

Participation on Traditional Gold Mining and Its Impact on Natural Resources, the Case of Asgede Tsimbla, Tigray, Northern Ethiopia

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Abstract

Since the fall of Derg regime (after 1991) private participations in mineral prospecting, exploration and development activities have been encouraged in Ethiopia. Consequently traditional gold mining (panning technique) has received a boost to become source of livelihood and employment for many landless and unemployed citizens and important source of hard currency. This research was initiated to assess the status of participation and evaluate resulting impacts on natural resources in Asgede-Tsimbla. Instruments including interviews, questionnaires, discussions, observations and reviewing of existed evidences were employed. Inference from data analysis indicated that majority of the traditional gold miners were youths (below 35 years old), unemployed (80%), and landless (90%). They use very traditional equipments and arbitrary approaches yielding inevitable natural resources degradations. Depletion and pollution of water resources, land disturbances and sever soil erosion, vegetation and biodiversity loses were the serious threats of traditional gold mining. The government and the local communities have to come up with toothed and sustainable strategies to make it environmentally friendly with optimum benefits. Further studies were also recommended on impact of traditional gold mining on water quality and downstream communities.

Keywords: Gravitational concentration, Dolla, artisanal mining

1 Introduction

The geologic feature of Ethiopia which ranges from oldest (Precambrian) to recent volcanic and sedimentary formation is rich in many precious minerals. The oldest (Precambrian) rocks host most of the economic metallic mineral deposits that include primary and secondary enriched (placer) gold. Before 1991 especially in the Derg regime, private investment was not allowed in the mineral sector rather governmental institutions

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were given the right to explore and develop the mineral wealth of the country, Ethiopia. As a result the sector has been contributing less to the economy of the country. But, As a result of the political change that took place in 1991, a new market oriented economic policy was introduced in the country. Accordingly, the government promulgated a new mining proclamation and mining income tax proclamations to encourage the participation of private capital in mineral prospecting, exploration and development activities.

Followed this, many artisanal, small scale and large scale miners have established in the country, Ethiopia. The No. of people dependant (direct and indirect beneficiaries) on the mining sector has increased to more than five(5) million ($> 5,000,000$) people (EMM, 2012).The traditional gold mining (panning technique) has received a boost in Tigray in the last two decades followed the new government policies where miners are encouraged to peg claims and operate legally. The intensive traditional mining of gold has been concentrated more in eastern, south eastern, central, north western and west zone of Tigray. These areas are mostly drain to Tekeze River Basin and Mereb River Basin.

The mining operations are generating income for the unemployed youths and subsidizing the lively hood of poor farmers of the region. Moreover, it is considered as means of generating hard currency for the country, Ethiopia. But, these miners are mostly unskilled, underequipped and not knowledgeable and have no appreciation of the environment. They use very traditional equipments and arbitrary approaches resulting inevitable impacts on the natural resources. The objective of this research was to assess the status of participation on traditional gold mining and its impacts on natural resources.

2 Materials and Methods

2.1 Area Description

This study was done in Tigray regional state of Ethiopia specifically Asgede Tsimbla, Asgede Tsimbla is one district in north western Tigray ($14^{\circ}42'$ to $14^{\circ} 11' N$ and $37^{\circ}34'$ to $38^{\circ} 19' E$). It is bordered by Tekeze River in the southern side (Genzebu, 2009). The agro - climate of the district hot to warm semi arid low lands, hot to warm sub moist lowlands and tipped to sub moist mid high lands. The area has uni-modal pattern (June – September) with a total annual rain fall ranging from 500 – 750 mm. The mean annual temperature ranges between 20 to $25^{\circ}C$ with an altitudinal 800 – 2300 m.a.s.l. the vegetation type of the district are Accasia Commiphora woodland, Combretum Terminalia woodland, riparian woodland and dry ever green mountain woodlands (Zenebe *et al.*, 2012)

Based on the census in 2007, the district owns about 135,621 total populations of which 69,143 were men and the remaining 66,478 were women. 10,111 (7.46%) of the population was urban dwellers (CSA, 2007). With an area of 2815.05 sq km, Asgede Tsimbla has population density of 48.18 persons per sq km. The sample enumeration by the CSA in 2007 indicated that only about 21, 495 farmers in the district, who held an average of 1.27 ha of land. Of the 27,406 ha of private land surveyed more than 89% were cultivated land, 6.86% fallow land ,2.5% pasture land, 1% wood land and 1.73 % was devoted to other uses. The district is also very popular in traditional gold mining operations and becoming important source of gold for the national bank of the country, Ethiopia.

2.2 Methods used

The study was mainly qualitative although some quantitative research methodology was also used in data gathering and analysis. Views, opinions and attitudes of people concerning traditional gold mining and its impact on natural resources was collected through instruments including interviews, observations, questionnaires and reviewing of existed evidence. Interview with local people, traditional gold miners, governmental and nongovernmental officers and experts guided by semi-structured questionnaires was made to generate the needed data. Stratified random sampling technique was employed to identify the 180 respondents. Further discussions were made to the case of benefit flows, characteristics of mining, impacts on natural resources and its governance through consultation meetings and focus group discussions with local administrators, village chiefs, counselors and other local stakeholders. Unpublished reports from governmental offices (water and mining offices, Agriculture and rural development offices, finance and planning offices and commercial bank of Ethiopia) were processed as source of data. Field observations and continuous follow up were also important source of data. Information provided by partners and field organizations was recorded as their perceptions and later used to cross-check data provided by artisanal miners.

3 Result and Discussion

3.1 Participation on Traditional gold mining

The result proved that the participation of people in Asgede Tsimbla on traditional gold mining was downscaled to the households of a family. In general speaking though variations in number of households which participate in traditional gold mining, there was no family which didn't participate in traditional gold mining practices in the district. Majority of the traditional gold miners were youths (below 35 years old), unemployed (80%), landless (90%) and below elementary school completed educational status (>85%). The gender composition of the traditional gold miners was also found to be 3male to 1female. The operations were known with both legal and illegal miner operating systems.

Table 1: Intensity of Participation on Gold Mining in Seasons

Participation	Seasons				
	Summer	Autumn	Winter	Spring	
Full time participant	Frequency	158	32	8	151
	Percentage (%)	87.78	17.78	4.44	83.89
Part time participant	Frequency	22	146	172	29
	Percentage (%)	12.22	81.11	95.56	16.11
No. of days per week in mining	Frequency	5.6	2.3	1.6	3.4
	Percentage (%)	80	32.86	22.86	48.57
Frequency of panning per day	Frequency	25.8	14.9	11.0	18.0
	Percentage (%)	-	-	-	-

Absolute dependence on the use of large amounts of water in mining operations dictates that mining operations were located as close to water sources as possible and at the water source and significant variation in intensity of participation was seen among seasons. Intensive participation was seen in summer season.

3.2 Processes and Methods Traditional Gold Mining

If it was according to the gold miners' presentation, a unit of land either from river bank, grazing land, crop land or any other land unit which is supposed to be location for the gold was first selected randomly or then tested. If the first panning test evidenced to be source of gold, huge mass of soil would be moved to water reservoirs and rivers. Different labor sources (manual, donkeys and camels) were observed in moving soil mass to rivers and reservoirs. The surface, sub surface and deep soil were used for traditional gold mining in *Asgede Tsimbla*. *Dolla* (local panning material) was the tool that most of the traditional gold miners used to separate gold from the soil using gravitational technique. Some gold miners were also using locally called *Rahba* instead of *Dolla* which was almost half of the volume of *Dolla*. The volume of *Dolla* was estimated to be about 20 liter of water. Finally gold concentration was done by the use of gravity separation through the medium of water which is popularly called "dig and wash". Huge amount of water was used to wash one *Dolla* of soil.

The methods used in the small-scale mining of the precious mineral in Tigray, however, can be categorized into the following three groups: Shallow mining locally called *Rierie*; Deep mining locally called *Tilket* and Surface mining locally called *Giffa*. Shallow mining techniques (*Rierie*), which are popularly called "dig and wash", are used to mine shallow alluvial deposits usually found in valleys or low lying areas. Such deposits have depths not exceeding 2metres. Vegetation was initially cleared and the soil excavated until the gold-rich layer was reached. The mineralized material was removed and transported to nearby streams for sluicing to recover the gold. It should be noted that in view of the relative ease of reaching these deposits and treating such ores, a significant proportion of the industry's operations are of this type. For similar reasons, illegal workings were predominantly of this type. Deep alluvial mining techniques were used to mine deep alluvial deposits found along the banks of major reaches, and certain older river courses. These methods involve excavating a pit and digging until the gold bearing gravel horizon, which is typically located at depths up to 10metres. Terraces or benches have to be constructed along the sides of pits to prevent collapse. The gold bearing gravel was then removed and sluiced to recover the gold. Surface mining technique (*Giffa*) was adapted to mining of gold at flood plains or other flat lands, which was done mostly immediate after flooding. The hard rock with holes is sunk to intercept the reefs and when accomplished, the reefs are worked along the strike. Where such reefs are weathered, small-scale miners use chisels and hammers to break ore. It was more or less similar with Ghanaian traditional mining method (Benjamin *et al.*, 2003).

3.3 Traditional Gold Mining vs Natural Resource Degradation

3.1.1 Water Depletion and Pollution

The gold mining operations was done by the use of gravity separation through the medium of water. The concentration was done using panning dishes called *Dolla* and

Rahba. Absolute dependence on the use of large amounts of water in mining operations dictates that mining operations were located as close to water sources as possible and in some cases at the water source. All respondents (100%) in the area agreed that the reliance on water for the mineral concentration results in accelerated evaporation of surface water, reduce surface water flows in rivers and streams, provide little recharge to groundwater, drainage of wetlands and the siltation of rivers and reservoirs. The depletion and pollution of fresh water in the district by mining activities was bound to have tragic consequences. Since the region was already classified as being under a water scarcity/stress regime, which does not only receive relatively little rainfall, but whose high air temperatures and degraded soil, traditional gold mining was competing directly or indirectly to derive maximum possible benefits from the available water resources with other water demanding activities. The digging up of river banks and floodplains in alluvial gold panning operations results enormous amounts of waste sand, gravel and rock dumps which contribute to siltation of river channels and dams. Similar to this, siltation due to artisanal mining was reported to have been increasing at the rate of more than 5% per annum in Zimbabwe, Tanzania and Mozambique (Chiwawa, 1993; Tarras-Walshberg and Flachier, 2000; Laurence and Sivotwa, 1998). Siltation results in the reduction of conveyance and storage capacities of rivers and dams and was believed to play a major role in the frequency and magnitude of flooding. Siltation was also responsible for the destruction of habitats for fish and other aquatic organisms. It was not inconceivable that serious water problem will be recorded in the region in a matter of a few years, if regional water management strategies are not immediately put in place.



Figure 1: Aflood plain and water ponded under serious threat by panners in the study area (2013)

3.1.2 Land Disturbance and Vegetation loses

Respondents agree that all operations of small-scale miners lead to considerable land disturbance. Since the gold ore is a result of river deposition, most of the gold mining operations are along river systems. But, significant numbers of gold miners use cultivated land and grazing land. For such artisanal alluvial gold panning operations, the digging up of river channels and banks, channels and their floodplains as well as surface trenching, using picks and shovels were common practice. In some cases, the mining requires the stripping of overburden to expose the mineral bearing horizons. As a result reduction of grazing areas for domestic and wild animals and cultivable areas for cereal crops were

common phenomenon in the district. The observations of the researchers were eye evidenced that extensive land units were converted to useless land which were cultivated or grazing land before due to unmanaged mining practice. The gullies and rills were more frequent in lands intervened by miners than in other land units.

The traditional gold mining was rampant factor for deforestation. Observing dried and root exposed indigenous big trees were very common in the mining sites. The deforestation was driven by the taking off the soil which gives anchorages and the need for underground support props and use of fuel wood leading to vegetation loss. Biodiversity was also further threatened by habitat destruction and uncontrolled hunting. The land disturbances and loss of biodiversity (particularly woodlands and grasslands) commonly leads to tension between miners and local communities. Deforestation loosens up the soil and allows free movement of water hence high velocity which may further damage the landscape. This in turn can lead to the overall reduction of agricultural productivity and biodiversity losses. All these hazardous conditions are present in the study area and if artisanal small scale gold mining is allowed to persist with its cascading effect coupled with lack of mitigation measures the district faces a high risk of being hit by numerous natural degradations in the future of which some of them are already encroaching slowly.



Figure 2: Some photos taken from the field showing serious land disturbance and vegetation losses due to traditional gold mining (2013)

4 Conclusion and Recommendation

Intensive participation of unemployed and landless youths on traditional gold mining was registered in Asgede Tsimbla. Absolute dependence on water resources for panning operation was the main reason for variation of participation in Traditional gold mining in the district among seasons i.e more participation was registered in summer season. Inferences from data analysis indicated that traditional gold mining in Asgede Tsimbla district poses a serious threat to the natural resources which in turn jeopardizes human lives and their livelihoods if the problem remains unabated. The activity has been attributed to promote quick drying up and pollution of water sources, extreme land disturbance and soil erosion, reasonable destruction of vegetation and biodiversity loss.

From the study, stopping of artisanal gold mining seems implausible measure, as this does not solve any problem as long as the operation remains with high economic value. However, it was recommendable that the government needs to protect and empower panners so that they carry out their activities sustainably and environmentally friendly. Policy formulation, licensing, mechanization, training, raising awareness education on environmental issues were some of the suggestions raised that can be used to empower artisanal small scale gold miners. Further studies on the impact of traditional gold mining on water quality and sedimentation of reservoirs were recommendable by the researchers.

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