



## An Archaeo-Metallurgical Investigation of Iron Smelting Residues at Zangon-Tama Site, Yabo Local Government Area of Sokoto State, Nigeria: A Preliminary Report

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### Abstract

This paper presents the preliminary report of an archaeo-metallurgical investigation of iron smelting residues at the Zangon Tama site in Yabo Local Government Area of Sokoto State, Nigeria, as part of a (Ph.D.) thesis research. Zangon Tama was one of the iron smelting sites within the Sokoto region. Archaeological surveys and excavation were used in gathering the datasets. This paper is limited to the survey as we await the excavation results and the smelting residues' analyses. The paper highlighted the surface configuration of the site consisting of iron slag, fragments of tuyeres, and remains of furnaces. The investigation revealed the extent of the site. It provided the archaeological data to be used for the archaeo-metallurgical analyses that will shed more light on the technical aspect of the smelting that took place on the site. The result of the investigation revealed high number of iron smelting evidence at the Zangon Tama site that includes iron slag, tuyere fragment and furnace remain.

**Keywords:** Archaeo-metallurgical, Iron Smelting, Zangon-Tama, Tuyere Fragment, Furnace

**Remains**

### Introduction

European travellers, colonial administrators and ethnographers have reported iron smelting in the Sokoto region and studied by historians and archaeologists (Krieger, 1963, Abubakar, 1982, Abubakar, 1987, Muktar 1990, Muktar, 2008). From 2018 to 2020, the researcher conducted archaeological survey and excavation at the Zangon Tama site in the Yabo Local Government Area of Sokoto State, Nigeria. Zangon Tama is located about 35 Kilometers on the Sokoto-Jega- Birnin Kebbi Road. It is a few meters from the main road between latitude  $12^{\circ}42'29.3''$  -  $12^{\circ}42'32.3''$ N and longitude  $005^{\circ}02'46.9''$  -  $005^{\circ}02'30.2''$ E with an average altitude of 311m above sea level. The site is located at the foot of a low-lying lateritic hill covered with few shrubs and trees. There is a valley and streams across the site. The inhabitants of the neighbouring village- Magabcin Sarki said that they have no knowledge of the iron working site. This would suggest that the Zango iron working site must have been abandoned before the new settlement was founded.

Prior to this research, the site was poorly known except for the research conducted by Muktar (2008) and Fabunmi and others (2019). The archaeological survey was conducted to identify and assess the spatial distribution of iron smelting residues at the site. It is also meant to collect finds and choose the area for excavation. This paper is a preliminary and progress report on the work done, and it is hoped that a full report would be provided when the archaeo-metallurgical analyses are completed.

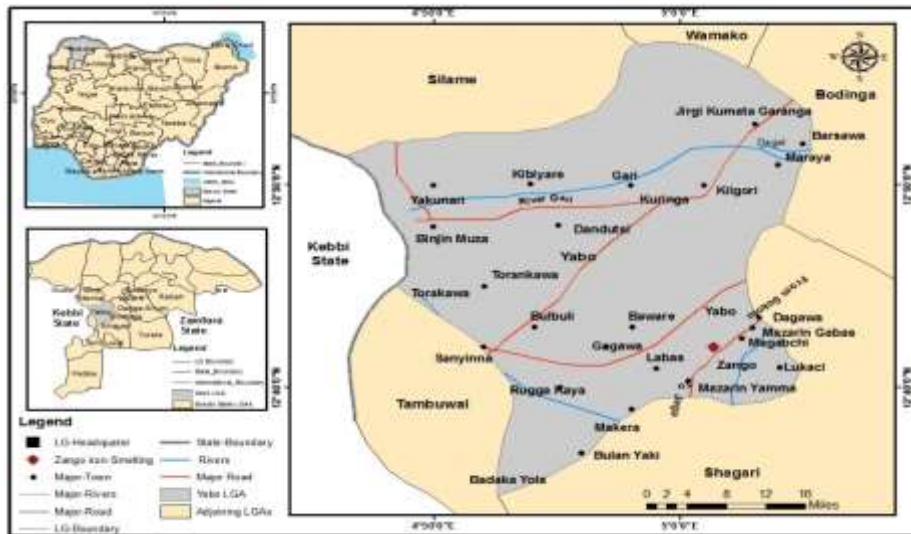
## Site Survey

The archaeological survey was carried out at the Zango iron smelting site from February 2018 to September 2020 with a team of six (6) members. The aim of the survey was total coverage of the whole site. This approach was adopted because past research in the area were limited in scope. The survey exercise was, therefore, carried out to gain a general impression of the site.

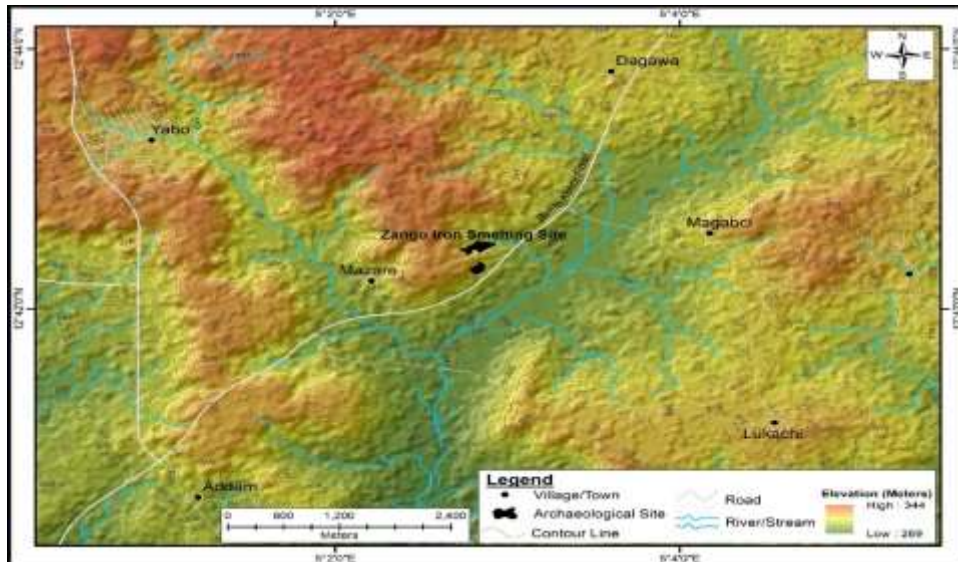
Specifically, the survey was carried out to:

1. Locate, identify and record the distribution of iron smelting residues on the site;
2. Collect artifacts within the site to gain insight into the spatial distribution of the residues on the site; and
3. Delimit the size (extent) of the site and select portions for excavation.

The method adopted was ground survey with a hand-held Global Positioning System (GPS). The GPS and Magnetic Compasses were used through walking and taking coordinates with particular emphasis on evidence of iron smelting. Gullies were closely examined for the evidence of iron smelting too. GARMIN 12 GPS with 3m precision was used during the survey. Evidence such as furnaces, tuyere fragments, and heap of iron slag were identified and recorded in notebooks and photographed using a digital camera. The GPS reading were then taken to GIS-Arc Environment for processing and production of map to show the graphical and spatial distribution of the finds and features identified during the survey (see Fig 2). Some furnace remains were selected and measured to determine their diameter and wall thickness. Samples of iron slag and tuyere fragments were collected and bagged for technical analyses.



*Fig 1: Map of Zangon Tama site (Inset- Map of Nigeria and Sokoto State. Source: Modified from <http://search.asf.alska.edu/>)*



*Fig 2: Relief and Drainage of Zango Iron Smelting Site and Environs. Source: Modified from <https://search.asf.alaska.edu/>*

### Results of the Survey

The survey yielded the following results. Two (2) clusters were recorded during the survey. They are:

#### Cluster 'A'

The first group in this cluster is located between latitude  $12^{\circ}42'17.1''$  -  $12^{\circ}42'17.7''$  N and longitude  $005^{\circ}02'48.0''$  -  $005^{\circ}02'48.6''$  E. It is characterized by the remains of iron smelting which comprises of furnace remains, tuyere fragments and iron slag scattered all over. The slags are generally large in size. Twenty 20 furnaces were recorded, mostly 70cm to 90cm in diameter, with a wall thickness of 10cm.

The second group of furnaces is located between latitude  $12^{\circ}42'18.7''$  -  $12^{\circ}42'23.7''$  N and longitude  $005^{\circ}02'48.7''$  -  $005^{\circ}02'53.7''$  E. This group has 3 categories of furnaces; the first group covers an area of about 6m in diameter. Five furnace foundations with a heap of iron slag all over were identified. The second group is about 5m east of the first group with a slag cluster and remains two furnaces. The third group is further to the east, with about ten furnace remains. It is located near the gully erosion that roughly divided the cluster into two. The GPS reading was taken at the centre of the group of furnaces on latitude  $12^{\circ}42'18.9''$  N - and longitude  $005^{\circ}02'47.5''$  E. The complete absence of pottery materials was noticed in virtually all the clusters.



*Plate 1: View of the lateritic outcrop at the site*



*Plate 2: Iron slag at cluster A*



*Plate 3: Remains of a furnace and tuyere fragment at cluster A*

**Cluster 'B'**

Cluster B is located North of Cluster A. The first group of furnaces in Cluster B is located between latitude  $12^{\circ}42'29.3''$ -  $12^{\circ}42'34.3''$ N and longitude  $005^{\circ}02'46.9''$ -  $005^{\circ}02'51.9''$ E. It is located at the centre of the cluster. The entire area is dotted with remains of iron slag and Five furnaces. The second group was also identified near one of the gullies at the site. It is located between latitude  $12^{\circ}42'29.2''$ -  $12^{\circ}42'30.5''$ N and longitude  $005^{\circ}02'49.9''$ -  $005^{\circ}02'51.5''$ E. Ten furnace remains, and a heap of iron slag was recorded.

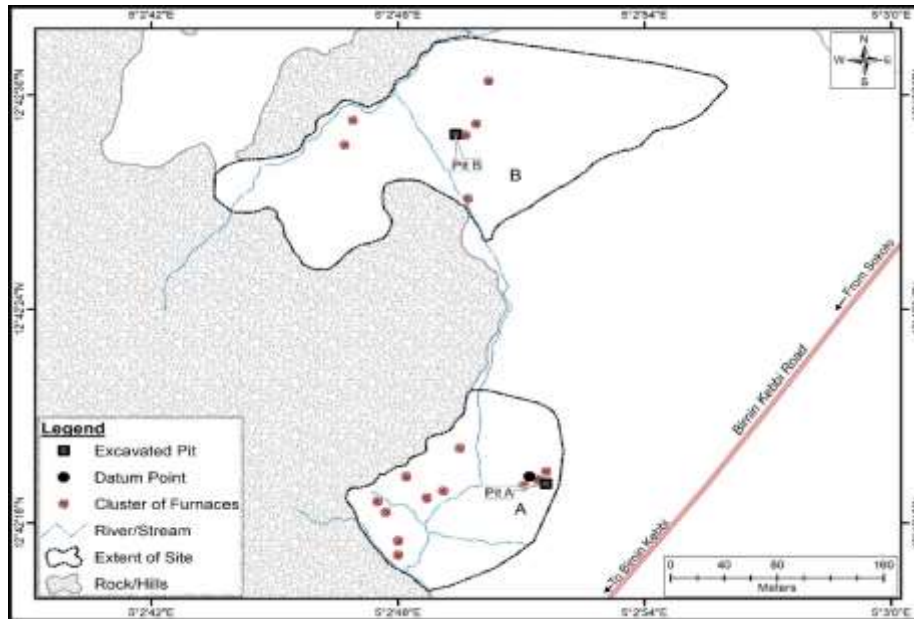
Further to the west, another group was also identified between latitude  $12^{\circ}42'26.8''$  -  $12^{\circ}42'28.8''$ N and longitude  $005^{\circ}02'49.7''$ -  $005^{\circ}02'50.5''$ E covering an area of about 5 square meters. Remains of iron slag and five furnaces and tuyere fragment were also identified.



*Plate 4: Another remain of a furnace with iron slag embedded*



*Plate 5: A group of furnaces at Cluster A*



**Fig 3: Site map of Zangon Tama iron smelting site**

The geographical coordinates of the extent of the site was also taken and from the results of the survey and measurements, the Zangon Tama site can be said to have extended approximately 0.01km<sup>2</sup> (17110.8m<sup>2</sup>) at cluster A and 0.03km<sup>2</sup> (36035.3m<sup>2</sup>) at cluster B (see Fig 3).

The survey indicates that the site covered a large area, 2 clusters were identified, and a total of 78 furnaces were counted, ranging from 60-130 cm in diameter and circular at the base. The space that was occupied by the furnaces in the ground was 80-120 cm on average. The upper parts of the furnaces were missing, thus making it difficult at this stage to determine its height. The furnace might be shaft and slag tapping due to the presence of tuyeres similar to those identified at Tsauni in the Zaria region (Odofin, 2010). Most of the furnaces shows rings of slag, indicating furnace reuse, as explained by Abubakar (1987).

### Conclusion

From the oral traditions, historical works and archaeological data collected, one can establish that the site is an industrial site of considerable importance in the area as earlier revealed by Abubakar (1982), Abubakar (1987), and Muktar (2008). By the 19<sup>th</sup> century, Iron smelting camps (Zango) were very popular and had attained a considerable level of sophistication and development that were parts and parcels of the general socio-economic changes sweeping over the Sokoto region in particular and Hausaland in general. The result of the investigation revealed a high number of iron smelting evidence at the Zangon Tama site that includes iron slag, tuyere fragment, and furnace remain. This goes to reaffirm the view that iron smelting was a highly significant industry to the societies around the Yabo area (Muktar, 2008) and the Sokoto region in general.

It is already possible to begin to see patterns of variation and continuity emerging in the data as evidenced in furnace design, tuyere fragments and external slag morphology. However, the



report of the excavation and the ongoing archaeo-metallurgical analyses will be able to shed more light on the iron smelting techniques employed at Zangon Tama. This will then allow for a more refined picture to emerge regarding the type of smelting that the past smelters practiced at Zangon Tama and the influences and cross-cultural interactions, if any, between the region and other iron smelting sites within Sub-Saharan Africa, the Near East and Europe.

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