



MITIGATING THE EFFECTS OF GOLD MINING ON FOREST-BASED RURAL LIVELIHOODS IN BIRNIN-GWARI LOCAL GOVERNMENT AREA, KADUNA STATE, NIGERIA

Ogunkalu, O. A^{1,*}, Sulaiman, R.A^{2*}, Adelani, D.O¹, Ogunsanwo, J.A^{3*}, Odeyale.O.C^{4*}.

¹Department of Forestry Technology, Federal College of Forestry Mechanization, Afaka, Kaduna.

² Trial Afforestation Research Station, Kaduna, Kaduna State. (Forestry Research Institute of Nigeria)

³Department of Basic Science, Federal College of Forestry Mechanization, Afaka, Kaduna

⁴Department of Forestry Federal College of Forestry Ibadan, Oyo State, Nigeria

Abstract

This study was carried out to evaluate the mitigations of mining effects on forest-based rural livelihoods in Birnin-Gwari Local Government Area, Kaduna State, Nigeria. Five (5) districts of mining activities were selected within the Government Area. Primary data were generated using questionnaires for this. A total of One hundred and twenty (120) questionnaires were distributed. Results revealed that adults from above 46 years of age were mostly (29.9%) affected by mining in the area. Also, (32.65%) of the affected people had secondary education and were majorly (62.50%) farmers. The negative effects of mining activities on the forest based livelihood activities of the respondents includes: (17.7%) reducing soil fertility > (16.4%) soil erosion effects > (15.3%) loss of Wild animals > (9.1%) scarce forage > (8.0%) loss of NTFPs and reduction in agricultural land. The mitigation measures identified includes: reclamation through state tree planting programme, waste management, water treatment and were achieved via different methods. It was concluded that the mining and exploration of gold poses great dangers to mining workers and neighborhood communities especially whose livelihood activities are forest based. We recommend that emphasis be shifted towards effective utilization of the mined resources in order to minimize the rate of mining induced de-vegetation and deforestation.

Keywords: Mining, Mitigations, Forest-based -livelihoods and Community dwellers.

Introduction

Nigeria is endowed with abundant mineral resources, crude oil, gold, diamond, salt, iron ore, natural gas, phosphate, coal and nickel among others. In Kaduna State, major gold fields are located in several communities including: Birnin-Gwari, Jama'a, Igabi, Kajuru, Kachia, Ikara, Makarfi, Giwa, Sanga and Kagarko (Kaduna State Water Board, 2004). Mineral exploration and exploitation in Birnin-Gwari began in the 1980s, though evidence suggested that local people used traditional methods of mineral mining before the colonial administration.

Mining has a number of activities, each of which has potentially-adverse impacts on the natural environment, society and cultural heritage, the health and safety of mine workers, and communities based in close proximity to operations (Akabzaa, 2000). The alteration to local ecology, especially soil and vegetation constitute costly disruptions on rural communities' livelihoods that depend largely on the land. Therefore, this research seeks to investigate the mitigations of mining activities on forest rural-based livelihoods in Birnin-Gwari Local Government Area, Kaduna State.

Materials and method

Study Area

Birnin-Gwari Local Government Area lies in the Western part of Kaduna State and forms a significant part of the state borders with Zamfara and Kastina States. It lies within the Northern Guinea Savanna. The rainfall ranging between 1000mm-1300mm per annum, the 'sub humid' zone receives an annual rainfall of 600mm-1000mm per annum (KSWB Birnin-Gwari office, 2004). The major occupation in this LGA is farming and livestock production (animal rearing). The coordinate of the study area is described in the table below.

Table1: Mining Community Latitude Longitude

Community	Latitude	Longitude
Old Birnini Gwari	10 ⁰ 39 ¹ N	6 ⁰ 56 ¹ E
Bugai	10 ⁰ 45 ¹ N	6 ⁰ 30 ¹ E
Damari	10 ⁰ 33 ¹ N	6 ⁰ 52 ¹ E
Kungi	10 ⁰ 36 ¹ N	6 ⁰ 44 ¹ E
Dagara	10 ⁰ 31 ¹ N	6 ⁰ 35 ¹ E

Field Survey, 2019

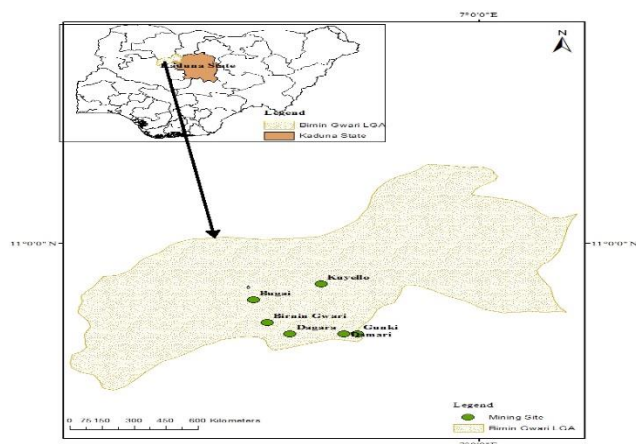


Fig 1: Map of the Birnin Gwari Local Government showing the study Area

Method of Data Collection

Primary and secondary data were used for this study. The primary data were generated through the use of structured questionnaires. Information on land reclamation and mitigation strategies employed in the Study Area was sourced through questionnaires as evidence of reclamation and the extent of corrective measures towards recovering the mined area.

Sampling Techniques

The six disdistricts of gold mining activities in Birnin-Gwari Local Government Area include: Old Birnin-Gwari, Damari, Bugai, Dagara, Kungi and Kuyello. However, Kuyello could not be accessed due to communal crises and insecurity. A total of one hundred (100) questionnaires were used for data collection such that twenty (20) questionnaires each were randomly distributed in each of the five (5) selected districts, and ninety-eight (98) questionnaires were retrieved for statistical analysis.

Data Analysis

Descriptive statistics including graph, frequency table and percentage were used for the data analysis.

Results

Table 2: Demographic Characteristics of the Respondents

S/N	Variance	Frequency	Percentage
1	Age		
	16 – 20	7	7.07
	21 – 25	10	10.10
	26 – 30	13	13.13
	31 – 35	20	20.20
	36 – 40	10	10.10
	41 – 45	10	10.10
	46 & above	29	29.29
2	Education		
	Non-formal	19	19.39
	Primary	29	29.29
	Secondary	32	32.65
	Tertiary	17	17.35
	Adult education	1	1.02
3	Sex		
	Male	88	88.89
	Female	11	11.11
4	Occupation		
	Forestry	18	18.75
	Farming	60	62.50
	Civil service	8	8.33
	NTFPS Collection	1	1.04
	Timber Contraction	1	1.04
	Minning	5	5.21
	Others	3	3.13
	TOTAL	98	100.00

SOURCE: Field Survey, 2019

Table3: Identify Gold Mining Mitigations and Reclamation Strategies in the Study Area

S/N	Mitigation Effect	Mitigation Criteria / indices	(Freq.) Bugai	Kuyello	Damari	O/Birnin- Gwari	Total	Percentage (%)
1	Reclamation	Re – establishment of vegetation	2	3	3	5	13	18.06
		Refilling of opened pits	4	3	4	6	17	23.61
		Slope and topography modification	3	6	4	5	18	25.00
		Organic soil amendment	4	5	3	5	17	23.61
		Cultivation of tolerant species (Rehabilitation)	2	7	1	2	7	9.72
		Total						72
2	Waste Management	Alternative use of dug out soil from gold mining for other purpose	6	4	4	6	20	32.26
		Land use classification (Local)		1	2	2	5	8.06
		Digging of water – way (erosion ways)	3	1	4	6	14	22.58
		Barigation and Isolation of stream use for gold washing	4	2	-	6	12	19.35
		Alternative use of dugout soil for road construction	2	5	1	3	11	17.74
		Total						62
3	Water Treatment	Addition neutralizing agent to mine polluted well	3	2	2	4	11	25.00
		Legislation against consumption of gold polluted water	2	4	3	6	15	34.09
		Isolation and barigation of mining polluted stream	-	1	-	2	3	6.82
		Organic treatment of polluted water (Using plant product)	4	2	4	5	15	34.09
		Total						44
4	shutting by laws and local pressure	Shut – down of mining operation monitoring	4	2	6	3	15	32.61
		Establishment of post -closure supervision	5	4	-	6	15	32.61
		Seizing of license from gold mining	7	2	-	7	16	34.78
TOTAL							46	100

SOURCE: Field Survey, 2019

Table 4: NEGATIVE EFFECTS OF GOLD MINNING ON RURAL BASED FOREST DEPENDANT LIVELIHOOD ACTIVITIES

LOCATION	LFS		LWA		ERSN		SOF		RFW		LNTFPS		LAT		EMV HT		Poor Fruit		LTPDTS		AOA		Total	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	Percentage (%)	
BUGGAI	5	20.8	8	20.8	5	20.8	3	12.5	1	4.2	1	4.2	1	4.2										100
OLD B/GWARI	9	14.1	6	14.1	8	12.5	7	10.9	4	6.3	5	7.8	5	7.8	4	6.3	4	6.3	7	10.9	5	7.8	100	
DAGARA	3	11.5	4	15.4	7	26.9	1	3.8	2	7.7	2	7.7	2	7.7	1	3.9	1	3.9	2	7.7	1	3.9	100	
BAMARI	5	20.0	5	20.0	3	12.0	2	8.0	2	8.0	3	12.0	3	12.0	0		1	4.0	1	4.0			100	
KUNGI	8	21.6	4	10.8	6	16.2	3	8.1	4	10.8	3	8.1	3	8.1	2	5.4	1	2.7	1	8.1			100	
TOTAL	30		27		29		16		13		14		14		7		7		13		6		100	
PERCENTAGE	17.1		15.3		16.4		9.1		7.4		8.0		8.0		4.0		4.0		7.4		3.4		100	

KEY:

- LFS = Loss of Fertile Soil
- LNTFPS = Loss of Non Timber Forest Products
- LWA = Loss of Wild animals
- ERSN = Erosion
- LAL = Loss of Agritile Land
- LTPATS = Loss of Timber products
- RFW= Reduced Fuel Wood
- SOF = Scarcity of Forest
- ED = Excessive Dryness
- PF = Poor Fruiting
- AOA = Lost of Agricultural Land

Discussions

Characteristics of the Respondents

Results of the socio-economic characteristics of the respondents are represented in table 2. Respondents within the age of 46 and above were the highest (29.9%) among the age categories in the study area. This is followed by those between the ages of 31 and 35 representing 20.20% of the population. Respondents of the ages 21 -25, 36 - 40 and 41- 45 each represented 10.10% of the population. It could be deduced from this study that the majority of the respondents are between the age of 46 and above. This age group of respondents are those whose daily activities are directly associated with the studied environment; farming, mining, fishing, hunting and marketing activities. Moreover, these categories of people are full of responsibilities of caring for their families. Hence, they are the group whose sources of livelihood were mostly affected positively or otherwise by mining activities. Regarding the educational distribution of the respondent, a good number of the respondents had secondary education (32.65%), about (29.59%) of the respondents had primary education, 17.35% of the respondents had tertiary education. This indicates that the majority of the people living around and or whose work (involved) directly or indirectly with mining operations are literate, Although, this does not mean that majority of the respondents are educated or literate enough to know the implication of mining on their environment whether socially, culturally and ecologically. Hence, their consciousness of its financial benefits makes the respondents concentrate on this activity; this is why they damage the environment the more in sourcing for money in order to maintain their socio- economic and financial wellbeing even at the expense of ecosystem.

Result shows that majority of the respondents are male and this represent 88.89%. This is an indication of the tedious nature of the job, it is the reverse of the popular saying “what a man can do a woman can do better” as only few women with petty trading, farming etc were identified. Though, this does not mean that mining doesn’t contribute to the socio-economic wellbeing of female respondents in terms of income generation. Occupationally, the majority of the people living in and around the mining site are farmers, this represent 62.50% of the population. Many of these people, especially the able men among them also partake in other activities either as job men in mining, and those who intermittently engage in mining to support their major source of livelihood, this because the communities are dominated by low income earning peasant farmers whose major livelihood activities are being affected. About 18.75% of them were miners, dealing with mineral extractions (majorly gold), while 5.21% of them were foresters. Others were civil servant, NTFPs collectors, and timber contractors represent 5.21% and 1.04% of the surveyed population.

Negative impacts of Gold mining activities on Rural Based Livelihoods Activities

The negative impacts of gold mining in the various districts selected for this study were similar, ranges from; loss of wild animals, loss of soil fertility, erosion, scarcity of forage, reduction of fuel wood, loss of other Non Timber Forest Products, loss of Agricultural land, environmental heat, and mining induced bad weather. Though, the extent to which the respondents reacted to the experience of these effects were differs from district to the other. See table 3 above.

The gross analysis of the negative impact of gold mining on the livelihood activities of the respondents is expressed in percentages in table 4 above. In the overall, majority of the respondents (17.7%) identified the major impact of mining as reducing soil fertility > (16.4%) soil erosion effects > (15.3%) Loss of Wild animals > (9.1%) scarce forage > (8.0%) loss of NTFPs > and reduction in land size for farming activities > (7.4%) stated loss of timber and reduction in the availability of fuel wood , (4.0%) environmental heat, the remaining (4.0%) relates the effects of gold mining to bad weather (8.0%). Loss of soil fertility was the greatest, this could be traced to combined effects of deforestation, de-vegetation and the excavation of soil surface, which later resulted in erosion which not only led to the washing away of topsoil but also exposure of heavy metals. These exposed heavy metals are washed (and or) blown down the streams leading to pollution of water bodies which has detrimental effects on aquatic and terrestrial lives dependent on the streams. This concurs with World Bank, (1995) which stated that the principal environmental hazards caused by small-scale mining activities are mercury pollution from gold processing and land scarcity. Cobgina *et al.*, (2012) also reported that generally, occupant children and adults are at risk of exposure to mercury in shallow dug-wells and dugouts in the Nangodi area which is very destructive to human life. Essumang *et al.* (2007) , Obiri *et al.* (2010) Paruchuri *et al.* ((2010) reported that in recent times, there have been cases of waterlogged pits, soil erosion, pollution of fresh vegetables and food items, rivers and other source of drinking water for communities in mining area. **Identified Mitigation Strategies in the Study Area.**

Four (4) major mitigation strategies were identified in the study areas. These major identified strategies include: i) Reclamation, ii) Waste Management, iii) Water Treatment, iv) Closure by Laws and Local Pressure. These mitigation strategies were achieved through different methods in the five districts.

Reclamation strategies: This was achieved through several methods, the methods include; refilling of open casts or pits, topography modification, organic soil amendment, and re-vegetation. Above eighteen percent (18.06%) of respondents identified re-vegetation as their way of reclaiming the old mined area, 23 .61% of them recognized refilling of open pits as the reclamation strategy used for mitigating the effects of gold mining on humans and her environment, 25.00% used slope and topography modification. Organic mineralization or amendment of the polluted soil was reported by 23.61% of them, while above nine percent (9.72%) of them reclaimed mined site through the cultivation of tolerant species such as: *Khaya senegalensis*, *Azadirachta indica*, *Mangifera indica*, *Eucalyptus camaldulensis* etc

Waste Management: There were several methods of waste management techniques employed in the area. Some of these include the alternative use of dugout soil for other purposes (32.26%). For instance, in road construction, block molding as revealed by them, 8.06% of the respondents identified that the area where gold was dominated have been purely designated for mining purposes while agriculture and residential area were classified out of the mining surrounding. Over (22.58%) of the respondents identified

digging of waterways and the channelization of the mined – site run-off to designated dam and isolated river normally used for gold washing in order to protect other adjacent water body and farmland from pollution. Above nineteen percent (19.35%) of them states the isolation of rivers where mined gold is normally washed as a way to mitigate the negative effect of mining in the study area.

Water Treatment: Based on the investigation, results show that (25.00 %) of the respondent identified the addition of neutralizing agent to mine polluted wells, 34.09 % attested to the use of legislation to guide against the consumption of gold mining polluted well and another 34.09 % percent usually applied organic method of water treatment on their source of useable or drinkable water due to the hazardous effect of mining on the community dwellers.

Also, shutting down by laws and local pressure was adopted in the study area. More than thirty-two percent of the respondents identified the use of local laws to shut down mining operations. Fifteen percent (15.00%) of them identified establishment of -post-closure supervisory teams, 34.78 % of them recognized the forceful termination) of mining license by the Government due to the activities of the pressure groups within the mining communities as measures towards mitigating the effects of gold mining.

Conclusion

From the results of this study, it could be concluded that the mining and exploration of gold pose great dangers with potential health risks to mining workers and neighbourhood communities, especially those whose livelihood activities are forest based such as; fuel wood collection, sources of herbs, fruits and seed gathering, harvesting of timber and other wood types, collection of non-timber forest products etc. Also, Government, individuals and mining companies displayed various mitigations and correctional efforts towards minimizing the effects of mining. Despite these efforts, the effects of mining on forest-based livelihood activities in the study area are still enormous.

Recommendation

Emphasis should shift towards effective utilization of the mine resources to minimize waste. This could be achieved by enhancing the local miners to have sophisticated sorting equipment, and also educating the miners on how to convert the enormous wastes to by-products. The miners should be sensitized to cover the open pit after mining to reduce mining-induced danger to vegetation, inhabitants and the neighbourhood of the mining location. Safe disposal of unavoidable waste in a stable and aesthetically acceptable structure must be enforced through legislation.

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