INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print) 2222-5234 (Online)
http://www.innspub.net
Vol. 22, No. 2, p. 239-247, 2023

RESEARCH PAPER OPEN ACCESS

Adaptive strategy of countryside residents in Okomu National Park (ONP) support zone community of Edo State, Nigeria

Ohwo Oghenekevwe Abigail*[1], Dolor Efemena Dickens[1], Gbigbi Theophilus Miebi[2], Ikpoza Eguono Aramide[3]

[1]*Department of Forestry and Wildlife, Faculty of Agriculture, Delta State University, Abraka, Delta State, Nigeria*

[2]*Department of Agricultural Economics, Faculty of Agriculture, Abraka, Delta State, Nigeria*

[3]*Department of Agricultural Economics and Extension, Dennis Osadebay University, Anwai Road, Asaba, Delta State, Nigeria*

Key words: Covid-19, Countryside-residents, Forest based activities, Encroachment, Community

http://dx.doi.org/10.12692/ijb/22.2.239-247 Article published on February 13, 2023

Abstract

This study examined the adaptive strategy of countryside residents by Okomu National Park, Edo State during Covid-19 lockdown. Multistage sampling was used to select 150 respondents from five support zone community around the park and twenty staff of the park. Information on forest-based activities and encroachment level before and after covid-19 lockdown was obtained using two sets of questionnaire. A 5-point likert scale ranked forest based activities; regression analysis determined the effect of socio-economic variable on involvement in forest based activities, 3-point scale ranked encroachment level while t-test tested for significance in encroachment level before and after the lockdown. Married (67.3%) young adults of 31-50 oldness (82.0%) dominated the community with 70.0% farmers with no personal land (58.0%). Farming (4.28±0.06), logging (3.59±0.10), hunting (2.95±0.09); and logging (4.80±0.14), hunting (4.80±0.14) and farming (3.40±0.23) dominated the forest-based activities by community and staff respectively. Regression analysis shows that increase in monthly income and education reduced involvement in forest-based activities. Encroachment level before and after lockdown was 1.89±0.06 and 2.39±0.06 (community); and 2.15±0.13 and 2.85±0.08 (staff), respectively. Significant difference was observed in encroachment level (-0.5±0.05-community and -0.7±0.02-staff) before and after covid-19 lockdown. Education of residents and adoption of agro-forestry in buffer zone to ensure residents' farmer accessibility to land is recommended to minimize the destruction of the park.

* **Corresponding Author:** Oghenekevwe Abigail ✉ oghenekevweabigail@gmail.com

Introduction

Adaptive strategy are ways by which living organism adjust in long run with changing environmental and competitive scenarios (Dictionary of Environment and Conservation, 2012). Human over the years have adapted to series of changes – Socio-economic and Environmental. The early men evolved from old-stone age of foraging (hunting and gathering) to horticulture, agriculture, pastoralism and industrialism (www.wikipedia.org accessed 23rd July 2021 at 8:56am) strategy in conformation with developmental change. Adaptation is a continuous event to depicting dynamism of life (Dictionary of Environment and Conservation, 2012).

The COVID-19 virus that affected the world in November 2019 with its disastrous health and life complications was indeed another phase of adaptation to man especially the response measure of global lockdown (World Health Organization (WHO), 2020). This measure has with it various socio-economic and environmental implications. Man being a social being was confined to his apartment, economic development was on hold and various environmental benefits and challenges were evident during this period (Reinhart and Reinhart, 2020). In Nigeria, the response was not different from other countries. Consequently, Nigeria citizens were exposed to untold hardship (starvation, inaccessibility to health facilities, insecurity and oppression from the political class as palliative were hoard instead of being distributed) (Fukuyama, 2020). The countryside residents were not exempted and depended on the available resources for survival (UNEP/ILRI, 2020).

Forest play unique role in providing the basic needs (economic, social and medical) of man (Ohwo 2016; Fadoyin *et al.*, 2020). Utilization of forest in daily living and welfare of countryside residents for food (protein, fruits, nuts, medical herbs, water, land) and energy (fuel-wood, charcoal) became a succor during the pandemic era (Gardner, 2020). The sole dependence of dwellers in Support Zone Community (SZC) by National Parks on forest and their involvement in Forest-based Activities (FAs) (hunting, logging and farming) constituted threat to achieving parks conservation objectives. Policy responses of COVID-19 from closing of borders, restrictions on travel to stay-at-home orders had damaging and positive effects (Bates *et al.*, 2020). This came with damaging effect of escalating famine in urban and rural areas, killing of wildlife, excessive exploitation of timber and non-timber forest resources became the norm because there were no other survival alternatives available at that moment (Badola, 2020; Gardner, 2020).

Protected Areas (PAs) were established to conserve biodiversity, but man's encroachment and modification to various challenges poses threat to achieving the goals of Pas establishment. Okomu National Park (ONP) situated in Edo State is surrounded by communities whose livelihood activities were locked with the lockdown in Nigeria. These people diverse an alternative means of survival by focusing on resources from the PAs. The depletion rate of forest in emerging country is alarming especially with high poverty level of ₦ 225 (0.25 dollars) daily (Gardner, 2020).

The sole dependence of countryside residents on forest especially in PAs led to aggravated deforestation and has negatively affected the conservation objective of protected area establishment. Deforestation was intensified during Covid-19 lockdown period (Bolam *et al.* 2021) when SZC were unable to access food and depended heavily and encroached on the forest to meet their basic needs.

This study examined the various Forest-based Activities (FAs) of SZC and the encroachment level before and after the pandemic in Okomu National Park with a view to evaluating impacts on forest conservation.

Materials and methods

The study area was Okomu National Park (ONP) and SZC. The ONP is the smallest National Park in Nigeria with a land area of 212 km², established by decree 46 of 1999 and lies between coordinates 6°15'- 6°29'N and 5°9'- 5°23' E (Monona *et al.*, 2020). The mean annual rainfall of the park approximate 2100mm while the mean monthly temperature is 30.2°C.

The soils are acidic sandy loam derived from deep deltaic and coastal sediments (Soladoye and Oni, 2000) with a gentle topography ranging from 30 m to 60 m above sea level.

The park is an important refuge for forest white-throated monkey (*Cercopithecus erythrogaster*) which is an endemic species in the Park. Endangered wildlife species such as Forest elephant (*Loxodonta africana cyclotis*), Chimpanzee (*Pan troglodytes versus*), Leopard (*Panthera pardus*) and Red-capped Mangabey (*Cercopithecus torquatus*) are found in the park (Ajayi, 2011). The park is rich in tree species of *Entandrophragma angolense*, *Lovoa trichilioides*, *Anopyxis klaineana*, *Ceiba pentandra*, *Celtis zenkeri*, *Triplochiton scleroxylon*, *Antiaris africana*, *Pycnanthus angolensis* and *Alstonia congoensis*. The SZC are Umaza, Udo, Ora, Asayitan, Nikrowa, Ofunama, Orogbon, Kolobe and Siluko.

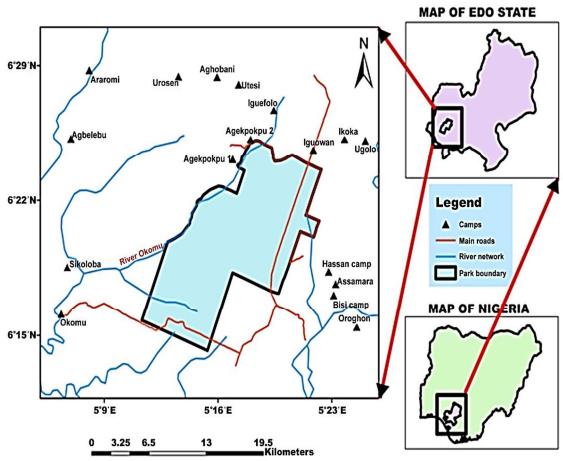

Fig. 1. Study Area map.

Sampling technique

Multistage sampling technique was used. The random selection of five (5) support zone community (Udo, Ora, Kolobe, Orogbon, Nikrowa) constitute the first stage. Three (3) camps were randomly picked from each community (2nd stage) and a random selection of ten (10) indigenes from the selected camp constitutes the third stage.

Method of Data collection

Primary data was obtained from respondents with two set of structured questionnaire and interview sessions. One for the SZC and the other for staff of ONP addressing the forest based activities and encroachment level before and after the lockdown.

Data Analysis

Descriptive statistics and likert scale response were used to determine various FAs. The activities were ranked according to level of intensity using a five point scale (5- extremely intense; 4 -very intense; 3- moderately intense; 2 - rarely intense and 1- not intense). A mean rank of 2.5 was used to classify these activities as intense or not intense.

The effect of the socioeconomic variables on the intensity of FAs was examined using multiple regression model below:

$$FA = \propto + \beta X_1 + \beta X_2 + \beta X_3 + \beta X_4 + \beta X_5 + \beta X_6 + \\ + \beta X_7 \ldots + \beta X_{11} + e \ldots (1)$$

Where,

FA= Intensity of FAs, β= Coefficients of variables, X_1= Gender,

X_2= Marital Status, X_3= Age, X_4= Religion, X_5= Level of education, X_6= Household size,

X_7= Income, X_8= Occupation, X_9= Land ownership, X_{10}= Indigenes/ place of origin,

X_{11}= Traditional executive membership

An increase in income, land ownership, education, occupation and involvement in traditional administration reduces involvement in FAs. A well paid individual can purchase most necessities for daily living; a land owner farms on personal land; an educated fellow prefers to work with companies than involved in forest activities while persons occupied with other forms of well-paid jobs are likely not interested in forest activities. Involvement in traditional administration allows the individual to make important decisions and negotiations hence reducing involvement in FAs. However, gender, marital status, oldness, family size and indigenes increases involvement in FAs. A three point likert scale rated level of encroachment before and after covid-19 lockdown following Ohwo *et al.* (2022). T-test was used to test for significant difference in encroachment level before and after the lockdown period (model 2).

$$t = \frac{u}{s/\sqrt{n}} \ldots (2)$$

Where t=- t-statistics, u = mean of the group, s= standard deviation, n = sample size

Result and discussion

Socio-economic characteristics of the respondents

The socio-economic characteristic of Okomu National Park SZC presented in Table 1 shows that majority (46.7%) were within the oldness bracket of 41-50 years, 74.0% were male, 67.3% were married, 51.3% were involved in other belief, 69.3% were secondary school holder and 55.3% have family size of 5-8. Seventy percent (70.0%) of the SZC were farmers, 37.3% receives ₦11000-40000 earnings monthly, 76.7% did not belong to any traditional organization with 12.7% belonging to vigilante group. The dominance of youths in support zone communities during this period was due to reverse migration of families from cities to countryside s whose jobs were altered by covid-19 (Thai PBS, 2020).

Ohwo and Ogoha (2017) reported that male gender in their prime years and married were mostly involved in FAs. The meager income of most respondents in the SZC further explains importance of alternative resources for livelihood sustenance which only the forest can provide (Ohwo and Ogoha, 2017).

Table 1. Socio-economic characteristics of countryside residents.

Variable	Frequency	Percentage	Variable	Frequency	Percentage
Sex			Monthly earnings		
Male	111	74.0	less 10000	10	6.7
Female	39	26.0	11000-40000	56	37.3
Total	150	100.0	41000-60000	35	23.3
Marital status			above 60000	49	32.7
Single	15	10.0	Total	150	100.0
Married	101	67.3	Job type		
Widow	23	15.3	Farming	105	70.0
Divorced	11	7.3	Trading	22	14.7
Total	150	100.0	civil servant	20	13.3
Oldness			Others	3	2.0
20-30	12	8.0	Total	150	100.0
31-40	53	35.3	Personal land		
41-50	70	46.7	Yes	63	42.0
above51	15	10.0	No	87	58.0
Total	150	100.0	Total	150	100.0
Belief			Community indigene		
Christianity	30	20.0	Yes	106	70.7
Islam	43	28.7	No	44	29.3
Others	77	51.3	member of traditional organization		
Total	150	100.0	Yes	34	22.7
Education			No	116	77.3
Primary	46	30.7	Total	150	100.0
Secondary	104	69.3	Traditional organization		
Total	150	100.0	no member	115	76.7
Family size			Vigilante	19	12.7
1-4	52	34.7	Confraternity	11	7.3
5-8	83	55.3	Goddess	5	3.3
above 9	15	10.0	Total	150	100.0
Total	150		100.0		

Source: Data output (2021)

The socio-economic characteristic of ONP staff presented in Table 2 shows that majority (45.0%) were 31-40 years of oldness, 55.0% were male, 80.0% were married, 50.0% were Christians, 80.0% have tertiary education, 50.0% were level 8 staff, 45.0% have served for over 20 years and 35.0% belong to Ecology and Resources Management Department. The establishment of parks created jobs and served as livelihood source to workers (Corlett *et al.*, 2020) as reflected by the above observations. The greater proportion of male staff explains the masculinity and energy demanding nature of forest jobs as observed by Ohwo *et al.* (2018).

Table 2. Socio-economic characteristics of ONP Staff.

Variable	Frequency	Percentages
Sex		
Male	11	55.0
Female	9	45.0
Total	20	100.0
Marital status		
Single	4	20.0
Married	16	80.0
Total	20	100.0
Oldness		
20-30	3	15.0
31-40	9	45.0
41-50	8	40.0
Total	20	100.0
Belief		
Christian	10	50.0
Islam	6	30.0
Others	4	20.0
Total	20	100.0
Education		
Secondary	4	20.0
Tertiary	16	80.0
Total	20	100.0
Department		
Planning, research and ICT	5	25.0
Ecotourism	4	20.0
Ecology and resources management	7	35.0
Human resources management	3	15.0
Works and maintenance	1	5.0
Total	20	100.0
Years of service		
1-5	4	20.0
11-15	7	35.0
above 20	9	45.0
Total	20	100.0
Rank		
Level. 9	8	40.0
Level 8	10	50.0
Level 7	2	10.0
Total	20	100.0

Source: Data output (2021)

The FAs carried out in Okomu National Park

The result of FAs shows that majority (88.0%) of SZC engaged in FAs during lockdown with 27.3% actively involved in farming (Table 3). The result of the intensity of FAs of support zone community shows that farming was very intense with a mean score of 4.28±0.06, logging, moderately intense (3.59±0.10), hunting (2.95±0.09) and trading (2.73±0.12) rarely intense while grazing was not intense (1.36±0.05). An overall mean of 2.98±0.03 shows that FAs were intense in SZC during the lock down period. The result from ONP staff showed logging (4.80±0.14) and hunting (4.8±0.14) as very intense, farming (3.4±0.23), moderately intense while trading (1.0±0.00), grazing (1.10±0.07), mining (1.0±0.0.00) and fishing (1.65±0.27) were not intense (Table 4). A weighted mean of 2.54±0.08 also reflects moderately intense involvement in FAs as observed by staff of ONP.

Table 3. Activities of respondents during covid-19 lockdown (SZC).

Variable	Frequency	Percentages
Engaged in FAs during lockdown		
Yes	132	88.0
No	18	12.0
Total	150	100.0
Forest based activities		
No activities	18	12.0
Fishing	5	3.3
Farming	41	27.3
Logging	6	4.0
Foraging	7	4.7
Farming and hunting	2	1.3
Farming and logging	29	19.3
Mining, farming and trading	7	4.7
Logging and trading	17	11.3
Farming and trading	6	4.0
Farming, hunting, logging and fishing	8	5.3
Fishing and hunting	4	2.7
Total	150	100.0

Source: Data output (2021)

Table 4. Intensity of FAs during Covid-19 lockdown.

Forest based activities	Mean (2.5)	Standard error
Community		
Farming	4.28	0.06
Logging	3.59	0.10
Hunting	2.95	0.09
Trading	2.73	0.12
Grazing	1.36	0.05
Overall mean	2.98	0.03
Okomu Staff		
Logging	4.80	0.14
Hunting	4.80	0.14
Farming	3.40	0.23
Fishing	1.65	0.27
Trading	1.00	0.00
Grazing	1.10	0.07
Mining	1.00	0.00
Overall mean	2.54	0.08

N.B: 5 (Extremely intense) 4 (Very intense) 3 (Moderately intense) 2 (Rarely intense) 1 (Not intense)

Source: Data output (2021)

The intensity of farming, logging and hunting performed by the SZC explains the provisioning function of forest and its land.

During Covid-19 lockdown, access to food was limited especially as there were no regular market and restricted movement with outrageous prices on the available food (Pramova *et al.*, 2012). The forest and its land became the consolation of SZC as they cultivated the ground (deforestation) and harvested bush-meat, snails, mushrooms and edible worms from forest (Gupta *et al.*, 2021). The percentage response of respondent on FAs is presented in Table 5. In ONP SZC, logging (34.7%), farming (47.0%) and trading (41.3%) were very intense, hunting (36.6%) was rarely intense and grazing (73.3%) was not intense. Staff of ONP observed logging (90.0%) and hunting (90.0%) as extremely intense, farming (70.0%) moderately intense, trading (100.0%), grazing (90.0%), mining (100.0%) and fishing (65.0%) were not intense.

Table 5. Percentage response of respondents on FAs.

	Variables	Extremely intense	Very intense	.Moderately intense	Rarely intense	Not intense
	Community					
1	Farming	60(40.0)	71(47.3)	19(12.6)	0 (0.0)	0(0.0)
2	Logging	38 (25.3)	52 (34.7)	29 (19.3)	23 (15.3)	8 (5.3)
3	Hunting	19(12.6)	21(14.0)	47(31.3)	55(36.6)	8(5.3)
4	Trading	10(6.6)	62(41.3)	8(5.3)	18(12.0)	50(33.3)
5	Grazing	0 (0.0)	0 (0.0)	14(9.3)	26(17.3)	110(73.3)
	Okomu Staff					
1	Logging	18(90.0)	0 (0.0)	2(10.0)	0 (0.0)	0 (0.0)
2	Hunting	18(90.0)	0 (0.0)	2(10.0)	0 (0.0)	0 (0.0)
3	Farming	5(25.0)	0 (0.0)	14(70.0)	0 (0.0)	1(5.0)
4	Fishing	2(10.0)	0 (0.0)	0 (0.0)	5(25.0)	13(65.0)
5	Trading	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	20(100.0)
6	Grazing	0 (0.0)	0 (0.0)	0 (0.0)	2(10.0)	18(90.0)
7	Mining	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	20(100.0)

Fig. in parenthesis is percentages

Source: Data output (2021)

Farming and forest clearing was intense (Escobar, 2020) due to reduced supply of food, no regular market activities with elevated cost of food items (Badola, 2020). Loss of jobs also motivated various involvement in FAs (International Union for Conservation of Nature, 2020). Hunting was also intense for cheap access to protein (Kideghesho and Msuya, 2012). With lockdown, rangers were out of patrol and illegal logging was the order of the day (Waithaka, 2020) as income were generated from sales of logs and lumber (McNeely, 2021) during this period in local setting. The overall engagement in FAs is a reflection of dependence of countryside residents on the forest estates for survival (Gardner, 2020).

The regression analysis of socio-economic influence on intensity of FAs shows that increase in marital status, belief, monthly income, occupation, native of community, education and member of traditional organization results in reduced involvement in FAs (Table 6). The reducing effect of marital status, belief and community indigene on FAs negates the *a priori* expectation. The reducing effect of education and membership of traditional organization reflects the awareness effect of importance of conservation and role of forests to environmental sustainability and cultural significance of forest (Attah, 2020). Increase in male gender, oldness, family size and personal land increases involvement in FAs.

Table 6. Regression result for the effect of socio-economic characteristics on intensity of forest based activities.

Model	B	Standard error	t-values	p-value
(Constant)	3.87	0.38	10.27	0.00
Gender	0.29	0.08	3.76	0.00
Marital status	-0.12	0.05	-2.57	0.01
Age	0.15	0.04	3.43	0.00
Religion	-0.09	0.04	-2.61	0.01
Level of education	-0.10	0.06	-1.62	0.11
Household size	0.04	0.04	0.95	0.35
Monthly income	-0.08	0.03	-2.41	0.02
Occupation	-0.18	0.04	-4.70	0.00
Personal land	0.06	0.08	0.76	0.45
Community indigene	-0.49	0.08	-6.28	0.00
Member of traditional organization	-0.03	0.07	-0.42	0.67

Source: Data output (2021)

The effect of household size pinpoints need to provide food for family members with the male being the house head in Africa setting. Aged family members with underlying ailment were most prone to contacting the Covid virus (Muche *et al.*, 2022) and are also endowed with traditional knowledge on utilization of herbs for treatment and prevention of ailments (Somerville 2020). Thus, the aged respondents were involved in collection of herbs, roots and fruits from forest for medications especially as there exist no access to health facilities during the lockdown (Villena-Tejada *et al.*, 2021). The increasing effect of personal land on FAs is accounts for declining nature of soil fertility from constantly farmed land and quest for better nourished soil for farming (Escobar, 2020, mcNeely, 2021).

A high encroachment level of SZC into ONP before and after the lockdown was observed with a mean value of 1.89±0.06 and 2.39±0.06 respectively. A weighted mean of 2.14±0.05 also shows a high encroachment level as reported by the SZC. The staff of ONP observed a high encroachment level into the park before and after the lockdown with mean of 2.15±0.13 and 2.85±0.08 respectively (Table 7). The percentage response of SZC and staff of ONP on encroachment level into the park before and after the lock down period were medium (58.7% and 65.0%) and high (54.0% and 85.0%) respectively (Table 8). There was significant encroachment level into the forest before and after the lockdown period (Table 9). The increasing encroachment level after the lockdown accounts for deforestation affecting parks conservation objectives. Pacheco *et al.* (2021) reported a 150% rise in deforestation in Africa linked to illegal logging and increased dependence on forest for survival especially their involvement in forest based activities.

Table 7. Encroachment level before and after Covid-19 lockdown.

Variable	Mean	Standard error
Community response		
ENC Encroachment before	1.89	0.06
ENC Encroachment after	2.39	0.06
Total mean	2.14	0.05
ONP staff response		
ENC Encroachment before	2.15	0.13
ENC Encroachment after	2.85	0.08
Total mean	2.50	0.08

N.B: 3 (high), 2 (medium) and 1 (low)

Source: Data output (2021)

Table 8. Percentage response of community members and staff of ONP .

S/N	Variables	High	Medium	Low
1	Community response			
2	ENC Encroachment before	24(16.0)	88(58.7)	38 (25.3)
3	ENC Encroachment after	81(54.0)	51(34.0)	18(12.0)
4	ONP Staff			
5	ENC Encroachment before	5(25.0)	13(65.0)	2(10.0)
6	ENC Encroachment after	17(85.0)	3(15.0)	0 (0.0)

Source: Data output (2021)

Table 9. Result of t-test showing encroachment level before and after Covid-19 lockdown.

Variable	Mean	Standard error	T	Df	Sig
Community	-0.50	0.05	-9.53	149	0.00
ONP staff	-0.70	0.15	-4.77	19	0.00

Source: Data output (2021)

Conclusion and recommendation

High involvement in forest based activities by support zone communities of Okomu National park was observed during Covid-19 lockdown. Farming, logging and hunting were mostly carried out to cater for food and survival of countryside dwellers.

The significant encroachment level after the lockdown shows the importance of forest in providing for stakeholders especially as there exist no alternative source of survival. The multi-functionality of forest with less damage can be enhanced via awareness creation and education of residents and adoption of agro-forestry in buffer zones ensuring accessibility to land by resident farmers.

References

Attah AN. 2020. Initial Assessment of the Impact of COVID-19 on Sustainable Forest Management African States, background Paper prepared for the United Nations Forum on Forests Secretariat pp 1-65.

Badola S. 2020. Indian wildlife amidst the COVID-19 crisis: an analysis of status of poaching and illegal wildlife trade, TRAFFIC India office pp 1-14.

Bates AE, Primack RB, Moraga P, Duarte CM. 2020. COVID-19 pandemic and associated lockdown as a "global human confinement experiment" to investigate biodiversity conservation. Biological Conservation, **248,** 108665-108674.

Bolam FC, Mair L, Angelico M, Brooks T, Burgman M, Hermes C, Hoffmann H, Martin RW, Mc gowan PJK, Rodrigues ASL, Rondinini C, Westrip JRS, Wheatley H, Bedolla-Guzmán Y, Calzada J, Child MF, Cranswick PA, Dickman CR, Fessl B, Fisher DO, Garnett ST, Groombridge JJ, Johnson CN, Kennerley RJ, King SRB, Lamoreux JF, Lees AC, Lens L, Mahood SP, Mallon DP, Meijaard E, Méndez-Sánchez F, Percequillo AR, Regan TJ, Renjifo LM, Rivers MC, Roach NS, Roxburgh L, Safford RJ, Salaman P, Squires T, Vázquez-Domínguez E, Visconti P, Woinarski JCZ, Young RP, Butchart SHM. 2021. How many bird and mammal extinctions have recent conversation action prevented. Conservation Letters **14(1),12762, 1-11.**

Corlett RT, Primack RB, Devictor V, Maas B, Goswami VR, Bates AE, Koh LP, Regan TJ, Loyola R, Pakeman RJ, Cumming GS, Pidgeon A, Johns D, Roth R. 2020. Impacts of the coronavirus pandemic on biodiversity conservation. Biological Conservation **246(108571),** 1-5.

Delia GR. 2020. Preventing the next pandemic: Zoonotic disease and how to break the chain of transmission. Nairobi: United Nations Environmental Programme and International Livestock Research Institute, A Scientific Assessment with Key Messages for Policy-Makers A Special Volume of UNEP's Frontiers Report Series pp. 1-82.

Escobar H. 2020. Deforestation in the Brazilian Amazon is still rising sharply. Science **369(6504),** 613-614.

Fadoyin AS, Agboje I, Adebanjo AE, Adeleye AS, Oladipo AD, Olatunji OA, Oladipupo-Alade EO, Sangotoyinbo OA, Haastrup NO. 2020. Contributions of Non-Timber Forest Products to the Standard of Living of Countryside residents in Edo State, Nigeria, International Journal of Research and Innovation in Applied Science Vol. **5(4),** 89-98.

Fukuyama F, Gavin FJ, mcMaster HR, Harvey H, Treuer D, Cooley A, Nuland V, Lighthizer RE, Loong LH, Allen D, Osterholm MT, Chua A, Gates RM, Zelikow P, Patrick S, Mallaby S, Ikenberry GH, Subramanian A, Feuer M. 2020. The Pandemic and Political Order: It Takes a State. Foreign Affairs **99(4),** 26-32.

Gardner C. 2020. Nature's of come back? No, the corona virus pandemic threatens the world's wildlife. Published April 14th @ 4:20pm SAST available @ https://theconversation.com/natures-comeback.

Gupta D, Lele S, Sahu G. 2020. Promoting a responsive state: The role of NGOs in decentralized 434 forest governance in India. Forest Policy and Economics **111(102066),** 1-11.

Kideghesho JR, Msuya TS. 2012. "Managing the wildlife PAs in the face of global economic recession, HIV/AIDS pandemic, political instability and climate change: experience of Tanzania," in PAs Management, Ed B. Sladonja (Rijeka: InTech) pp. 65-91.

McNeely JA. 2021. Nature and COVID-19: the pandemic, the environment, and the way ahead. Ambio **50,** 767-781.

Muche M, Yemata G, Molla EA, Muasya M, Tsegay BA. 2022. COVID-19 lockdown and natural resources: a global assessment on the challenges, opportunities and the way forward, Bulletin of the National Research Centre, **46(20),** 1-13.

Ohwo OA, Abioye RO, Oluwadare AO, Popoola L. 2022. Impact of forest as succor to rural dwellers during the Covid 19 pandemic in Delta State, Nigeria. Book of Abstracts of the Forests and Forest Products Society 8th Biennial conference held at the Forestry Research Institute of Nigeria, Ibadan, Nigeria, August 17-19. pp 37.

Ohwo OA, Adeyemi AA, Ighofose E. 2018. Evaluation of technical efficiency of sawmills in Udu Local Government Area of Delta State, Nigeria. African Journal of Agriculture Technology and Environment **7(1):** 99-108

Ohwo OA, Ogoha E. 2017. Contributions of sawn-wood trade to livelihood sustenance in Sapele Local Government Area of Delta State, Nigeria. Journal of Agriculture and Food Environment **4(1),** 37-46.

Ohwo OA. 2016. Price differences and causal factors in marketing of selected sawn-wood species in Delta State, Nigeria. Journal of Agriculture and Food Environment **3(1),** 83-92.

Pramova E, Locatelli B, Djoudi H, Somorin OA. 2012. Forests and trees for social adaptation to climate variability and change. Wiley Interdisciplinary Reviews: Climate Change **3(6),** 581-596.

Reinhart C, Reinhart V. 2020. The pandemic depression: The global economy will never be the same. Foreign Affairs September/October.

Soladoye MO, Oni O. 2000. Biodiversity studies at Okomu Forest Reserve in Edo State. A report of the National Agricultural Research Project pp. 128.

Somerville K. 2020. COVID-19 increases the pressure: Botswana's rhino-poaching crisis, global Geneva, Conservation Frontlines **2(3),** pp. 1-9.

Villena-Tejada M, Vera-Ferchau I, Cardona-Rivero A, Zamalloa-Cornejo R, Quispe-Florez M, Frisancho-Triveño Z, Abarca-Melendez RC, Alvarez-Sucari SG, Mejia CR, Yañez JA 2021. Use of medicinal plants for COVID-19 prevention and respiratory symptom treatment during the pandemic in Cusco, Peru: A cross-sectional survey. PLoS ONE **16(9-e0257165),** 1-18.

Waithaka J. 2020. The Impact of Covid-19 Pandemic on Africa's PAs Operations and Programmes. Available online at: https://www.iucn.org/sites/dev/files/content/documents/2020/report_on_the_impact_of_covid_19_doc_july_10.pdf.~Pp44 (accessed August 31, 2020).Google Scholar.

World Health Organization (WHO). 2021. COVID-19 Situation Report, Weekly Epidemiological Report **27,** Pp. 26.