RESEARCH ARTICLE

Illegal gold mining, land degradation and food security in Nigeria: a case of Yauri, Kebbi State, Nigeria

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Abstract: Illegal gold mining and land degradation can affect food production negatively. This study examines the impacts of illegal/surface gold mining and land degradation on food security in Yauri, Kebbi State. Data for this study were collected from both primary and secondary sources. A total of 250 copies of questionnaire were administered to the respondents in the study area using systematic random sampling technique. Chi-square (Goodness of Fit test) was used to test the relationship between illegal surface gold mining and land degradation/food productivity in the study area. Descriptive statistics such as simple percentages, graph and frequency among others were used to analyze the data. The findings revealed that there is significant relationship between illegal/surface gold mining and land degradation/food productivity. 97.1% used farmland as their mining site and 98.4% dumped tailings and mining waste on the land. The result further showed that more than 96% of the respondents abandoned farming activities for illegal gold mining. This finding indicates loss of farm labour which may result to food insecurity in the study area. The study therefore recommends that constitutional provision should be tailored towards empowering states to control and extract whatever minerals deposited within their domain for the overall economic benefit of the citizenry.

Keywords: Land degradation, Food security, Mining, Gold, Environmental degradation

Introduction

Nigeria faces huge food security challenges. About 70 percent of the population lives on less than N 100 (US\$ 0.70) per day, suffering hunger and poverty. Despite its reputation as petroleum resource-dependent, Nigeria remains an agrarian economy. The sector provides over 40% of gross domestic product (GDP) with between 60 and 70% of the population productively engaged in farming. But large regional differences exist. For instance, in the southeast, 22% of the people live in rural areas with most of them engaged in non-farming activities (Chinedum, 2012). Nigeria has about 79 million hectares of arable land, of which 32 million hectares are cultivated. Over 90% of agricultural production is rain-fed. Smallholders, mostly subsistence producers account for 80% of all farm holdings. Both crop and livestock productions remain below potentials. Inadequate access to and low uptake of high quality seeds, low fertilizer use, inefficient

production systems and land degradation due to mining among others lead to this shortcoming.

Over the past century, global food production has more than kept pace with human population growth, but there are worries about whether we will be able to maintain this space. Soil scientists reported that about two-thirds of all agricultural lands show signs of degradation. Biotechnology and intensive farming techniques responsible for much of our recent production gains however, which are too expensive for the farmers. In a world of food surpluses, the United Nations estimates that some 850 million people are now chronically undernourished, and at least 60 million face acute food shortages due to natural disasters, conflicts, or land degradation resulting from mining and other anthropogenic activities (Cunningham and Cunningham, 2007).

According to Olorunfemi and Jimoh (2000), man is essentially a geomorphologic agent that has continuously exploited environmental resources to his advantage with so much disregard to the emerging stress and consequently problems. Man, also has the ability to put a parcel of land into a number of uses. Indeed, a given parcel of land is often confronted with

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a number of competing uses. The general consequence is that, Landuse mixes tend to occur depending on different preferences. But as the process of subjecting a parcel of land mass into various use commences, soil and vegetal resources become degraded. These soil resources for example become exposed. The exposure hardens up the soil and it sometimes loses some of its nutrient status. The net effect of this development is a downward trend in agricultural development. Further, the vegetal resources may be completely wipe out of existence (extinction) and at times may lead to a total destruction of the ecosystem and farm land.

Generally, mining affects all the components of the environment and the impacts are permanent/temporary, beneficial/harmful, repairable/irreparable, and reversible/ irreversible. However, impacts produced by illegal mining activities are felt most by the ecology, land and atmosphere. These environmental impacts are perhaps of greatest concern to many observers of the mining sector. Farm lands are destroyed; the fertile top soils and microorganism are severely damaged making agricultural production impossible.

Surface Mining, which refers to a method of extracting minerals from the earth by their removal from an open pit or borrows, requires a large tract of land for its operations (Wikipedia, 2008). This is the type of mining perpetuated by the illegal gold miners in the study area (figure 1 and 2).

Definitions of food security abound, but essentially, food security is access by all people at all times to the food required for a healthy life (Frankenberger, 1990; Von Braun, 1991). However, increasing food prices arising from declining farm productivity have reduced the economic access of the poor to the minimum

quantity of food required. Consequently, 550 million people in the world were food insecure in 1989 (World Food Commission, WFC, 1990). This number increased to 800 million in 1994 (IFPRI, 1995), thereby making a 45 % increase in less than a decade. Worse still, it was realized that food insecurity, like malnutrition breeds at the highest rate in South Asia and the sub-Saharan Africa (SSA) including Nigeria, thus indicating that hunger might remain a major challenge confronting the world by 2020 (Oyekale, 2001). As possibilities for expansion of agricultural land are limited, this would imply taking in use marginal lands (Biswas, 1994). Therefore, an increase in food production is necessary per hectare of arable land. Currently, there is increased attention for environmental degradation impact on food productivity and it has been an important issue during the 1996 FAO World Food Summit. Land degradation then leads to reduced productivity. This has the effect of increasing land shortage still further, and thus leads to more and more food insecurity. Most of the countries are experiencing rapid population growth coupled with minerals exploration and extraction through nonscientific and environmentally degraded methods. Hence, they have to cultivate increasing areas of available land, ranging from arable land to all other types of soil. In so doing, natural vegetation is destroyed and replaced by cultivated fields. Thus, with constant farming and mining, a once fertile land loses its fertility. As a consequence, there is loss in productivity which has resulted in food insecurity in many parts of the world.

This study attempts to examine the impacts of illegal/surface gold mining and land degradation on food security and productivity in Yauri, Kebbi State, Nigeria.

Figure 1: Excavation and Destruction of Land during Surface Gold Mining in Yauri

Land Degradation and Food Security

Land degradation has negative connotations that imply the loss of something of value within the environmental economic system (Gretton and Salma, 1997). The lost value may be related to the productivity of the land for agriculture, the environment as a host to naturally occurring species of Flora and Fauna or to the environment as a place for other human activities such as mining, secondary industries, human habitation and waste assimilation.

Land degradation as defined by Abdi, Glover and Luukkanen (2013), is the result of complex interrelationships between biophysical and socio-economic issues which affect many people and their land, especially in the tropics and developing countries. According to the authors, the term land degradation involves both soil and vegetation degradation.

Figure 2: Photograph showing how Natural Land and water have been degraded due to Gold Mining in Yauri

Figure 3: Shanty Settlement of Miners in Yauri

A number of theories have been put forward as the fundamental cause of land degradation. McConnell (1983) asserts that soil erosion is a result of rational

farm decision making. A rational producer, maximizing the discounted net revenue from land over time would not respond to soil loss until the present

value of marginal private returns obtained from additional soil loss goes below the implicit marginal private cost of soil loss. The net value from land consists of two components which are the present value of the revenue stream and the present value of the terminal value off the land. According to Miranowski (1984), soil erosion, not only affects future productivity but also the terminal value. The presence of large external cost (off-site costs) is neglected in the private decision. The rationale for policy intervention arise in two contexts, (a) where off-site costs are significant, (b) where the on-site land degradation effect is not transparent to the owner. However, land degradation has received widespread debate at the global level as evidenced in the literature: (UNEP, 1992, Johnson and Lewis, 1995; Oldeman et al; 1992, Middleton and Thomas, 1997; Maingnet,1994; Lal et al, 1997). At least two distinct

schools have emerged regarding the prediction, severity, and impact of land degradation. One school believes that it is a serious global threat posing a major challenge to humans in terms of its adverse impact on biomass productivity and environmental quality (Dregne and Chou, 1994). Ecologists, soil scientists, and agronomists primarily support this argument (Eswaran, Lal and Reich, 2001). The second school, comprising primarily economists, believes that if land degradation is a severe issue, why market forces have not taken care of it. Supporters argue that land managers (farmers) have vested interest in their land and will not let it degrade to the point that it is detrimental to their profits (Crosson, 1997). The authors further maintained that the term degradation or desertification refers to irreversible decline in the biological potential of the land (figure 2).

Figure 4: Heaps of rock waste and tailings generated and land degradation as a result of mining activities in Yauri

Study Area.

Yauri Local Government is located southward on the eastern bank of the famous River Niger at about 200 kilometers away from Birnin Kebbi, Kebbi state capital. It falls within latitudes 10° and 30° N of the equator and longitudes 3° and 6° E of the Greenwich meridian (Figure 3). The south and western part of the study area share boundary with Niger and Zangareo states respectively. The study area covers about 3,380

square kilometers (1,306 sq. miles) as reported by Frank (1980).

Yauri enjoys a Tropical Continental type of climate of which according to Köppen-Geiger climate classification is 'Aw' (Tropical Climate). This is largely controlled by two air masses, namely Tropical Maritime and Tropical Continental, blowing from the Atlantic and the Sahara Desert respectively (Minka and Ayo, 2013).

Figure 5: Study Area

Source: Ministry of Land and Survey, Kebbi State/Google

Methodology

Data for this study were collected from both primary and secondary sources. Primary sources of data include questionnaire and interview. A total of 250 copies of questionnaire were administered to the people, mostly farmers and miners in the study area using systematic random sampling technique, however, 245 copies of questionnaire were retrieved and analyzed. The instrument was designed using multiple choice options. Data from secondary sources include journals, periodicals, text books and internet materials. Goodness of Fit test or Chi-square was used to test the relationship between illegal surface gold mining and land degradation and food productivity in the study area. Descriptive statistics such as simple percentage, graphs and frequency among others were

used to analyze the data obtained from the field survey.

Results and Discussion

The profile of respondents as presented in table 1 shows that 100% of the illegal gold miners are male. The study revealed that only men are involved in this kind of business in the study area. This finding may be due to cultural and religious affinity of the community which restrained women from engaging in strenuous economic activities during their reproductive age. It is observed that in this part of Nigeria, men are regarded as the bread winner while the women are not allowed to engage in any economic activities. They are basically home makers taking care of the children and their husbands. Furthermore, majority of the miners are youth between the age brackets of 12 – 18 (24.5%), 19 – 25 (25.3%) and 26 – 35 (21.6%) respectively. However, most of the gold miners are illiterates.

Table 1: Distribution of Respondents by Socio Economic Characteristics

Demographic Characteristics		Frequency	Percentage
Sex:	Male	245	100
	Female	0	0.0
Age:	12 – 18	60	24.5
	19 – 25	62	25.3
	26 – 35	53	21.6
	35 – 45	50	20.4
	46 and above	20	8.2
Education:	None	75	30.6
	Primary	96	39.2
	Secondary	73	29.8
	Tertiary	1	0.4
Marital Status:	Married	148	60.4
	Single	97	39.6
Occupation:	Illegal Gold Mining	194	79.2
	Farming	34	13.9
	Trading	16	6.5
	Civil Servant	0	0.0
	Others	1	0.4
Years of Illegal Mining Activities:	1 – 3	65	26.5
	4 – 6	93	38.0
	7 years and above	87	35.5

Source: Author's Field Survey, 2017.

30.6% representing 75 respondents do not have formal education, 39.2% attended primary school while only 29.8% have secondary school education. This implies that illegal gold mining do not required any skills or educational attainment. The study also revealed that majority of the respondents (79.2%) are gold miners, while very few are farmers (13.9%) and petty traders (6.5%). In the same vein, many of the miners have been doing the illegal business for over 7 years (35.5%) while only 38.0% of the respondents engaged in the business for 4 – 6 years during the period of study.

Economic and Social Dynamics in the Illegal /Surface Gold Mining Community

The economic and social dynamics of the respondents is showed in table 2, the result revealed that mass influx of people migrated to the illegal gold mining community (96.3%).76.3% of the immigrants are gold miners from other communities while 39.2% are job seekers looking for employment.

Table 2: Economic and Social Dynamics in the Illegal Gold Mining Community

S/N Economic& Social Dynamics	Yes	%	No	%
1. Mass influx of people into the gold mining community	236	96.3	9	3.7
2. Majority of the immigrant are gold miners	187	76.3	58	23.7
3. Job seekers also moved into the illegal gold mining community	96	39.2	149	60.8

4. Majority of miners were formally farmers	215	87.8	30	12.2
5. Social vices (prostitution, drug Addiction, pilfering etc.) are observed among the gold mining community	238	97.1	7	2.9

Source: Author's Field Survey, 2017.

The study also revealed that 87.8% of the gold miners were farmers who abandon their farming activities for illegal gold mining. This indicates a marked reduction in farm labour, thus ultimately reducing food productivity which may lead to food insecurity in the study area. Many respondents (97.1%) also observed social vices such as prostitution, drug addiction and pilfering among others in the illegal gold mining community. Further investigation showed that majority of the people lives in shanties and shacks in the gold mining community (see figure 3) indicating high level of poverty. This implies that abject poverty is one of the major factors that motivate people to go into illegal gold mining in the study area.

Impacts of Illegal/Surface Gold Mining on Agriculture and Food Security

The negative impacts of illegal and surface gold mining on agriculture and food security cannot be overstressed. Table 3 shows that majority of the respondents (97.1%) used farm land as their mining site thereby destroying the fertile soil in the study area (figure 4). 98.4% representing 241 respondents confirmed that excavated soil and tailings were dumped on the farm land. These finding simply that farming activities cannot be practiced were these tailings are being dumped. This action can impact negatively on food security by reducing food crops production in the study area.

Table 3: Impacts of Illegal Gold Mining on Agriculture and Food Security

S/N	Effects of Gold mining	Yes	%	No	%
1.	Used farm land as mining site	238	97.1	7	2.9
2.	Dumped excavated soil on farm land	241	98.4	4	1.6
3.	Dumped the excavated soil anywhere	108	44.1	137	55.9
4.	Excavate farm land which result into deep Pit during gold mining	213	86.9	32	13.1
5.	Left farming for gold mining	236	96.3	9	3.7
6.	Mining activities reduced soil fertility and affect farmland negatively	226	92.2	19	7.8
7.	Illegal gold mining activities do not allow farmers to cultivate the land	198	80.8	47	19.2

Source: Author's Field Survey, 2017.

Table 3 also revealed that farmlands are excavated resulting in deep pit during the process of gold mining (see figure 1). Agricultural activities cannot be practiced in such degrading environment. The destruction of natural ecosystem and soil structure are overwhelming in the study area. It was observed from the study that mining activities reduced soil fertility and affect farmland negative (92.2%). This finding confirms the result of the study conducted by Cunningham and Cunningham (2007). Furthermore, the result showed that 80.8% of the respondents agreed that illegal gold mining activities do not allow farmers to cultivate the farm land. This is a major setback for agricultural activities and food production in Nigeria. 96.3% of the respondents abandoned

farming activities for illegal gold mining in the study area. This finding indicates that food production is seriously impeded which may result to food insecurity in the study area.

Reasons for High Preference for Illegal Gold Mining to Farming

Opinions of respondents were sought on the reasons why the residents prefer illegal gold mining to farming in the study area. Table 4 revealed that majority (50.6%) engaged in gold mining due to quick financial benefits and lucrative nature of the business compared to farming with slow financial turnover. 25.3% confirmed that illegal gold mining does not required

formal skill or training. This finding supports the reason why illiterates and school dropout are attracted

and formed the major labour force in the illegal gold mining activities (see table 1).

Table 4: Reasons for High Preference for Gold Mining to Farming

Reasons for Gold Mining	Frequency	Percentage
Make more money in gold mining then farming	124	50.6
No regulation and control	9	3.7
No initial capital required	34	13.9
Does not require formal skill or training	62	25.3
Free entrance and exit into the business	16	6.5
TOTAL	245	100

Source: Author's Field Survey, 2017.

Table 4 also showed that 13.9% representing 34 respondents indicated that illegal gold mining does not require initial capital to invest in the business. This makes it easy for many people mostly those with low educational qualification to engage in surface gold mining freely in the study area.

Finally, very few respondents (6.5% and 3.7%) confirmed free entrance and exit and no regulation and control respectively in the illegal mining activities. This indicates that government is not showing interest in the control and regulation of solid minerals exploration and mining in the study area.

The Relationship between Illegal/Surface Gold Mining and Land Degradation /Food Productivity in the Study Area.

The above relationship is tested using chi-square or Goodness of Fit test with the procedure enumerated as follows;

Step 1. Hypothesis Testing:

Ho: There is no relationship between illegal/surface gold mining and land degradation/food productivity in the study area.

H1: There is relationship between illegal/surface gold mining and land degradation/food productivity in the study area.

Step 2. Test Statistic

$$X^2 = \sum \frac{(O-E)^2}{E}$$

Table 5: chi-square calculation

	LD	FI	EP	SV	Total
Yes	81 74.4*	53 58.8*	62 60.6*	16 18.2*	212
No	4 7.7*	9 6.1*	6 6.3*	3 1.9*	22
Undecided	1 3.9*	6 3.1*	2 3.1*	2 0.9*	11
Total	86	68	70	21	245

*Expected Value

$$X^2 = \sum \frac{(O-E)^2}{E}$$

$$X^2 = 11.89$$

The statistical calculation of the chi-square using the formula $X^2 = \sum \frac{(O-E)^2}{E}$ is done using the variables on table 5, where:

LD = Land Degradation, FI = Food Insecurity, EP = Environmental Pollution, and SV = Social Vices

Step 3. Determination of Critical Value

The degree of freedom (df) = 4-1 = 3

Therefore, using Chi-square distribution table at 0.05 with Degree of Freedom(df) 3, the result is 7.815. This is the critical value or table value.

Step 4. Decision Rule

- a. If $x^2 > 7.815$, H_0 should be rejected
- b. If $x^2 < 7.815$, H_0 should be accepted.

Conclusion and Recommendations

Nigeria food security is threatened by the activities of illegal mineral exploration and mining that dots the landscape in many states. Apart from the negative effect this solid mineral exploration and mining have on food production, the soils and the natural environment are also destroyed. Ecosystem is being disturbed, soils are exposed to degrading agents, forest resources are facing extinction, and social vices are on the increase. Many studies have confirmed that illegal gold mining affects food production, food security and promote land degradation.

Environmental degradation has become a major global concern for human survival. According to the World Commission on Environment and Development (WCED), the future is to face an ever-increasing environmental decay, poverty, hardship and pollution. In the light of this, it is imperative for the government to articulate legislation that will prohibit illegal mineral exploration and mining in Nigeria.

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Since the calculated Chi-square (x^2) 11.89 is greater than the table value (critical value) of 7.815, the null hypothesis (H_0) is therefore rejected. The alternative hypothesis (H_1) which is, there is significant relationship between illegal/surface gold mining and land degradation/food productivity in the study area is accepted. This result affirms that the activities of illegal surface gold mining culminates to land degradation and low agricultural productivity and food insecurity in the study area. This is in line with the study carried out by Poku (2016) on the effects of illegal small-scale mining on crop production in Amanse Central, Ghana which reported that gold mining result to land degradation and poor crop production due to soil pollution and destruction of fertile agricultural land and the ecosystem.

It is also recommended that monitoring and enforcement unit should be establish in both state and federal ministries of environment, if in existence should be strengthened with equipment and financial support to enable such unit carry out effective monitoring and enforcement so as to curb illegal mining and land degradation in the country.

Furthermore, statistics should be made available through empirical research on the available solid minerals deposit and their economic values in the country. This will provide quick evaluation and motivate the government to explore and mine these minerals for the benefit of the citizen.

Finally, constitutional provisions should be tailored towards empowering states to control and extract whatever minerals deposited within their domain for the overall economic benefit of the people. This will enhance effective control by the state government and illegal exploration and extraction will be minimized.

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