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The Impact of Gold Mining on Pastoral Communities Livelihoods in Butana Locality, Gedarif State, Sudan

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Abstract
This study was carried out in Butana locality at Gedarif State-Sudan during the period (2018-2020). The aim of this study was to assess the impacts of gold mining exploration and activities on local pastoral community livelihoods. A questionnaire were designed to obtain data about gold mining and its impact on local community livelihoods. Four villages namely (Al-Bougaa, Al-Rubdaa- Abo-Golaa and Al-Tkoon) were selected through Random sampling technique from the total villages about (54) surrounding the gold mining sites. (60) households were randomly selected which constituted about (10%) of the total number of households in these villages, which approximately about (600) families. Data was analyzed using Statistical Package for Social Sciences (SPSS) software version (20) and descriptive statistical methods were applied. The results showed that, the main source of income for the head of household was animal rearing (83.3%), (60%) of respondents were herding sheep, (68.3%) of respondents were practice grazing in sedentary pattern .Also the result indicated that (58.3%) of them in mining sites agreed that there are negative impacts of gold mining exploitations on rangeland soil, while (33.3%) of respondents stated that soil degradation occurs in the form of accelerated water erosion. The study concluded that there are negative impacts of gold mining exploitations on rangeland soil and vegetation cover. These could led to soil degradation and water erosion. Therefore, the study recommended that the awareness of local communities across the active mining areas should be increased in the study area.

Keywords: local communities, Al-Tkoon, gold mining, soil degradation, pastoralist

Introduction

Gold mining has been an important source of livelihood for rural communities throughout the world (Hinton *et al*., 2003; Mudd, 2007; Phillipson, 2006).Mining is a major economic activity in many developing countries (Tauli-Corpus, 1998; UNEP, 1997). Operations, whether small or large-scale, are inherently disruptive to the environment (Makweba *et al*., 1996), producing enormous quantities of waste that can have deleterious impacts for decades (UNEP, 1997). The environmental deterioration caused by mining occurs mainly as a result of inappropriate and wasteful working practices and rehabilitation measures. Rangelands are used for hard rock mining, such as gold, copper, silver, or zinc, which benefits the economy of surrounding communities. Water coming from rangelands generates hydroelectric power. Mining and extraction of coal, oil, and natural gas are important energy resources gained from rangelands**,** (Mosley, 1985)**.** The first gold amalgamation activities in Sudan were done by British small–scale mining companies in Red Sea Hills and Northern Sudan, when they were intermittently operating during 1904–50s. Recently, gold mining is found in 14 states of Sudan. An operation was carried out by 91 big

companies and 590 small ones prospecting for gold in 106 sites (Khartoum Journal, 2013). Work in gold mines involves the use of simple manual tools of shovels, pickaxes, hammers, chisels and pans in both surface and underground environments (Aryee *et al*,. 2003). As a result of separation of South Sudan in 2011 and loss of petroleum money which contributed (50%) of the GPD, the contribution of gold to national economy has come at the right time to save the economy from collapse. By 2014, traditional gold mining contributed about 90% of the gold mining industry in the country (Sudannow, 2014; African Mining Brief, 2014). However, regardless of such an economic gain, traditional gold mining has negative impacts on the of miners, local, and a miner levels. The gold rush in Sudan has also resulted in massive migrations which triggered conflict over the land ownership in the recipient areas (Vivian, *et al.*, 2011). The rangeland of Al-Sobag area, of Butana were exposed to several problems, the most important of which were the mining activities that were practiced in its lands without controls, which made them vulnerable to environmental degradation and retrogression. This study will try to assess the impacts of gold mining on socio-economic aspects of local communities in Butana locality – Gedarif state.

Materials and Methods

Study Area

The study was conducted in Gedarif state in the eastern Sudan specifically Butana locality. Butana, is one of seven localities that all combined forming Gedarif state. These are Fashaga, Faw, Gallabbat East, Gallabbat West, Gedarif, Rahad and Butana locality. It lies between between latitude (13 N up to 16 N) and longitude (34 E to 37E) within an area of 34000 km2, (Dong *et al*., 2011).

Data Collection

The primary data were collected through field visits and observations that were done in the study area in October 2018, in order to assess and quantify the impact of gold mining activities, besides the general characteristics of local communities and livelihood in the study area. Structured questionnaire was designed to collect information from the household about the impact of gold mining on socio-economic aspects in the study area. Different issues were addressed that included; personal characteristics, education, pattern of rangeland use, types of structure species, sources of income, impact of gold mining activities on household livelihoods, animals and rangeland. Four villages namely (Al-Bgaa, Al-Rbdaa, Abo-Joola and Al-Tkoon) were randomly selected around the gold mining activities in the study area, the total number of villages (54) they selected by Butana project. The sample unit was a household head and the sample was selected according to population size in each village. A total of (60) Households randomly selected which represent about (10%) of the total number of households in these villages, which approximately about (600) families. The secondary data and information's were collected to cover the review of literature from different sources which includes textbooks, scientific paper, reports and previous study. Other sources include internet and documents on gold mining.

Data Analysis

The data were analyzed using the Statistical Package for Social Sciences (SPSS) software (Ver.20) by computing descriptive statistics. The results were presented using frequency and percentages. The chi square test was performed to test significant of differences between respondents viewed. Data presentation was done through charts and graphs.

Results and Discussions

Local Community characteristics

Age Groups of the Respondents

Figure (1) shows that, there were highly significance differences at ($P<0.000$) among the household according to their age grouping. The largest percentage (33.3%), of respondents ages range between) 31- 40) years. fallowed by (26.7%) of those ages over 50 years, (25%) of those aged between(20-30) years and the lowest percentage of those aged between (41-50) years who represented(9%). This shows that majority of the respondents within working age and is still productive; this might be as a result of their occupation which requires an active age group.

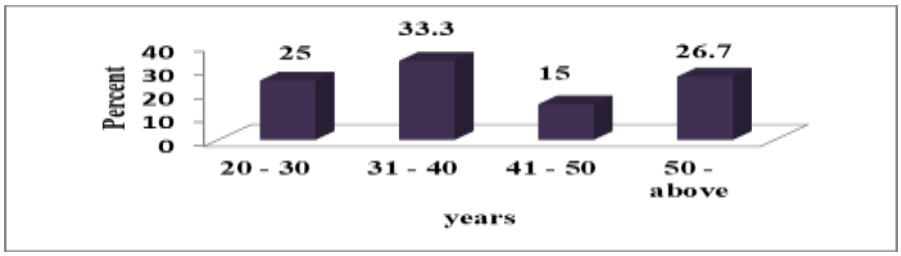

Figure (1) Age Groups of Respondents

Education Level of Local People at the Study Area

Results represents in Figure (2) showed that there were highly significant differences at (P<0.000) among respondent according to their education level. Most of the respondents at education level up to the primary or basic level, (46.7%) followed by illiteracy and Khalwa, they similar percentage (18.3%), then secondary (13.3%) and university (3.3%), which indicates that the education levels is very high compared to illiterate. It is clearly positive that a growing number of children went to school in the area. This may be, explained the fact that almost all the communities in the study area care about importance of education for their children. These results indicate the possib-ility of raising environmental awareness among the respondents in order to understand the environmental risks resulting from gold mining on natural resources, especially natural rangelands. Durmuş-Özdemir, (2016), reported that the education is significant in understanding the hazards that threaten the environment and suggesting solutions for such risks and raising awareness on environmental matters.

Figure (2): Education Level of Respondents

Livelihoods Activities of Household in Study Area

Results represent in Figure (3) showed that there were highly significant differences at (P<0.000) among respondent in the study area, based on their opinions about the source of their income. The majority of them was depending on livestock raising and crops production. The main source of income for the head of household was animal rearing (83.3%), this may be explain that, respondents were depend mainly on herding animals, followed by (76.7%) of them depend on rain fed agricultural activities, then about (33.3%) were traders and (30%) were involved recently in gold mining activities, specially the respondents in villages within the active mining sites they agreed that the positive impacts of mining exploitations are construction of houses and infrastructural development like Al-Rubdaa village. In this regard, Meaza and Demssie, (2015) inferred that gold mining has positive and adverse effects on livelihoods of local communities, landless youths and migrants.

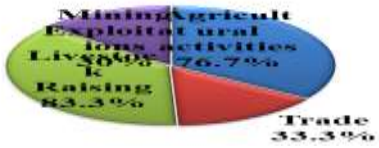

Figure (3): Main Sources of Income in the Study Area

Grazing Patterns Practiced at Butana Area

The results in figure (4) showed that there were highly significant differences at (P<0.000) among respondents about the grazing patterns that practices by households in the study area. The majority of respondents (68.3%) were practice grazing in sedentary pattern, because the whole area was a rangeland belonging to the popular, with some areas used for cultivating sorghum and some vegetables to meet their need for food and local utilization of residues crops as forage for animals, while (18.4%) of respondents were nomadic, flowed by (13.3%) were semi-sedentary. The reasons behind the settlement of nomads is one of the indictors of the recent changes in the study area, due to declining in livestock numbers, water services, and repeated drought. Also they settled because they lost their main assets (animals) due to socio-political marginalization.

Figure (4): Grazing Patterns Practices by Households in the study area

Gold Mining Activities in Al-Sobag Area at Butana Locality

Starting Time of Gold Mining Exploration

The results in Figure (5) showed that there were highly significant differences at (P<0.000) among respondents' opinions. The majority (66.7%) of respondents said they were starting and practice of gold mining activities in study area since the year (2009-2010) up to know, which almost 10 years ago and (30%) of them were practices of gold mining activities for five years ago. This result indicate in more recent years the pastoralists were involved in gold mining and exploration activities in 2009 in order to diverse sources of income and improve their livelihoods. Pringle, *et al*, (1990) stated that, mining activity occurs very widely over relatively small areas of the rangelands. However, it is an intense land use which can create significant off site effects. Mining activity is not a general factor influencing every pastoral business. However, where mining activity occurs on a pastoral lease it can have a negative impact on the pastoral business, quality of life for the pastoralist and the rangeland resource.

Figure (5): Starting Period of Gold Mining Exploration and Extraction by Households

Methods Used for Exploitation of Gold mining in Butana area

The results in figure (6) showed that there were highly significant differences at (P<0.000) among respondents about gold methods. It is clear that majority of respondents (60%) were used traditional and simple tools and mechanize methods in the processing and extraction of gold, followed by (35%) used traditional method, wile (5%) of them used of machines. The result

indicated that there are two types of workers they used both traditional tools and some kinds of machines, those who work individually or work under the umbrella of an investor, group of investors, and companies. These processes reduced the amount of agricultural land available and pastoral activities in the surrounding areas used by local people considerably. This result agreed with (Aryee *et al*. 2003) who stated that work in gold mining operations involves the uses of simple manual tools of shovels, pickaxes, hammers, chisels and pans in both surface and underground environments.

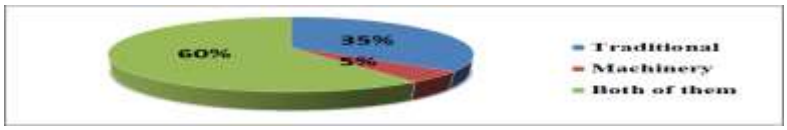

Figure (6): Types and Methods of Gold Mining Exploitations in the study Area

Impact of Gold Mining Exploitation on Soil at Butana Area

The results in figure (7) showed that there were highly significant differences at (P<0.000) among respondents about the effect of gold exploitation in rangeland soil. The majority of respondents (58.3%) within the active mining sites agreed that there are negative impacts of gold mining exploita-tions on soil of rangeland, in forms of big pits, which usually begins with the removal of the vegetation cover used both the surface and deep soil for mining, followed by (48.3%) of them answered that its clear in loss of soil fertility, while (33.3%) of respondents said that soil degradation occurs in the form of accelerated water erosion and (28.3%) of them said that soil degradation sign as Sand dune .Thus, badly controlled of gold mining methods and activities can destroy soil and living resources leaving behind. Gold mining exploitations had affected land degradation make a serious problem in study area. These results reflects negatively on vegetation cover, biomass productivity and vegetation diversity in Butana rangeland. According to the (USDA, 2000) which stated that, soil quality on rangeland can effects plant production, reproduction, mortality, erosion, water yields, water quality, wildlife habitat, carbon sequestration, vegetation changes, establishment and growth of invasive plants and rangeland health.

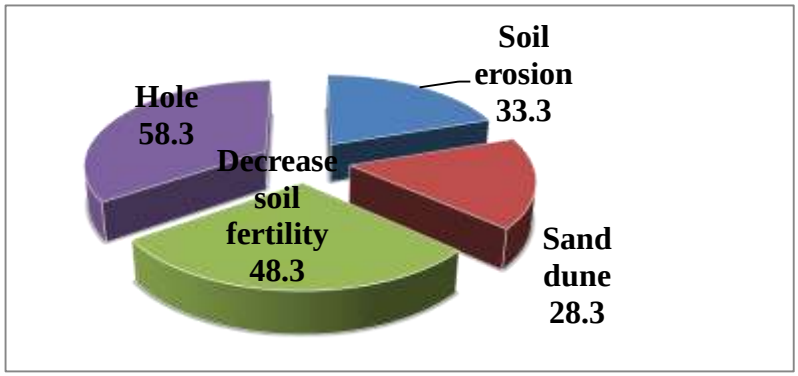

Figure (7): Impact of Gold Mining Exploitation on Soil in the Study Area

Impacts of Gold Mining on Livestock at Study Area

Figure (8) showed that there were very high significant differences at (P<0.0001) among respondents between their opinions about the impacts of gold mining activities on livestock in the study area. According to their opinions the study revealed that about (95%) of respondents

agreed that gold mining activities affected negatively on the animal production pattern related to problems facing livestock husbandry. (53.3%) said that the impact clear in decreased of rangeland areas followed by (46.7%) answered that it reflected in forms of water and air pollution and diseases with same percentages. Also about (45%) of the respondents mentioned that the impacts results in leg broking and mortality of animals, while (25%) of the respondents agreed that impact comes through change in composition and structure of vegetation cover. This result agreed with Peterson and Heemskerk, (2002) whom reported that the vegetation cover was transformed into intensive gold mining areas. (11.7%) respondents said that the effect of gold mining comes through reducing and blocking of animals routs, which often lead to severe conflicts between pastoralist and farmers and more complex for free movement of livestock in the study area, therefore the nomadic using means of transport in the movement of animals. These results explains that there are several problems facing livestock in the study area especially in villages within the active mining sites as a result of gold mining exploitations but diseases and water quality had been experiencing changes in the color and taste of water the main problem across the study area.

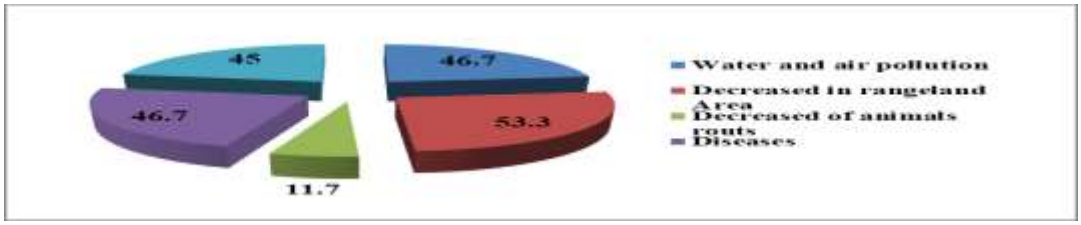

Figure (8): The Most Common Effects on Animals in the study area

Impacts of Gold Mining on the Health of Community:

According to the results showed in figure (9) indicated that there were highly significant differences at (P<0.000) among respondents opinions regarding to community health. The majorities of respondents (85%) said that mining exploitation had impacted negatively in human health. (45%) of them agreed that gold mining had promoted the spread and growth of these diseases such as malaria, diarrhea and typhoid fever by were the main threats to community health in the localities. These could be due to the fact that the miners are leaving pits with water which form breeding grounds for mosquitos which in turn bringing malaria across the localities. Also (56.7%) of respondent said that gold mining exploitation had brought about changes in the color and taste of their water by pollution. Both man and animals can be seriously, and indeed fatally, affected by pollution from these sources, particularly by heavy metal contamination of drinking water. Another impact mentions by (26.7%) of respondents was the possibility of contamination by cyanide and other liquids that would mix with surface water and hence pose a danger for both humans and animals. (20%) of them stated that toxic dust fall out as the result from gold mining operations and extraction lead to death of vegetation, crops and livestock can result and the effects on public health can also be serious. These results similar to Stephens and Ahern, (2001) who studies of surface mining focus on coal, granite and rock mining and health risks related to dust breathing. In all levels of mining health risks occur with dust exposure,

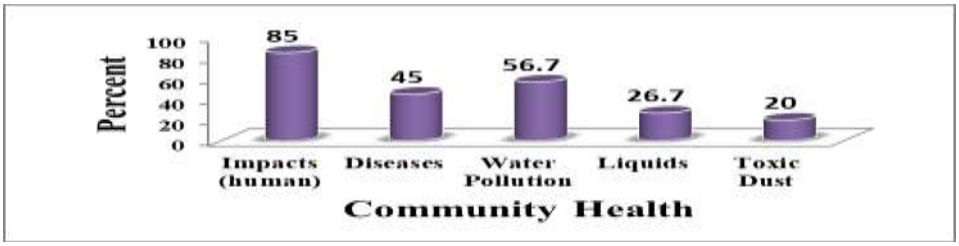

Figure (9): Impact of Gold Mining Exploitation on Community Health:

Other Causes of Rangeland Degradation in Butana area:

According to the results in figure (10) which showed that there were highly significant differences at (P<0.000) among respondents in term of others causes that lead to degradation of rangeland resources in Butana area. The majority of respondents (90%) mentioned that there are majors other reasons than gold mining activities causes degradation of rangeland resources in forage production in particular, (63.3%) respondents answered that shortage of rain fall and distributions is rank one of the main causes, followed by (43.3%), said that the degradation comes due to seasonal fire, about (40%) agreed that expansion of rain-fed agriculture, also more than 30% of them explained that conflicts over resources due to high competition between different users and only (6.7%) said that the sign of rangeland resources degradation are very clear as indicated of increased settlement and population pressure in the study area in recent years. These results agreed with (fashir,2014), which report that rangeland degradation by many reasons, due to that a large numbers of pastoralists have migrated from their villages searching water and fodder; in addition to that many local people abandoned the animal breeding due to low income, inefficiency production, and poor production system and rangeland degradation. In consequence the pastoralists face increasing poverty, decreasing food energy and conflicts among land users. On the other hand, the population increase in the area associated with increasing demand for food production in rangeland, resulting in more pressure on the rangeland resources. Similarly other studies (Meier *et al.* 2007) highlight that decreased vegetation is associated with growth of pastoral conflict in the Africa. Meadows and Hoffman, (2003), who stated that, it is important to consider the potential impact of changing climates, especially with respect to rainfall distribution and quantity.

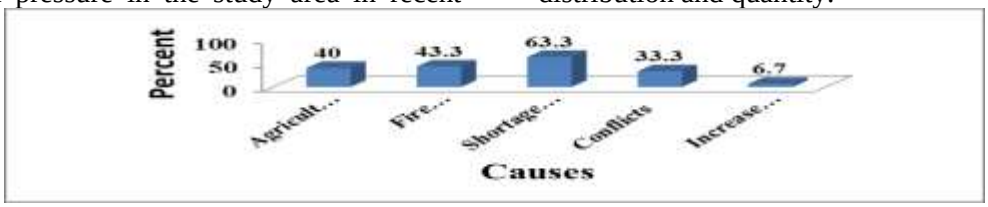

Figure (10): Other Major Causes of Rangeland degradation in Butana area

Conclusions:

It is concluded that there are negative impacts of gold mining exploitations on soil of rangeland, clear in forms of big pits, which usually begins with the removal of the vegetation cover used both the surface and deep soil for mining, led to soil degradation and water erosion. Gold mining activities affected negatively on the animal correlated the problems facing livestock and human health.

Recommendations:

✓Formation of strong laws and regulations at local communities' level for planning and managing gold mining sites.

✓An integrated land use plan should be devised in the study area.

✓Increasing livelihood opportunities such as small-scale agricultural industries at the villages could reduce land disturbances induced by gold mining activities.

✓Raise the environmental awareness of the local community of Butana area towards the environmental risks of gold mining, and its negative impacts on natural resources and human health.

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أثر تعدين الذهب على سبل كسب عيش المجتمعات الرعوية

– محلية البطانة – ولاية القضارف

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المستخلص

أجريت هذه الدراسة في محلية البطانة بولاية القضارف – السودان خلال الفترة من (2018–2020م). هدفت الدراسة الي تقييم آثار أنشطة التنقيب عن الذهب على الجوانب الاجتماعية والاقتصادية وسبل كسب العيش للمجتمعات المحلية. إعتمدت طريقة جمع المعلومات بصورة أساسية علي المعلومات الاولية والتي اشتملت على الزيارة الميدانية و المسح الاجتماعي والاقتصادي للمجتمعات المحلية التي تسكن حول مناطق التعدين للذهب لمعرفة الخصائص الشخصية المميزة بجانب الأنشطة الاقتصادية التي يمارسونها بإتباع منهجية البحث النوعي وكذلك جمع البيانات المتعلقة بالتعدين عن الذهب وتأثيره على الجوانب الاجتماعية والاقتصادية لمعيشة الأسر. اختيرت عدد أربع قرى (البقعة ، الربداء – أبوجولة والتكون) بصورة عشوائية من مجموع القرى المحيطة بالمواقع المتأثرة بأنشطة تعدين الذهب لتمثل مجتمع البحث. بناء علي ذلك تم تصميم استبانة استهدفت عدد (60) رب أسرة حيث أخذت عن طريق العينة العشوائية المنتظمة والتي تمثل نسبة (10٪) من إجمالي عدد الأسر في هذه القرى حوالي (600) أسرة تقريبا. تم الحصول علي المعلومات الثانوية لتغطية أدبيات البحث من مصادر مختلفة والتي شملت الكتب، المجلات، التقارير والدراسات السابقة والإنترنت. كذلك تم تحليل البيانات الاجتماعية والاقتصادية باستخدام برنامج الحزمة الإحصائية للعلوم الاجتماعية (SPSS) (الإصدار 20.0) عن طريق حساب الإحصاءات الوصفية. تم عرض تحليل النتائج في شكل تكرارات ونسب مئوية بالإضافة للمخططات والرسوم البيانية. أظهرت نتائج تحليل الدراسة بان غالبية الأسر في منطقة الدراسة يعتمدون بشكل أساسي في دخلهم علي تربية ورعاية الحيوانات بنسبة (83.3٪)، كما وجدت الدراسة ان نسبة 60٪ يمتلكون الأغنام والغالبية العظمي منهم بنسبة 68.3٪ يمارسون الرعي المستقر في القري. كذلك أشارت النتائج الدراسة إلى أن نسبة (58.3٪) من المستجوبين بالقري المتأثرة بالتعدين أمنوا علي وجود أثار سلبية واضحة على تربة بينما 33.3 % منهم أكدوا تدهور للتربة في شكل التعرية المائية. خلصت الدراسة الي الي أن هنالك تأثيرات سالبة لاستخراج الذهب علي تربة المراعي والغطاء النباتي مما أدي الي تدهورها عن طريق التعرية المائية. أوصت الدراسة بضرورة رفع الوعي البيئي للمجتمعات المحلية في مواقع التعدين من خلال البرامج الارشادية بالتركيز علي الجوانب السالبة.