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Effects of deforestation on rural household income in Oyo state, Nigeria

Utjecaj krčenja šuma na prihode seoskih domaćinstava u državi Oyo, Nigerija

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ABSTRACT

The study examined the effects of deforestation on rural household income in Oyo state, Nigeria. The specific objectives include; identification of the types of livelihood activities; identifying the causes of deforestation; and determining the effects of deforestation on household income. A total of one hundred and eighty (180) rural dwellers were interviewed in 2020. We collected the data through the use of questionnaires and focus group discussions and analysed the data with descriptive statistics and ordinary least square regression (OLS). The result shows that the majority (85.5%) of the respondents were farmers. The livelihood activities employed by the rural households include the combination of farming with any of charcoal production and livestock rearing (50%); charcoal business (33%); the gathering of non-timber forest products (14%); and artisanal work respectively (3.3%). The major causes of deforestation were farm expansion (55%), charcoal use (20.6%), building construction (11.7%), and lumbering (3.9%). The regression analysis revealed that farm expansion, charcoal business, and lumbering were found to significantly increase the household income in the study area. The study thereby recommends the adoption of agroforestry for improved livelihoods and to boost household income, energy, food security and this will also reduce deforestation.

Key words: *deforestation; livelihood; household income; agroforestry; Oyo state*

INTRODUCTION - *Uvod*

Forest resources are a key resource base for economic development with the capacity to provide a perpetual stream of income and products while supporting other economic activities such as fisheries and other agricultural activities through its ecological services and functions which are the mainstay of Nigeria's economy, engaging over 70% of the population (BENSEEDS, 2004; Sambe et al., 2018 & Oyetunji et al., 2020). In Nigeria, forests serve as the home for genetic diversity which provides a rich source of medicinal plants, high-yield foods, and a host for other useful products (Sambe et al., 2018). They supply goods such as timber in addition to non-timber products (food, medicine, raw materials, and fuel e.g. fruits, bamboo, chew stick, game) which benefit most communities to meet the requirements of the rural economy and it supports the livelihood of about 20 million inhabitants, particularly in rural communities (Jatto et al., 2021).

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Deforestation is any activity that hinders the forest ecosystem as a result of agricultural and socio-economic activities to attain development (Ibrahim et al., 2015). It affects the economic activities and threatens the livelihood of forest-dependent people by reducing the supply of forest products (Annan, 2013). Unsustainable wood exploitation, agricultural expansion, bush burning, and infrastructure construction, are generally known to be the major determinants of land degradation and deforestation in Nigeria (Oyebo et al., 2010).

The increasing quest for economic development has led to a speedy degradation of the forests in Nigeria. Forests are depleted annually through industrial, commercial, and other urban-related activities. This is accelerating the degradation and depletion of forest resources and is currently impacting the environment. Deforestation is an ongoing occurrence in Nigeria and it is becoming more evident with increasing population and urbanization (Sambe et al., 2018 & Fasona et al., 2018).

In Nigeria, the rate of deforestation seems to have accelerated in recent years. Deforestation estimates for the country have been put at roughly 285,000 hectares yearly (Sims, 2021). It is expected that if this trend is not addressed, about 50% of the nation's forest land area would be depleted by the next decade. Therefore, deforestation has been considered the main challenge to the forest ecosystem in Nigeria (Sims, 2021 & Fasona et al., 2018).

Nigeria's forest land occupies over nine and a half million ha 10% of the total 92,376,700 ha of land area. The Nigeria forest resources that are located in the lowland and highland forests, plantations, and woodlands contribute 2.5 % to the gross domestic product (GDP) and directly or indirectly employ about two million citizens by supplying poles and fuelwoods with more than 80,000 employees engaged in the wood processing industries (Food and Agricultural Organization (FAO) 2014). Oyebo et al. (2010) indicated that about 9% of forest cover in Nigeria remains intact. Large scale logging and wood extraction activities are also important factors of forest degradation in Nigeria. Particularly, the forest plantation where wood with other forest products are exploited has been put to serious encroachments, degradation of vegetation, and put to use for agriculture, urbanization and for industrial development (FAO, 2014). Nigeria is reported to have the highest rate of deforestation all over the world and it is at 5 % with almost 410,000 ha of total forest land loss yearly between 2010 and 2015. Nigeria is also ranked ninth according to wood extraction with about 73,103m³ with 87 % used as fuelwood (FAO, 2016).

In Sub-Saharan Africa which includes Nigeria, and in particular, Oyo state, many rural dwellers are still actively involved in deforestation due to their dependence on fuel wood and other forest products as their major energy source and income (Sambe et al., 2018 & Jatto et al., 2021). Their dependence on these products has therefore contributed to the depletion of the country's forest cover. One essential aspect of the knowledge gap is the limited pieces of evidence on the economic implications of deforestation in the state.

However, the inestimable values of forests in promoting sustainable livelihood cannot be over-emphasized; hence the need for an economic assessment of our environment is necessary due to climate change concerns. Given the aforementioned, this study, therefore, is investigating the effects of deforestation on rural household income in Oyo state, Nigeria. The specific objectives are to identify the types of livelihood activities employed by the farming households; identify the causes of deforestation; and determine the effects of deforestation on the household income in the study area.

MATERIAL AND METHODS - *Materijal i metode istraživanja*

Study area

The study was conducted around the forested areas of Oyo Agricultural Development Zones in Oyo state, Nigeria. The state is in the southwestern part of Nigeria and it is situated between latitudes 7°3'0.26'' N and 9°11'6.10'' N and longitudes 2°42'25.14'' E and 4°33'23.84'' E (NBS, 2012). The climate is characterized by a dry season between November and March; and a wet season between April and October. The average annual rainfall is 1252.5 mm, while the average temperature ranges from 23.2°C to 31.9 °C, almost throughout the year, with an annual mean relative humidity of 59.1% (NBS, 2012). The total land area of the state as stated by NBS (2012) was 2,650,000 ha and the total land area of forest reserves is 342,461 ha with forest reserves accounting for only 12.92% of the total land area (Alo, 2017). The State consists of four Agricultural Development Programme (ADP) zones that are sub-divided into Local Government Areas or Blocks, namely Shaki with nine LGAs/Blocks, Ogbomoso with five, Oyo with five, and Ibadan/Ibarapa with fourteen (Oyo State Agricultural Development Programme (OYSADEP), 2017).

Data collection procedure

The data for this study was collected in 2020. A total of one hundred and eighty (180) rural dwellers were in-

terviewed through the use of questionnaires and focus group discussions. Information sought included the socio-economic characteristics of the respondents; the types of livelihood activities employed by the respondents; the causes of deforestation; and the effects of deforestation on the income.

Sampling techniques

A 4-staged sampling method was adopted to choose respondents. The first stage involved the random selection of three Agricultural Development Programme (ADP) zones out of the four ADP zones in the state. The zones we selected are Ogbomoso, Saki, and Oyo. In the second stage, we randomly selected one Local Government Area also known as ADP blocks from the selected zones. The selected LGAs were Oriire from Ogbomoso Zone, Saki East from Saki Zone, and Oyo East from Oyo Zone. In the third stage, the study randomly selected six (6) villages from the selected 3 LGAs, eighteen villages were selected all together. In stage four there was a random selection of ten (10) rural families in each of the selected villages, making a total of one hundred and eighty respondents for the study.

Analytical techniques and model specification

The data collected were analyzed with descriptive statistics and multiple regression analysis in other to achieve the specific objectives.

Descriptive statistics

Descriptive statistics such as the frequency tables, mean, percentages as well as graph were used to describe and summarize the socio-economic characteristics of the respondents; the types of livelihood activities employed by the respondents; and the causes of deforestation in the study area.

Multiple regression

The model was used to analyze the effect of deforestation on the income of the respondents. It is represented as:

$$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + e_i \quad (1)$$

Where:
Y = Income (Naira)
B_0 = Intercept
B_1-B_7 = Coefficients of the independent variables
X_1 = Farm expansion (Hectares)
X_2 = Charcoal usage (1= yes; 0, if otherwise)
X_3 = Construction (1= yes; 0, if otherwise)
X_4 = Urbanization (1= yes; 0, if otherwise)
X_5 = Lumbering (1= yes; 0, if otherwise)
e_i = Error term

RESULTS AND DISCUSSION –
Rezultati i diskusija

Socio-economic characteristics of the respondents

The result in Table 1 revealed that the majority of the respondents (63%) are males while 37% are females. Also, 38.3% of the respondents are within the age bracket 41-50 years while 19.4% represent the 31-40 age bracket and 21.1% represent the 51-60 years bracket while the rest 16.1 covers the 61 and above age group. This suggests that the 41-50 years age group dominates the most economically active group and this age group tends to get actively involved in deforestation. The majority of the respondents are married (75.5%) while 14.4% are single and 8.9% are divorced respectively.

The majority of the respondents are farmers; they cover 85.5% of the respondents while a few of them (14.5%) is engaged in secondary occupation. This was in line with the report of Jatto et al. (2021) in their study. Also, most of the respondents have been involved in farming for a very long time. Those with about 35 years of farming experience accounted for 29.4% of the respondents while 27.8% have 25 years of farming experience.

The result shows that 68% of the respondents have no formal education while 16% of the respondents have primary education. About 7% of the respondents have secondary education while 9% have tertiary education. This shows that the lack of education makes the respondents get actively involved in deforestation since they may not know the adverse effects of deforestation.

The majority of the respondents (53.3%) have an average household size of 6-10 members while 25.5% of the respondents have an average household size of 1-5 members whereas, 15.6% of the respondents have an average household size of 11-15 members while 5.6% have a household size of 16-20 members. The finding was supported by the National Bureau of Statistics (NBS) report in 2012 that an average rural farm household had about six members. The majority of the respondents (67.8%) secured their land through inheritance while 12.8% of them secured their land through rent. Also, 11.1% of the respondents purchased their land while a fraction of the 6.67 got their land through gifts. Hence the reason why the majority of the respondents get involved in deforestation is due to the claim that they have on the land.

Table 1. Socio-economic characteristics of the respondents

Tabela 1. Socio-ekonomske karakteristike ispitanika

Variables	Category	Frequency	Percentage
Gender	Male	113	63
	Female	67	37
Age (years)	<30	9	5
	31-40	35	19.4
	41-50	69	38.3
	51-60	38	21.1
	>60	29	16.1
Marital status	Single	26	14.4
	Married	136	75.5
	Divorced	16	8.9
	Others	2	1.1
Primary occupation	Farming	154	85.5
	Others	26	14.5
Secondary occupation	Trading	70	38.9
	Hunting	43	23.9
	Artisan	23	12.8
	Others	44	24.4
Farming experience (years)	1-10	5	2.78
	11-20	40	22.2
	21-30	50	27.78
	31-40	53	29.4
	41-50	23	12.78
	51-60	9	5
Educational level	No formal	125	68
	Primary	28	16
	Secondary	11	7
	Tertiary	16	9
Household size (number)	1-5	46	25.5
	6-10	96	53.3
	11-15	28	15.6
	16-20	10	5.6
Source of farmland	Inheritance	122	67.8
	Rent	23	12.8
	Outright Purchase	20	11.1
	Gift	12	6.67
	Leasing	3	1.67
Farm size (hectares)	1-10	51	28.3
	11-20	75	41.67
	21-30	47	26.1
	31-40	6	1
	41 and above	1	0.57

Source: Field survey, 2020

The result shows that 41.67% of the respondents have large farmland of between 11-20 hectares while 28.3% have 1-10 hectares of land. Also, 26.1% have between 21-30 hectares of land while a little fraction of 3.3% of the respondents has more than 40 hectares of land. This indicates that the respondents who have larger farmland tend to deforest more.

Types of livelihood activities employed by the respondents in the study area

Figure 1 shows that the respondents are predominantly farmers and are involved in other livelihood activities. About half of the respondents (50%) engaged in more than two livelihood activities like farming, charcoal, and livestock rearing together; 32.8% of them are in the farming and charcoal business; whereas, 13.9% of them are involved in gathering of non-timber forest products (NTFPs) while a small fraction (3.3%) of the respondents are artisans. This result shows that the respondents are forest-dependent. This result indicates that soon, there could be adverse effects on the inhabitants of the study area if proper and adequate measures are not taken to mitigate these activities.
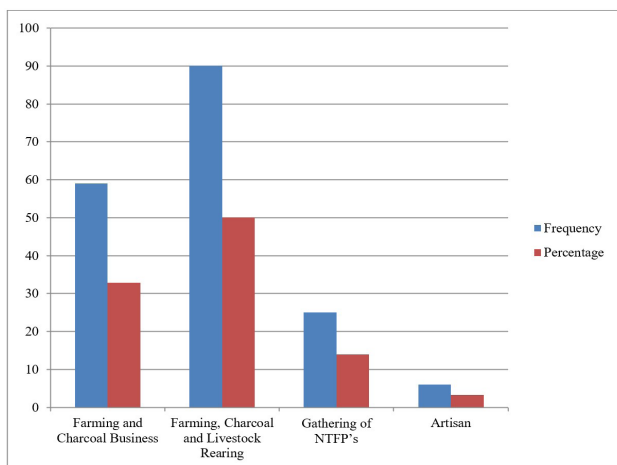

Figure 1: Types of livelihood activities employed by the respondents in the study area
Source: Field survey, 2020

Grafikon 1. Vrsta egzistencije i aktivnosti zaposlenih ispitanika istraživanog područja

Causes of deforestation

Figure 2 reveals that a large percentage of the respondents (55%) deforested because of farm expansion. This is in line with Sambe et al. (2018) that agricultural land expansion is generally viewed as the main source of deforestation contributing to about 60% of the total tropical deforestation. FAO (2016) stated that agricultural expansion is the proximate driver of deforestation

worldwide because humankind has greater technological capacity than ever before to bring about rapid land-use change on a very large scale, albeit with differences in geographical distribution. Also, 20.56% of the respondents get involved in charcoal use. This affirms the findings of Oyetunji et al. (2020) that deforestation is usually caused by timber exploitation, charcoal, and firewood consumption and that these factors are exacerbated by population growth. Others include building construction (11.67%), lumbering (8.89%), and 3.89% accounted for other purposes like the production of herbs, hunting, and bush burning.
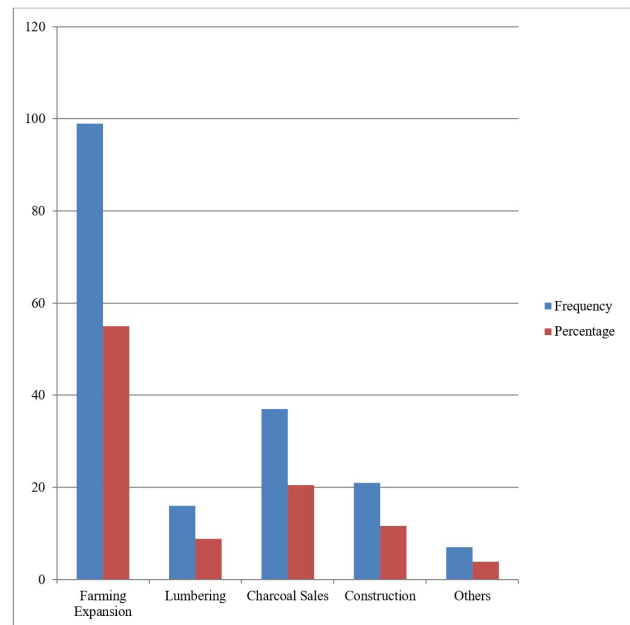

Figure 2: Causes of deforestation in the study area
Source: Field survey, 2020

Grafikon 2. Uzroci krčenja šuma u području istraživanja

The effects of various causes of deforestation on the income of the respondents

Table 2 shows that the R^2 value of the model was 0.4125 implying that the independent variables in the model explained only about 41% of the variability in the household income. From the results of the regression analysis in Table 2, farm expansion, charcoal usage/business, and lumbering are the causes of deforestation affecting the income of the respondents in the study area. This is in line with Osoba et al (2019) that stated that deforestation was identified with the livelihood activities of the people such as hunting, farming and trading of forest products. Farm expansion is positively significant at 5%, that is, the more the people deforest, the more it affects their income. This is in line with Adu et al. (2012) which stated that agriculture contributes to deforestation in the tropics. Also, charcoal usage/bu-

siness has a positive and significant effect at 5% on the income of the farmers; this implies that most of the respondents majorly deforest for charcoal use asides from the primary reason which is farm expansion. On the other hand, lumbering is positive and significant at 10%. The other variables included in the model were construction and urbanization which were found to be insignificant but positively related to household income.

Table 2: The effects of various causes of deforestation on the income of the respondents

Tabela 2. Utjecaj različitih uzroka krčenja šuma na prihode ispitanika

Variables	Regression coefficients	Standard error
Farming expansion	0.241717	0.536404**
Charcoal sales	0.331831	0.0463517**
Construction	0.0115333	0.061504
Urbanization	0.0178356	0.0618546
Lumbering	0.011741	0.0608963*
_constant	11.13972	0.1084988
R^2	0.4125	

Source: Author's computation, 2021
**5% level of significance; *10% level of significance

CONCLUSION - *Zaključci*

The study concluded that the majority of the rural dwellers are primarily farmers with a long farming experience and they belong to an economically active age. The majority of them are males married with large household size and farmland and have no formal education. Livelihood activities such as combinations of farming, charcoal business, livestock rearing, the gathering of NTFPs, and artisanal work are the major occupations. Farm expansion, charcoal production and usage, building construction, and lumbering are identified to be the major causes of deforestation.

It can be inferred that the effects of deforestation on rural household income produce a positive and significant effect in determining the rural dwellers' income. Farm expansion, charcoal business, and lumbering are the major factors influencing deforestation in the study area. However, the study recommends that the Government and other relevant stakeholders should initiate policies aimed at promoting the adoption of agroforestry technologies to augment their productivity and income thereby increasing their standard of living.

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SAŽETAK

U Nigeriji šume predstavljaju bazu genetske raznolikosti koja pruža bogat izvor ljekovitog bilja, hrane visokog prinosa i drugih korisnih proizvoda. Šume pružaju opskrbu drvetom uz brojne nedrvne šumske proizvode kao što su hrana, lijekovi, sirovine i gorivo, npr. voće, bambus, štapić za žvakanje, divljač od kojih koristi ima većina lokalnih zajednica. Studija je provedena u šumovitim područjima zona poljoprivrednog razvoja u državi Oyo, Nigerija. Za odabir ispitanika usvojena je metoda uzorkovanja u 4 faze. Prva faza uključivala je slučajni odabir tri zone Programa razvoja poljoprivrede (ADP) od četiri ADP zone u državi. Zone koje smo odabrali su Ogbomoso, Saki i Oyo. U drugoj smo fazi nasumično odabrali jedno područje lokalne uprave poznato i kao ADP blokovi iz odabranih zona. U trećoj fazi, studije, nasumično je odabrano šest (6) sela, iz odabrana 3 LGA-a, ukupno je odabrano osamnaest sela. U četvrtoj fazi nasumično je odabrano deset (10) seoskih obitelji u svakom od odabranih sela, što je ukupno činilo sto osamdeset ispitanika za potrebe studije.

Deskriptivna statistika kao što su tablice učestalosti, srednje vrijednosti, postoci kao i grafikoni, korišteni su za opisivanje i sažetak socioekonomskih karakteristika ispitanika, vrste životnih aktivnosti kojima se bave ispitanici, i uzroci krčenja šuma. Usvojena je višestruka regresijska analiza kako bi se analizirao učinak krčenja šuma na prihode ispitanika. Rezultat pokazuje da su većina (85,5%) ispitanika poljoprivrednici. Djelatnosti kojim seoska domaćinstva ostvaruju zaradu uključuju kombinaciju poljoprivrede s proizvodnjom drvenog ugljena i uzgojem stoke (50%), posao s drvenim ugljenom (33%), sakupljanje nedrvnih šumskih proizvoda (14%), odnosno zanatski rad (3,3%). Glavni uzroci krčenja šuma bili su širenje farmi (55%), korištenje drvenog ugljena (20,6%), izgradnja zgrada (11,7%) i sječa drva (3,9%). Regresijskom analizom utvrđeno je da širenje farme, proizvodnja drvenog ugljena i sječa drveta značajno povećavaju dohodak domaćinstva u području istraživanja. Može se zaključiti da učinci krčenja šuma na dohodak ruralnih domaćinstava imaju pozitivan i značajan učinak u određivanju prihoda ruralnih stanovnika. Širenje farmi, proizvodnja drvenog ugljena i sječa glavni su faktori koji utiču na krčenje šuma u području istraživanja.

Conflicts of Interest: The authors declare no conflict of interest.