviews, focus group discussions, informal interviews and direct observations. A structured questionnaire was used to collect demographic information of participants, contributions of forest to smallholder famers, income levels, challenges encountered and solutions which can be used to for sustainable management of forests. Stratified random sampling was used to select participants where six villages were selected using randomly selected and they were stratified into six stratum. Hundred and twenty (120) participants were selected from all six villages thus representing 40 % of the total population from all six villages used. The questionnaires were pilot tested to villages which were not selected for survey to allow enumerators to be familiar with the questions and to allow for corrections on questions. The questionnaire used was composed of many closed ended questions and few open ended questions to allow easy data coding and entry.

Key informant interviews were conducted with local Agritex extension workers, teachers and traditional leaders in the area. After seeking permission to take interviews from traditional leaders, interviews proceeded were key informants were interviewed individually to avoid interferences between participants. In case of absence of key informant, telephone interview was conducted.

2.2.3 Data Collection Instruments

(a) Questionnaire

Pilot tested questionnaires were administered to selected participants from different villages. The questionnaires were having village codes on top for easy data entry. Questionnaires administered were used to collect demographic information of participants, contributions of non-timber forests, benefits of harvesting timber products, socio-economic and environmental effects of overutilisation of forests products as well as sustainable forest management practices which can be used to manage forest resources. Questionnaire used were having more closed ended questions and few open ended questions. All questions were in vernacular language to allow local people to understand easily. Questionnaires were the best since most smallholder farmers understand local language.

(b) Interviews

In depth interviews were used to collect information from selected key informants in the ward. Several formal and informal interviews were done with participants selected from the study area and people with expert knowledge from agencies, EMA, AREX and teachers. Deliberate opened-ended informal interviews were posed to respondents so that they would talk openly and give more in information as compared to formal ones. Data collected was including contribution of non-timber forest products, sustainable forest management practices which can be used to manage forest resources sustainably. Participants who were not available on their homes were interviewed using telephone but not much recommended due to high level of bias. These participants were visited on their homes to verify the information they provided. This was done to make sure collected data were true and reduce bias. Face to face interview was done to participants individually to avoid interference from other participants. Interviews are regarded as the best method because they allow participants to express their views without fear.

2.2.4 Focus Group Discussions

The study group in ward 32 was subjected to a session of group discussions per village. This was done to help the researcher save time by gathering as many facts from various respondents from single sessions per village. Focus group discussions made it easy to elucidate the aim of the research and its major constructs to a group than to each individual which is time consuming. Discussions enhanced participation by the elderly and the illiterate reducing the need to read and write.

2.2.5 Data Analysis

Data collected was processed using Microsoft excel and descriptive statistics were used to summarise the data. IBM Statistical Package for Social Sciences (SPSS)

DOI: https://doi.org/10.30564/re.v3i1.2874

version 25 was used to generate descriptive statistics. Descriptive statistics used include bar graphs, frequency distribution tables, percentage distributions, means, standard deviation and standard error of means.

3. Results

3.1 Household Characteristics

Table 1. Socio-demographic characteristics of participants in ward 32 of Chivi District

Characteristics	Frequency (n)	Percentage (%)
Gender		
Male	45	36
Female	80	64
Age (years)		
16-20	12	9.6
21-30	9	7.2
31-40	22	17.6
41-50	40	32.0
51-60	32	25.6
61+	10	8.0
Marital status		
Single	26	20.8
Married	72	57.6
Widowed	11	8.8
Divorced	16	12.8
Education level		
Primary	15	12.0
Secondary	70	56.0
Tertiary	40	32.0
Occupational status		
Self employed	60	48.0
Employed	20	16.0
Unemployed	37	29.6
Retired	8	6.4

Table 1 shows the socio-demographic characteristics of the participants in ward 32 of Chivi District. Out of 125 participants, 64% were females and 36% were males. This indicates that most people in rural communities are females compared to males. Of all the participants, 32% were in the age range of 41-50 years, 25.6 % in the age range of 51-60, 17.6 % in the age range of 31-40, 9.6 % were in the age range of 16-20 with 8% in the age range of 61^{+} and only 7.2% were in the age range of 21-30 years. Out of 125 participants most (57.6%) were married while only 20.8% were singles, 12.8% were divorced and only 8.8% were widowed. Out of all participants, 56% attained secondary education while 32% had attained tertiary education and only 12% had primary level. Slightly below half (48%) of the participants were self-employed while 29.6% were unemployed, 16% were employed and only 6.4% were retired from formal employment. These characteristics of the sample correspond well to characteristics of the population. This was verified by visiting different villages and see whether the sample truly represent the population. The area had more females of which many of them were married and had secondary education but self-employed.

3.2 Contribution of NTFPs to Livelihoods of Smallholder Farmers in Ward 32

The results show that fruits were the common product obtained from forest by participants in ward 32 of Chivi (Table 2). Findings from participants show that all respondents (100%) from six villages indicated that they obtain fruits from the forests as major contribution to source of food during winter and rain season. Some participants also indicated that they even sell fruits to get income for paying fees. They usually do this along Beitbridge highway as means of survival and raising income to support their families. Out of 120 participants, 84.2 % indicated that they obtain vegetables from forests which they use as relish which contribute as a source of nutrients leading to improved nutrition in smallholder farming areas in ward 32. All participants from Berejena, Muza and Chiponda villages indicated that they mainly get their vegetables from forests especially during rainy season. Few participants (11) from Mutede village also indicated that they get vegetables from forests as a source of relish for their meals (Table 2). Out of 120 participants, 43.3 % indicated that they obtain honey from forests which they sell to raise money for different uses. Most (17) of the participants who obtained honey were from Chiponda village and the least (3 participants) were from Berejena village. Moderately above half (62.5 %) of the participants indicated that they obtain edible worms from forests, dry them and sell some of them as means of income generation. These were mainly obtained from *Mopane* and *Brachystegia* species. Slightly above half (52.5 %) of the participants indicated that forest contributes medicines and half (50%) indicated that forests contribute fibre which can be used for many

 DOI: https://doi.org/10.30564/re.v3i1.2874

uses by farmers (Table 2).

The findings also show that forests contribute roofing material in the form of thatching grass as indicated by 80.8 % of the participants in ward 32 with most (20) participants from Berejena and Mutede indicated this and least (9) participants from Chiponda village (Table 2). Out of 120 participants, 59.2% reported that forest contributes edible juice and 45% indicated that forest contributes wild meat through hunting. Participants indicated that they sell juice especially from Marula fruits to generate income for paying fees, buying groceries and clothes.

Table 2. NTFPs obtained from forests as indicated by participants from six villages in ward 32

	Villages of participants in the study area						
NTFPs	**Berejena N=20**	**Makovere N=20**	**Muza N=20**	**Mutati N=20**	**Mutede N=20**	**Chiponda N=20**	**Overall (%)**
Vegetables	20	16	20	14	11	20	84.2
Fruits	20	20	20	20	20	20	100
Honey	3	7	12	9	4	17	43.3
Edible worms	16	12	8	19	3	17	62.5
Medicines	8	13	16	6	12	8	52.5
Edible juice	14	20	11	9	4	13	59.2
Thatching grass	20	14	18	16	20	9	80.8
Wild meat	7	4	10	15	6	12	45.0
Fibre	9	15	6	16	5	9	50.0

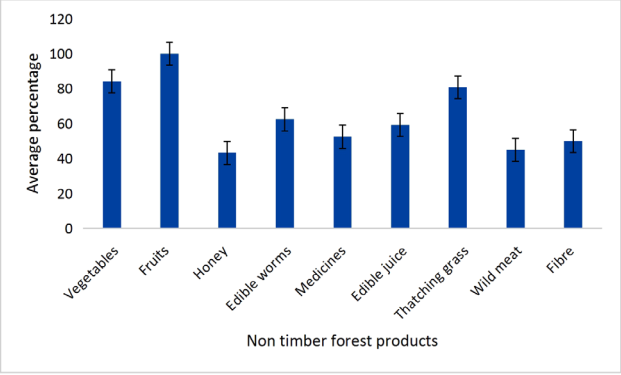

Figure 2. NTFPS obtained from forests and contribute to human livelihoods in ward 32

Results on Figure 2 indicate that people from ward 32 of Chivi mainly obtain fruits, vegetables and thatching grass from surrounding forests.

3.3 Benefits Encountered by Smallholder Farmers from Harvesting Forests Products

Out of 120 participants, all indicated income generation, firewood and source of heat for brick moulding were the most benefits they enjoy from harvesting timber and non-timber forest products. Participants indicated that they sell wood carving products in South Africa and at local market to generate income for use for various purposes. Out of 120 participants, 102 (85 %) indicated that harvesting non-timber forest products improved nutrition since most products from forest are natural and contain a lot of macro and micro-nutrients required by human body. Due to improved nutrition, 37.5 % of participants indicated that products from forest boost immune system and reduce incidence of diseases (Table 3).

Moderately below half (31.7 %) of the participants indicated that products from forests such as grass and fodder harvested by animals improved animal production especially during dry season when most parts of the area will be having little grass. Only 79.2 % of participants revealed that harvesting timber and non-timber forests products provide people with cheaper sources of relish.

Table 3. Benefits encountered by smallholder farmers from harvesting non-forest products.

Benefits	Frequency (N=120)	Percentage (%) contribution
Income generation	120	100
Improved nutrition	102	85.0
Vegetables	89	74.2
Brooms	110	91.7
Firewood	120	100
Resins	7	5.8
Reduced incidence of diseases	45	37.5
Improved animal production	38	31.7
Reduced incidence of veld fires	75	62.5
Source of heat for brick moulding	120	100
Standard error	12.7	10.6
Standard deviation	40.2	35.5
Mean	82.6	68.8

The results also reveal that all other benefits had percentage benefits above the mean (68.8%) except reduced incidence of veld fires, improved animal production,

DOI: https://doi.org/10.30564/re.v3i1.2874

reduced incidence of diseases and resins which all had percentage benefits below the mean (Table 3). The results are also summarised on Figure 3 below to show a clear comparison of benefits obtained by people in ward 32 of Chivi from forests.

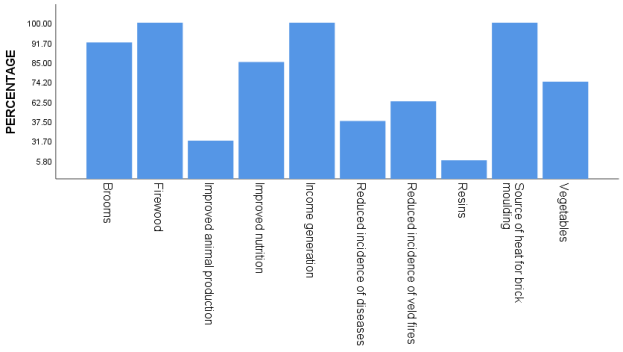

Figure 3. Benefits encountered by smallholder farmers from harvesting NTFPs

3.4 Sustainable Forest Management Practices

Table 4. Sustainable forest management practices

Sustainable forest management practice	Frequency (N=120)	Percentage (%)
Afforestation	120	100
Reforestation	120	100
Woodlots	76	63.3
Community forests	80	66.7
CBFRM	92	76.7
Seeking permission from land owners	105	87.5
Agroforestry	15	12.5
Standard error	13.7	11.4
Standard deviation	36.2	30.2
Mean	86.9	72.4

Results show that most participants had knowledge on forest management practices which can be used to promote sustainability in resources obtained from forests. Out of 120 participants, 120 (100%) indicated the use of afforestation and reforestation as major forms of sustainable forest management practices which must be adopted by all people in ward 32 of Chivi. Agroforestry was indicated by 12.5 % of the participants as one of the sustainable forest management practices whilst the use of community forestry was indicated by 66.7 % of participants and the use of woodlots using fast growth tress was indicated by 63.3 % of participants (Table 4). Out of 120 participants, 87.5 % indicated that people should seek permission from land owners and traditional leaders whenever they want to harvest forest products to promote sustainability. The use of community based forest resources management (CBFRM) was raised by 76.7 % of the participants as an important practice which promotes sustainable forest management.

All other sustainable forest management practices raised by participants had their percentages above the mean except agroforestry, community forests and woodlots which were raised by few participants below the mean (Table 4).

4. Discussion

4.1 Contribution of NTFPs to Livelihoods of Smallholder Farmers in Ward 32

Fruits were the main non-timber forest products which contributed more towards human livelihoods as a source of food. This was so because fruits most fruits are consumed directly by collectors. This coincides with results by Shackleton *et al.* [12] who reported that most families collect non timber forests products in the form of fruits and consume directly. The results were also affirmed by Powell *et al.* [13] and Vira *et al.* [14] who reported that most farmers harvest and consume fruits as source of food with other sell them to earn income used for domestic purposes such as paying for grinding mills, buying sugar and paying for school fees. Vegetable were also harvested and indicated by majority of the participants. Forest was and they are still sources of natural vegetable to humans which include *Cleome gynandra* as the most common harvested leafy vegetable from forests and woodlands in the area. Result coincides with findings by Rasmussen *et al.* [15] who reported that farmers in Chirumanzu harvested a lot of leafy vegetable in their forests. The findings were also in support of findings by Powell *et al.* [16] who reported that most people depend on forest for food sources during dry seasons. These were indicated as the only sources for natural vegetable and other NTFPs needed by people as a source of food.

Non timber forest products contributed in many ways towards human livelihoods with some being used as medicines to cure a variety of diseases, especially sexually transmitted diseases (STDs) which most people fear to visit hospitals. The results concurred with results by Kugedera [11] who reported that marula roots, leaves and bark were used as a source of medicine to treat coughs, STDs and menstrual pains in women. Majority of these NTFPs were regarded as life reliever by most local people

 DOI: https://doi.org/10.30564/re.v3i1.2874

since they are the only source of food, income generation and juices which can be obtained cheaply in forests than buying food stuffs in shops. NTFPs has a major role to play in human livelihoods.

4.2 Benefits Encountered by Smallholder Farmers from Harvesting NTFPs

Forest products play a major part in benefiting smallholder farmers especially those located in marginal areas of the country and those in dry regions. Forest products are the only sources of direct income to smallholder farmers and provide a quick money compared to any other resources. This coincides with results by Sunderlin *et al*. [1] who reported that some NTFPs have large and reliable markets where they can be sold to generate income to pay school fees, buying agricultural inputs and paying emergency medical costs. Standard of living can be improved by harvesting forest products since they are required by many people especially in urban areas. Farmers can sell them and buy clothes, television sets and even bicycles for easy movement. This coincide with results by Rasmussen *et al.* [15] who reported that forest provides economic benefits to people and empower them economically if they harvest them sustainably because they are in great demand by people in urban areas who do not have time to harvest these resources in forest.

People who include trees and fallows in their agricultural lands benefited a lot through soil fertility restoration, improved crop and animal production. This coincides with results by Rasmussen *et al.* [17] who reported that inclusion of fallows in agricultural lands control soil erosion, reduce water loss, improve soil fertility which boost crop production and animals harvest tree leaves which are good sources of proteins. This was reported to increase animal production as well as to benefit farmers from soil conservation [18] and reduced costs of implementing soil erosion control methods on yearly basis [11, 19]. Smallholder farmers also benefit from introduction community clubs by non-governmental organisations (NGOs) which empower smallholder farmer to produce a variety of products through value addition and sell them at higher prices generating a lot of income. This coincides with findings by Seed Award [20] which reported that women in Chivi benefited a lot from establishment of Batanai Club which was majoring on harvesting marula and produce soda, butter and fermented juice which they sell to raise their families.

4.3 Sustainable Forest Management Practices

Afforestation and reforestation were regarded as the major sustainable forest management practices which can be used by smallholder farmers as means of managing forest trees. However these are ways of managing tree population making forests to remain forests and creating forests so that people will benefit as the trees grow. This coincides with results by Briassoulis [21] who reported that the use of afforestation and reforestation can be major ways of combating degradation and deforestation which results from cutting down of trees for timber and many other NTFPs. However, indigenous trees take many years to mature and there is need to find other ways of sustainably managing forests. The use of agroforestry was raised as an alternative to afforestation and reforestation. Agroforestry involves the growing of tree species with fast growth rate and mature over a short period of time with many benefits to farmers [22]. Trees can be grown in arable lands to supply fuel wood, fruits, and medicines, improve soil fertility and control soil erosion at once [23] this releases pressure on forests for firewood, humus, fruits and poles [23, 24, 25]. Agroforestry can be adopted as means of managing forests sustainably since it releases pressure on forest and allow trees to regenerate in natural forests without any disturbances.

The use of community based forest resources management was also regarded as a sustainable way of managing forest resources where a central committee will be set which runs community forest. This coincides with results by Mojeremane and Tshwenyane [26] who reported that forest resources in Namibia are not harvested without direct permission from traditional leaders. The use of woodlots and community forests can support sustainable management of natural forest as these reduce pressure on natural forests since community members will be obtaining posts, fuelwood and other NTFPs from woodlots and community forests.

5. Conclusions

Most participants were females and most of these were married. Non timber forest products were regarded as one of the major sources of income for smallholder farmers in dry regions. These were one of the major sources of food for humans in dry seasons. Forests provide a lot of NTFPs which contributed immensely to human livelihoods and improve their standard of living. Fruits and vegetables were the main NTFPs indicated by participants which contributed to human food and help in poverty reduction. Most people in dry regions harvest NTFPs, process them and add value so that they fetch a lot of money when sold on market. Besides contributing to human livelihood directly, NTFPs also benefit people in the form of improved living standards, improved animal production as well as reduces incidences of diseases especially STDs which can

DOI: https://doi.org/10.30564/re.v3i1.2874

be cured using medicines from forests. However, there is need to manage forest resources sustainably so that future generations will use these resources. The use of afforestation, reforestation, woodlots and agroforestry also helps in managing forests sustainably by reducing pressure on natural forests since people will be obtaining fuel wood, poles and timber from woodlots and community forests.

Recommendations

Forests are imported resources in human livelihoods and there is need for people to manage forests in a sustainable way in their localities. It can be recommended that farmers harvest resources sustainably making sure that they will be able to harvest same resources from same forests. There is need for people to form community forest resource management committee as means of improving access to forest resources to every community member. There is also need for traditional leaders to enforce strict laws against those who sabotage regulations and rules of CFRM. Further studies are also recommended to see how other areas manage their forest resources as well as to explore contribution and benefits of forest resources to human livelihoods.

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