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Logging Effects on Non-Timber Forest Products (NFTPs) Availability in Etung Rainforest Ecosystem, Cross River State, Nigeria

Ogar T. O[1], Bisong F. E[1], Eka Z. O[2,*]

[1]Department of Geography and Regional Planning, University of Calabar, Calabar, Nigeria
[2]Department of Geography, Islamic University in Uganda, Mbale, Uganda
*Corresponding author: zainabeka@gmail.com

Abstract The effects of logging activities on the availability of non-timber forest products (NTFPs), which includes special, non-wood, minor, alternative and secondary forest products was assessed. The NTFPs are useful substances, materials and/or commodities obtained from forests which do not require harvesting (logging) trees. They include game animals, fur-bearers, nuts, seeds, berries, mushrooms, oils, foliage, medicinal plants, peat, fuel wood, and forage on which the rural forest communities in Etung Local Government Area of Cross River State, Nigeria depend was examined. The study relied on primary data through direct field measurements. Forty-two plots of 50mx100m were laid in the logged and unlogged sites of the forest – twenty-one either way. This was achieved through stratified random sampling. Thirty-one (31) NTFPs were identified and enumerated and the results were compared with the unlogged areas which served as controlled plots. The students''t' test was used to test for significant difference. A mean of 1.37 in the quantity of NTFPs in the unlogged sites and 1.98 in the logged sites were revealed. This implied that reduction in the quantity of NTFP as occasioned by logging would undermine the quality of rural life as the people's livelihood is intimately connected to the forest; hence nationalization of the remaining forest is therefore recommended.

Keywords: *logging effects, non-timber forest products, rainforest ecosystem, cross river state*

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1. Introduction

Right from prehistoric time man has associated intimately with the forest, deriving food, medicines, shelter and jobs there from. The forest was also a place of worship especially for African traditional religion. By these roles, the forest was therefore sacrosanct. This holism in their perception as to the organic linkages of the various components of the natural environment and their relationship to human livelihood and well being perhaps lies at the root of the African soul [1]. Amplifying this view, Suliman [2], asserted that African people maintained an intimate relationship with nature, characterized by a high degree of sensitivity and respect for the working of the natural ecosystems and almost sacred limit of exploitation and sense of duty to conservation. Today, the story is not the same as most emphasis is placed on logging (the process of harvesting and hauling timber and their products from stump to the point of processing or sale).

Timber and their products are erroneously assumed to be the most significant output of the forest. This has accelerated logging rates to the extent of jeopardizing Non-Timber Forest Products (NTFPs) which are mainly forest products other than timber and animals. An estimated total of over 700 different NTFPs have been identified in Cross River State, and of these over 400 are harvested [3]. Financial yield of NTFPs is estimated to be much higher than the total revenue derivable from timber products in Cross River State [4]. In 1988, worldwide commercial trade in wild plants (excluding timber) and animals was valued at $5 billion dollars [5]. Each wild plant that provides the chemical basis for developing new drug is projected to generate at least 290 million dollars annually [6].

Generally, it is common to find more people in NTFPs extraction business relative to those in timber extraction yet the level of impact on the rainforest ecosystem created by the few timbers extractors far outweighs those of NTFPs collectors. This is because it is practically easier to collect NTFPs sustainably than it is to log sustainably, as it is the case with timber dealers [7]. Few timber dealers therefore benefit to the detriment of the majority NTFPs collectors and the rainforest ecosystem. Thus, it is expedient to assess the effect of logging on the quantity of NTFPs available for collection by the people in Etung rainforest.

1.1. Site Description

Field work was carried out in Etung Local Government Area, which is located approximately between Long.

08° 55' and 09° 02' E and Lat 05° 42' and 06° 00' N (Figure 1) in accordance with the method of Gilbertson *et al* [8]. The Etung Local Government Area is within the central part of Cross River State. It is one of the areas of significant tropical rainforest in Cross River State which now constitute a major part of what is left in Nigeria. It is also reputedly the most significant rainforest left anywhere in West Africa and one of the most diverse ecosystems in the world [9]. The forest belongs to the Oban division of Cross River National Park, which according to Federal Environmental Protection Agency [10], contains the highest tropical biodiversity in Africa, with remarkable wildlife.

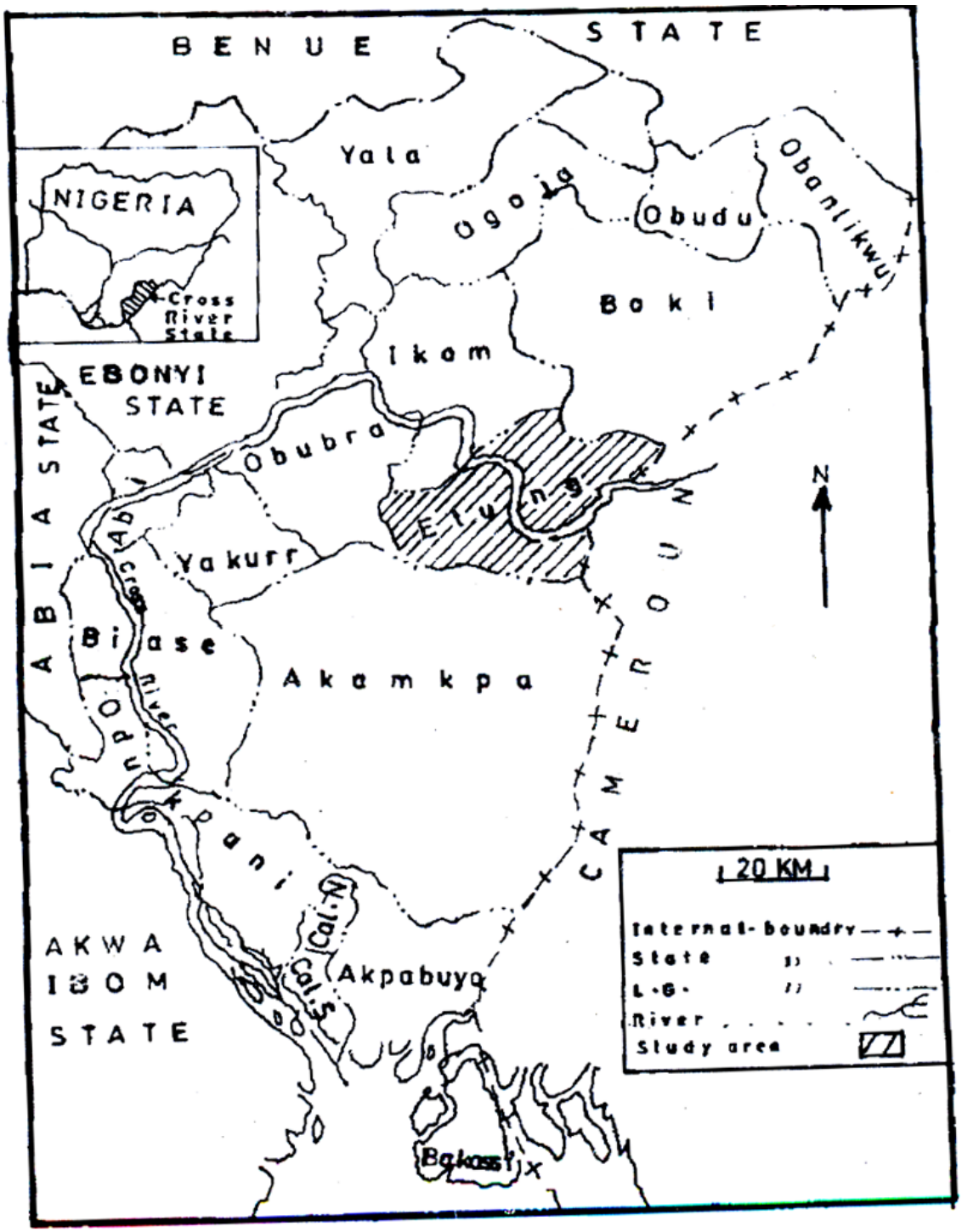

Figure 1. Map of Cross River State showing Etung Local Government Area

2. Materials and Methods

Direct field measurements of forty-two (50x100 meters) quadrats or plots laid on the sample sites was carried out. Stratified random sampling was employed so as to distribute samples to the various strata based on the proportion of each stratum in relation to the total. Put differently, the logged and unlogged sites of the forest were used as strata whereby the quadrats or plots were grouped into homogenous subsets from which forty-two (42) were randomly selected. Selection of sample is a most important issue in quantitative plant ecology because

the reliability of the final conclusion hinge largely on how well the data base has been built [11]. Out of the forty-two quadrats, twenty-one were laid in the logged areas of the forest and the other twenty-one which served as controlled plots were laid in the unlogged areas of the forest.

Every quadrat was surveyed and white strings tied along the borders of each quadrat to facilitate general orientation during mapping. The strings also made it easier to determine whether individual plants were located within a given quadrat or not. For the purpose of identification and enumeration of NTFPs, a team of three individuals well versed in the act, walked the quadrat starting at the left corner baseline in concentric circles of decreasing size to the centre of the plot. The data so generated were analyzed using the students't-test. The essence is to compare the means of sample values and to determine the significance of the difference between data on logged and unlogged sites. The data set was transformed into tables of values for the purpose of analyses. The analysis is based on the hypothesis:

H_0: There is no significant difference in the total number of NTFPs found in the logged and unlogged sites of the forest.

H_1: There is significant difference in the total number of NTFPs found in the logged and unlogged sites of the forest.

The t-test was applied here after a logarithmic transformation of the data. This is to make the data more amendable to the t-test and more so because results of any hypothesis test carried out on transformed values holds good for the original values [11].

3. Results and Discussion

Table 1. Logarithmic Transformation of Raw Scores Corrected to Two Decimal Places

S/NO.	X	Y	Log X	Log Y	Log(X- $\overline{X}$)	Log (X- $\overline{X}$)^2	(Y- $\overline{Y}$)	Log(Y- $\overline{Y}$)^2
1	23	35	1.36	1.54	0.28	0.09	0.17	0.03
2	10	37	1	1.57	-0.08	0.01	0.2	0.04
3	39	45	1.59	1.65	0.51	0.26	0.28	0.08
4	45	49	1.65	1.70	0.57	0.32	0.33	0.11
5	31	51	1.49	1.71	0.41	0.17	0.34	0.12
6	8	22	0.90	1.34	-0.18	0.03	-0.03	0.00
7	8	16	0.90	1.20	-0.18	0.03	-0.17	0.03
8	18	58	1.26	1.76	-0.18	0.03	0.39	0.15
9	5	15	0.70	1.18	0.38	0.14	-0.39	0.04
10	7	14	0.85	1.15	-0.23	0.05	-0.22	0.05
11	5	25	0.70	1.40	-0.38	0.14	-0.03	0.00
12	30	50	1.48	1.70	0.4	0.16	1.37	-0.18
13	7	12	0.85	1.10	-0.23	0.05	-0.27	0.07
14	4	7	0.60	1.85	-0.48	0.23	0.48	0.23
15	29	45	1.42	1.65	0.34	0.12	0.28	0.08
16	31	43	1.49	1.63	0.41	0.17	0.26	0.07
17	10	31	1.0	1.50	-0.08	0.01	0.13	0.02
18	4	9	0.60	0.95	-0.48	0.23	0.42	0.18
19	5	6	0.70	0.78	-0.38	0.14	0.59	0.35
20	25	25	1.40	1.40	0.32	0.10	0.03	0.00
21	50	65	1.70	1.81	0.62	0.38	0.44	0.19
22	40	81	1.60	1.91	0.52	0.27	0.54	0.29
23	10	18	1	1.26	-0.08	0.01	-0.11	0.01
24	2	4	0.30	0.60	-0.78	0.61	-0.77	0.59
25	21	65	1.32	1.81	0.24	0.06	-0.44	0.19
26	31	40	1.50	1.60	0.42	0.18	0.23	0.05
27	4	8	0.60	0.90	-0.48	0.23	-0.47	0.22
28	6	5	0.78	0.70	-0.3	0.09	-0.67	0.45
29	2	3	0.30	0.48	-0.78	0.61	-0.89	0.79
30	20	24	1.30	1.38	0.22	0.05	0.01	0.0
31	13	23	1.11	1.36	0.03	0.00	-0.01	0.00
			$\overline{X}$ = 1.08 Sx = 0.41 $\sum$x = 33.45 N=31	$\overline{y}$ =1.37 Sy = 0.38 $\sum$y=42.57 N = 31		$\sum(x-\overline{x})^2 = 4.97$		$\sum(y-\overline{y})^2 = 4.25$

Calculated t = 2.9, Critical t = 2.0.

From Table 1 above, X represents logged sites and Y unlogged sites. The calculated't' was 2.9 and critical't' value at 0.05 significant levels was equal to 2.0. Since the calculated't' (2.9) was greater than critical 't' (2.0), H_0 was rejected and H_1 upheld. Thus, there is a significant difference in the number of Non-Timber Forest Products (NTFPs) found in the logged and unlogged sites. Therefore NTFPs are found to be higher on the unlogged sites than the logged sites.

The difference is not by chance but the result of logging activities which directly affect NTFPs. Although during logging, NTFPs are usually not the prime target, but the process of selecting trees, felling, bucking, removing limbs and unmerchantable tops, hauling and loading, skidding, etc. has tremendous effect on them. All NTFPs

around any target tree or accessible route are usually cleared so as to reach the desired tree and also, when trees are felled, they smash up considerable amount of lower layer of the forest, affecting every NTFP around that region. More NTFPs are equally affected when the wood is being removed from the forest.

The field survey of 31 types of NTFPs (that have been used by the people in diverse ways) revealed that a total of 931 NTFPs were found on the 21 unlogged sites of the forest while on the 21 logged sites, a total of 550 NTFPs were found (Table 2).

The difference of 381 NTFPs in favour of the unlogged sites is accounted for by the depletion of NTFPs in the logged sites. This difference is summarized graphically in Figure 2.

Specifically, the various NTFPs fund on the logged and unlogged sites of the study area are represented graphically in Figure 3 below.

Table 2. Census of Non-Timber Forest Products (NTFPs) taken from 42 Plots Laid in Logged and Unlogged Sites of the Study Area (21 either way)

S/N	BOTANICAL NAME	LOCAL/COMMON NAME	PRIMARY USE	LOGGED SITES	UNLOGGED SITES
1	*Laccosperma secundiflora*	Rattan cane (Ekot)	Anchor rope; typing rope	23	35
2	*Gnetum africanum*	Salad (Afang)	Vegetable leaf	10	37
3	*Eremospatha macrocarpa*	Rathan Cane (Ifura)	Weaving, tying, building ropes	39	45
4	*Piper spp*	Hot leaves (bush pepper)	Vegetable, use in soup	45	49
5	*Pandanmus canelabrum*	Screw pine	Leaves use in weaving matting	31	51
6	*Aframomum spp*	Alligator pepper (hot)	Seed use medicinally	8	22
7	*Afromomum hanburyi*	Alligator pepper (sweet)	Used as medicine	8	16
8	*Marantaceae spp*	Wrapping leaves	Wrappers	18	58
9	*Ocimum spp*	Native mint	Used as medicine	5	15
10	*Momordica augustisepala*	Native sponge	Scrubbing	7	14
11	*Garcinia mannii*	Chewing stick	Mouth brushing	5	25
12	*Irvingia gabonensis*	Bush mango	Used as soup thickener	30	50
13	*Cola accuminata*	**Native cola**	Stimulant/ceremonial Significance	7	12
14	Ogbamu	Mgbamu/ Ogbamu	Soup thickener	4	7
15	*Plukenetia conophora*	Ebungha/ Bush Cola	Seed is used as snack	29	45
16	*Garcinia cola*	Bitter Cola	Stimulant	31	43
17	*Pleurotus tuberosus*	Elephant mushroom	Used in soup	10	31
18	*Heinsia crinata*	Atama	Vegetable leave	4	9
19	*Lasianthera africana*	Editan	Vegetable leave	5	6
20	*Thaumatococus donielli*	Moimoi Leaves (Ogbun)	Wrappers	25	25
21	*Brachystegia eurycoma*	Achi	Thickening agent in soup	50	65
22	*Gongronema latifolium*	Otasi (Bush bitter leaf)	Vegetable leaf	40	81
23	*Afrostyrax lepidophillus*	Country onion	Bark used as spice to flavour paste	10	18
24	*Elaes guinensis*	Oil palm	Palm oil	1	4
25	*Monodora myristica*	African Nutmeg	Aromatic seed to flavour pepper soup	21	65
26	*Raphia vinifera*	Raphia/Bambo palm	Weaving and building	31	40
27	*Poga Oleosa*	Shell nut	Delicious oil extracted from seed kernel.	4	8
28	*Raphia hookeri*	Wine palm	Leaf use as fibre, sap as drink.	6	5
29	*Australia congolensis*	-	Seed tester used as Shaker for dancing	1	3
30	*Dacroydes edulis*	*Native Pear*	Edible Fruit	20	24
31	*Xylopia spp*	Bush pepper spice	Whole fruit used as spice in soup	13	23
	TOTAL			**550**	**931**

Source: Authors Field Survey.

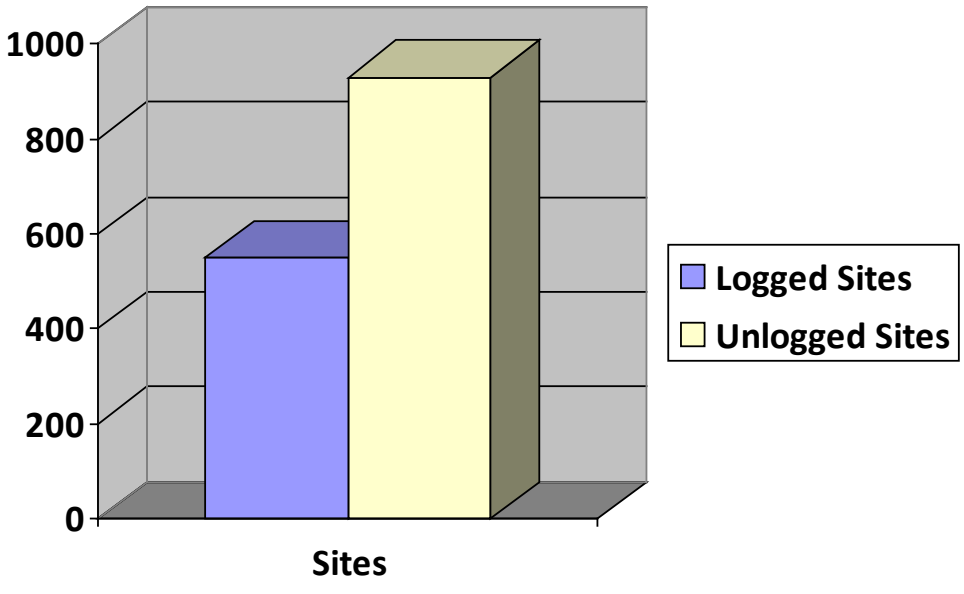

Figure 2. Graphical Representation of Quantity of NTFPs on the Logged and Unlogged Sites of the Study Area

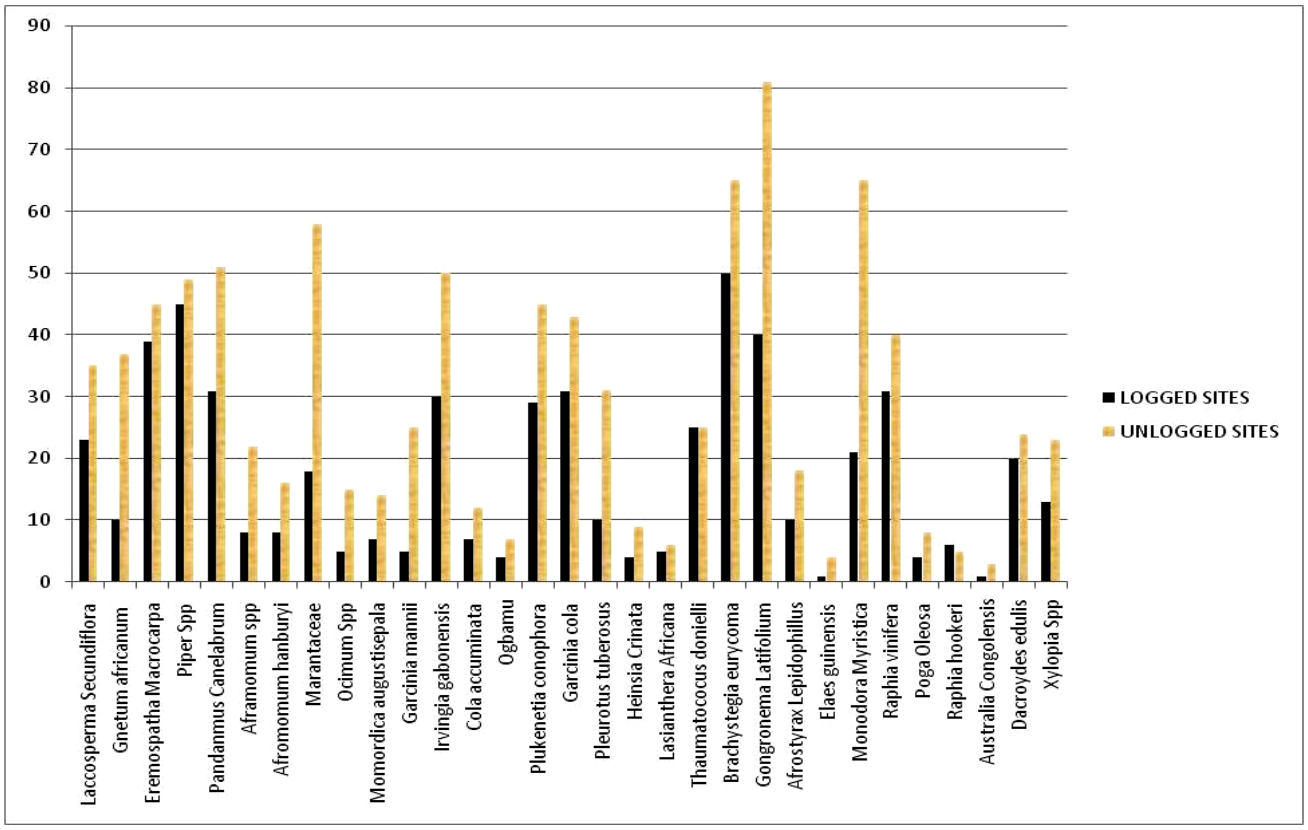

Figure 3. Graphical Representation of Various Types of NTFPs on the Logged and Unlogged Sites of the Study Area

The findings are in consonance with the theoretical expectation of the study. Studies in Brazil and Ghana [13,14] also noted that selective logging and intensive logging had depleted the non-timber forest resources so that collectors and processors have come to rely more heavily on forest resources. For the forest people of Etung LGA, the story is unpleasant since they depend on NTFPs collection for revenue generation, domestic purposes and augmenting subsistent incomes. Reduction in the quantity of NTFPs implies lesser revenue and lesser NTFPs for domestic use. This would undermine the quality of rural life unless NTFPs collectors would be more rugged and aggressive in their hunt for NTFPs to areas hitherto not ventured into. If this be the case, then rainforest ecosystem will suffer more and this is at variance with goal seven of Millennium Development Goal (MDG) of achieving sustainable forestry.

The process of clearing to gain access to every targeted tree as well as felling and removal of such trees leads to the depletion of at least 31 types of NTFPs. This implies that the quantity of NTFPs available for collection by rural folks is drastically reduced. Since livelihoods are intimately connected to the forest, it will obviously undermine the quality of rural life. The extent of these effects on livelihood remains to be assessed.

3.1. Conclusion

The study recommends nationalization of the remaining forest (like all natural resources) on the basis that these are resources available to the economy of the State, where due process is followed before exploitation. Further studies that will quantify logging effects on rural livelihood will require participatory research appraisal to corroborate the present study.

Statement of Competing Interests

Authors declare that no competing interests exist.

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