

■ RESPONSE

Farming vs. Gold Mining in the Nyanga Highlands, Zimbabwe

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Ann Kritzinger in *Nyame Akuma* 73 and a number of other scattered publications has been strenuously advocating the interpretation of the terraces and stone structures of Nyanga as evidence for gold production rather than the previously accepted agriculture/settlement site hypothesis. This has generated a number of objections from archaeologists to which she has responded but we remain unconvinced. John Sutton in *Nyame Akuma* 74 has made relevant criticisms, presented a generalised view of the plausibility of the agricultural hypothesis in the African historical and ethnographic context, and drawn attention to the lack of any memory or record of gold working in the area which might be expected from the vast scale of the proposed undertaking. He has also given a summary description of the standard pit-structure which I do not need to repeat here. Geological objections to Kritzinger (2008b) have been raised in detail by Love and Walsh (2009).

I am intimately familiar with much of the archaeological evidence (Soper 2002) and her recent paper in *Nyame Akuma*, although it concentrates mainly on tunnels, provides a context to raise a number of points that are inconsistent with her hypothesis. Many of these points were in fact raised under her *Cookeia* paper (Kritzinger 2008a) but were not satisfactorily refuted by her replies. I would have liked to address directly the practical methodology of the proposed processes of gold extraction and whether they are consistent with the regular features of the terraces, and the pit-structures in particular. Unfortunately this is difficult, as Kritzinger has not given any specific details of how she thinks the processes were carried out. I will thus raise a number of points which are inconsistent with her ideas. Some points address the appropriateness of specific features of the stone structures for extracting gold, oth-

ers question the feasibility of using these structures in terms of distribution and water supply.

I am not qualified to comment on the details or results of her sampling programme, though a couple of questions do occur to me. Are gold traces equally or adequately present throughout the distribution of the terraces and pit-structures in the different geological contexts, the sedimentary series in particular? The drains are described as “flumes integral to tailings removal” (p.16); her Table 3 notes gold in all the drains sampled, up to 1.78 g/t. Is this wastage consistent with the supposed washing method? She mentions the collection of samples from a one metre deposit in a “tank”. There is no description of the deposits but such accumulation in pits is extremely rare and probably results from silting or slope-wash after abandonment. If gold traces are present throughout they must reflect background gold levels.

First however her “anomalies” may be addressed – which even if valid would hardly disprove the agricultural interpretation.

“Infertility of the soil on steep stony hillslopes”: untrue. To quote K.Verbeek in Soper (2002: 18) “The main constraint in Nyanga, especially in the highlands, is fertility, and the slope soils, not being subject to deep weathering, are immature and thus retain a higher proportion of mineral nutrients. Stoniness is not so critical for crop production and here is partly alleviated by terracing, which also concentrates the shallow soil; in addition, continuing decomposition of the parent material contributes significantly to ongoing fertility, especially on dolerite. Thus the more fertile soils on steep slopes are likely to have been preferred to the infertile oxisols of the adjacent plateaus, since the latter are characterised by low inherent fertility, especially on sandy soils.”

Narrow width of some terraces: true but inevitable if steep slopes are to be exploited; gentler slopes have wider terraces.

Manure: the evidence for the use of manure is circumstantial but is consistent with African ethnographic parallels. Results of phosphate analysis were inconclusive

and do not negate use of manure. Any protection of crops from wild animals would have been in organic materials which would not survive.

Consistent presence of quartz: occurrence of quartz was not an aspect of my own research but some comments are in order. Vein quartz and quartz rubble is to be expected on terraces if occurring in the local geology. If concentrations of “crushed quartz” were consistently associated with *all* pit-structures, I like to think I would have noticed it. Her figure 5 seems to show rounded sand grains rather than the sharp angles one might expect from crushing. I have observed heaps of smallish weathered fragments of quartz, around a couple of metres in diameter and ten or fifteen centimetres high, localised on relatively level untterraced land. I had tentatively interpreted them as stone clearance during cultivation.

Design of pit-structures: the “principles for recovery of a heavy metal by gravity concentration” are not specified, but can hardly be exclusive to any other function. All the regular features of these structures are equally or more consistent with family homesteads with livestock; there is no anomaly here. The term “pit-structure” is not a misnomer but a simple descriptive label coined by Roger Summers (1959), avoiding any assumption of function. Kritzinger’s “hydraulic tank systems” leaps to a conclusion of function which is open to doubt (see below), symptomatic of the whole gold hypothesis.

If these structures she calls “hydraulic tank systems” (archaeologically known as “pit-structures” and “pit-enclosures”) were specifically designed and built for the extraction of gold, all their characteristic features must be explicable in practical terms throughout their distribution and the distribution must coincide with workable levels of gold. The latter may be the case but remains to be demonstrated. It is not meaningful to select atypical examples to support a special hypothesis as she has done in the case of restricted tunnel entrances.

Although she does not cover other elements of the “tank system” in this paper, they merit some comment. The slots in tunnel roofs are hardly “hopper-like” (though on her figure 3 she labels it “ventilator”), being only around 15cm wide and 50cm long, cut through the floor of the house above, which is divided by a low wall, one half being stone paved and the other half, at a slightly higher level, having a plastered floor with a hearth. This is reasonably interpreted as a kitchen/living area with accommodation for small stock such as goats, a traditional practice in this area. The slot is more convincingly explained as a device through which to drop poles to block the tunnel. Presumably what she calls “work bays” are what I interpret as house bays, low rough stone walls surrounding clay-walled houses. Her “oven-type structures” seem to be the raised platforms likely to have supported storage huts; the clay floors of these show no regular evidence of baking. The “heavy duty grinding equipment” consists of normal grinding stones for grain and in some cases comparable grinding hollows in adjacent rock surfaces.

To return to the focus of the present paper: the tunnels.

“Restrictive dimensions of uphill entrances”. This is not a constant feature; there are plenty of full size entrances and any restrictions are likely to be due to siltation after abandonment, which appears to be the case in her figure 3. Since many tunnels are not restricted this cannot be a critical feature, so any restriction, even if it can be shown to be deliberate, can only be a modification.

She has not explained the very standard dimensions of the tunnels, 50cm wide and 1.10m high, plus or minus about 10cm (observation of the dimensions, not statistically calculated). The width may be a practical measure, but why the height of 1.10m? Indeed why should they be roofed at all if only for channelling water flow? Her suggestion that the roof would ensure the provision of clean water (2008:26) is unconvincing; water from artificial furrows would generally already be clean except after heavy rainfall, while slope wash from such rainfall would already be muddy and there is no indication of settling tanks to reduce this. The consistent height requires explanation. This of course also applies to the dwarf cattle interpretation. One explanation could be that the tun-

nels were designed to admit only dwarf cattle, excluding larger beasts, perhaps as a selective breeding strategy, emphasizing the cultural or practical value placed on the breed.

The tunnel curvature has a structural reason: if you want an entrance tunnel with down gradient to flush out the pit from the upper side, (one point at least on which we agree), you can only curve it in from the side of the platform. A straight entrance from the upper side of the platform would require considerable excavation, often impossible on shallow bedrock. A more interesting point is the *left*-hand curvature into the pit which has very few exceptions. This can have no functional advantage over a right-hand curve and must be culturally determined.

Her “review of tunnel statistics 1900—2000” is a useful summary but hardly adds to her arguments. Her point about the “bovine phobia for dark holes”, militating against the use of the pits for cattle, is doubtless true for cattle accustomed to living in open fields, but calves moving in and out of tunnels from birth would surely have been familiarised and have no difficulty. John Sutton has discussed the use of the pits for stall feeding of cattle and accumulation of manure. I have proposed that in some cases the manure was not accumulated, but flushed out as slurry and caught below the drain from the pit in a small dammed basin, for immediate fertilisation of a homestead garden, retained by a radial wall from the side of the platform. I may also point out that the pits provide a well protected accommodation for the cattle within the homestead, sheltered from the cold winds of winter.

She implies that the gold washing started within the tunnel and has one sample which might support this. Any gold deposited in the tunnel would have to be recovered by crawling in the dark from the “tank”, an unlikely inconvenience.

“*Tanks*”. Firstly, there is the critical but as yet unanswered question of whether the pits would hold water at all. The dry-stone facing of the pit wall would need to be backed by an impermeable reinforcement of clay, and I am not aware of any excavation of the platform fill which could prove or disprove this.

Although firmly convinced that these are tanks, she has not conjectured on their function or how they could be filled and operated. Plugging the mouth

of the drain to retain water would be difficult but perhaps possible, but unplugging it under a couple of metres of water and controlling the outflow would be problematic. There is one case where a loose stone slab covers the mouth of the drain (Soper 2002:178) but this would be necessary in the accumulation of manure to prevent blockage. No gold washing could take place while the tank was full of water, backing up the tunnel. Water storage for gold washing below the drain would seem a possibility but this has not been suggested, nor is there any evidence for appropriate sluices, some indication of which would surely have survived. What else might such storage be for? Perhaps it could have been for flushing away any tailings below the drain but the presence of small dammed basins below the drain in some cases is inconsistent; they would rapidly silt up with any tailings and in any case would also be flushed away. Kritzinger’s figure 2 quotes me as noting a “complex system of ditches and hollows” below the pit-structures, but omits the preceding “in some cases”; such cases are relatively rare and indicate the reuse of water or perhaps the direction of flushed slurry manure to lower gardens.

Water. An adequate controlled stream of water is an essential requirement for the gravity recovery of heavy minerals, whereas for occupied farming homesteads a supply of flowing water would be a useful asset but not essential. Kritzinger has not yet addressed the full implications of water supply. It would be useful to have some estimates of the volume of water and rate of flow required for washing different materials, but some relevant points can be discussed. The construction of massive pit-structures can be regarded as a capital investment, the utilisation of which would require a regular flow of water to make them economically viable. This would have to apply to *all* pits if they were for gold extraction. Certainly some of the pits were served by artificial furrows, traces of which are still detectable. Many more are so sited topographically that they could have been so served, but others could not. Reliance on rainfall would hardly be adequate; local catchments are often limited, and sporadic rainstorms restricted to the few months of the rainy season would not suffice or provide a steady flow. In other papers she has suggested that the radial walls from some platforms were for directing slope wash but they are not so positioned; all are below the tunnel entrances

and many are on the opposite side of the platform. The retention of soil for homestead gardens is a more consistent interpretation.

Water supply applies particularly to the variant structures of lowland Ziwa, dubbed *pit-enclosures*, which have other features which are inconsistent. The platforms of these structures are lower and the pits shallower and smaller (average diameter 3.20m) than the upland pit-structures, with the usual drain below (and no radial walls). The upper side of the platform has an enclosure wall around 1.20m high, greatly thickened around a straight entrance passage which is often lintelled with stone slabs, of the familiar height and width. These passages can be closed by a built-in draw bar, comparable to the upland tunnels closable by dropping poles through the slot. The tunnel to the pit is generally straight with no slot and starts within the enclosure near the entrance. Not all tunnels are roofed; roof slabs could have been removed for reuse, or the lintelled enclosure entrance already provided the height restriction. In many cases these tunnels have been deliberately partly or completely blocked with stones, which rarely if ever occurs in the highland pit-structures. Any water supply would have to come through the entrance passage, possible but inconvenient. The majority of such structures could not be served by furrows. It may also be noted that many other Ziwa enclosures have no pits, though of similar size and shape, with identical divided houses and raised platforms for storage huts. These are clearly occupation homesteads, not industrial installations.

There are no pit-structures in the lowland areas below the northern highlands. Here the homestead design is what I have called “double concentric enclosures” of similar size, with a low and rather rough outer wall and a central well-built enclosure, equivalent to the pit in size and position. This could still have accommodated a few cattle (not necessarily dwarf) but could have no association with gold extraction.

The same water restrictions apply to the terraces which are not considered in her present article, but which she claims are typical of strip mining. The terraces are not served by water furrows and the gentle longitudinal gradients of only one or two degrees would seem inadequate for washing soil, reliant in any case only on sporadic storms. As John Sutton

has pointed out, the formal construction of the double faced, rubble filled terrace risers would seem grossly elaborate to protect against land slip in the course of exploitation (Kritzinger 2008: 26). The labour invested in such permanent structures could only be justified by the *retention* of soil for long term use and cannot be attributed to the one-off *strip-ping* of soil, even if that were consistent with the design. Some terraces on a slope of only a few degrees are separated by walls a metre or more high, for instance those adjoining the site museum at Ziwa.

Labour. Both the agricultural and gold hypotheses must be labour intensive. If the pit-structures were industrial installations with “work bays”, rather than occupied homesteads, where was this labour accommodated? Contemporary settlements throughout the area have not been identified and are unlikely to have been missed.

Altitudinal distribution. The altitudinal distribution of the terraces and pit-structures, which she has in fact noted in another article (Kritzinger 2009), is relevant. The upper limit of terracing is at about 1700m above sea level, approximately the top of the main escarpments; the lower limit is not clearly defined but they continue down into the valleys and lowland ridges to ca. 900m. The standard pit-structures have a lower limit of 1400m with only 3 recorded slightly below this. They continue up to 1900m, with “ruined pit-structures”, apparently earlier prototypes, up to over 2000m. Thus between 1400 and 1700m they are directly associated with terraces, but the majority are above any terracing and these may be quite densely concentrated. Nyangui Forest Block G for instance has one group of 29 well preserved pits in 11 hectares and another group of 25 pits in 8 hectares (Soper 2002: 95). These are easily interpreted as village communities, not so easily as industrial buildings. They could hardly all be supplied with sufficient raw material for gold extraction or sufficient water to carry it out, even if all were not in use at the same time. Kritzinger implies that the “tanks” were for washing crushed quartz. This would surely not have been carried up to 200m from the terraces and I do not believe there are sufficient quartz outcrops above the main escarpments (or probably even there) to feed so many pit-structures. The extraction of eluvial gold would require the processing of huge quantities of soil. Kritzinger’s idea of the narrow tunnel slots as “hoppers” could not accommodate this.

Bulk soil could not be dumped and washed in the restricted size and circular shape of the “tank”, and so it could only be introduced at the tunnel entrance, which is clearly not designed for this.

Conclusion. While many questions remain to be answered to clarify the practical and social aspects of the agricultural/homestead interpretation, the evidence and the points raised above are all consistent with this. The same cannot be said for the gold hypothesis which requires the selection of evidence and special pleading.

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