



## Collection and Processing of Non-timber Forest Products in North Eastern Pakistan of Azad Jammu and Kashmir: An Empirical Study

Muhammad Zubair<sup>1\*</sup>, Ahmad Nawaz Ansari<sup>1</sup> and Syed Bilal Hussain<sup>2</sup>

<sup>1</sup>Department of Forestry and Range Management, FAS&T, Bahauddin Zakariya University, Multan, Pakistan.

<sup>2</sup>Institute of Molecular Biology and Biotechnology, Bahauddin Zakariya University, Multan, Pakistan.

### Authors' contributions

This work was carried out in collaboration among all authors. Author MZ designed the study, performed the statistical analysis and edited the manuscript. Author ANA conducted the field work and wrote first draft of the manuscript, Author SBH managed the literature searches and analyses of the study. All authors read and approved the final manuscript.

### Article Information

DOI: 10.9734/AJRAF/2020/v6i430117

#### Editor(s):

(1) Dr. Nebi Bilir, Isparta University of Applied Sciences, Turkey.

#### Reviewers:

(1) Nilim Kalita Krishi Vigyan Kendra, Assam Agricultural University, India.

(2) A. AbdulRaheem, University of Madras, India.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/62978>

Original Research Article

Received 20 September 2020  
Accepted 23 November 2020  
Published 10 December 2020

### ABSTRACT

Himalayan region has diversity of Non-Timber Forest Products and is considered as biodiversity hotspot. Current research is baseline study providing information on extraction and processing of Non-Timber Forest Products especially medicinal plants in North Eastern Pakistan of Azad Jammu and Kashmir. A total of 60 respondents (local collectors) were selected based on snowball sampling procedure. Results revealed that income generation remained the prime reason for collection of Non-Timber Forest Products in both regions and collectors have to travel up to 4-6km for collection. Most (i.e.,91%) of the respondents collected Non-Timber Forest Products for medicinal reasons in Bagh District whereas vegetable collection (i.e.,86%) is the prime reason for collection in Neelam valley. Non-Timber Forest Products are mostly collected manually during summer for 6-10 hours with frequency of 1-3 times in a season. It was also observed that most of the respondents in Bagh district opted for sun drying whereas sun and shade drying remained a preference of respondents in Neelam valley. It was concluded that a public-private partnership is inevitable for sustainable harvesting, processing and marketing of Non-Timber Forest Products in the region.

\*Corresponding author: E-mail: [zubair.fast@bzu.edu.pk](mailto:zubair.fast@bzu.edu.pk);

*Keywords: Non-timber forest products; processing; harvesting; himalaya; storage.*

## 1. INTRODUCTION

The region of North Eastern part of Pakistan is surrounded by the Himalayan ranges. These mountains are home to the dense forests also known to be as biodiversity hotspots harboring important floral species, about 70 per cent of them are only specific to this particular region also termed as Uni-regional [1]. The forests are enriched with such natural floral species that has the capability of providing the community with food, medicine and constructional benefits [2]. It is recorded that the Himalayan range falling under Pakistan harbors about 400-600 medicinal plants that are not only used for subsistence but also are used for generating income [3]. However, the people in these communities are known to have plenty of traditional knowledge regarding the presence and utilization of these plants thus they use them regularly in their household and use them to earn fast cash at the time of need [4]. Meanwhile the people living in these regions are directly or indirectly dependent upon the forest exploitation particularly Non-Timber Forest Products for the sustenance of their livelihood [5]. Thus, the collection, processing and trading of Non-Timber Forest Products are one of the most important economic activity prevalent in the entire region [6].

Non-Timber Forest Products are known to create opportunities in developing entrepreneurial jobs in the poorest rural communities [7]. The collection and processing of Non-Timber Forest Products in poor villages of Himalayan regions is known to support the people for both subsistence and commercially either regularly or as safety net [8]. They not only add livelihood security but also generate permanent employment opportunities [6]. Often in these communities' children and women are known to be involved in the collection of these plants. These women and children cover extensive distance and endure steep and difficult terrains for the collection of these products and then bring these products in their homes for value addition [9]. Processing and storage are the most important yet neglected aspect of Non-Timber Forest Products business [9,10]. The processing methods are the critical factor that imparts value to the product and hence making them marketable. In Asia, where poverty is prevalent Non-Timber Forest Products after collection ends up in the homes of the collectors for a minimum sort of processing procedures and then are handed over to the middlemen. Most of

the processing methods in this region are conventional that are being used from the centuries and yet these methods of processing are significantly contributing towards increasing market value of the Non-Timber Forest Products [11].

The collection activities usually result in not only compromising the resource base, generating serious environmental implications and imply health threats to both collectors and plants [12]. Moreover, the negative ecological effects resulting from the collection processes, most common problem is the over exploitation of the resource base that not only increase the pressure on it but due to unsustainable and destructive harvesting leads to the extinction of the plant [13]. While an indirect negative environmental impact occurring during the attainment of fuel wood for processing procedures or hunting and pollution during Non-Timber Forest Products collection ventures that lead to further degradation of the environment [14].

The enabling factor for processed non timber forest product should have good quality of the final product having non-perishability and innovativeness. It has been observed that in order to get higher amounts of financial return from the sales of these products the compliance on the quality standards is a necessity which unfortunately is not being met, thus these people get lower price of these products. The market is full of substitute products to the Non-Timber Forest Products products which are also quite attractive and cheaper which also lead to a lower demand of these Non-Timber Forest Products [11]. Non-Timber Forest Products usually have variable and sometimes low quality, lack of innovation, perishability of the product and only a basic value addition are also the main constraints in lower production and profitability. The value addition of Non-Timber Forest Products usually is limited by lack of government interest and poor financial conditions of the people. The community is often relied on the utilization of the conventional and often laborious processing coupled with outdated and poor equipment that does not match to the quality demanded by the market [15]. In view of the importance of Non-Timber Forest Products for sustenance of livelihoods, this paper is being focused on how local communities involved collection and processing of Non-Timber Forest Products in

North eastern Pakistan of Azad Jammu and Kashmir for sustenance of their livelihoods.

## 2. RESEARCH METHODS

The present study was carried out in two places in North Eastern Pakistan of Azad Jammu and Kashmir i.e. Bagh District and Neelam Valley. Bagh is one of the big districts in the Territory present in the foothills of the Western Himalaya. This region is spread over 1368Km<sup>2</sup> having mean annual temperature of about 2.3-21.6 °C while the precipitation rate in the area ranges from 333–1249 mm. While the Neelam valley is the largest district of North Eastern Pakistan of Azad Jammu and Kashmir that is present in the north east to the capital Muzaffarabad. The bow shaped valley occupies an area of 3739 km<sup>2</sup> having an altitude of 1125-6129 m above sea level. The mean temperatures in the valley usually varies from -10.9 to 17.3 °C, while the precipitation ranges from 246–1048 mm. Neelam and Bagh district have diverse temperate forests consisting of dense upper story in which conifers dominate while in the understory there are diverse herbs, shrubs and grasses most of them are endemic and are very important both ecologically and economically for this ecosystem and in the markets both national and international.

The people working in Non-Timber Forest Products sector were given priority for the respondent's selection. A few of them involved were harvesters of Non-Timber Forest Products. Some of them selected were the middlemen that purchase the Non-Timber Forest Products from the harvesters and sell into the market. The survey also involved the contractors and smugglers too in order to tap the information from all the characters (villagers including children and women) involved in Non-Timber Forest Products enterprise. Reaching them and tapping information was quite difficult as they resided in difficult to access valleys. Collectors and contractors were selected from both the dense forest and roadsides. It was done in order to observe the relationship of involvement of Non-Timber Forest Products does actually depends upon the habitat of the community.

### 2.1 Research Strategy

The study made use of survey as research strategy. Survey was conducted based on acquiring information from all the sampled respondents based on face-to-face interaction in order assure attainment of information as most of

the respondents were hesitant in supplying their collected products. Survey was administered during the month of October 2017. Sampling involved selection of respondents based on snow-ball sampling. It was made sure that questions designed must be simple.

### 2.2 Statistical Analysis

Summary sheet was prepared using questionnaire information. The information was then analyzed SPSS 21 software. Chi square test was used to draw out comparisons across district and variables and to generate any significant information.

## 3. RESULTS & DISCUSSION

### 3.1 Collection and Harvesting Of Non-Timber Forest Products

**Reason for Non-Timber Forest Products collection:** Table 1 depicts the reason behind the Non-Timber Forest Products collection mentioned by the respondents was the lack of other jobs due to which this venture helps them not only to make quick money but also to use them to fulfill their daily household needs. The Chi square test resulted positive having significant relationship between the collection of Non-Timber Forest Products and employment of the community in both the districts ( $\chi^2=15.193$ ;  $p<0.002$ ). In the Neelam Valley high proportion of the respondents (i.e., 53%) were collecting medicinal plants in order to sell and earn money. While in district Bagh, an opposite trend was seen as most of the people (i.e., 86%) were collecting Non-Timber Forest Products mostly for their own use (Table 1). A similar study conducted in Vietnam indicated that in some of the areas of the country Non-Timber Forest Products were used only for their day-to-day needs, while in some other areas it was observed that they were more used for their financial aspect [16]. While research conducted in Miao forest reserve depicts that the villagers were using Non-Timber Forest Products for their household consumption [17].

**Distance covered for Non-Timber Forest Products collection:** Further table-1 showed the distance covered for Non-Timber Forest Products collection which is statistically significant amongst district ( $\chi^2=24.351$ ;  $p<0.000$ ). It was observed that the participants (i.e., 53%) in the Neelam valley used to cover longer distances (>10 Km) for the collection of Non-

Timber Forest Products in the steep and life-threatening terrains. While in the Bagh district it was observed that people in this region (i.e.,66%) cover much shorter distances(4-6km) for the attainment of Non-Timber Forest Products (Table 1). A similar result was advocated by studies related to the extraction of Non-Timber Forest Products in which the authors describe the long distances and problems that the collectors have to face in order to collect the required Non-Timber Forest Products [18].

**Type of Non-Timber Forest Products collected:** Table 1 results depicted a significant relationship among the districts with reference to medicinal plants collected ( $\chi^2=8.850$ ;  $p<0.003$ ). It was observed that in both the study sites the collection of Non-Timber Forest Products type was rather different (Table 1). In Neelam valley most of the people (91%) were collecting Medicinal plants and Morels as Non-Timber Forest Products. While in Bagh more people (86%) were involved in collecting wild vegetables as Non-Timber Forest Products.

When it comes to type of Non-Timber Forest Products collected, Table 2 indicates the significant results amongst districts (Table 2). The results show that the collection of *Aconitum heterophyllum* in the district Neelam was very widespread (69%) thus showing a *significant relationship with respondents* ( $\chi^2= 13.673$ ;  $p<0.000$ ). *Morchella esculenta* was the second most collected Non-Timber Forest Products in the Neelam valley (53%) but showed non-significant relationship ( $\chi^2= .811$ ;  $p<0.368$ ) whereas *Mentha longifolia* (3%) *Viburnum cotinifolium* (3%) and *Paeonia emodi* were the least collected Non-Timber Forest Products and showed a significant relationship with the

respondents. ( $\chi^2= 16.212$ ;  $p<0.000$ ,  $\chi^2= 3.877$ ;  $p<0.049$ ,  $\chi^2= 16.212$ ;  $p<0.000$  respectively). The trend in the Bagh valley was a little different as in this region collection emphasis was more on the vegetables as most of the people were collecting and bringing the same for domestic use.

The most widespread collection was of *Dryopteris blanfordii* (86%) while another important Non-Timber Forest Products was *Skimmia laureola* (71%) a medicinal plant that was widely used in the region while *Viburnum cotinifolium* (29%) was collected in much less amount (Table 2). Their relationships with the respondents of both the districts were significant with values  $\chi^2=16.482$ ;  $p<0.000$ ,  $\chi^2=11.291$ ;  $p<0.001$ ,  $\chi^2=3.877$ ;  $p<0.049$  respectively. [19] displayed somehow compatible results with the current findings. The research carried out in the temperate regions of the country showed that the medicinal plants like *Bergenia ciliata*, *Paeonia emodi* and *Valeriana jatamansi* were the most collected plants, while in the edible section the most famous for household use as well as for income generation was *Morchella esculenta*.

**Season and Frequency of Collection:** Table 3, depicts analysis that yielded a significant relationship among the collection time and the participants from the study sites ( $\chi^2=10.691$ ;  $p<0.005$ ). The results showed that majority of the respondents from Neelam (94%) and Bagh region (58%) were collecting Non-Timber Forest Products mainly in winter season (Table 3). It is because of the fact that due to extreme and harsh climates in the winter the seeds are unable to germinate thus the distribution of the vegetation in the winter season is very limited thus plant materials in form of Non-Timber Forest Products are not available.

**Table 1. Non-Timber Forest Products collection characteristics of the study area**

Variable	No. of respondents in percentage			$\chi^2$ Statistics
	Categories	Neelam	Bagh	
Reason of collection of Non-Timber Forest Products	Income generation	48	52	15.193 (.002)
	Fast Cash	14	6	
	Insufficient resources	16	3	
	Health	22	39	
Distance Covered	>10 km	05	5	24.513 (.000)
	7-10 km	06	5	
	4-6 km	53	61	
	1-3 km	36	29	
Types of Non-Timber Forest Products Collected	Medicinal	91	14	8.850 (.003)
	Vegetables	9	86	

Source: Primary data computed

Thus, this is the major reason for collectors to not collect Non-Timber Forest Products in this time of the year [20]. It is observed that the species in this time of the year are blooming and are ample in quantity.

After the analysis, a significant relationship was found out among the districts and the frequency of collecting Non-Timber Forest Products by the local people ( $\chi^2=7.595$ ;  $p<0.006$ ). The collection frequency observed among the people in the Neelam region were more or less similar. Communities were collecting Non-Timber Forest

Products for 1 to 3 times in a season, while there were very few people found out to be collecting it above 4 to 6 times a season (Table 4). [21] Got same kind of results while conducting a similar research. It was observed that the people were having a little frequency of collection per season, but ample quantity was extracted during one go. It was also observed that as the collection of Non-Timber Forest Products in this region was not the main business of these people so they would go less, and the frequency came out to be lower.

**Table 2. Relationship among the Type of Non-Timber Forest Products and the district of the respondents**

Respondents in Percentage				
Variable	Categories	Neelam	Bagh	$\chi^2$ Statistics
Non-Timber Forest Products types in the study area being collected	<i>M. esculenta</i>	53	71	.811 (.368)
	<i>P. emodi</i>	3	71	16.212 (.000)
	<i>G. wallichianum</i>	22	71	6.149 (.013)
	<i>H. perforatum</i>	6	86	18.875 (.000)
	<i>D. blanfordii</i>	9	86	16.482 (.000)
	<i>V. biflora</i>	13	57	5.906 (.015)
	<i>S. laureola</i>	9	71	11.291 (.001)
	<i>M. longifolia</i>	3	71	16.212 (.000)
	<i>V. jatamansi</i>	38	0	5.805 (.016)
	<i>V. cotinifolium</i>	3	29	3.877 (.049)
	<i>A. heterophyllum</i>	69	0	13.673 (.000)
	<i>B. ciliata</i>	38	14	1.566 (.211)
	<i>A. chasmanthum</i>	19	0	2.602 (.107)
	<i>J. dolmiaea</i>	16	0	2.133 (.144)
	<i>S. lappa</i>	47	0	7.733 (.005)
<i>Trillium govanum</i>	19	0	2.602 (.107)	
<i>B. amplexicaulis</i>	47	14	2.368 (.124)	

Source: Primary data computed

**Table 3. Non-Timber Forest Products collection Techniques and time relationship with the district of the respondents**

No. of respondents in percentage				
Variables	Categories	Neelam	Bagh	$\chi^2$ Statistics
Collection techniques of Non-Timber Forest Products	Manually	44	71	13.500 (.001)
	Tool	56	29	
Collection period	Summer season	94	6	10.691 (.005)
	Winter season	58	42	
Collection time	1-5 hr	14	2	14.060 (.003)
	6-10 hr	69	41	
	>10 hr	15	3	
	Don't know	02	54	
Frequency of Collection	1-3 times	72	96	7.595 (.006)
	4-6 times	28	4	

Source: Primary data computed

**Table 4. Processing method and pest attack relationship with the respondent's district**

<b>No. of respondents in percentage</b>				
<b>Variables</b>	<b>Categories</b>	<b>Neelum</b>	<b>Bagh</b>	<b><math>\chi^2</math> Statistics</b>
Processing method	Sun Drying	38	86	9.859 (0.002)
	Sun and Shade Drying	62	14	
	Mechanical drying	0	0	
Pest attack on Stored Non-Timber Forest Products	Yes	69	31	9.423 (0.002)

**Time periods and Collection methods:** Table 3 indicates mostly conventional methods i.e use of hands and tools for extracting Non-Timber Forest Products are being used. It was noted that there was significant relation among the district and methods Non-Timber Forest Products collection ( $\chi^2=13.500$ ;  $p<0.001$ ). It was observed that in Neelum district the respondents (56%) were using sickle to extract Non-Timber Forest Products, while in Bagh people (44%) were using hands for the extraction of these plants (Table 3). [9] Depicted somehow similar results that the people extracting the plants manually usually used them in their daily life but those who extract with the tools were actually selling it.

**Non-Timber Forest Products processing and Storage:** Further, Table 4 reveals most of the respondents from both of the study districts had placed special emphasis on the conventional methods of processing the Non-Timber Forest Products. It was observed that most widespread method was of drying through sun and shade in order to deplete the moisture present. A significant relationship among the processing technique and the respondents of both the districts were found ( $\chi^2=9.859$ ;  $p<0.002$ ) depicting that Non-Timber Forest Products collection and processing in the region goes side by side (Table 4). The villages were having no government or privately-owned processing unit. [22] Depicted that the respondents involved in survey were using conventional techniques in order to process Non-Timber Forest Products such as drying in the sun or in the shade further it was observed that the processing technique usually depends upon the type of the Non-Timber Forest Products being used.

These results were in line with the study of [23] in which it was concluded that in most of the undeveloped and developed countries the forest proximate communities were not having their own storage units due to which they were finding it difficult in the storage of Non-Timber Forest Products thus resulting in the deterioration of the product and hence lower profitability. Similarly,

no specific community or government owned processing unit was not present in the study sites. A Similar research depicted that the villages of the local collectors in Africa had no processing units developed by the government and the people were forced to process in their homes thus resulting in lower production and profitability.

**Problems faced during processing:** It was observed that the respondents were quite wary of the insect attack that was an active issue during the storing ventures. The respondents were taking measures to cope with this problem. As most of the participants in the Neelum and Bagh valley were storing the dried plants in airtight sacks in order to save it for insect pest attack

#### 4. CONCLUSIONS

It could be concluded from results the forests the forests of Neelum and Bagh Districts North Eastern Pakistan of Azad Jammu and Kashmir. The present study concludes that the forests of Neelum and Bagh district are supplying the local communities with vast amount of Non-Timber Forest Products that are not only generating them employment opportunities, providing fast cash at the time of need and providing subsistence but also is helping in fulfilling the daily requirement of the households. The study depicts that the people from the community are using extremely laborious, life threatening and unsustainable methods of harvesting and extraction of Non-Timber Forest Products which if continue could disturb the population of these extremely valuable plants. Further it was observed that the processing of the Non-Timber Forest Products is virtually and literally absent in the region, only focusing on the traditional and conventional methods of processing and storing which leaves their produce to certain vulnerabilities. The study recommends the necessity of Public-private partnership to communicate collectors and inhabitants with sustainable collection, processing and storage

techniques along with market information for generating high premiums.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

### REFERENCES

1. Rashid S, Ahmad M, Zafar M, Sultana S, Ayub M, Khan MA, Yaseen G. Ethnobotanical survey of medicinally important shrubs and trees of Himalayan region of Azad Jammu and Kashmir, Pakistan. *Journal of ethnopharmacology*. 2015;166:340-351.
2. Amjad MS, Zahoor U, Bussmann RW, Altaf M, Gardazi SMH, Abbasi AM. Ethnobotanical Survey of Medicinal Flora of Harighal, Azad Jammu & Kashmir, Pakistan. *Journal of Ethnobiology and Ethnomedicine*. 2020;16:65. Available:<https://doi.org/10.1186/s13002-020-00417-w>
3. Amjad MS, Qaeem MF, Ahmad I, Khan SU, Chaudhari SK, Zahid Malik N, Khan AM. Descriptive study of plant resources in the context of the ethnomedicinal relevance of indigenous flora: A case study from Toli Peer National Park, Azad Jammu and Kashmir, Pakistan. *PloS One*. 2017;12(7): e0180917. Available:<https://doi.org/10.1371/journal.pone.0180917>
4. Mahmood A, Mahmood A, Malik RN. Indigenous knowledge of medicinal plants from Leepa valley, Azad Jammu and Kashmir, Pakistan. *Journal of Ethnopharmacology*. 2012;143(1):338-346.
5. Ishtiaq M, Mahmood A, Maqbool M. Indigenous knowledge of medicinal plants from Sudhanoti district (AJK), Pakistan. *Journal of ethnopharmacology*. 2015;168:201-207.
6. Sher H, Aldosari A, Ali A, de Boer HJ. Economic benefits of high value medicinal plants to Pakistani communities: an analysis of current practice and potential. *Journal of Ethnobiology and Ethnomedicine*. 2014;10(1):10-71.
7. Ahmad, Mushtaq, Muhammad Zafar, Nuzba Shahzadi, Ghulam Yaseen, Terence M. Murphey, Shazia Sultana. Ethnobotanical importance of medicinal plants traded in Herbal markets of Rawalpindi-Pakistan. *Journal of Herbal Medicine*. 2018;11(2018): 78-89.
8. Nasir S, Ahmed J, Asrar M. Medicinal plants: a promising resource for poverty alleviation in the milieu of Swat. *FUUAST Journal of Biology*. 2014;4(2):237-245.
9. Zubair M, Jamil A, Lukac M, Manzoor AA. Non-Timber Forest Products Collection Affects Education of Children in Forest Proximate Communities in Northeastern Pakistan. *Forests*. 2019;10:813. DOI:10.3390/f10090813
10. Pandey AK, Tripathi YC, Kumar A. Non timber forest products (NTFPs) for sustained livelihood: Challenges and strategies. *Research Journal of Forestry*. 2016;10(1):1-7.
11. Meinhold K, Darr D. The Processing of Non-Timber Forest Products through Small and Medium Enterprises—A Review of Enabling and Constraining Factors. *Forests*. 2019;10(11):1026.
12. Tripathi S. Customs, Traditions, NTFP Collection. Marketing and Key Issues of Garasia Tribes of Abu Road Block In Rajasthan, India. *International Journal of Innovative Research and Advanced Studies (IJIRAS)*. 2016;3(8):113-119.
13. Larsen HO, Olsen CS. Unsustainable collection and unfair trade? Uncovering and assessing assumptions regarding Central Himalayan medicinal plant conservation. *Plant Conservation and Biodiversity*. 2006;105-123.
14. Tewari DD. Is big business approach to managing Non-Timber Forest Products (NTFPs) benign? Rising unsustainable extraction and looming policy challenges. *Journal of Human Ecology*. 2014;47(1):87-102.
15. Suna S. Procurement of NTFPs in Kalahandi District of Odisha. *International Journal of Academic Research & Development (IJAR&D)*; 2019.
16. Quang DV, Anh TN. Commercial collection of NTFPs and households living in or near the forests: Case study in Que, Con Cuong and Ma, Tuong Duong, Nghe An, Vietnam. *Ecological Economics*. 2006; 60(1):65-74.
17. Sarmah R, Arunachalam A, Melkania U. Utilization pattern of non-timber forest products (NTFPs) by the tribal people in Changlang district of Arunachal Pradesh, India. *Journal of Non-Timber Forest Products*. 2011;18(2):105-118.

18. Mujawamariya G, Karimov AA. Importance of socio-economic factors in the collection of NTFPs: the case of gum Arabic in Kenya. *Forest Policy and Economics*. 2014;42:24-29.
19. Adnan M, Begum S, Khan AL, Tareen AM, Lee IJ. Medicinal plants and their uses in selected temperate zones of Pakistani Hindukush-Himalaya. *Journal of Medicinal Plants Research*. 2012;6(24):4113-4127.
20. Chhetri HB, Gupta VNP. A survey of non-timber forest products (NTFPs) in upper Mustang. *Scientific World*. 2007;5(5):89-94.
21. Mukul SA, Uddin MB, Manzoor Rashid AZM, Fox J. Integrating livelihoods and conservation in protected areas: understanding the role and stakeholder views on prospects for non-timber forest products, a Bangladesh case study. *International Journal of Sustainable Development & World Ecology*. 2010; 17(2):180-188.
22. Jimoh SO. Sustaining the roles of non-timber forest products in rural poverty-reduction and household food security in Nigeria. *Journal of Fisheries International*. 2006;1: 63-69.
23. Duchelle AE, Kainer KA, Wadt LH. Is certification associated with better forest management and socioeconomic benefits? A comparative analysis of three certification schemes applied to Brazil nuts in Western Amazonia. *Society & Natural Resources*. 2014;27(2):121-139.

© 2020 Zubair et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*  
*The peer review history for this paper can be accessed here:*  
<http://www.sdiarticle4.com/review-history/62978>