

The Role of Indigenous Knowledge on the Development of Iron Industry among the Tugen of Baringo County in 1895-1963 in Kenya.

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Abstract

The role of indigenous knowledge on the development of iron industry among the Tugen of Baringo County; Kenya. The study examined two distinctive epochs from which the understanding of how ironwork in Tugen land was conducted. They learnt the skill through their interaction with their physical environments to cope with the changing climatic conditions by making suitable artefacts for the varied demands in all sectors. The study relied on oral traditions and archival sources as primary sources. Secondary sources were utilised, such as unpublished works like articles, books, and thesis. The study described the distribution, methods and techniques and the procedure used in ironwork. It further assessed the types and uses of iron products. This study established the forces that led to the dismantling of the industry during the early periods of colonial rule, such as taxation, forced labour, settler farming, and western education. Ironwork in the 1930s underwent re-organisations in the form of labour innovativeness, cultural transformation, marketing strategies etc. These were analysed to ascertain the forces behind the persistence and resilience of the industry. The Tugen devised ways of survival to compete favourably with the British colonisers, which led to the Tugen transformation of the iron industry from 1945. This paper raised an argument against this position. The study has recorded the Tugen iron industry for posterity purposes. The study recommends the inclusion of indigenous knowledge to any industrial development and innovation in the country.

Key terms: Indigenous industry, indigenous knowledge, iron making.

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INTRODUCTION

Iron ores are rocks and minerals from which iron can be extracted. An iron ore deposit is a mineral body of sufficient size, iron content, and chemical composition with physical and economic characteristics that will allow it to be a source of iron either immediately or potentially (Kennedy, 1990). For centuries, most of the iron used in Africa was locally produced (Zezeza, 1997). Most African societies were able to produce their iron or obtain it from neighbouring communities through trade. Iron ore was available in virtually all parts of the continent, especially in the lateritic crust covering much of the savannah regions. The origin and use of iron implements in Africa were influenced by the agricultural revolution, which led to iron tools for cultivation and farming. The demand for trade items resulted in some societies working as smelters or smiths, specialising in the many skills necessary for production.

After the Tugen settled in the Tugen hills, they manipulated the environment for their survival. The Tugen being an agricultural and pastoral community, required iron tools and other implements. Stone implements had proved ineffective in the hilly terrain because they broke often and could not be reshaped or sharpened. That called for the need for better implements. Iron making was done by some known Tugen blacksmiths referred to as kitonyik. In its natural state, iron ore is embedded in rocks. The ore was exposed due to weathering, and when it was detected, exploitation of the ore began. The traditional ironworking in Baringo was a complex, skilled, lengthy, and very labour-intensive process. It had to be carried out by a workgroup (kitonyik) and never by an individual smelter. Iron ore deposits were scarce and unevenly distributed in Baringo County, and that explains why it was only practised by a few families such as Kap Kiptombul from Embo Rutto, from Kaptare. The Iron Ore was usually dug up from ferriferous quarries on the slopes of the Tugen hills. The smith men had a complex and highly specialised mining ironstone

system. The miners dug to a depth of 50 to 60 feet to obtain high-quality ore.

The training was by apprenticeship. However, due to the intensity of the work, male adults were mostly involved, and women were exempted from doing other chores in society. This knowledge was passed from father to son to ensure continuity of the craft. However, members from other communities who showed interest were trained. Apprentices were taught the basics in iron-smelting, such as how to procure the ore, make and feed fire through the bellows, make charcoal, and later refine and forge the ore. The training process took ten to fifteen years when the learner had acquired enough skill and was able to show evidence of what he had learned by showing the implements such as knives to the smith. The blacksmith then approved the learner's ability as a smith. The learner was given a bracelet as an identification mark and to show social differentiation in society. Blacksmiths were highly respected in society and held a high status in society. The Tugen held their technology with much secrecy as a control system to avoid having the trade being practised by many people. It was a way of licensing a few blacksmiths in the trade. The public was not allowed in the smithy except when there were rituals for anointing the blacksmith. During rituals, the blacksmith was given powers over the production process in the whole community since he controlled production in the society. Having graduated as a blacksmith, one was allowed to operate his smithy whereby he engaged in smelting and smiting. (Schmidt, 1997) The smelting process was often carried out away from the rest of the community. Ironworkers performed rituals to encourage good production and ward off bad spirits by singing, praying, giving medicines, and offering sacrifices.

It was almost similar to those practised in other parts of Africa. Among the Hausa in Kano areas of Nigeria, a blacksmith begins to train his male children from six or seven years upwards. The small son of a smith, whose main

job is to work the bellows, participates in subsidiary work around the forge, assisting his father and elder brothers, gradually working himself into the more important and technically difficult tasks, and perhaps earning a little pocket money at the same time. Snitching is an industry that requires some technical ability, apart from patience and physical strength, and a lengthy training period is essential if the boy is to master the craft. In this way, by the time he reaches his mid-to-late teens, he will probably have broken away from his father's anvil (uwar malcera, literally 'mother of the forge*'), and become a 'perfect blacksmith*', just as his elder brothers will have done in their time (Jaggar, 1978).

The 21st century is an age of unprecedented technological innovation where modern technology is considered the height of human achievement. This era has witnessed the invention of ultra-modern technologies, including the ICT-information and communication technology. In many ways, it has become the backbone of society and provides the infrastructure upon which other technologies can sit. It is incredibly pervasive, rapidly increasing, and undoubtedly important (George, 2006). Yet as vital as modern technology seems. Tapper and McLachlan (2003) observed that there is a real danger, as erratic twenty-first-century processes of modernisation threaten to sweep away all vestiges of traditional culture, including physical remains and folk memories, that valuable and sustainable skills and technologies are being rapidly and wastefully discarded for short-term commercial purposes. There is a risk that the thrusting of rapid technological change on developing societies by the industrialised nations will lead to premature obsolescence and discarding of indigenous technologies, which could still, both now and in the future, be deployed with advantage (Tapper & McLachlan, 2005). During the colonial period, traditional practices involving traditional knowledge systems were largely ignored, undervalued or replaced by colonial practices. The demise of that knowledge is unimaginable. For this reason, the current study attempts to unravel the tugen iron industry to ascertain the nature of indigenous knowledge of the

tugen and how it affected the manufacture of indigenous artefacts.

LITERATURE REVIEW

This section will handle the critical and relevant literature on ironwork. The literature review acknowledged the contributions of other scholars on themes on ironwork in the world and Baringo County in particular. In addition, it analysed the literature related to the study, which formed the basis for research questions and objectives to broaden the ideas on the topic to be studied. It also addressed historical gaps that needed to be filled in the study. Iron played a central role in many societies of early Africa. It held both spiritual and material power. Physically, Africans used iron to create tools for agriculture, utensils for everyday life, and weapons for protection and conquest (Shillington, 2012, p. 45). Spiritually, Africans considered iron potent. Because of the elemental forces wielded to create iron out of the earth, smiths were revered, respected, and feared (Ross, 2000). They made bellows; the air pumps used to heat the furnace's fire in the shape of male genitals while the furnaces themselves were intentionally constructed to resemble a woman's body (Shillington, 2012). The ore would be placed in the belly of the female structure, a word that also translates to life or soul in several African languages. Thus, the miracle of creating iron out of the dirt was comparable to the miracle of procreation.

It must be noted that modern European technology is an offshoot of indigenous technology. Rodney (1974) categorically argued that the 15th-century European technology was not totally superior to that of other parts of the world, including Africa, because the Europeans relied on India Cloth for resale in Africa, and they purchased cloths from several parts of the West African Coast for resale elsewhere. During this period, European technology was still at its early stage. The industrialisation of 1700 ushered in sophisticated machine products. Here lies the difference between indigenous technology and modern technology. Little suggested that the Tugen interacted

with their neighbours and subsidised their products through trade. Instead, Ne argued that increased dependence on pastoralism occurred in the context of regional trade networks in which Nubian, Indian, Swahili, and Somali traders bought, traded, or sold maize, millet, goats, and cattle (Little, 1992). The stability of this regional economic system was subject to problems created by fluctuations in grain prices, market quarantine restrictions imposed by colonial governments, severe droughts and famine relief programs, and expansion of lands used for the production of cash crops, e.g., coffee, pyrethrum, wheat, onions, and red chillies (Little 1992). Little (1992) suggests that the II-Chamus commit themselves to limited agriculture for three reasons: (1) to reduce their dependence on an unpredictable grain market; (2) to purchase livestock after droughts and associated declines in herd size; and (3) to secure and to maintain access to land and water. This ensured continuity of leatherwork in Baringo despite the challenges.

In his work *eroding the Commons*, Anderson (2002) noted that in the 1930s, Baringo was the first district in which development programs were implemented. It was a testing ground for ideas on how reform should be implemented. He further noted that in the years after the Second World War, as the colonial government carried an enlarged programme of rural development, Baringo became an important reference point for others. The work will be very useful in the current study in tracing the origin and culture of the Tugen. It is often the case that indigenous innovations are environmentally friendly and sustainable compared with scientific innovations. It has been viewed and understood that while local or indigenous technology or practice is recognised as a common practice already adopted and widely used, Innovation is considered more of something new that may have emerged from traditional practices but not necessarily the same (Rai & Shrestha, 2006).

RESULTS AND FINDINGS

Materials Required for Iron Making

The essential metallurgical component of iron smelting includes iron ore, furnace, tuyers, bellow, slag, ingot, etc. A brief analysis of these components is given below. Iron Ore; Essentially, all the iron ores are iron oxides with impurities like silica and alumina. Primitive smelters melted iron ore in the temperature range of 110 to 1200 C using charcoal as heating and reducing material to extract the iron metal. The metal so obtained was a mass of spongy iron mixed with iron oxide and silicates. Iron oxides were reduced to iron, leaving a complex mixture. This mixture is the major constituent of iron slag known as fayalite ($\text{FeO} \cdot \text{SiO}_2$). Blacksmiths had the knowledge to squeeze out the aforementioned impurities of slag by hammering and reheating the spongy iron and converting it into a solid bloom. Iron Smelting Furnace; the furnaces were usually made of clay and varied greatly in shape and size. Some of the important forms of this furnace include open, clay-lined pit, conical shafts about 01 to 03 meters high and tall cylindrical shafts about 02 to 03 meters high. A fireplace plays a significant role in smelting iron ores. A smelting furnace must produce high temperatures, and it must maintain combustion gases in a reducing condition, thus ensuring that smelting does occur and that the smelted metal does not revert to a metal oxide in the furnace (Rostoker & Bronson, 1990:25).

Sand/Quartz; The use of sand and small quartz pieces during smelting activities are evident. The iron smelters were used to increase the temperature inside the furnace during smelting. Bellow; Bellows are the devices used by the indigenous iron smelter to supply air into the furnace or smithy during their traditional iron-making activities. Usually, two long hollow bamboo pipes are used to supply high drift air to the furnace from below. One end of these bamboo pipes are connected with the bellows, and the wider end of the tuyeres is attached at its other ends. These bamboos serve the purpose of the pipe. The term 'tuyere' basically means a nozzle through which air is blown at a high draft into a furnace for smelting operation.

Bellows are the devices for supplying the air draft inside the furnace through the tuyeres.

Wood and Charcoal; Wood or charcoal were used as basic fuel in iron making throughout the world. Recent studies using smelting in the iron-making furnace have been conducted by Norbach (1997) where he has shown that charcoal is not the only option as fuel. Wood could have been an option. However, he has also mentioned the formation of heavy smoke produced by the wood. During the process, wood converts into charcoal. Charcoal Making Furnace; Fuel is an essential ingredient that helps to get continuous and constant heat during the smelting activities. Charcoal is an excellent fuel for this iron smelting. According to Forbes (1972:193), "in the most primitive form of direct extraction of iron from its ores, a mixture of the ore was treated either in a hole in the ground furnace or a hearth fire with charcoal". As the raw wood or log contains a high percentage of oxygen, it burns very quickly, requiring a large quantity of wood in a single period of iron smelting. Normally to cut short the quantity of wood, they prefer to convert the raw wood into charcoal, for which the traditional iron smelters burn the big logs in the pit covered with green leaves, earth and sand. This cover blocks the supply of oxygen into the pit. Due to the inadequate supply of oxygen, the burnt logs turn into charcoal. Sal (Shorarobusta) gives much better charcoal than any other tree. Hence, the Sal is used instead of other species, where it is available abundantly, by the traditional iron smelters (Leuva, 1963:148). Other Materials; apart from the above materials, some other materials are used in different stages of this iron smelting activity. Some of the important objects include a hammer, winnowing fan and water.

Stages Involved in Iron Making

The iron making process passes through a long process, starting from the collection of ore and firewood to the selling of products. A brief analysis of these processes is discussed below.

The iron smelting process began with locating, mining and collecting ore. Depending upon the source of ore, the method of collection varies from place to place, which includes digging of laterite or hematite from quarry pits, riverbed or weathered outcrops. The Tugen blacksmiths dug a hole on the ground, and a big pot was placed inside, which was used for collecting the ore. Since ironworking is labour-intensive, division of labour was paramount. Therefore, after the ore had been extracted, another group picked it and carried it for smelting using pots, baskets, and trays. Finally, the collected lump of ores was deposited near the furnace and was broken into small nodules or stockpiled with either stone or iron hammer.

The next stage was the construction of the smelting furnace. A furnace was a small structure that was grass thatched without walls. A hearth was dug in the middle, and it was to produce high temperatures of about 700 - 9000 °c to smelt the iron. The floor of the heath was smeared with clay, which acted as an insulator. This ensured that the heat was retained within the furnace for a long period. Smelting was conducted using the blast furnace method. It was used to produce liquid iron. It was operated at higher temperatures and a greater reducing condition. This was achieved by increasing the fuel to the ore ratio. As a result, more carbon reacted with the ore and produced cast iron rather than solid iron. Furnace making is an important part of iron smelting activity. The iron smelters usually prepare two types of furnaces, i.e., charcoal making and iron smelting. Both of these furnaces are almost permanent and continue for a long period with minor repairing and maintenance. The charcoal making furnaces are usually located near a water source, inside or close to the jungle, where wood or log is available sufficiently for making charcoal. These furnaces are prepared by using clay from local resources in all cases. Uses of sand, small nodules, bio-products, grass, etc., are frequently used to include binding materials. The use of sand or stone pieces helps increase the furnace's heat and continue for a long period. Sometimes, wooden posts and grass or leaves are used to prepare the dome of the

furnace on which the litigated clay is pasted to give the shape of the furnace.

The next stage was the procurement of wood and charcoal, which served as the fuel during the combustion of iron ore. Only hardwood trees were preferred because they produced much heat and kept the fire glowing for a long. The popular tress species were dalbergia melanoxylon (ebony), brachylaena huillensis (khaya), newtonia buchananii (hagania abyssinica), olea Africana (oak), combretum schumannii, cynometre webberi, and Terminalia brownie. Wood was the main fuel used, and therefore, its acquisition and availability were paramount. The vast forested land in Baringo, such as katimok, saimo, mochongoi and chemasusu, made the iron-making industry possible. The trees were felled, chopped up into convenient logs, assembled at a point, and arranged appropriately to obtain charcoal. To prepare charcoal, the smelters dug trenches in the form of a cross. The floor was overlaid with combustible materials such as dry twigs. The logs were carefully packed in the trench, with combustible materials inserted at regular intervals. The pack was then covered with fresh leaves and finally overlaid with wet sand. The fire was then introduced to the pack through side openings. After the burning had been completed, the workgroup undid the pack and picked the charcoal. The rationale for bringing the wood into the enclosure was scientific, that is, to restrict the intake of oxygen and minimise the byproduct of ash. Charcoal from the hardwood is considered to produce a great heat required for the furnace, which was kept going on all year round (Goucher, 1981).

Fire was introduced into the furnace through the holes at the base of the furnace, and it was activated and sustained by the use of bellows connected to a pass through the furnace wall into the combustion chamber. The smelter kept replenishing the furnace with firewood. The fire released heat in great intensity, thus facilitating the smelting process whereby iron got separated from the slag. The furnace was charged for about 36 to 48 hours or

so, during which it was fed with more ores and charcoal at regular intervals. The ores used in ancient smelting processes were rarely pure metal compounds. The impurities were removed from the ore through the process of slag. Slag is the material in which the impurities from pores and furnace lining, and charcoal ash collect. When the charge attained high enough temperatures, the molten material flowed through the drainpipe into the pit, leaving behind mainly iron globules. After the furnace had cooled, these were collected and consolidated by hammering them into large lumps. After the smelting process, the blacksmith removed the bloom from the furnace. The slag was removed and disposed of. A pair of tongs were used to remove the bloom from the furnace. The iron bloom was dipped in water and kept by the smithy until he required refining and forging.

The furnace was located in the bush far away from the homestead. The reason for this was to avoid the risk of the homestead catching fire and keep it away from the public. In addition, the Tugen were religious and associated with the failure of smiting to bad Omen caused by people who had ill intentions. That is why before any activity was done, a cleansing ceremony had to be conducted. As an informant observed, indigenous smelters did not comprehend the chemistry of the bloomer process in iron smelting. Nevertheless, the Tugen practical knowledge of smelting was based on scientific rationale, as can be seen from their charcoal production techniques and the loading of the furnace with ironstones and charcoal. The firing of the furnace is usually done in the evening and continues for the almost whole night. They used to set fire at the bottom passage, and by supplying high drift air from bellow, they spread it to other areas of the furnace.

The traditional iron smelting furnace needs a high drift of air for smelting activities. Therefore, the Tugen iron smelter of Baringo used two foot-bellows to produce this air and later, it was supplied into the smelting furnace through two bamboo pipes and tuyeres. These foot bellows were set close to each other at a few feet distance from the

smelting furnace. A set of the bellow is a combination of a wooden bowl; a cattle hide, a string made of cattle hide, a small wooden piece, a bamboo spring and a bamboo pipe. For the preparation of a wooden bowl, a small-sized log is usually to be chopped out, and a hole is to be made at one side to connect the bamboo pipe. The open side of the wooden bowl was usually covered with a hide. A small wooden piece was tied with the string and passed inside the bowl through the centrally located hole of the hide cover. During the operation of the bellow, this piece of wood was used as a valve to check the air. Another side of the string connects with one end of the long bamboo, which was earlier placed close to the backside of the bellow. This long bamboo pipe was used as a spring to pull up the covered cattle hide. The furnace was operated three to four times a month.

On other days, the smelters are engaged in other associated activities like preparation of charcoal and collection of iron ores etc. The whole process of iron smelting took 11 to 12 hours. On the day of smelting, the inside and outside of the furnace were cleaned, and then the bellows and tuyeres were attached to the furnace. The filling of the furnace with iron ores and charcoals is basically done during the daytime, and the smelting work is started in the evening. The smelter lights the furnace through its bottom passage. Immediately after lighting in the furnace, another person of the family starts operating the foot bellows to supply the air. Usually, a female member of the family was engaged in operating both of these bellows. For this, the bellow operator places her feet on the hide covers of the bellows and puts pressure on them alternatively one after another. When pressing the bellow cover, the wooden valve helps block the cover's central hole and forces the air towards the furnace through the bamboo pipe and tuyeres. In the meantime, she used to free other feet from the bellow, which facilitates the elasticity of the hide covers in an upward direction. The smelter always checks the furnace and puts the required charcoals and ores into the furnace through its top passage. Sometimes melted iron blocks one end of the

tuyeres, for which the smelter replaces the tuyeres frequently with new ones.

At the beginning of melting, the slag is drained out from the bottom passage in a semiliquid condition which indicates the beginning of the melting process. The experienced smelter tries to remove this slag with a big iron tong. The final product of smelt was ingot or bloom/wrought, which is a rough bulk containing nodules of metallic iron, bits of the slag waste, partially reacted ores, unburnt charcoal, a varying amount of dissolved carbon and sometimes, bits of burnt clay of furnace. This ingot/bloom was removed carefully from the furnace and given the desired shape by continuous heating with a hammer. Later, it was broken up into small or desired pieces by regular heating, beating and cooling for making artefacts which are usually done in forging hearth, which is usually an open fire with air pumped through a single or double piped hand bellow. It is heated until the iron piece is red-hot and soft and then kept on a stone or iron anvil with iron tongs and hammered to remove the remaining slag and other unrequired stone or ore particles and fuse the iron pieces to a usable size.

These traditional iron smelting furnaces were not very easy or simple to operate. Only the skilled iron smelter could able to know the status of melting iron and other requirements. It was only by controlling the ratio of ore and fuel and controlling of air supply he could regulate the temperature and composition of gas inside the furnace to control the chemical reactions. During this iron smelting, the essential chemical reactions include separating oxygen from the iron-oxide ores by reaction with either elemental carbon or carbon monoxide produced by the burning charcoal (Goucher, 1981). After removing the wrought or ingot, the smelter immediately removes the unrequired slags by continuous beating with a big hammer. Sometimes, he reheats this ingot again and again in the process of shaping and finally prepares small pieces or raw iron to give the desired shapes.

Uses of Iron Implements by the Tugen

When the Tugen were making iron implements, it was based on the community's specific needs.⁵² However; any surplus was sold to neighbouring communities or given out as gifts to visitors. The implements included tools, weapons, and ornaments.

Tools and Knives

Tools and weapons were made using the same technique, but they were shaped differently according to their use. After making the bloom, the blacksmith will reheat it, beat it, and mould it with his intended shape. This enables the blacksmith to make a variety of tools and weapons. The most important farming tool was called *mogombee* (hoe), virtually used in all homesteads for ploughing (Sutton, 1985). To make the hoe, the blacksmith took a piece of iron bloom and reheated it, beat it, and moulded it to get a long blade. It was leaf-shaped with two cutting edges and a sharp pointed top for breaking the soil. This blade can be fitted with a wooden haft by the farmer to make it longer for handling. The Tugen were agriculturalists, and any invention that enhanced its development was highly valued. They made sickles, which were used to harvest millet and sorghum, and kitchen knives used to slaughter animals and cut meat and vegetables into smaller pieces to facilitate easy cooking. They made branding tools for marking their animals for security reasons, distinguishing them from those of other clans and marking cattle ownership. The branding tool was a long iron rod. They made bells tied around the animal's neck so that they could locate them easily. When they go out to graze in the forests or when they get lost, you could hear the bell. In addition, when raiding occurs, they can easily trace their movement. They made circumcision knives for both males and females as the Tugen practised circumcision. Others were the axe, which was made for falling trees, especially when preparing ploughing land, and for splitting firewood for various uses.

Weapons

This was another area where the Tugen exhibited its dynamism in the manufacture of weaponry. To make a weapon, the blacksmith first reheated the bloom until it became malleable, and when it was hot, it was hammered into the shape desired. Next, the head was sharpened on both sides' using whetstones. The head was then hafted into a wooden handle, ready for use. A variety of knives was made using this method. The Tugen also made spears using this method. A spear that was 1-2 meters was referred to as *ngotet*. In advance, the iron head was hafted into a wooden spear prepared from a hardwood tree. The spears varied depending on the use and the age set of the user. For example, an elder had short spears, which were used for personal defence and the defence of the family, given that the Tugen culture considers the father as the head of the family. The warriors carried more giant spears because they were to defend society from external aggression. They were the influential members of society responsible for society's internal and external security. In most cases, this was accompanied by a shield made from animal skin for protection purposes.

The other item made by blacksmiths was the arrowheads. The blacksmith hammered some hot blooms into metals that were supposed to be light to make an arrowhead. They were sharpened on both sides and had a pointed end. They were hafted into a wooden stick, which was prepared earlier. They should be as straight as possible, clear of branches and knots. Some of the arrowheads were smeared with poison that was extracted from certain plants for controlled use in the society. Others use a snake or spider poison though it is done secretly and strictly to avoid misuse by society members. The arrows were then fletched by adding feathers to the arrow shaft in order to stabilise the arrow. They are then stored in a quiver (*songe*) and placed strategically in the house. The arrow works with the bow, a stick with a string tied between ends that propel the arrow to its target. The arrows could not travel at far speed. The bow (*kiyang*) increased the speed, and the range Arrows were used for warfare and hunting,

which was the main source of obtaining food by the Tugen. The use of the bows and the arrows manifested a clear change in technology by the Tugen. It is also clear that the use of poison, which was used, demonstrated a high level of knowledge and technique of the Tugen (Kandagor, 2010).

Ornaments

The Tugen valued beauty and made all forms of decorations for that purpose. Most of the items were made from iron, and others were combined with other materials such as wood, seeds, fruits, and even bones to obtain an excellent item. The Tugen utilised what was available in the community, although when the Arab traders arrived in Baringo in the 18th century, the Tugen obtained beads from them, which they used. This signified an advanced stage of human evolution where beauty was appreciated. Ornaments were worn according to age, gender and status.

Ornaments for Females

Young uncircumcised girls made and wore necklaces made of beads and covered with red ochre. They were made of twelve strings of beads. These were made from the wood of the *kipungeiwa* tree and cowhide spacers, threaded using wild sisal thread (*kilembele*). The wooden beads were cut out with a knife for decoration, and the outer edge is a string of white beads, each separated by four to six red beads threaded on the wire. They also had ear blocks, which the girls used to stretch their earlobes for decoration purposes. Earrings worn were made of iron rods that produced sound as they walked around (Kandagor, 2010). When the girls are circumcised, they are married off with an elaborate marriage ceremony at fifteen. Traditionally, the Tugen did not consider a woman to belong to an age set until she was married. After that, she could marry any age set except that to which his father belongs. Marriage ceremonies were highly valued in the Tugen community. The girl will be adorned with earrings (*mwanak ab itik*) with beads stitched on cowhide all around the edge.

Ornaments for Males

The young uncircumcised boys had their earlobes pierced as they approached the time for circumcision. They will then wear earplugs (*sora*), which were iron wire-like earrings in each earlobe after circumcision. In each age set, the initiates were bundled into *siritie*, and they were the same earlobes for identification.⁵⁶ They also wore anklets, which were made from small bells of iron filled with pieces of iron. These anklets produced sound when they were shaken.

Status

The Tugen blacksmiths were respected and held high social positions, just like in other parts of Africa. The Mande blacksmiths hold important positions in society. The chief often calls upon Blacksmiths for guidance in major decisions regarding the village. Among the Tugen, a blacksmith position in the society was marked by the bracelet they wore for identification purposes. Village heads also wore them as a sign of their power in society. It categorised the young and the old, the circumcised and the uncircumcised, and the rich and the poor who wore different ornaments. The Tugen were traditionally involved in recreational activities that involved playing musical instruments and dancing. Songs would accompany many work-related activities for both men and women. In addition, they sang during ceremonial occasions such as births, initiations, and weddings. Dances to punctuate these occasions would be performed while wearing ankle bells and accompanied by traditional instruments such as flutes, horns, and drums. The Tugen community developed iron technology that was unique and meant specifically for the community. The Tugen devised unique methods using indigenous knowledge, which was not obtained from any other sector. In fact, other communities envied the skill and attempted to borrow through trade and intermarriage. With the intrusion of colonialism, this superb industry was destroyed, either articulated or manipulated to enable the Tugen to be entrenched into the world capitalist economy.

Conclusion: The paper contains some important evidence associated with the pre-industrial iron smelting of the Tugen of Baringo County. On the basis of the collected different smelting evidence, like dome-shaped charcoal-making furnace, iron-smelting furnace, tuyeres, ores, slags, ingot, anvil, iron artefacts, and potsherds from rich iron ore belt the Tugen devised various indigenous methods, which suited the local environment. This analysis includes a description of the physical iron-producing as well as charcoal making structures, the transformation process, and the output. Moreover, the products of indigenous industries, with their rigorous processes, are more durable and perhaps expensive compared to simple and cheap products. This is partly due to the fact that the knowledge of indigenous technology exists in oral form or is learned from elders through apprenticeship. It is also part of the complex unfolding of events stemming from severe cultural disruption faced by native Africans during the colonial period. Conclusively, and as Mawere (2014) rightly observed, it is beyond dispute that Africa is endowed with indigenous materials and technologies that, if harnessed, could relieve the continent of its environmental, political and socio-economic related problems and advance

communities' development. The harnessing of such technologies would relieve Africa from the burden of relying too much on Western modes of production that require 'modern' materials, tools and equipment that in most cases are too expensive or rather difficult to acquire. To this end, the revival of indigenous technology is imperative for the future of the African race.

Recommendation: Indigenous Industry among the Tugen cannot be overemphasised. This work showcased the indigenous knowledge and skills adopted by the tugen to develop a superb industry. The crude processes could be enhanced to attain the status of modern technology, and its efficacy will be more appreciated if the following are taken into consideration: A modification of the processes of indigenous technology to suit present-day technology as an appropriate means of community empowerment, banning the importation of locally produced goods as a means of encouraging and promoting Tugen's indigenous products, banning the importation of locally produced goods, secondary and tertiary institutions and finally establishment of Institutes or centres for training young entrepreneurs on indigenous technology.

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