**THE ROLE OF INDIGENOUS KNOWLEDGE ON THE DEVELOPMENT OF IRON INDUSTRY AMONG THE TUGEN OF BARINGO COUNTY; 1895-1963;KENYA**

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**Abstract**

One of the most important indigenous industries among the Tugen community was Iron Making. The Tugen evolved an industry which was superb as per the standards of that time and has continued to thrive even up to the colonial and post-colonial period. The origins, development and the resilience to change through the turbulent years is the interest of this paper. The study examined two distinctive epochs from which the understanding of how ironwork in Tugen land was conducted. The position that is strongly advanced through this paper is that even before colonialism the Tugen of Baringo County practiced indigenous industries such as pottery, blacksmithing, and leatherwork among others using knowledge and skills which were developed independently. Ironwork, which will be dealt with extensively in this paper was characterized by the application of knowledge and skills by skilled individuals who were supposed to selflessly serve the society by making iron materials for the members of the society. They learnt the skill through their interaction with their physical environments, to cope with the changing climatic conditions by making suitable artifacts for the varied demands in all sectors. The study relied on oral traditions and archival source as a primary source. Secondary sources were utilized such as unpublished works like articles, books, and thesis.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 which led to the dismantling of the industry during the early periods of colonial rule such as through taxation, forced labor, settler farming and western education. Ironwork in the 1930s underwent re-organizations in form of labor innovativeness, cultural transformation; marketing strategies etc. These were analyzed to ascertain the forces behind the persistence and resilience of the industry. The Tugen devised ways of survival so as to compete favorably with the British colonizers 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.

**Keywords: Indigenous industry, indigenous knowledge, iron making**.

**1.1 Background information**

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 African was locally produced. (Zeleza. T.P., (1997). Most African societies were able to produce their own iron or obtain it from neighboring communities through trade. Iron ore was available in virtually all parts of the continent, especially in the lateritic crust covering much of the savanna 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 specializing in the many skills necessary for the production process.

 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 begun. The traditional ironworking in Baringo was a complex, skilled, lengthy, and very labor-intensive process. It had to be carried out by a workgroup (kitonyik) and never by an individual smelter. Iron ore deposits were very scarce and unevenly distributed in Baringo County, and that explains why it was only practiced by a few families such as Kap Kiptombul from Embo Rutto, from Kaptere. The Iron Ore, which was usually dug up from ferriferous quarries on the slopes of the Tugen hills. The smith men had a complex and highly specialized system of mining Iron stones. The miners dug to a depth of between 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 to do other chores in the society. This knowledge was passed from father to the 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 refining and forging 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 also to show social differentiation in the 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 practiced 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, P.R., 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 practiced 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, quite apart from patience and physical strength, and a lengthy training period is quite 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. (Philip John Jaggar.,( 1978))

**1.2 statement of the problem**

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 come to be the backbone of society, and provides the infrastructure upon which other technologies can sit. It is extremely 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 modernization 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 industrialized 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 and McLachlan, 2005). During the colonial period, traditional practices involving the use of traditional knowledge system were largely ignored, undervalued or replaced by colonial practices. The demise of that knowledge is unimaginable It is for this reason that 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 artifacts.

**1.3 Objectives**

1. To evaluate the materials required for iron making by the Tugen community.
2. To discuss the process of iron making among the Tugen community
3. To evaluate the uses of the various Tugen iron products

**1.4 Research questions**

1. What were the materials used by the tugen in the iron making process
2. Describe the steps followed when making iron products for various uses from 1895 up to 1963.
3. How were the iron products used by the Tugen.

# Study Area

The study was conducted in Baringo County. Baringo County is one of the 47 Counties in Kenya Baringo County is situated in the Rift Valley Region and shares borders with 8 counties namely, West Pokot to the North West, Turkana to the North, Samburu to the North East, Laikipia to the East, Nakuru to the South, Kericho and Uasin-Gishu Counties to the South West, and Elgeyo-Marakwet to the West. The County consist of seven Sub-Counties, namely Baringo South, Mogotio, Eldama Ravine, Baringo Central, Baringo North East Pokot and Tiaty East. It has 30 Wards and 116 Locations. It is located between longitudes 35 30’ and 36 30’ East and Latitudes 0 10’ South and1 40’ North. The equator cuts across the country at the southern part. It covers some 11,015 Square Kilometers of which 165 Square Kilometers is water surface with a population of 555,561 people in 2009. The county has five livelihood zones: Pastoral 33%, Agro-Pastoral 9%, Marginal mixed farming 39%, Mixed Farming 14% and Irrigated Cropping 4%.( Baringo Smart Survey Report July 2019)

# 1.6 Scope and limitations

With the increase in the social, economic and political activities of man in the pre-colonial period and the use of iron implements in daily life, there has been a corresponding increase in iron explanation and use in the development in the tugen community. In view of this situation, the present study analyses the steps in the procurement of iron and their use in the community. The scope of the study is restricted to iron smelting and smiting and the use of iron products. The empirical study in this research is restricted to conceptual areas where iron deposits are located. The study consciously extracted the relevant information on ironwork in the pre-colonial period.

# 1.7 Justification and Significance of the Study

The study on Tugen leatherwork is critical because of the significant role it plays in the economic development of a county. It is history which is now urgently needed and it must be collected before it is buried with the present generation of elders who preserve it in their memory. It is important to record and document Tugen indigenous industries in written form for future use. It will show how the Tugen harnessed the surrounding environment for survival and in the process contribute to knowledge about African indigenous industries. It was the Tugen way of life, and did not record it. Moreover, the available literature of previous studies did not adequately explain the phenomenon. They tend to contradict the existing knowledge about the phenomenon. The study will offer fresh insight in the study.

**1.8 Literature Review**

This section will handle the critical and relevant literature of ironwork.The literature review was able to acknowledge the contributions of other scholars on themes on irowork in the world and Baringo County in particular. It analyzed the literature related to the study which formed the basis for research questions and objectives in order 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 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 the body a woman (Shillington, 2012, pp. 57-60). 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 dirt was comparable to the miracle of procreation.

It must be noted that the modern European technology is an off-shoot 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 also 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 industrialization of the 1700 ushered in sophisticated machine products. Here lies the difference between indigenous technology and modern technology

Little suggested that the Tugen interacted with their neighbors and subsidized their products through trade. 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 1992:40–41). 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 production of cash crops, e.g., coffee, pyrethrum, wheat, onions, and red chilies (Little 1992:37–38). Little (1992:98–104) suggests that the Il 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.

Andersonin his work *eroding the Commons* noted that in the 1930’s 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 second world wars, as the colonial government carried 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 when compared with scientific innovations. It has been viewed and understood that while local or indigenous technology or practice is recognized as a common practice already adapted and widely used, Innovation is considered more of something new that may have emerged from traditional practices but not necessarily the same (Rai and Shrestha 2006).

**1.9 Methodology**

This study was conducted through a Historical Research Method. Historical Research Method is the gathering of data from situations that have already occurred and performing statistical analysis on the obtained data. The research was based on the collection of Primary and Secondary Data. Primary Data was collected through direct communication with the respondents through oral interviews and open-ended questionnaires. The major source of primary Data is Archival Sources. Archival material will be obtained from Kenya National Archives in Nairobi and Nakuru. It was also obtained from documentation centers in Baringo County. Secondary data include going through Books, Journals, Thesis Reports, Dissertations and policy reports. The study targeted elderly people, leaders, farmers and blacksmiths within the community. The study was based on a sample selected from the study area that is Baringo County specifically the area where iron making was practiced. The sample target was obtained using. Purposive sampling and the Snowball Technique. Two methods will be used to analyze data that is, Qualitative analysis or thematic analysis and corroborative analysis method.

**1.10 FINDINGS OF THE STUDY**

## 1.10.1 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 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 and is known as fayalite (FeO.SiO2). 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 meter high and tall cylindrical shafts for about 02 to 03 meter high. . It is a fire place which plays a major role in smelting of iron ores. A smelting furnace must produce high temperatures, and it must maintain combustion gases in a reducing condition, thus insuring that smelting does occur and that the smelted metal does not revert to a metal oxide in the furnace (Rostoker and Bronson, 1990:25)

Sand/Quartz; The use of sand and small quartz pieces during smelting activities are also evident. The iron smelters were using these 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 furnace from bellow. One end of these bamboo pipes are connected with the bellows and the wider end of the tuyeres are 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 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 high percentage of oxygen, it burns very quickly, requiring a large quantity 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 burns the big logs in the pit covering 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 trees . 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 activities. Some of the important objects include hammer, winnowing fan and water.

## 1.10.2 Stages involved in Iron Making

The iron making process passes through a long process starting from collection of ore and fire wood to selling of products. Brief analysis of these processes are discussed below.

The iron smelting process began with locating, mining and collecting of 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 pit, river bed or from 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 labor-intensive, division of labor was paramount. Therefore after the ore has been extracted, another group picked it and carried it for smelting using pots, baskets, and trays. The collected lump of ores were deposited near the furnace and were 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 0c 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. More carbon reacted with the ore and produced a 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. for charcoal making and for 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 water source, inside or close to the jungle, where wood or log is available sufficiently for making charcoal. In all cases, these furnaces are prepared by using clay form local resources. Uses of sand, small nodules, bio-products, grass etc. are frequently used as inclusion or binding materials. The use of sand or stone pieces helps to increase the heat of the furnace and to continue for a long period. Sometime, 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, 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 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. 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 rationalee for bringing the wood into the enclosure was scientific, that is, to restrict the intake of oxygen and minimize the byproduct of ash. Charcoal from the hardwood are considered to produce a great heat required for the furnace, which was kept going on all the year round. (Goucher. C.L)

.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 ores 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 has cooled, these were collected and consolidated by hammering them into large lamps. After the smelting process, the blacksmith removed the bloom from the furnace. The slag was removed and disposed of. To remove the bloom from the furnace, a pair of tongs was used. 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. 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, cleansing ceremony has 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 furnace is usually done in evening and continues for almost whole night. They use 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 the 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 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 usually a small sized log is to be chopped out and a hole is to be made at its 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 in 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. In the day of smelting, first of all the inside and outside of the furnace was cleaned, and then the bellows and tuyeres were attached with the furnace. The filling of the furnace with iron ores and charcoals is basically done during the daytime and the smelting work was 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 for operating both of these bellows. For this, the bellow operator places her feet on the hide covers of the bellows and put pressure on them alternatively one after another. At the time of pressing of bellow cover the wooden valve helps to block the central hole of hide-cover and forced the air towards the furnace through the bamboo pipe and tuyeres. In the mean time, she used to free other foot from the bellow which facilitates the elasticity of the hide covers in upward direction. The smelter always checks the furnace and put 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 are drain out from the bottom passage in semiliquid condition which indicates about the beginning of 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, varying amount of dissolved carbon and sometimes, bits of burnt clay of furnace. This ingot/bloom was removed carefully from the furnace and given a desired shaped by continuous heating with a hammer. Later, it was broken up into small or desired pieces by regular heating, beating and cooling for making artifacts which is 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 was red-hot and soft and then kept on a stone or iron anvil with an 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. The essential chemical reactions taking place during this iron smelting includes the separation of oxygen from the iron-oxide ores by reaction with either elemental carbon or carbon monoxide produced by the burning charcoal.( Goucher. C.L)

## After removal of the wrought or ingot, the smelter immediately removes the unrequired slags from it by continuous beating with a big hammer. Sometimes, he reheats this ingot again and again at the process of shaping and finally prepares small pieces or raw iron to give the desired shapes.

## 1.10.3 Uses of Iron Implements by the Tugen

When the Tugen were making iron implements, it was based on the specific needs of the community.52 However, any surplus was sold to a neighboring 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 the use. After making the bloom, the blacksmith will then reheat it, beat it, and mold it with the shape he intends to have. This enables the blacksmith to make a variety of tools and weapons. The most important farming tool was referred to as *mogombee* (hoe), which was virtually used in all homesteads for plowing. (Sutton. (1985). ) To make the hoe, the blacksmith took a piece of iron bloom and reheated it, beat it, and molded 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 are agriculturalists and any invention that enhances its development was highly valued. They made sickles, which were used for harvesting millet and sorghum, and kitchen knives, which were used for slaughtering animals and cutting meat and vegetables into smaller pieces to facilitate easy cooking. They made branding tools for marking their animals for security reasons, distinguishing their animals from those of other clans and marking ownership of cattle. 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. Also, when raiding occurs, they can easily trace their movement. They made circumcision knives for both males and females as circumcision was practiced by the Tugen. Others were the ax, which was made for falling trees, especially when preparing plowing land, and also 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. 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 were made using this method.

The Tugen also made spears using this method. A spear that was 1-2 meters, was referred to as *ngotet*. The iron head was hafted into a wooden spear, which was prepared in advance 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 defense and for the defense 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 the the internal and external security of the society. In most cases, this was accompanied by the shield, which was 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 arrow head. 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 which 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 stabilize the arrow. They are then stored in a quivar (*songe*) and placed in a strategic place 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, D.R.(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 utilized 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 which were worn were made of iron rods which produced sound as they walked around. (Kandagor, D.R.(2010).

When the girls were circumcised, they are married off with an elaborate marriage ceremony at the age of fifteen. Traditionally, the Tugen did not consider a woman to belong to an age set until she is married. 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 are shaken.

**Status**

The Tugen blacksmiths were respected and held high positions in society, just like in other parts of Africa. The Mande blacksmiths hold important positions in society. Blacksmiths are often called upon by the chief 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 categorized 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. 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 either destroyed, articulated or manipulated to enable the tugen to be entrenched into the world capitalist economy.

**1.11 Conclusion**

The paper contains some important evidence associated with pre-industrial iron smelting of the Tugen of Baringo County. On the basis of the collected different smelting evidences, like dome-shaped charcoal-making furnace, iron-smelting furnace, tuyeres, ores, slags, ingot, anvil, iron artifacts and potshers 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 its 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

**1.12 Recommendation**

Indigenous Industry among the tugen cannot be over emphasized. 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.

 • Introducing indigenous technology in Kenya as a mandatory course in primary, secondary and tertiary institutions.

• The establishment of Institutes or centers for training young entrepreneurs on indigenous technology.

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