## ■ GUINEA

### The Technology of Iron Production in the Fouta Djallon Region of Guinea[1]

*Rolf Jensen*
*Department of Economics*
*Connecticut College*
*New London, Connecticut*
*USA, 06320*

### Introduction

By the early 1950s, iron smelting had disappeared from the Fouta Djallon region of Guinea. After that, and certainly by the end of the First Republic in 1984, virtually all iron workers of the region felt that smelting had disappeared for good. In 1995, however, iron smelting returned to at least three villages in the Fouta Djallon. While the decisions to perform a smelt in each village were seemingly independent, a common reason given was the desire on the part of elder ironworkers to teach the technology to a younger generation of ironworkers in the hope of keeping it alive.

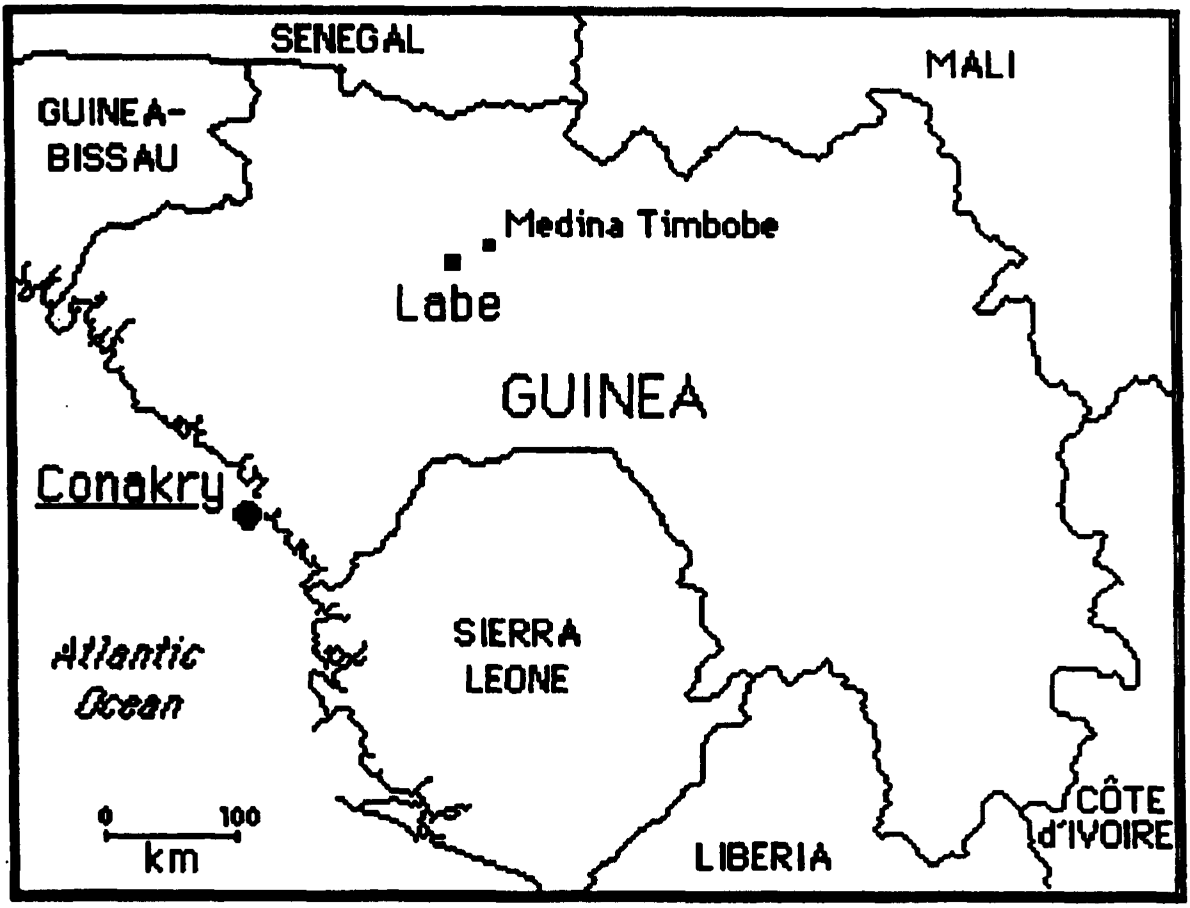
This paper describes the smelt that was performed in one of these villages, Medina Timbobé[2]. Medina Timbobé is located approximately 30 kilometers to the northeast of Labé. Like most villages of the Fouta Djallon, it is a predominantly Fulbe (Peul) village. While the ironworkers of Medina Timbobe consider themselves Fulbe, they are thought to be of Mande origin[3]. Ironworkers here, as in the rest of the Fouta Djallon, are all Muslim. The Medina Timbobe smelt was supervised by four elder ironworkers. One of the four is believed to have been 97 years old; the others were all over the age of 80. The elder ironworkers selected two apprentices who were around 40 years old and who were responsible for many of the technical and ceremonial activities associated with the smelt. It was expected that the two apprentices would be in a position to supervise smelts after the deaths of the four elder ironworkers.

### Furnace Construction

Iron smelting technology throughout the Fouta Djallon involved the use of a natural draft furnace. Construction of the furnace in Medina Timbobe took place in late April. This was only a few weeks before the anticipated start of the rainy season and was considered to be a somewhat late date for furnace construction to begin. It was decided, consequently, to speed up the construction process from the customary period of ten to fourteen days. In what was thought to be an acceptable compromise between the need to begin the smelt prior to the start of the rains and the need for the furnace to dry prior to the start of the smelt, construction was accomplished in four days of work which were spread out over a six day period. This included the lighting of a fire in the partially constructed furnace at the end of the second day of work in order to speed up the drying time.

The furnace was constructed with mud that was made of earth from a large termite hill and that was reinforced with straw. The inside and the outside of the furnace wall were coated with mud made of earth from a smaller and different type of termite hill. The tuyeres were made from the same mud as the furnace wall, but the straw content of the tuyeres was significantly greater. An outside coating of mud made from small termite hills was also applied to the tuyeres. The furnace reached a height of approximately 1.9 m above ground level and a depth of approximately 1.2 m below ground level. Construction began with a tracing ceremony and the placement of five "feet" made of mud that were intended to serve as support columns for the above-ground portion of the furnace. They averaged 30 cm in width and were built 25 cm into the ground along the perimeter of the furnace chamber. They were separated by large pieces of brick that were later removed in order to create five ground level window openings for the tuyeres. The furnace wall was built up over the mud feet and the bricks. The wall was 23 cm thick, and the inside diameter of the furnace chamber at ground level was 1 m. After the lower portion of the wall had dried, work on the furnace pit began. The pit opened into an outside trench that was lm deep, 95 cm wide, and 2.5 m long. The front of the furnace was marked by the opening between the furnace pit and the outside trench. Work on the furnace wall and the chimney

**Figure 1:** Map of study area.



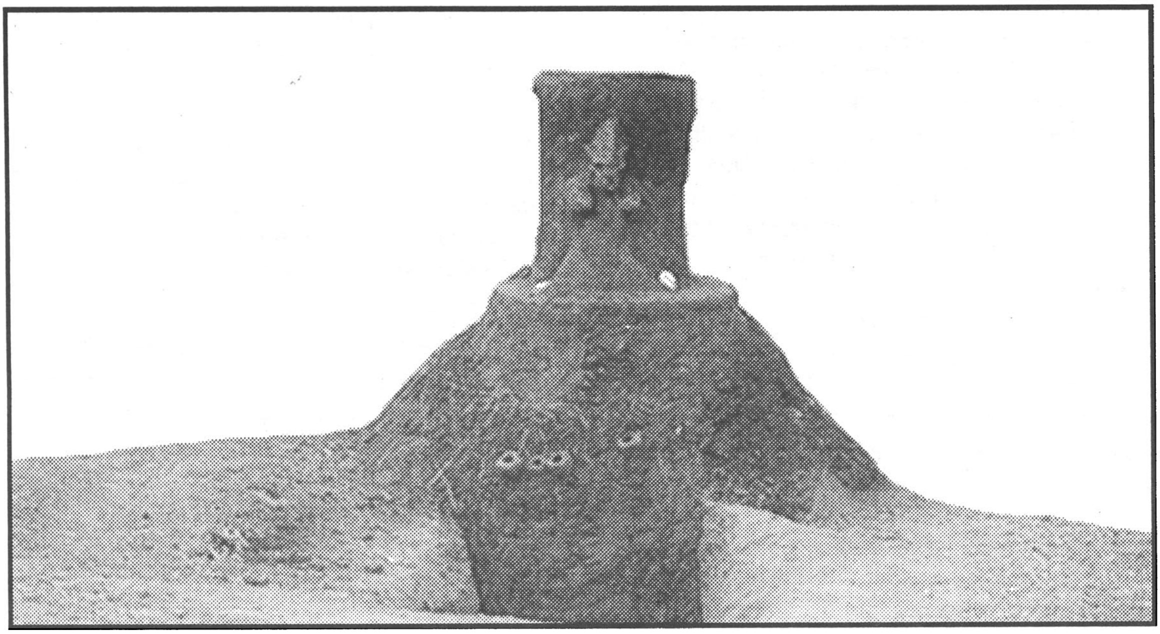

continued after the opening between the pit and the trench was established. The narrowing of the furnace to the base of the chimney formed an outside ledge that was used to stand on when loading the furnace and while performing many of the ceremonies associated with the smelt. The chimney itself was 85 cm high.

A total of twelve tuyeres were used for the smelt[4]. The tuyeres were made by packing a 2.5 cm thick layer of mud and straw around a tapered wooden pole. The diameter of the air opening narrowed from 5.5 cm at the top of the tuyere to 3.5 cm at the bottom. The tuyeres were cut to a length of approximately 130 cm. The large window at the front of the furnace contained four tuyeres; each of the other four windows contained two tuyeres. The tuyeres were placed into the furnace at a fairly steep angle of approximately 75°. Once in place, they were covered with a layer of moistened sand that was built up along the wall of the pit. The bottom of the pit, also layered with sand, extended approximately 10 cm below the tips of the tuyeres. After the tuyeres in the side and rear windows were in place, the windows were sealed, and a mud wall was built up along perimeter of the furnace to support the portion of the tuyeres that extended beyond the furnace. The tuyeres at the front of the furnace were supported by a mud door that had been built up between the pit and the trench. The window for these tuyeres was not completely sealed until after the furnace was lit.

## The Smelt

Immediately after the placement of the tuyeres, a kindling mix of straw, wood, and ceremonial plants was loaded through the front window. The furnace was then lit, and an estimated 200 kg

**Figure 2:** The furnace constructed during the study.



of charcoal were loaded through the furnace chimney. More than an hour later, after flames above the top of the furnace were visible, the first mix of ore and charcoal was loaded through the chimney. The mix contained roughly equal amounts of charcoal and crushed ore and was loaded into the furnace at somewhat irregular time intervals over the course of the smelt.

The entire smelt lasted approximately 40 hours. During the early stage of the smelt, the flame from the chimney was blue in color. The flame disappeared each time a mix of ore and charcoal was loaded, and a lit match was held to the top of the chimney to reignite the flue gasses. Within twenty four hours, the flame had turned orange in color and no longer appeared to go out as the furnace was loaded. Throughout the smelt, it was difficult to feel the passage of air through the tuyeres, and pieces of straw extending from the ends of several tuyeres seemed to respond more to the force of outside wind than to the flow of air passing through the tuyeres into the furnace.

Throughout the smelt, efforts were made to keep slag from rising in the tuyeres. An iron rod was inserted at regular intervals into those tuyeres which were still free of slag as well as into those tuyeres in which slag had just begun to rise. Four to five pieces of charcoal together with a moss-like ceremonial plant were also put into tuyeres in which slag had begun to rise. Where slag continued to rise, use of the iron rod was abandoned out of fear of breaking the tuyere. In extreme cases, leaf plugs were inserted into the end of a tuyere to prevent the further flow of air. Approximately 24 hours into the smelt, slag was present in six of the twelve tuyeres, and two of these had been plugged. At the end of the smelt, one tuyere remained plugged, three were almost completely blocked with slag, and a fifth tuyere was broken[5].

Iron was removed from the furnace through the front door and into the outside trench. Once the door was broken, it took approximately 30 minutes to pry the bloom, located toward the front of the furnace, loose. The supporting wall and the four remaining window seals were then broken down. The window openings were used to look for smaller pieces of iron which were then also passed into the trench. Iron was removed from the trench with the use of logs, tree vines, pick axes, and for the smaller pieces, shovels. It was then quenched in buckets of water that had been placed alongside the furnace. Removal of the iron continued in this manner for over an hour.

## Post-Smelting Operations

Pending laboratory analysis, it is difficult to determine the relative content of iron, slag, and other impurities in the bloom that was extracted from the Medina Timbobé smelt. At the same time, the technology of iron production throughout the region typically involved a secondary treatment to separate smelted iron from the slag and other remaining impurities[6]. This refining treatment took place after the bloom was crushed intosmall pieces and allowed to dry in the sun for several days. The treatment also required the use of a different charcoal *(yalaqué)* from the charcoal (*telé*) that was used as part of the smelt[7]. *Yalaqué* was placed in an open pit that was dug 20 cm wide by 30 cm deep and that was lined with a sifted residue taken from the floor of the furnace after the smelt. The pit was fired by bellows, and the crushed pieces of iron were placed on top of the burning charcoal. Once the separation process was complete, the iron could then be worked into bars intended for the fabrication of tools and other implements using the more commonly found *telé* charcoal.

## The Social Articulation of Iron Smelting Technology

Historically, the social integration of iron production throughout the Fouta Djallon was a complex one in which smelting technology helped constitute and simultaneously was constituted by a variety of other economic and non-economic aspects of social life. It should not be surprising, therefore, to see that the attempt to reconstruct this technology in the village of Medina Timbobé necessarily involved an attempt to reconstruct many of these determining aspects.

Important among these was a set of religious beliefs in the spirits of nature whereby the human transformation of nature was understood to require an ability to interact with and control those spirits. The Medina Timbobe smelt was permeated with examples of this interaction with the spirits. At the tracing ceremony that marked the start of the furnace construction process, for example, the spirits were called to the proposed furnace site and elaborate sacrifice of chickens was performed to determine if the spirits would give their consent to the smelt. Had this ceremony not been successful, work on the furnace would have come to an immediate halt and the smelt would not have taken place. A number of additional animal sacrifices were performed during the furnace construction process, and the blood from these sacrifices was offered to the spirits by rubbing it on different parts of the furnace as well as on the nearby piles of charcoal and iron ore. Once the smelt began, the actual transformation of ore into iron was thought to be in the hands of the spirits, and the role of ironworkers was reduced to one of performing musical and other ritual ceremonies in an attempt to keep the spirits working.

One of the significant things about the ceremonies performed as part of the Medina Timbobé smelt is that many of the songs and incantations do not belong to any of the languages currently spoken in Guinea. At the same time, they appear to bear some phonic resemblance to a number of those languages. It is likely that further research on the ceremonial language of the Medina Timbobé smelt would shed a good deal of light on the origins and history of iron production throughout this region. Among other things, it might help determine whether (as ironworkers now claim) the technology came to the region with the more or less simultaneous arrival of the Fulbe and of Islam or whether the technology was already in place by the time Islam was introduced to the region.

Post-smelt products and by-products are also believed to have been imbued with magical properties by the spirits and are, consequently, widely sought after throughout the region. It is believed, for example, that a field will have consistently higher yields if it is worked for the first time with a hoe made from smelted iron instead of a hoe made from automobile springs. The broken end of a tuyere placed inside of a home is thought to be able to ward off evil spirits, and water used to quench the iron once it is removed from the furnace is believed to contain a wide range of healing properties. In the contemporary market economy of Guinea, the value of these items did not go unnoticed by the participants in the Medina Timbobé smelt[8], and if the technology of iron smelting does survive, the religious attributes of the products and by-products of the smelt are likely to be a contributing factor.

Another important aspect of the technology of iron production that had to be recreated as part of the Medina Timbobé smelt was the form of the labor process itself. With the spread of markets throughout the Fouta Djallon, iron working has taken on the form of petty commodity production and has become, consequently, highly individualized. The Medina Timbobé smelt, however, required a form of the labor process that was constituted not by individual commodity producers but by a larger work group and by an extensive division of labor within that group.

What is especially significant here is that the labor process involved the active participation of women and that the division of labor within the work group, therefore, was constituted not only on the basis of age but on the basis of sex as well. The participation of women of all ages in the smelting process contrasts sharply with the taboos surrounding women that are widely documented in the literature on African iron production. In that literature, the exclusion of women is one of the important common features of iron production across large portions of Africa, and much of the understanding of this exclusion is built around the theme of the furnace as womb and of the smelt as gestation process (Herbert 1993; Goucher and Herbert 1996; Barndon 1996). Interestingly, elements of this theme were also present in the Medina Timbobe smelt, perhaps most notably in the sculpting of the upper body of a female figure just above the furnace opening. The participation of women in the Medina Timbobe smelt, therefore, raises a number of important questions. Does, for example, the participation of women represent an illustration of Schmidt's use of Levi-Strauss' concept of 'bricollage' as way of understanding variation and change in smelting technology (Schmidt 1996b)? Alternatively, does the participation of women provide an important illustration of how this technology was constituted not only by the political, economic, and cultural aspects of an earlier society but, in the attempt to recreate this technology, by the political, economic, and cultural aspects of contemporary society as well?

## Conclusion

The Medina Timbobé smelt of 1995 reveals a technology of iron production that is markedly different from the ones documented elsewhere in Africa. It also suggests that there was significant variation in the technology of iron production within the Fouta Djallon region itself. While scientific comparison of these different technologies is admittedly difficult, laboratory analysis of the products and by-products of the Medina Timbobé smelt might provide the basis for some preliminary comparisons of this sort. At the same time, the smelt reveals a rich articulation of iron production technology with what Schmidt has called the culture of iron production (Schmidt 1996a). Further investigation into the culture of iron production would not only contribute to a richer understanding of iron production in the Fouta Djallon region of Guinea but also to a better understanding of the origin, variation, and change in smelting technology across this region.

## Notes

1. I would like to thank Peter Schmidt for his helpful comments and suggestions.
2. The documentation of the smelt includes approximately ten hours of 8mm video film (Jensen 1997). Work on a 60 minute edited version of the film is in progress.
3. Although the origin of smelting in the Fouta Djallon is uncertain, ironworkers throughout the region all have what is thought to be a Malinke name of *Kante*, and the 19th and early 20th century literature actually refers to them as Malinke (Pole 1985:145).
4. The actual number of windows and tuyeres varied widely across the region. As many as 30 tuyeres are reported in the literature (Pole 1985:144-45) while in my own interviews with ironworkers who had performed smelts in the past, the number ranged from five to eighteen tuyeres.
5. Difficulties with the tuyeres were not uncommon, and there was nothing about the problems encountered here that was viewed as extraordinary by the elder ironworkers.
6. Goucher and Herbert (1996:51) also note the existence a similar refining process in the Bassar region of Togo.
7. While the use of *telé* for smelting purposes was widespread throughout the region, the charcoal used for the subsequent treatment of the iron

varied. What seems to be important here is not the use of *yalaqué* per se but the use of a different charcoal from the one used during the smelt.

8. Indeed, the value of these items is so great that the end of the Medina Timbobe smelt was marked by a chaotic scramble for water and pieces of tuyere on the part of everyone in attendance and by the eruption of serious disputes among the ironworkers themselves over the distribution of iron.

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