ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25mar625

Impact of Quarrying on the Productivity of Smallholder Arable Crop Farmers in Ebonyi State Nigeria

Ukpai, O.O*; Iheke O.R.

Micheal Okpara University of Agriculture, Umudike

Publication Date: 2025/04/02

Abstract: This study examines the impact of quarrying on the productivity of smallholder arable crop farmers in Ebonyi State, Nigeria. Additionally, it determines Total Factor Productivity (TFP) and the factors influencing productivity. The study also explores the impact of quarrying on productivity. A multistage sampling technique was used to select 120 farmers (60 from quarrying and 60 from non-quarrying areas). Data were collected through structured questionnaires and oral interviews and analyzed using descriptive statistics, TFP formulae, multiple regression and Chow tests. Socioeconomic findings reveal that farmers in quarry areas are typically younger (mean age: 40 years) than those in non-quarry areas (42.5 years). They are predominantly male (73.3% and 61.7%) respectively and mostly have tertiary education. Their farm sizes are small (0.85–1.1 hectares), with most farmers having 1–7 years of experience and supporting households of 4–6 people. In terms of TFP, non-quarry farmers achieved a higher average TFP (1.719) than quarry farmers (1.450), with a large proportion in both areas (78.3% and 63.3%, respectively) registering TFP values between 1.000 and 1.999. Regression results further showed that credit, education, and extension contact were the most significant determinants of TFP, with credit showing positive impacts in both areas, education having a strong effect in non-quarry areas, and extension contact being stronger in quarry areas. Chow's tests confirmed statistically significant differences in TFP levels (F=2.2669, p<0.05), slopes (F=2.2480, p<0.05), and intercepts (F=2.7581, p<0.01), indicating that quarrying adversely alters the relationship between inputs and outputs. The study concludes that small-scale farmers in quarrying areas face significant environmental degradation, affecting productivity. To address these challenges, recommended interventions include improving credit access, strengthening extension services, and enforcing stricter environmental regulations on quarrying to enhance both income and technical efficiency among smallholder farmers.

Keywords: *Quarrying Impact, Total Factor Productivity (TFP), Smallholder Farmers, Agricultural Productivity, Environmental Degradation.*

How to Cite: Ukpai, O.O; Iheke O.R. (2025) Impact of Quarrying on the Productivity of Smallholder Arable Crop Farmers in Ebonyi State Nigeria. *International Journal of Innovative Science and Research Technology*, 10(3), 1880-1877. https://doi.org/10.38124/ijisrt/25mar625

I. INTRODUCTION

A. Background of the Study

The agricultural sector plays a vital role in the growth and development of the economy by contributing significantly to about 23.78% of the Gross Domestic Product (GDP) and offering employment to about 86 percent of rural households and 65-70 percent of the workforce. In January to March 2021, the sector accounted for approximately 22.35% of the total GDP, while over 70% of Nigerians engaged in subsistence farming (FAO, 2021). Development in agriculture is an opportunity to escape rural poverty to making a living, yet evidence-based macroeconomic policies are required. The manufacturing sector also relies heavily on agriculture for inputs, hence the necessity for agro-based industrial goods.

Agriculture is the primary source of livelihood for approximately 61% of Sub-Saharan Africa's rural dwellers and is characterized by small farm holdings (<5 ha) and low productivity (kg/ha) compared to the majority of Asian developing countries (Nchuchuwe & Adejuwon, 2018). Evidence emphasizes agriculture's core role in economic development (Rezek et al., 2018). It is crucial to measure agricultural productivity to establish efficiency, technical change, and management performance (Uka et al., 2021). A majority of smallholder farmers experience decreased productivity due to factors like climate change, postharvest loss, and land degradation. Rural communities hence turn to other livelihoods that include quarrying. Quarrying involves the extraction of non-metallic rocks and aggregates, which in most instances leads to environmental degradation, loss of habitats, and loss of biodiversity (Martínez-Ruiz et al., 2007). Despite their role in fostering economic development, quarry activities negatively impact productive

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25mar625

arable crop production by encouraging land degradation, soil erosion, and air pollution (Eta et al., 2019).

Environmental disturbances caused by quarrying include geomorphological changes, noise pollution, water pollution, and land abandonment (Eshiwani, 2014). The effects reduce soil quality, decrease land fertility, and reduce crop yields (Omosanya & Ajibade, 2011). Studies indicate that quarry dust affects plant growth by suppressing photosynthesis and causing necrosis, chlorosis, and premature leaf fall (Eta et al., 2019). Moreover, vibrations caused by quarrying lead to land instability, which aggravates environmental hazards (Sreenivasa & Reddy, 2014).

Despite numerous studies examining the environmental and socioeconomic impacts of quarrying (Abate, 2016; Asante et al., 2014; Ukpong, 2012), there is limited research examining its direct impact on agricultural productivity. This study aims to bridge the research gap by investigating the impact of quarrying on the productivity of selected crops among smallholder farmers in Ebonyi State, Nigeria.

B. Problem Statement

It has been observed that quarrying in developing countries is usually free from environmental management, which causes extensive ecological degradation (Darwish et al., 2011). In Nigeria, excessive population and low agricultural productivity exacerbate food insecurity (FAO, 2019). Quarrying in Ebonyi State has brought about environmental degradation and reduced agricultural productivity, which poses challenges to food security and economic development. Climate change also threatens food systems in other ways, with projections suggesting an increase in 10% of the people who are food-insecure by 2050 due to reduced crop production, higher prices of food, and ecosystem integrity loss (Oxfam, 2013).

Previous research has explored the roles played by environmental factors, climate change, and policy regimes in shaping food security in Nigeria. Little research exists on the impact of quarrying on farm productivity. While the economic value of quarrying has been identified by studies, it is crucial to understand its trade-offs, particularly on soil fertility, water supply, and agricultural production in Ebonyi State. The objective of this research is to provide empirical evidence on the effect of quarrying on farm productivity and make policy recommendations on how to mitigate its negative effects on smallholder farmers.

C. Objectives of the Study

The study aims to explore the impact of quarrying on the productivity of smallholder arable crop farmers in Ebonyi State. The specific objectives are:

- To outline the socioeconomic characteristics of farmers in quarried and non-quarried areas.
- To determine the total factor productivity and its determinants.
- To examine the impact of quarrying on productivity.

II. RESEARCH METHODOLOGY

A. Study Area:

The research was conducted in Ebonyi State, Nigeria, in the southeastern geopolitical zone. It shares boundaries with Benue, Enugu, Abia, and Cross River states. The state has an area of 5,533 km² and a growing population of 4,816,675 in 2019. Ebonyi State is made up of 13 Local Government Areas (LGAs) and three agricultural zones: Ebonyi North, Central, and South. The primary economic activity is farming, with the dominant crop being rice, particularly in Ikwo, Edda, and Afikpo. Yams, cassava, and palm products are other principal crops. Ebonyi is also rich in mineral resources, including lead, limestone, salt, and marble. Quarrying is also prevalent in Ebonyi, with over 27 quarry sites spread across six LGAs, affecting local farming and the environment.

B. Method of Sampling:

Multistage sampling technique was utilized. Ebonyi South, a zone of intensive quarrying activities, and Ebonyi North, where little or no quarrying activity was carried out, were identified first. Two LGAs (Afikpo, Ivo, Ishielu, and Ebonyi) were purposively selected in each of these zones. Then, three communities from each LGA (six from quarry and six from non-quarry) were sampled, then two villages from each community were randomly sampled, totaling 24 villages. Last but not least, five farmers per village were randomly selected from rosters presented by agricultural extension officers, yielding a final sample size of 120 farmers (60 from quarry and 60 from non-quarry).

C. Data Collection:

Primary data were collected using structured questionnaires and oral interviews. Primary data collected included farmers' socioeconomic characteristics, information on TFP and determinants, and impact of quarrying on productivity. Initial visits helped in the establishment of key contacts for effective data collection. Farmers provided firsthand perceptions, while key informants verified findings.

D. Data Analysis:

Socio-economic characteristics were studied through the application of descriptive statistics i.e. frequency, means, charts, percentage, etc. TFP and determinants of TFP for arable crop farmers were scrutinized using the multiple regression model and TFP equation. Testing between quarry and non-quarry areas to ascertain the effect of quarrying on productivity has been conducted using Chow's test.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25mar625

III. RESULTS AND DISCUSSION

A. Socio-Economic Characteristics of the Respondents

Table 1: Summary of Socio-Economic Characteristics in Quarry and Non-Quarry Areas

Variable	Category	Quarry (Freq, %)	Mean TFP	Non-Quarry (Freq, %)	Mean TFP
Sex	Female	16 (26.7%)	1.403	23 (38.3%)	1.349
	Male	44 (73.3%)	1.467	37 (61.7%)	1.222
Age	20-34	13 (21.7%)	1.034	13 (21.7%)	0.480
	35-49	42 (70.0%)	1.579	32 (53.3%)	1.734
	50-64	5 (8.3%)	1.446	15 (25.0%)	1.375
Mean age		**40**		**42.5**	
Level of Education	No Formal	1 (1.7%)	0.766	5 (8.3%)	0.054
	Primary	3 (5.0%)	0.877	1 (1.7%)	0.069
	Secondary	25 (41.7%)	1.352	16 (26.7%)	0.700
	Tertiary	31 (51.7%)	1.606	38 (63.3%)	1.703
Marital status	Single	11 (18.3%)	1.434	4 (6.7%)	1.365
	Married	37 (61.7%)	1.533	51(85.0%)	1.265
	Divorced/widowed	12 (20.0%)	1.207	5 (8.3%)	1.253
Household size	1-3	20 (33.3%)	1.285	18 (30.0%)	0.765
	4-6	37 (61.7%)	1.516	35 (58.3%)	1.375
	7-9	3 (5.0%)	1.738	7 (11.7%)	2.052
Mean household size		**4.15**		**4.45**	
Primary occupation	Civil Servant	11 (18.3%)	1.498	11 (18.3%)	0.910
	Farming	32 (53.3%)	1.380	41 (68.3%)	1.350
	Trading	17 (28.3%)	1.549	8 (13.3%)	1.362
Farm size (ha)	0.2-1.1	54 (90.0%)	1.489	45 (75.0%)	1.311
	1.2-2.1	4 (6.7%)	1.133	11 (18.3%)	1.118
	2.2-3.1	2 (3.3%)	1.016	4 (6.7%)	1.237
Mean farm size		**0.85**		**1.1**	
Farming Experience	1-7 years	56 (93.3%)	1.441	8 (63.3%)	1.022
	8-14 years	4 (6.7%)	1.550	22 (36.7%)	1.680
Mean experience		**4.5**		**6.6**	
Credit access	No	33 (55.0%)	1.173	32 (53.3%)	0.666
	Yes	27 (45.0%)	1.788	28 (46.7%)	1.963
Cooperative Membership	No	35 (58.3%)	1.265	38 (63.3%)	0.816
	Yes	25 (41.7%)	1.708	22 (36.7%)	2.056
Extension Contact	No	12 (20.0%)	0.943	20 (33.3%)	0.473
	Yes	48 (80.0%)	1.576	40 (66.7%)	1.670

Source: Field survey, 2024.

The result on Table 1 above shows the following facts about the socio-economic characteristics of farmers in the two areas:

In terms of gender, men dominate farming in both quarry (73.7%) and non-quarry (61.7%) areas, in line with studies on land ownership and cultural limitations for women. Men are more efficient in quarry areas (1.467), yet women are slightly more efficient in non-quarry areas (1.349), in support of studies on gender-based efficiency in agriculture. Similarly for age, young farmers (35-49 years) dominate, 70% in quarry and 53.3% in non-quarry. Their TFP is the highest (1.579 in quarry, 1.734 in non-quarry), a balance of experience, physical strength, and adoption of technology. Productivity declines after 50 years as farmers assume supervisory roles. Outcome on education showed that the majority of the farmers have tertiary education (51.7% in quarry, 63.3% in non-quarry), and this translates to higher TFP (1.606 and 1.703, respectively). Those with no formal education have the lowest TFP (0.766 in quarry, 0.054 in non-quarry), corroborating the roles of education in innovation adoption and farm efficiency. Lastly, marital status, revealed that the majority are married (61.7% in quarry, 85% in non-quarry). However, single farmers in

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25mar625

quarry areas (TFP 1.434) and divorced/widowed farmers in non-quarry areas (TFP 1.365) are the most productive, suggesting fewer household responsibilities increase farm dedication. Household Size result shows that most farmers have 4-6 members per household, which boosts labor availability. Most TFP is observed for farmers with the highest household sizes (7-9 members), suggesting more family labor increases farm efficiency. Besides, the result regarding primary occupation reported farming as main occupation (90% in quarry, 75% in non-quarry). The full-time farmers report the highest TFP (1.453 in quarry, 1.682 in non-quarry), while civil servants and traders, farming part-time, report decreasing productivity. Regarding farm size, most of the farmers cultivate on small areas (0.2-1.1 hectares). The quarry farmers have smaller lands (mean 0.85 ha) due to land shortage. Contrarily, the farmers with the smallest landholdings achieve the highest TFP (1.489 in quarry, 1.311 in non-quarry), which suggests that intensive land utilization raises efficiency. Farming experience also saw the majority of the farmers ranging between 1-7 years of experience (93.3% in quarry, 63.3% in non-quarry), indicating a fairly young farming population. The highest TFP is found among farmers with 8-14 years of experience (1.550 for quarry, 1.680 for non-quarry), reflecting the contribution of experience to farm efficiency. Farmers with fewer years of experience are more open to innovation, however, suggesting the need for selective training programs. Noteworthy, concerning access to credit, a great proportion of the arable crop farmers lack access to credit (55% in quarry areas, 53.3% in non-quarry areas), in conformity with studies (Babatunde *et al*., 2017; Akinlade *et al*., 2019) citing financial constraints as a characteristic of Nigerian agriculture. Farmers with access to credit recorded more TFP values (1.788 in quarry, 1.963 in non-quarry) compared to their counterparts (1.173 and 0.666, respectively), indicating that there is a strong positive link between financial access and productivity. Limited credit access remains a key constraint due to perceived lending risk, excessive interest rates, and collateral requirements, which forces farmers to utilize negative informal credit channels. Access to credit makes it possible for investment in quality inputs at the appropriate time, adoption of new practices, and scale economies, which ultimately translates into higher profitability. Also, on membership of cooperatives, while the benefits are many, the majority of the farmers (58.3% in quarry, 63.3% in non-quarry areas) are not members of cooperatives, perhaps due to ignorance or logistical concerns (Ojo et al., 2019; Yusuf *et al*., 2020). The cooperative farmers recorded significantly higher TFP values (1.708 for quarry, 2.056 for non-quarry), suggesting that membership increases productivity due to higher access to credit facilities, inputs, market information, and bargaining power (Adeyemo, 2014; Ibrahim *et al*., 2016). Non-quarry farmers are impacted more positively by cooperative support, which could be due to more effective utilization of resources and government interventions. Eliminating obstacles to membership could boost membership in cooperatives and agricultural performance. Finally on extension contact, the majority of farmers in quarry (80%) and non-quarry (66.7%) areas made contact with extension services, which had a positive effect on productivity. Farmers that made extension contact had higher TFP values (1.576 in quarry, 1.670 in non-quarry) compared to those that had no contact at all (0.943 and 0.473, respectively). This confirms the role of extension services in knowledge acquisition, adoption of improved practices, and efficiency enhancement (Ojo *et al*., 2020; Ibrahim *et al*., 2021). Extension contact increases the adoption of climate-smart agriculture, access to market information, and technical capacity, which finally improves resilience and farm profitability (Adebayo & Oladele, 2018). Productivity and sustainability in agriculture can be further improved by increasing extension programs.

- *Productivity*

Table 2 Distribution of the Total Factor Productivity of Arable Crop Farmers

Total Factor Productivity	Quarry Area		Non-Quarry Area		Pooled	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
0.000 - 0.999	10	16.7	6	10.0	16	13.3
1.000 - 1.999	47	78.3	38	63.3	85	70.8
2.000 - 2.999	3	5.0	16	26.7	19	15.8
Total	**60**	**100.0**	**60**	**100.0**	**120**	**100.0**
Minimum	**0.475**		**0.392**		**0.392**	
Maximum	**2.310**		**2.892**		**2.892**	
Mean	**1.450**		**1.719**		**1.584**	
Std. Deviation	**0.418**		**0.547**		**0.485**	

Source: Field survey, 2024

The result in the above table indicated that farmers in non-quarry areas had a greater mean TFP (1.719) compared to farmers in quarry areas (1.450) with a mean pooled average of 1.584. The statistically significant finding (t = -3.03, p = 0.0031) indicates that environmental degradation problems in quarry areas, such as soil fertility reduction and land degradation, negatively impacted productivity. TFP distribution analysis shows that more farmers in quarry

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25mar625

fields were at suboptimal levels of efficiency, where only 5% of them were above 2.0 TFP levels, compared to 26.7% in non-quarry fields. The findings concur with studies pointing to resource constraints and poor agricultural practices as bottlenecks to productivity (Sadiq *et al*., 2020; Awotide *et al*., 2015). To address these challenges, policymakers must engage in soil rehabilitation, targeted subsidies, and increased extension services alongside increased technology uptake and better input availability to enhance sustainable agricultural productivity.

➢ *Determinants of Total Factor Productivity*

Table 3 Estimate Factors Affecting Total Factor Productivity of the Arable Crop Farmers

Variable	Quarry area	Non-quarry area	Pool data	Pool Date with dummy
Constant	-1.597	-6.893	-3.805	-4.155
	(-2.28)**	(-3.94)***	(-3.13)***	(-4.29)***
Age	0.337	0.999	0.204	0.333
	(1.55)	(1.80)*	(0.54)	(1.11)
Sex	-0.018	-0.240	-0.077	-0.064
	(-0.29)	(-1.46)	(-0.68)	(-0.71)
Marital status	0.071	0.095	0.282	0.083
	(0.91)	(0.51)	(2.20)**	(0.82)
Occupation	-0.015	0.063	-0.020	-0.029
	(-0.44)	(0.64)	(-0.29)	(-0.54)
Household size	-0.063	0.101	0.197	0.154
	(-0.65)	(0.29)	(0.97)	(0.94)
Education	0.031	0.858	0.766	0.745
	(0.60)	(8.02)***	(9.01)***	(10.35)***
Farming experience	0.142	0.179	0.213	0.262
	(1.21)	(1.06)	(1.49)	(2.47)**
Credit access	0.258	0.515	0.347	0.325
	(3.35)***	(2.22)**	(2.27)**	(2.62)***
Cooperative membership	0.078	0.026	0.109	0.089
	(1.04)	(0.11)	(0.73)	(0.75)
Extension contact	0.321	0.142	0.314	0.268
	(4.17)***	(0.57)	(1.95)*	(2.14)**
Farm size	-0.047	-0.041	-0.002	0.008
	(-0.92)	(-0.33)	(-0.02)	(0.12)
Dummy				0.367
				(4.04)***
R2	0.732	0.845	0.712	0.746
Adjusted R2	0.671	0.809	0.683	0.724
F Statistic	11.948***	23.771***	24.271***	33.500***

Source: Field Survey, 2024

The determinants of the Total Factor Productivity (TFP) of the farmers of arable crops in quarry, non-quarry, and pooled data models are credit access, extension contact, and education. Double log functional form was the most appropriate, and the high R^2 values showed that the models accounted for a high percentage of the TFP variation. Credit access emerged as the most significant factor with positive coefficients in all the models. Credit access in the quarry zone had 0.258 ($p < 0.01$) and 0.515 ($p < 0.05$) in the non-quarry zone. The pooled data and pooled data with dummy also had significant effects of 0.347 ($p < 0.05$) and 0.325 ($p < 0.01$), respectively. This result is in agreement with Awotide et al. (2015) that access to credit increases agricultural productivity through the ability of the farmers to invest in vital inputs and technology.

Extension contact positively influenced TFP within the quarry zone (0.321, $p < 0.01$) and in pooled data models (0.314, $p < 0.10$; 0.268, $p < 0.05$), although there are no major impacts in areas free from quarry activities. These results support the claim that extension services are vital for addressing environmental problems. As remarked by Ragasa *et al*. (2016), farmers who utilize extension services are more productive on average because of increased knowledge and better practices. The impact of education is partial; there were no significant impacts in the quarry region, but there were in other areas. The non-quarry contexts produced an impressive coefficient of 0.858 ($p < 0.01$) and stayed significant in pooled models with coefficients of 0.766 ($p < 0.01$) & 0.745 ($p < 0.01$). This is further supported by Asadullah and Rahman (2009), whose findings

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25mar625

demonstrated that education enables farmers to adopt more modern agricultural practices and technologies, thus increasing their productivity.

In addition, a dummy variable (0.367, $p < 0.01$) suggests that some local factors which were not observed, for instance environmental factors, have strong influences on Total Factor Productivity (TFP). This goes in line with what Nkonya *et al.* (2015) claimed that agricultural production is highly positively impacted by favorable environmental conditions.

In general, access to credit was the TFP determining factor that had the highest reliability across all models. Education was significant except in the quarry regions while extension contact was significant except in the non-quarry area. These findings highlight the need for targeted interventions, including improved credit access, tailored extension services, and educational programs, to enhance agricultural productivity in different farming environments.

B. Impact of Quarrying on Agricultural Productivity

Table 4 Impact of Quarrying on Agricultural Productivity

Total Factor Productivity			
Test for differences	**∑e**	**DF**	**F Cal**
Quarrying area ($\sum e1^2$)	2.5531	48	2.2669**
Non-Quarrying area ($\sum e2^2$)	8.9480	48	
Pool ($\sum e3^2$)	14.7600	108	
Test for homogeneity of slopes			
Quarrying area ($\sum e1^2$)	2.5531	48	2.2480**
Non-Quarrying area ($\sum e2^2$)	8.9480	48	
Pool with dummy ($\sum e4^2$)	14.4636	107	
Test for differences in intercept			
Pool ($\sum e3^2$)	14.7600	108	2.7581***
Pool with dummy ($\sum e4^2$)	14.4636	107	

Source: Field survey, 2024

The analysis reveals significant differences in Total Factor Productivity (TFP) between quarrying and non-quarrying areas. The F statistic for TFP differences is 2.2669, significant at the 5% level, indicating that quarrying activities negatively impact productivity, likely due to land degradation, pollution, and resource depletion.

Similarly, the test for homogeneity of slopes ($F = 2.2480$, $p < 0.05$) suggests that the relationship between inputs and productivity varies across the two areas. This implies that factors such as labor, capital, and technology influence TFP differently depending on quarrying activities. Additionally, the test for differences in intercepts ($F = 2.7581$, $p < 0.01$) shows that even with constant inputs, productivity remains lower in quarrying areas, highlighting inherent disparities.

Overall, these findings align with studies by Adeniran et al. (2020) and Aigbedion *et al.* (2007), which emphasize the adverse effects of quarrying on soil fertility, water availability, and ecosystem health, ultimately reducing agricultural productivity.

IV. CONCLUSION

The study therefore concludes that quarry had negative impact on agricultural productivity, lowering the productivity of arable crop farmers. Arable crop production in quarrying locations were less profitable compared to non-quarry areas as could be seen through their total factor productivity. Access to credit, education and extension contact affected TFP of the farmers.

RECOMMENDATIONS

To mitigate the negative impact of quarrying on agricultural productivity, the government and environmental agencies should enforce land reclamation and soil rehabilitation measures. Financial institutions should improve access to credit for affected farmers, while agricultural extension services must be strengthened to provide training on sustainable practices. Education and capacity-building programs should be expanded to enhance farmers' knowledge of modern techniques. Lastly, policy support and stakeholder collaboration are essential to balancing quarrying activities with sustainable agriculture, in order to ensure improved productivity and food security.

ACKNOWLEDGMENT

I wish to express my heartfelt appreciation to my supervisor, Prof. O.R. Iheke, for his encouragement and guidance, whose expert contributions and criticisms added immensely to this study. I also appreciate the Department of Agricultural Economics, Michael Okpara University of Agriculture, Umudike, for making the academic environment and facilities available for carrying out this study.

My deepest appreciation goes to the smallholder farmers in Ebonyi State who participated in this research, kindly granting me access to their time and experiences. Their cooperation made it possible for this research to be conducted. I also acknowledge the cooperation of field

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25mar625

enumerators and research assistants whose dedication facilitated the ease of gathering the data.

Finally, I am also deeply thankful to my friends and family for the never-ending support and encouragement provided during this research experience.

REFERENCES

[1]. Abate, N. (2016). The impact of stone quarrying on the environment and the livelihood of communities in Northern Ethiopia. *Global Journal of Human-Social Science: B Geography, Geo-Sciences, Environmental Science & Disaster Management*, 16(2), 19-30.

[2]. Adebayo, S., & Oladele, O. (2018). The role of extension services in improving agricultural productivity: A case study of smallholder farmers in Nigeria. *Journal of Agricultural Extension and Rural Development*, *10*(5), 112-123.

[3]. Adeyemo, R. (2014). Cooperative societies and agricultural development in Nigeria: A review of their contributions. *International Journal of Social Economics*, *41*(3), 212-228.

[4]. Adeniran, A. W., Adewole, M. B., & Oyejide, O. J. (2020). Environmental impact assessment of quarrying in Nigeria. *Journal of Environmental Management*, 264, 110417. https://doi.org/10.1016/j.jenvman.2020.110417

[5]. Akinlade, R. J., Yusuf, S. A., & Omonona, B. T. (2019). Financial constraints and productivity of smallholder farmers in Nigeria: The role of credit access. *Nigerian Journal of Economic Studies*, *8*(1), 45-58.

[6]. Aigbedion, I., & Iyayi, S. E. (2007). Environmental effect of mineral exploitation in Nigeria. *International Journal of Physical Sciences*, 2(2), 033-038.

[7]. Asante, F., Boakye, J., & Badu-Nyarko, S. K. (2014). Environmental and rural livelihoods implications of small-scale gold mining in Talensi-Nabdam Districts in Northern Ghana. *Journal of Geography and Regional Planning*, 7(8), 150-159. https://doi.org/10.5897/JGRP2014.0453

[8]. Awotide, B. A., Abdoulaye, T., Alene, A., & Manyong, V. M. (2015). Impact of credit access on agricultural productivity: Evidence from smallholder cassava farmers in Nigeria. *Agricultural Finance Review*, *75*(1), 58-74.

[9]. Babatunde, R. O., Olagunju, F. I., & Adejobi, A. O. (2017). Constraints to credit access among smallholder farmers in Nigeria. *African Journal of Agricultural Research*, *12*(14), 1185-1193.

[10]. Darwish, T., Khater, C., & Jomaa, I. (2011). Environmental impact of quarries on natural resources in Lebanon. *Land Degradation & Development*, 22(3), 345-358. https://doi.org/10.1002/ldr.1011

[11]. Eshiwani, F. (2014). Effects of quarrying activities on the environment in Nairobi County: A case study of Embakasi District. *Unpublished master's thesis*, University of Nairobi, Kenya.

[12]. Eta, J. E., Agbor, R. B., & Agbor, G. A. (2019). Effects of quarrying activities on the environment in Calabar Municipality, Cross River State, Nigeria. *International Journal of Research and Innovation in Social Science*, 3(5), 170-175.

[13]. FAO. (2019). *The state of food and agriculture 2019: Moving forward on food loss and waste reduction*. Food and Agriculture Organization of the United Nations. Retrieved from https://www.fao.org/publications

[14]. FAO. (2021). Nigeria at a glance. Food and Agriculture Organization of the United Nations. Retrieved from https://www.fao.org/nigeria/fao-in-nigeria/nigeria-at-a-glance/en/

[15]. Ibrahim, H., Mohammed, A., & Alhassan, U. (2016). The impact of cooperative societies on agricultural development in Nigeria. *International Journal of Development and Economic Sustainability*, *4*(2), 39-51.

[16]. Ibrahim, H., Yusuf, A. I., & Mohammed, A. (2021). Extension services and agricultural productivity: A review of Nigeria's extension system. *Journal of Agricultural Research and Development*, *20*(3), 145-160.

[17]. Martínez-Ruiz, C., Fernández-Santos, B., & Putwain, P. D. (2007). Natural and man-induced revegetation on mining wastes: Changes in floristic composition during early succession. *Ecological Engineering*, 30(3), 286-294. https://doi.org/10.1016/j.ecoleng.2007.04.003

[18]. Nchuchuwe, F. F., & Adejuwon, K. D. (2018). The challenges of agriculture and rural development in Africa: The case of Nigeria. *International Journal of Academic Research in Progressive Education and Development*, 1(3), 45-61.

[19]. Nkonya, E., Mirzabaev, A., & von Braun, J. (2015). *Economics of land degradation and improvement: A global assessment for sustainable development*. Springer.

[20]. Ojo, M. O., Akande, S. O., & Adekunle, W. (2019). Membership of agricultural cooperatives and farm productivity in Nigeria. *African Journal of Agricultural and Resource Economics*, *14*(1), 98-115.

[21]. Ojo, T. O., & Adebayo, S. M. (2020). Agricultural extension services and sustainable farming practices in Nigeria. *African Journal of Sustainable Development*, *10*(2), 67-80.

[22]. Omosanya, K. O., & Ajibade, O. M. (2011). Environmental impact of quarrying on Otere Village, Odeda, Southwestern Nigeria. *OGUAA Journal of Social Sciences*, 4(1), 54-63.

[23]. Oxfam. (2013). Growing disruption: Climate change, food, and the fight against hunger. Oxfam Issue Briefing. Retrieved from https://www.oxfam.org/en/research/growing-disruption-climate-change-food-and-fight-against-hunger

[24]. Rezek, J. P., Campbell, R. C., & Rogers, K. E. (2018). Assessing the role of agriculture in reducing poverty in rural Nigeria. *Journal of Development Studies*, 54(12), 2196-2216. https://doi.org/10.1080/00220388.2018.1469743

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25mar625

[25]. Sadiq, M. S., Mohammed, U. S., & Singh, I. P. (2020). Land tenure security and agricultural productivity: Evidence from Nigeria. *World Development Perspectives, 20*, 100259.
[26]. Sreenivasa, C., & Reddy, K. S. (2014). Environmental impact of soil and sand mining: A review. *International Journal of Science, Environment and Technology*, 3(3), 955-970.
[27]. Udoh, E. J. (2011). Land management and resource-use efficiency among farmers in Nigeria. *Journal of Development and Agricultural Economics, 3*(4), 163-171.
[28]. Uka, N. K., Nwosu, A. C., & Nwachukwu, I. N. (2021). Technical efficiency of smallholder cassava farmers in Abia State, Nigeria: A stochastic frontier approach. *Journal of Agricultural Extension*, 25(1), 14-25. https://doi.org/10.4314/jae.v25i1.2
[29]. Ukpong, E. C. (2012). Environmental and social impact of stone quarrying in Ebonyi State, Nigeria. *World Journal of Environmental Biosciences, 1*(1), 1-9.
[30]. Yusuf, S. A., Omonona, B. T., & Akinlade, R. J. (2020**).** Constraints to cooperative membership and agricultural productivity in Nigeria. *African Journal of Economic Policy, 27*(1), 78-92.