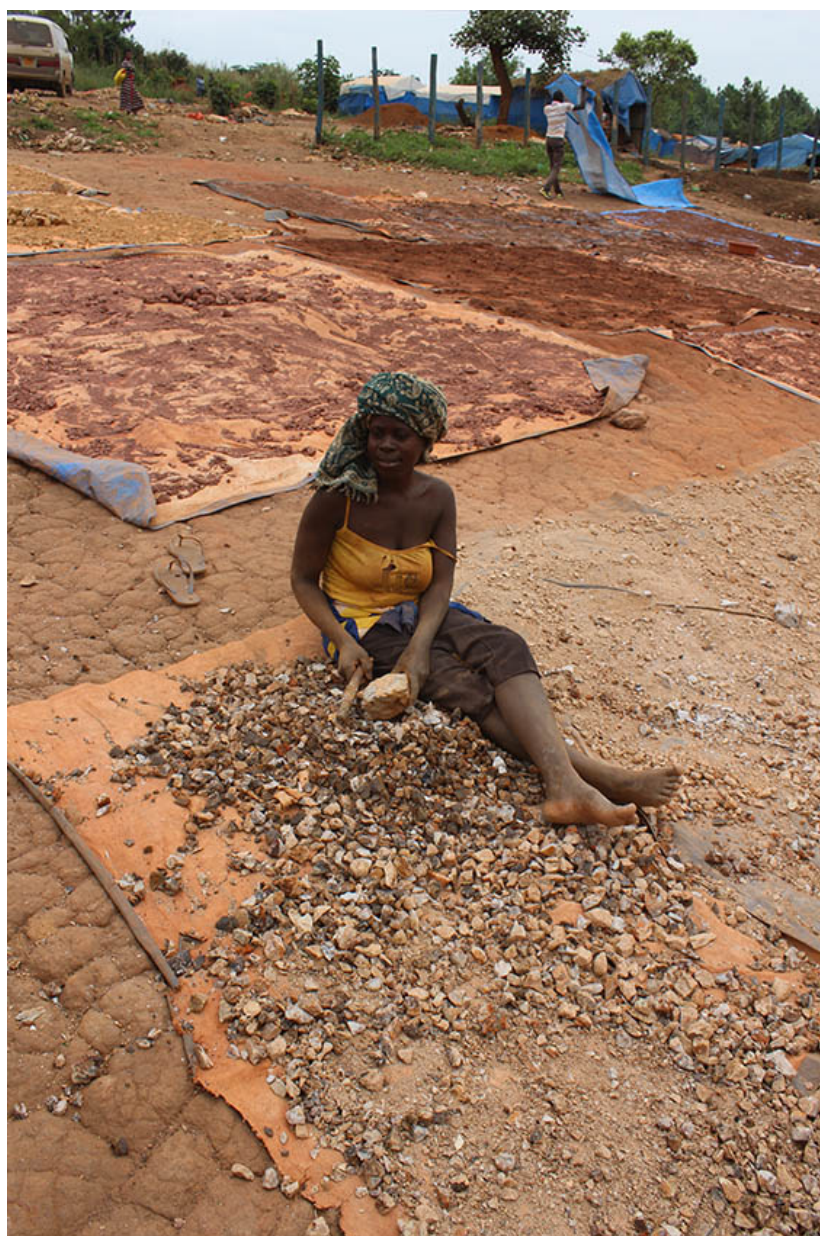




## Fact finding mission Uganda March 2017

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## Abstract

Five small-scale gold mining sites have been visited. Apart from one, which was very small, all sites are candidates as sites for introducing mercury-free gold extraction in Uganda. However, two of the sites stood out as the best candidates as teaching grounds for future trainers within mercury-free gold extraction

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Appendices are attached separately:

Appendix 1: Photos showing suggested demonstration set-up seen from different angles

Appendix 2: Figures to description of small-scale gold mining in Uganda

Appendix 3: How to construct the big tub. Prepared by Leoncio Na-Oy

## Introduction

Throughout Uganda are numerous small-scale gold mining sites where thousands of miners use mercury every day to recover the yellow metal. This impose a heavy burden on the environment of Uganda and on the health of the Ugandan population. Funding has fortunately been obtained from Dialogos to introduce mercury-free gold extraction (Ref 1) on some of the Ugandan small-scale mining sites. The project described below is a fact finding mission where selected small-scale gold mining sites were visited in order to determine which sites will be the best choice for demonstrating mercury-free gold extraction by a group of small-scale miners from Philippines and for the Philippine miners to train local miners as trainers for further spreading of the mercury-free gold extraction

technique. The fact finding mission also outline which equipment has to be constructed/purchased in order to make the demonstrations of mercury-free gold extraction. During the brief survey of mining and processing sites it was observed that the procedures of extracting gold used by the Ugandan small-scale mines and processors are not sufficiently efficient. Minor changes in procedures will be able to increase gold recovery considerably.

### Participants in the fact finding mission

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### Field work

Five different small-scale gold mining (ssgm) sites have been visited during the five days spent in the field (see list below and map for location). Below is a brief summary of the ways of extracting gold are used at the different sites.

The first site visited is Budde, we did not see the source of the gold ores. However, it appeared to be from a deeply weathered deposit where most of the ore was weathered and only a minor fraction consisted of rock fragments.

The ore was carried from the source down to an area with abundant water supply. First step was to dry the ore and then pass it through a jaw crusher. The person operating the crusher did not use dust mask. The crushing was not particularly efficient so the ore being processed contained a large number of 3 to 4 mm sized rock fragments. This is a common feature with all the sites seen during the trip.

The crushed material was panned in plastic tubs together with mercury. After this panning mercury was recovered squeezed and the amalgam was burned in open air. The tailings from this panning was passed through a homemade sieve and flushed with intermittent water flow over a set of zig-zag sluices covered with cloth. From time to time the cloth was

removed and the heavy material including mercury droplets were washed in a tub and re-panned (See Appendix 1 and 2).

### **Artisanal Small Scale Gold Mining Places visited**

<b>Number</b>	<b>Details of the Visited site</b>
1	Name of site: <b>Budde mines</b> Name of District: Bugiri District Sub-country – Est. Number of miners: 50 people Method: Use Mercury and cyanide Organisation: There is no Miners Association
2	Name of site: <b>Simase mines</b> Name of District: Namayingo District Sub-country – Est. Number of miners: > 1000 people Method: Use Mercury and cyanide Organisation: There is a miners association
3	Name of site: <b>Lubaali mines</b> Name of District: Mubende District – Bukuya Constituency Sub-country – Kitumbi Est. Number of miners: > 1000 people Method: Use Mercury and cyanide Organisation: Lubaali Artisanal Gold Mining Association
4	Name of site: <b>Kampala mines</b> Name of District: Mubende District Sub-country – Kitumbi Est. Number of miners: > 1000 people Method: Use Mercury and cyanide Organisation: There is a miners association
5	Name of site: <b>Katenga mines</b> Name of District: Buhweju District Sub-country – Rwegwe Est. Number of miners: > 500 people Method: Use Mercury and cyanide Organisation: There is a miners association

In processing sites serving hard rock mining the procedure was as follows:

The material from the pits/shafts was crushed manually to walnut size. This is followed by milling in drums with hard metal balls. The quality of the milling is not impressive. The milled material contains a large percentage of rock fragments with sizes of +5 mm. The milled material is then passed over zig-zag sluices capturing heavy minerals. The heavy minerals are then panned in plastic tubs where mercury is added. The miners realise that the milling was not sufficient and therefore move the tailings from the panning back to the drum for repeated milling. This creates a serious problem. Formation of mercury flour in large scale (Ref2). The milling of mercury in the drum will pound the metal into tiny droplets called mercury flour. Mercury flour has lost its capacity of coalescing. Another unfortunate capacity of mercury flour is that the droplets are so small so they can float on water and thus easily escapes the processing site and are flushed into the environment. This means that all the small droplets of mercury cannot be recovered by the miners and. The result introduces two major problems. Highly increased mercury pollution and significant loss of gold. The loss of gold is significant. Investigations elsewhere have revealed gold contents in tailings of 16.5 grams per ton (Ref2)! The same figures can surely be found in Uganda.

The sites visited during our field work varied in size from a few miners to several hundred (possibly more than thousand) miners. The sites are generally well organised with owners of pit claims and groups of workers carrying out the different steps of gold extraction.

The aim of the field work was to get a good impression of the gold extraction processes carried out at different sites and to evaluate which site(s) is (are) best suited for demonstrating mercury-free gold extraction and to train local teams to carry out mercury-free gold extraction.

Based on our tour of sites two sites are regarded as best choices for demonstration and training of trainers. Site 2 and 4 (see map below).

**Simase mine site (2)** is at the shore of Lake Victoria and has a large number of processing sites. Including several ball mills. Water is easily accessible from the lake. Topography of the site make establishing one or two demonstration sites very easy. It must be emphasised that the ball mills in this area are polluted with mercury and that has to be cleaned. There are many workers at the site men and women so it should not be difficult to raise interest for the new technique among those workers. The site is several

hours drive from town, but local accommodation is accessible so the Philippine miners don't lose time on transportation.

**Kampala mine site (4)** is on top of a mountain. It has one disadvantage which is that water has to be transported to the processing site. However, it has two advantages. One is that the milling at the mine site is absolutely mercury free as stated by a shaft owner. Second is that the site is fairly recently established so many of the workers have not established rigorous processing procedures and are thus hopefully less conservative than in site with long tradition of using mercury. Furthermore, the shaft owner we met proved genuinely interested in going mercury-free in order to be on good terms with the government.



Site map

### General processing technique

The visits to the five small-scale gold mining and processing sites proved that in spite of having all relevant equipment then the extraction of gold is likely to be rather inefficient



with the result that gold recovery is low. One of the problems is milling. Output from milling shows that there is a high percentage of rock fragments ranging in size up to few centimetres. This is unfortunate giving the amount of work spent on extracting gold and then maybe 25 percent of the gold is locked up in rock fragments (see photo in Appendix 2). Whether the non-efficient milling is caused by too short milling time or too few are too small hard metal balls in the mills is uncertain.

It is suggested to get an expert in processing look at the different sites and then guide the miners and workers to better working methods. It will probably not require investment in equipment, but better use in what is available.

## Conclusion

Small-scale gold mining in Ugandan is widespread. The workers are often organised in groups. Simase and Kampala mine sites have been selected as best candidates for demonstration of mercury-free gold extraction and training of Ugandan small-scale miners. Generally the processing methods are fine, but better tuning in of the processing will in all likelihood yield much higher gold recovery

## Incomplete list of equipment and things to remember

- Tub for the milled material. To be built locally in wood or metal
- Chute with dimensions to fit the tub
- Cloth for the chute. Ask Bantox miners to bring some from Philippines
- Pans of metal. Ask Bantox miners to bring some from Philippines and have some made in Uganda out of old 200 l metal drums.
- Tubs big enough so miners can do the panning in them
- Small water pump for recycling water and for flushing the big tub. Maybe not necessary for site 2, but definitely for site 4
- Big and small shovels
- Clay bowls for burning
- Borax powder
- Gas burner/charcoal
- Magnets from old loudspeakers

- Plastic bags for the magnets
- Small plastic bags for the gold recovered
- Strong rubber gloves
- Mercury-free milling drum and mercury-free metal balls

## References

<sup>1</sup>Educational video on youtube Gold extraction with BORAX for small-scale miners -. <https://www.youtube.com/watch?v=X6Sawj0HyF0>

<sup>2</sup>Appel and Na-Oy: Mercury-Free Gold Extraction Using Borax for Small-Scale Gold Miners. <http://www.scirp.org/journal/jep> <http://dx.doi.org/10.4236/jep.2014.56052>