

## ■ ETHIOPIA

### Ethnoarchaeological research on iron smelting in southwest Ethiopia

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### Introduction

This ethnographic study was conducted in March, 2000 among iron smelters in the highlands of southwest Ethiopia, in the village of Uska Dencha (Figure 1). People here still smelt iron, probably one of the last areas where this is performed. This is due to the remoteness of the area, the nearest road is 65 miles away, and the area can only be reached by footpaths crossing several mountain ranges. All goods, including scrap iron, have to be brought in by head loads. The village is situated on a mountain ridge at an altitude of 7000 feet. The difficulty in bringing in scrap iron plus the superior quality of the iron smelted from the local ore are the reasons given for maintaining the smelting tradition. They use a low shaft furnace made of clay, with a slag-pit. Iron smelting is done in the bush away from the settlement, this is mainly related to the taboos on women menstruating being present during the smelting activities. There are few taboos related to smelting, women participate in all the work related to the reduction process, also in blowing the bellows. However, the sacrifices and rituals performed during the smelt are only done by the smith.

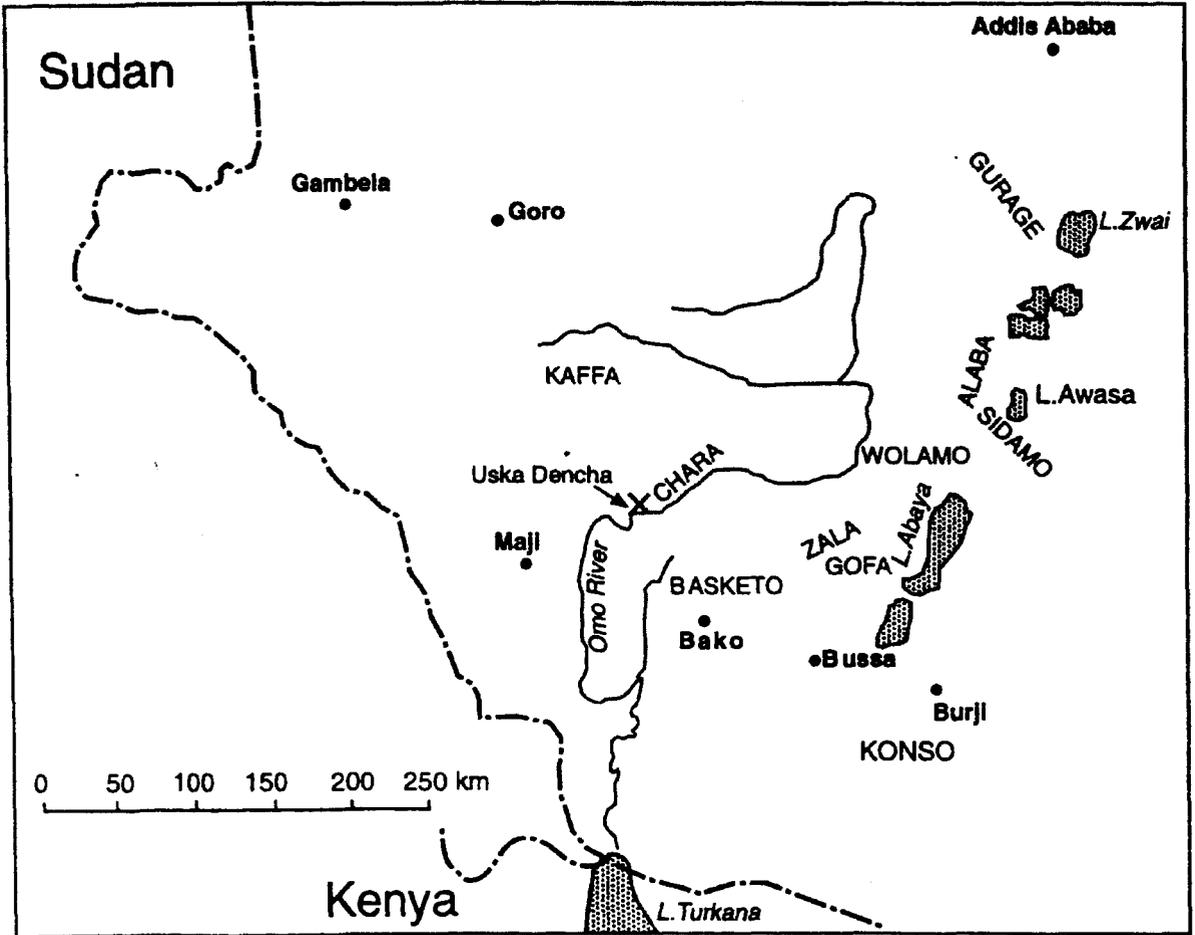
In this paper, we address some of the issues related to the technological and ritual aspects of iron working. Iron smelters are called *gitamanna*, the big potmakers. They belong to an endogamous group of caste-like specialists. They are set apart as impure and cannot intermarry. With the exception of *gitamanna* and *ottomanna* (potters) intermarriage and commensality between members of different 'castes' leads to 'pollution' and requires

'purification' in order to avoid the danger of supernatural as well as social sanctions. The relation between *gitamanna* and *manna* is thus best seen as two ranked strata within the same caste, without strong ritual restrictions establishing strict interaction boundaries between them. The task of smelting is associated with the task of pot making, not with the task of forging iron tools. In some communities smelting and forging are exclusive tasks performed by the *wogatche* and *gitamanna* respectively. In others, there may be no *wogatche* and forging is performed by members of the *gitamanna* caste. As is the case among the *gitamanna* in Uska Dencha, smelting and forging was done by the *gitamanna*. This does not however, imply rise in rank to *wogatche* 'caste'. 'Caste' identities are ascribed by birth and don't automatically change if a member start practicing another occupation than the one associated with his 'caste'. In several publications we plan to address different technological, symbolic and organizational aspects relating to maintenance of such social distinctions despite a certain flexibility with regard to the 'caste' identity of a person performing the productive tasks. Members of higher ranked castes will however avoid performing tasks associated with lower ranked 'castes'.

### The area

The village of Uska Dencha consists of about 225 households or about 1000 people. The villagers are farmers and keep some livestock, mostly cattle and goats. The main crops cultivated are ensete, teff, sorghum, yam, taro, maize, bananas and some coffee (mostly sold for cash). The village is spread out on several small hills along a mountain ridge. Houses and plots of cultivated land are quite dispersed. It takes around one and a half hours to walk from one end of the village to the other. Most of the land is cultivated by slash and burn, and large trees are seen chopped down for burning. The area around the village is quite deforested but there are stands of quite large trees not too far from the village. The location of the village is to a great extent determined by availability of water. Small rivers are cross-cutting the village. A few plots of land are cleared for ploughing, mainly in connection with teff and maize cultivation. The main agricultural tool is the iron-pointed digging stick.

Figure 1: Map of southwest Ethiopia.



**History of the area**

During the last century, this area was part of the Konta kingdom, and was located at its western outskirts. According to Haberland (1964, 1978), new kingdoms emerged around 1500 AD, these included Konta, Dauro, Wolaita and Goffa. However, the history of the area is rather obscure and some researchers will put it as far back as to the 12<sup>th</sup> century (Cerulli 1956). Although Haberland (1964, 1978) sees the emergence of these southern kingdoms as modeled after the early Ethiopian Empire in the north, it is rather difficult to get historical information on these processes. The strong Galla invasion in the east and south during the 16 and 17<sup>th</sup> century had big repercussions on the surrounding people on the southwestern fringes. Todd (1975) starts his survey of the history of the area with the Amahara invasion in the beginning of last

century. The Amahara altered and diminished the role of the kings or chiefs, which during the pre-Amahara days was the focal point of a redistribute economy. They played important political, economic and ritual roles. Their ritual roles were crucial since the well being of the people and land depended on the sacrifices by the chiefs. Their role was reduced by the Amhara who took the local people as slaves and slavery was widespread (ibid. 22-23). Haile Selassie I issued a new law against slavery in the 1930s. In the late 1930s the Italian force drove the Amhara out, and abolished slavery, however the Italians were soon removed and the Amahara reinstated and followed their old system. However, the Amaharas tried to alter the caste like system of ranking. The status of these polluting endogamous groups ran contrary to the Amahara belief that "all slaves are equal", however, they had little success (Todd 1975:259).

Uska Dencha is located in the border area between Konta and Kaffa. The villagers belong to the Chara people and speak the Chara language (Omotic). The only craft specialists in the village are the *gitamanna* (the term is considered derogatory and they identify themselves as Dime), consisting of four households. They speak the Konta dialect which is also an Omotic language but which is different from Chara. They live at the outskirts and in an area located at a lower part of Uska Dencha. Their houses are similar to the other village people, and they cultivate land and own livestock. Today there is no way of differentiating them from the villagers in terms of material items except those associated with iron working. During the Konta kingdom this was different, they were not allowed to own land and livestock. They were dependant on the King for their food and in return they should provide the iron objects needed for agriculture and war.

### The technology of iron smelting

The smelt we observed was undertaken at our request by Chilacho, the master smelter in Uska Dencha. It involved gifts of two goats plus local beer and locally distilled liqueur, which was consumed when preparing for, and undertaking, the smelt. An incident occurred when we first came to the place of the furnace. The clay pot bellows were broken. According to Chilacho this was done by children in the village. He was very furious and would not come near the furnace before some of the people from the village had removed the broken pieces. He then sacrificed three pieces of iron ore and one tuyere together with 10 birr (the local currency) he put these under a tree c. 10 meters away from the furnace. He drank a cup of liqueur and some of the content he poured out on the ground as a sacrifice to what he calls his fathers devil. Chilacho cursed the people who broke the pots of clay bellows. The kiln used was from last year's smelt and needed some repair by smearing of clay on minor cracks in the wall. Three of the pot-bellows had been broken by children from the village and had to be repaired or remade. The kiln was located on an un-inhabited, but cultivated, hillside, separated from the village by a valley at a walking distance of about half an hour.

### Preparation of ore

Iron ore is found along the hills at a distance of one hour walk from the furnace place. Ore is excavated from small pits which are dug out from hillside locations. The search for rich locations takes time and several tests may be undertaken before one decides on the place to invest labor in the rather time consuming task of getting out the iron ore which is extracted by long iron tipped digging sticks. Nine men from the village and Chilacho worked together (no other members of the Chilachos family participated in this activity). Chilacho insisted that he was the only person who knew where the iron ore could be found. He walked around to several places before he decided where to excavate. It was however not Chilacho but one of the men from the village who in the end pointed out the place the smelter chose. Before Chilacho started to dig for ore he sat down outside the pit to drink local liqueur. Before he started to drink, he poured part of it on the ground as an offer to the god of his ancestors. They needed to dig a two meter deep pit into the hillside before they found good pieces of iron ore, which occurs in bands. The ore was crushed at the site to sort out the pieces of good ore. The mining was heavy work and the men had to be frequently relieved (every half an hour). Only three men could work together inside the pit. It took around 5 hours to extract 73 kg of iron ore. Chilacho participated in digging but was also examining the ore very carefully and weighing it in his hands to pick out the good pieces. The ore was packed in bundles made of dry straw and carried to the furnace place. Chilacho later estimated that they did not extract enough ore and 34 kg was mined from the same place three days later. The total amount of ore was thus 107 kg.

### Preparation of charcoal

The same group of men who extracted the ore also prepared the charcoal. They chose hard wood trees only. They picked out three very big trees that had previously been cut down for slash and burn cultivation; these are dried and partly charred. This is sufficient for one smelt. The charcoal was brought back to the furnace in 8 grass bundles. The charcoal making is very close to the furnace place more or less along the same hill. The transport of charcoal is thus not a problem at this short distance.

## The making of tuyeres

Both Chilacho and his wife made the tuyeres. They made 8 small ones (*zeida* in the Dime language) and 8 of the larger flared type (*tsole*). *Tsole* is said to be associated with the penis, and *zeida* with the foreskin of the penis. They had already had 7 *zeida* and *tsole* from the previous smelt, so 15 tuyeres were used. Some extras were kept in case some were damaged. The clay used is the same clay used for making pots. The tuyeres are sun dried or put close to the fire for drying, which takes about 24 hours. The tuyeres were made at the homestead in the village, just outside the hut.

## Repairing the furnace

The furnace was always constructed outside the settlement area. The reason given for this was that it would prevent people who were unclean (mainly menstruating women) to harm the smelting operation. Chilacho reused a furnace from earlier smelts. This is different from many other areas in Africa where the furnace is knocked down to take out the bloom, and where a new furnace has to be

made each time they make a new smelt (Haaland 1985). According to the smith in Uska Dencha the furnace can be re-used several times if it is not too damaged. This was possible and the bloom was dug out from the bottom of the furnace and removed through the top. The furnace had some cracks and these were repaired by taking clay from the surrounding soil and mixing it with water (Figure 2).

The following information on how the furnace was constructed is based not on our observations but on what Chilacho told us. The furnace was erected by Chilacho, his wife and son. The main job for the wife was to fetch water and mix the clay. It took around 9 to 10 days to make the furnace. It was built in layers and dried by the sun and by fire from bundles of grass and green wood put inside the furnace. The furnace constructed was 80 cm above ground, and 40 cm below ground for the slag pit. The furnace wall was 12 cm thick and the inner diameter of the furnace across the mouth (opening) was 42 cm. Radiating around the base of the furnace were 15 holes made for the 5 pot bellows to be attached to the tuyeres. Each pot-bellow had three openings for the tuyeres. A goat was sacrificed when the furnace

Figure 2: Clay is selected for the repair of the furnace.



was completed, and the blood was spread outside around the furnace. It must not come inside the furnace. The reason given for this was that it would cause death among the people who eat the sacrificed meat. We could not elicit many taboos connected with furnace construction except for menstruating women. Their presence was said to be harmful to the smelt. There were otherwise no prohibitions on women to participate in making the furnace or smelting the ore. The social context thus seemed quite different from what has been described for other areas such as the Bantu speaking areas in sub-Saharan Africa.

### **Making of pot bellows**

Chilacho had to make new clay pot bellows, since some used ones had been broken by children from the village. The pot bellows had to be made 4-5 days before the smelt since they needed this long time to dry. The repair of the furnace and the pot bellows were all done in one day. They needed 5 clay pot bellows, these had a diameter of 40 cm across the opening. The same type of clay soil was used to make the pot bellows as was used to repair and make the furnace. The clay was kneaded with the feet. The mixing of clay and water was done by villagers, however the pot bellows were mainly made by the smith and his family. A depression was dug around which the pot bellows were constructed.

### **Smelting**

The raw material used consisted of 107 kg of ore and 120 kg of charcoal. The smelting started at noon and was completed after 10 hours, in the evening at 10 p.m. The smith and his family gathered around 12 o'clock to prepare the smelt. Chilacho started by smearing cow dung mixed with water around the rim and inside the pot bellows. According to Chilacho, this should be dung from a young cow, heifer, to ensure a successful smelt. They then started to prepare the tuyeres to be fitted to the furnace. The larger tuyeres were fitted to the base of the furnace with wet clay soil, while the small tuyeres were fitted between the opening of the pot bellow and the large tuyeres. There were 5 pot bellows shaped as clay bowls, set into the ground and sun dried. The pot bellows were partly dug into the ground and are slightly tilted towards

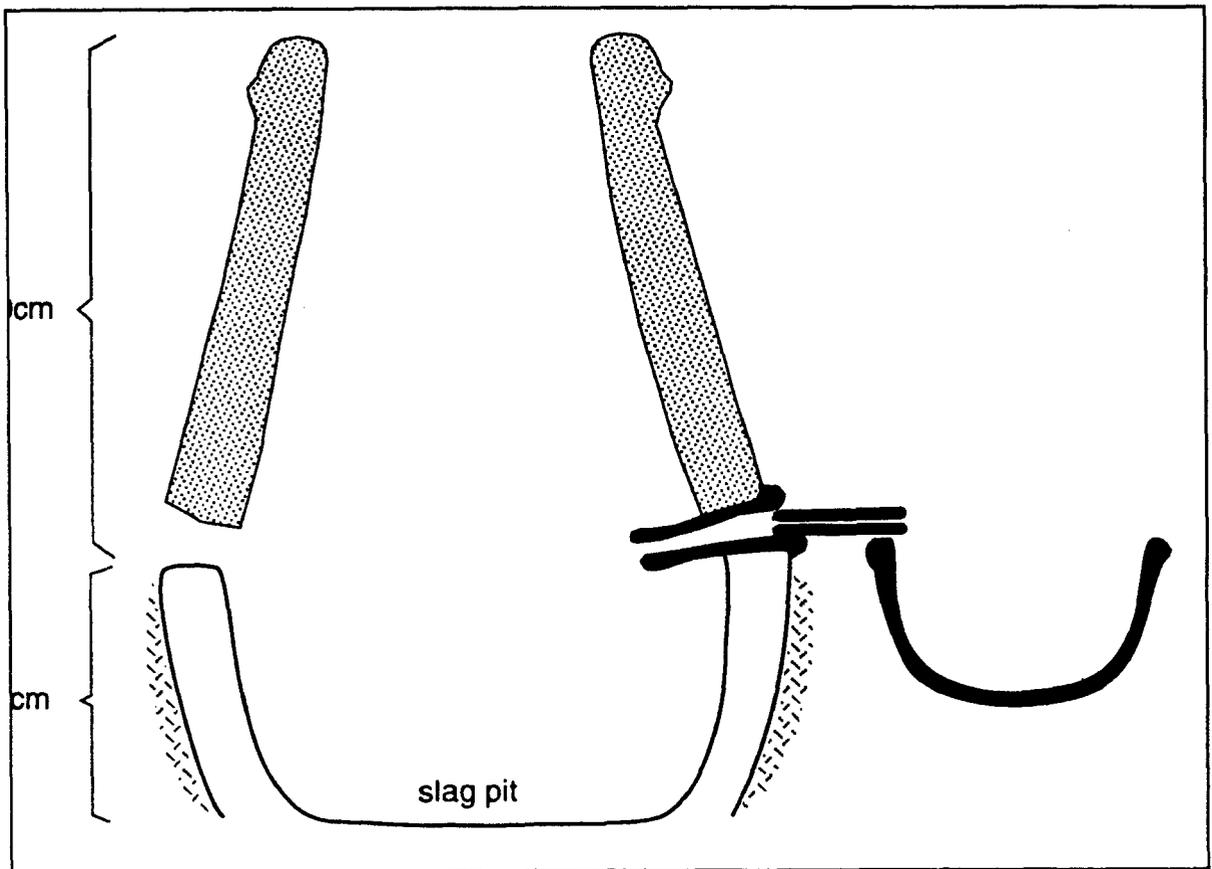
the furnace, the small tuyeres bridge the opening between the pot bellow and the opening of the large tuyeres, the larger tuyeres were stuck into the furnace (Figure 3). The opening of the pot bellows were covered with goat skin, and tied to the top of the pot bellows with a rope, made of plant fibre. A hole had been made in the center of the skin which acted as a valve. The fitting of the clay tuyeres were mainly done by Chilacho and his family.

When the tuyeres and pot bellows were completed, the smith put branches of trees around the furnace to shade the workers when they were smelting. Having completed the fitting of tuyeres to the furnace, they started to fill up the furnace with four bundles of long dry grass which were put through the top opening. The furnace was then lit from the top and from the holes at the base, and charcoal was added. The filling of the furnace with charcoal and ore was done by Chilacho only, who monitored the timing of the furnace fillings very closely. When they started to blow the bellows, Chilacho sacrificed a goat. The throat of the goat was slit and the blood was collected in a calabash, the smith smeared the furnace and the pot bellows with this blood. When the charcoal was red hot Chilacho put the first tray of iron ore into the furnace. Filling of charcoal and ore was done with a long wooden tray. Charcoal and ore were filled continuously with the ratio of 3 trays of charcoal to one tray of ore. After four hours six people - three men and three women - started to blow the bellows. They were members of Chilachos family and some Chara people from the village. There were six extra people available to release the smelters when they got tired and wanted to rest, drink, and eat. Chilacho also participated in operating the bellows although he did this to a lesser degree than the other family members, since he took great care in overlooking the furnace. The women seemed to work equally hard as the men. The smelting was completed by 10 p.m. Chilacho said he could tell this from the colour of the flame, the noise made from the slag, and the content of the furnace. The furnace was left until the next morning.

### **Removing the bloom**

The next morning water was poured into the furnace to quench the bloom. An iron stick was used to break up the bloom and slag. The young

Figure 3: Drawing of the furnace with the pot bellow and tuyeres put in place.



teenage son of Chilacho climbed inside the furnace through the top to take out the bloom which consisted of iron, slag and charcoal. He handed this to his father who examined it. He carefully picked out pieces, which he put aside as either good iron or what he called un-cooked iron. This last category consisted of iron ore where the slag had not been successfully removed. He judged this to be due to the fact that it had rained during the night before the smelt and that the ore had not been sufficiently dry. He estimated the yield of iron to be enough to make one iron pick or possibly two. By taking the bloom and the slag from the top they did not have to break down the furnace after each smelt. It could thus be worked continuously over extended periods. This is contrary to what we had observed among the Fur in West Sudan, where the shaft furnace was broken down after each smelt to be able to remove the product (Haaland 1985). We observed that the slag picked up from the base of the furnace had flow marks. This is interesting since it could have been

mistaken for tapable slag, and should be taken into consideration when we based on the slag remains try to identify what type of iron smelting techniques were employed.

### Some cultural aspects of iron smelting

The ideas associated with smelting are closely related to ideas about procreation. When the tuyeres are put into the furnace, it is seen as analogous to sexual intercourse leading to birth of children. The furnace is perceived as the womb of a woman. When they take out the iron bloom they say the woman has given birth, and the slag, is considered in some respects similar to after-birth. The taboos and rituals associated with smelting were few. Women who were menstruating could not participate, since they would pollute the furnace and the smelters should abstain from sexual intercourse during the smelt. If a person has had sex and he then blows the bellows it was said he would be burnt by

the fire. Charcoal is perceived as hot and symbolically associated with semen.

Chilacho and his wife are not involved in any puberty rites, rituals related to birth, marriage, or death in the community. They are isolated from the village life as regards rituals in general. There is an attitude of avoidance among the villagers. The *gitamanna* were avoided because they were believed to have the evil eye like the *manna* (potters). The evil eye is said to cause sickness and death. There is also ideas about the smith transforming themselves into animals. They are also believed to be eaters of human flesh. People avoid drinking, eating, or having contact with them like shaking hands or intimate contact like sex. The village people will avoid entering the house of a *gitamanna*.

**A comparative note**

Judith Todd did a study of iron smelting among the Dime people to the south of our area, to the east of the Omo River during the mid 1970s (Todd 1976, 1978, 1985; Todd and Charles 1978). Todd concentrated her study on the technological aspects of iron working. Our observations on the technical parts are similar to hers in most respects. It differs in the certain aspects such as the size of the furnace. She observed the smelt taking place in a larger furnace, the furnace was one meter tall and used 6 pot-bellows with three holes made in the furnace wall to accommodate the tuyeres. There was also a difference in the timing of making and repairing pot bellows. In our case they did this 4 days before while Todd observed this taking place the day of the smelting. Surprisingly our furnace even if it was smaller 80 cm it had thicker walls. This was probably due to our furnace having been repaired more often. For us it was important to note that Todd in her study also observed women taking part in the different activities such as blowing the bellows. This was reassuring since we might otherwise have suspected that the female smiths were taking part nowadays because of the decreasing number of *gitamanna* in the village during the last 6 years

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