



Technological Advances That Enabled The Tugen To Adapt To The Physical Environment; A Historical Perspective.

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ABSTRACT

Ever since man evolved, he has continuously manipulated the environment for his own survival and the society at large. The physical environment has been crucial in man's adaptation process as it dictated what man should do and how he should live. Climate change on the other hand has been a phenomena throughout history and man had to adapt to the changing climatic conditions. With a climate change, new species emerge and older species disappear necessitating man to explore and come up with new techniques to cope with the change. We cannot control the weather. In the 21st century one may ask why the past would bother them. Historically the past activities shapes the future activities. Therefore, to built up history one has to start with the past. The main purpose of this paper is to identify the historical technological advances which has enabled the Tugen of baringo county, to adapt to the physical environment and understand the importance of the indigenous technology in shaping the life of the Tugen. As the tugen were therefore manipulating the environment for their survival through agriculture, hunting and gathering, clothing etc they either encountered or created problems which also required to be solved through continuous technological innovations. The study was based on underdevelopment theory by Walter Rodney. The environmental challenges of the 21st century arise from the interaction of many different human activities. The multiple environmental problems in specific locations such as global warming, land degradations and ozone depletion, call for new research and management approaches.

Key words; Evolution, Adaptation, Manipulation, Climate change, Physical environment, Human activities.

Introduction

Indigenous is used to describe a thing that originates or occur naturally in a country, region, etc.¹ For anything to be indigenous, it must belong to the people in question rather than being alien to them. Technology describes the application of practical or mechanical sciences to industry and commerce. It is the total knowledge and skills available to any human society for industry, art, science, etc. Therefore, indigenous technology can be said to mean the application of practical or mechanical sciences based on the available local resources and skills to industry and commerce. Similarly, indigenous technology is technology employed by the native inhabitants of a country.

In the 5 million years since early man first emerged from East Africa's Rift Valley, the earth's climate has grown increasingly erratic. Over cycles lasting hundreds of thousands of years, and regions were overrun by forests, which gave way to grasslands and landscapes were fracture by deep lakes.²



It was within the context of this swiftly changing landscape that humans evolved their sizeable brains and capacity for adaptive behaviour. In such a world, the ability to think creatively, to imagine solutions to survival threats, proved to be a major asset. The evolution of the brain is the most obvious example of how man evolved to adapt. That is the means by which humans are able to adjust to new situations. This adaptive ability subsequently helped man to colonize new habitats.

With the dawn of agriculture around 10,000 years ago, man embarked on a new experiment rather than adapting to the existing environment. Man began adapting to the environment to meet their needs, slashing and burning forest to create room for agriculture. That in turn allowed more leisure time, larger societies and a freer exchange of information. As cultural and technological knowledge improved man was able to harness the energy of other animals and in time harness the dramatic power of fossil fuels as well.

Before the colonial experience in Africa, indigenous technology was well expressed in the local systems. Remarkable technological innovations were made by pre-colonial Africans in traditional iron, wood and ivory working as well as in cloth weaving, pottery and indigenous drugs development.

From historically documented accounts and oral traditions there are varying accounts that give the origins Kalenjin groups. All agree that the Kalenjin lived at *TulwobKony* near Mt Elgon before dispersing in different directions at the middle of the 17th century.³ They all dispersed forming the present day seven Kalenjin groups. From the narratives of the interviewees, they confirm that the Tugen did not enter Baringo district in single migratory file. Deducing from the historical accounts, relevant facts and from stories it is clear that they entered the district in four groups and each was composed of several clans.

By 1903 the areas between *Kamasia* or Tugen hills, Londiani Mountains, the Nandi and UasinGishu plateau were sparsely occupied. There were a few numbers of Tugen who lived over the edge of the Tugen hills down the rivers of Lake Baringo and up the slope of the Tugen hills near Ravine station in the southern region.⁴

By 1910, Tugen were still roaming in the district. By around 1914, overcrowding became acute here and there was a severe drought in 1918 called the drought of *Kipngosia*. The Tugen travelled across the Kerio Valley to the west and south west of Nandi in search of grains to be exchanged with whatever they had especially iron implements. Another drought of 1924 – 1927 which was referred to as *KiplelKowo* because of piles of bones of dead cattle consequently led to external trade.⁵

To the south settlement was interrupted by European settlement who took concession of land. Further migration depended largely on the fortunes of the individual member or families. A determinant factor was how they adjusted economically to the new environment⁶. The physical state of the Tugen hills determined not only the course of clan settlement but also their mode of subsistence.

Statement of the problem



It is wrongly assumed that African people are backward because the means of production known among the Europeans were not present in Africa or because our ancestors used different methods to build their houses, to farm, to dress and to cure themselves of physical or spiritual distress. To many scholars such as Okon (1991), any movement to adopt and strengthen traditional technologies is backward and primitive. He argued that the most pressing technical problems connected with man's earthly welfare have been solved through the use of techniques which are either very advanced or are related to traditional skills.

Similarly, Indigenous technology has often been ignored and minimal research has been exclusively on them. Scholars only tackle them in their research work. Others blame the underdeveloped systems on the indigenous systems. It is for this reason that the paper seeks to prove that indigenous technology is unique to specific setups and communities developed at their own phase. The Tugen community adapted to the Tugen environment and manipulated it for their survival.

Research objectives

1. To find out in ways in which the physical environment enabled the Tugen to adapt to the environment.
2. To analyse the challenges the Tugen encountered as they adapted to the environment.

The study area

The study will be carried out in Baringo County which is located in the former Rift Valley Province of Kenya. It covers some 10,627 sq. km of which 165 sq. km is water surface. The population of Baringo county was 555,561 according to 2009 Kenya population census. It has male population of 50% and female population of 50%. It has a population density of 50 people per km². The annual growth rate is 2.6%.⁷ The Tugen country is situated in the middle of the Rift Valley and sandwiched between Elgeyo Escarpment to the East forming the Eastern wall and Ngelesha hills to the West forming the Western wall. The Tugen inhabit a beautiful but rugged hill zone. The Tugen hills rise in a salient from Eldama Ravine in the south, to the Kito pass and Pokot territory in the North. From a floor of about 4,000 feet the hills peak roughly at 7,000 and 8,000 feet where most Tugen reside.⁸

The Tugen utilize the varied micro environments offered by their hilly habitat to raise cattle, sheep and goats and to grow some crops, traditionally millet and some sorghum but now mostly maize. The Tugen regions have differing climatic zones. The highlands (Mosop), the lowlands (Soin) and the intermediate (Kurget) zones. The Soin to the west of Tugen hills was called Turukwei while the Soin to the east of the Tugen hills was called Mogoswek. The lowlands and the intermediate zones are hot and dry. The Tugen people can be divide geographically into three sections; The Southern (Lembus), The Central (Somorr) and the Northern (Arror).⁹

Research 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 and district-based archives such as Baringo County. Secondary data are records of accounts prepared by someone other than the person or persons who participated in or observed an event. They include going through Books, Journals, Thesis Reports, Dissertations and policy reports. The study targeted elderly people, leaders, farmers, blacksmiths, basket makers, beehive makers and pottery makers within the community. These are people who are believed to be having in depth understanding on issues of indigenous technology. The study was based on a sample selected from the study area that is Baringo County specifically the area occupied by the Tugen community. The sample target will depend on the number which the researcher will get using two sampling technique. These two sampling techniques will be used. One is the 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.

The Tugen indigenous technology

For most of his life on earth man had relied on the natural environment to provide him with his daily needs. Like other animals he ate whatever food was available. The natural environment largely decides what food is available naturally, without any deliberate effort by man to produce it. The way in which food is obtained has played a great part in shaping human social institutions and systems over the years. Technology which was invented in the initial stages of evolution depended on the type of food being sought.

The Tugens as a way of obtaining food practiced hunting. The Tugen made constant attempts to survive through exploitation of the environment for the provision of their basic needs. The Tugen occupied varied ecological zones which provided a variety of game to be hunted. Hunting was done by boys and herdsman as a sport and also as a way of eliminating carnivorous animals which were a threat to their livestock. Hunting of small animals such as rodents and duikers was done with the assistance of traps, snares, arrows and spears. Most of the game was also for food. Large herds of game found in Baringo such as large numbers of Antelope, Zebra, Elephants and Rhinoceros. The game was hunted for meat, sport, skin and elephant tusks for trade. By 1920, the large animals were rare having been shot out by the demands of ivory traders and European hunters.¹⁰

Gathering which was the common subsistence companion of hunting remained important. There were the edible berries of *ngosiek* tree. These fruits were gathered and boiled for several hours before the white flesh of the berry could be eaten. Other fruits were *lamayek*, *arya*, *kabiker*, *bobek* and *talamik*. These fruits and game were obtained from the forests such as *Katimok*, *Lembusand* and *Mochongoi*. The Tugen did not grow any crops or fruits because of their shifting nature as they were looking for pasture for their livestock. The Tugen were affected by a serious period of drought and famine, around 1897 -1899 which was referred to as 'hunger of chemng'al. Many Tugen sought assistance at this time from Nandi, and they moved southwards through Lembus and into Tinderet in the hope of finding supplies of grain or other foodstuffs.¹¹ During the drought of 1924 – 1924 (*Kiplekowo*) which was the worst drought within living memory hunting and gathering played a major role in providing alternative food from the dying animals. They were supplemented with vegetables which were collected when they were in season and dried through dehydration to be used during the dry season.¹²



Bee keeping has been an important way of obtaining food among the Tugen. The bee-keepers made bee-hives (*moingonik*) from wood which made it possible for the Tugen to collect honey. The making of beehives was done by woodcarvers who hallowed out bee-hives out of wood. They were hanged on trees where they were secure from thieves. After honey had been harvested, they were put in honey barrels called *keto*.¹³ It was a wooden barrel carved from a special wood obtained locally. Wood was cut and hallowed locally with a chisel, thronged with cowhide with a leather lid. The honey from this occupation is used as an ingredient for brewing beer, *kipketinik*, which were used in ceremonies such as marriage and circumcision. Honey was also used as medicine for abdominal pains¹⁴.

Iron smelting occupied a peripheral position among the Tugen. Specific individuals or groups with special talents performed iron making. The clans who did this were the *Kimoi* and *Tuiyoi* clans. They made their local iron from iron ore (*Ngoriemik*). They made agricultural tools, swords, spears and arrows which were sold to other Tugen groups. A knife (*rotwet*) was made of iron and had both sides sharpened for harvesting millet and slaughtering animals. They also made cowbells (*twoliot*) which were tied on the neck of the favourite bull that leads the other cows for easy tracing when they got lost. It was an item of trade between the Tugen and the Keiyo.¹⁵

The Tugen had well-established system of pottery that is making earthen ware vessels. There are certain clans who specialize in the pottery industry and for centuries the profession has been handed down from generation to generation. In the pottery industry all the work from start to finish is done by women. The process of making pots is from digging of the clay, beating and softening in the moulding and drying, the burning of pots and finally marketing. The pottery industry is carried out when it is generally dry because at this time the clay is suitable for moulding and it will dry more hence the pots will last longer. The pots will be used for storing food, transportation of milk, food, water, cooking food and utensils. Examples include clay pot called *kessum* which was a clay pot used for keeping water cold.¹⁶

The Tugen also made baskets. Baskets are made from strings of small scrubs like bamboo. They include food baskets known as *kitas* which was woven from bamboo fibres and smeared with cow dung and was used to hold grains or flour. They also had *kiskisye* which was used to keep in and serving food¹⁷. They were beaten to soften or strengthen them. They are put in the sun to dry. The next process is to wind them together into a long string about 15 feet long. When enough strings are prepared the work of knitting the basket's is undertaken. Baskets are of different shapes and sizes according to fashion, taste and function. Basket making is looked upon as a spare time job; it is generally done during conversations or travelling. There are also some which are sewn together to make a tray (*kibis*) which is used for drying grain and winnowing of millet. A small tray called *tube* is used as a dish for serving or keeping food. They made gourd carrier called *lekwellee* which was made by small sticks tied together by use of plant fibres. It contains the water gourds used to carry or transport water by women and young girls. Wooden implements were greatly used in cultivation. They include digging hoe *mokombo* which was used for digging in the millet fields. It had iron implement halved into it. They also had wooden hoe *ngoromb* which was a traditional wooden hoe used to till the farms before the advent of iron made hoes. The manufacturing of digging sticks required less skill, making the production a domestic affair. In most homesteads, the males made the digging sticks required by



their family members hence it was uncommon to find digging sticks being marketed. Another wooden implement was a stool *ngecher* which was a three-legged wooden carved stool which used by the owner or as headrest.¹⁸

Fishing was also done in water environment such as Lake Baringo and the many rivers in the county such as Kerio river which is 400km long and has a subsidiary source at Timboroa forest. It runs through Kerio valley and forms a boundary between Baringo, Elgeyo Marakwet, West and East Pokot and Turkana counties. Another important river is the Perkerra which starts from Chemasusu forest and runs in a northerly direction for some 100km and enters into Lake Baringo in Marigat. The Molo river is also important in the county. It originates from the Mau forest and it runs through Molo and Mogotio and it flows in a Northern direction and empties into lake Baringo. Receiver starts from Katimok and Saimo forest in the Northern Tugen hills and flows in a northern, then western directions through the Kerio valley to Barwessa. Others are Endao, Waseges, Lobi, Emom etc. and provided constant supply of food for man. Fishing is not open to many people because the environment in which it is possible exist only in few areas. Technology for fishing had to be developed before fishing can supply food on a regular basis. Fishing communities developed tools such as rafts, canoes, harpoons, nets and fish traps.¹⁹

Pastoralism or nomadic herding was also practised and provided regular supply of food. As long as the environment was favourable, man had to rare animals suitable for the environment. Pastoralists had to know areas not suitable for livestock rearing, especially places with diseases such as tsetse flies were avoided. There were few human barriers to movement and so man could exploit the scattered resources of large areas of land. The most important occupation was pastoralism, which is the rearing of livestock. The livestock reared are cattle, goats and some sheep among others, and rearing is dictated by the climatic conditions of the area. Livestock have had a crucial place in the culture of the Tugen. They provided milk, blood, hides for shoes, clothes bedding and material for making bags. It also determines man's social standings in that the larger the herd, the greater the respect a man earned. Owing to the important contribution cattle make towards the livelihood of the Tugen, they have come to be regarded as economic assets and also a source of life. Livestock was a source of wealth and measure of value of the individual and the community at large. It can be said that exclusive male ownership of livestock in pre-colonial Tugen enabled men to occupy higher positions in the accumulation cycle. The men looked after the cattle and other livestock and were responsible for all kinds of transaction related to the transfer of livestock in relationships such as marriage.

Agriculture is another area which makes the greatest demands on the environment. It requires fertile soils and reliable rainfall. Once a farmer has planted his crop, he must wait in one pace for his harvest. Farmers had to choose their crops according to the environment in which the growing crop would live. Grain crops will not do well in the rain forest and forest crops do not do well in forests. The Tugen were cultivators who cultivated land to grow crops. The crops grown were dictated by the ecological location in the Tugen area that is the lowland plains (*Soinzones*), the area between highland and the lowlands (*Kurget*) and the highlands (*Mosop*²²). The crops grown were mostly finger millet and sorghum. In the southern region cash crops such as maize, coffee, beans were introduced by the Europeans. A determinant factor was how they adjusted economically to the new environment²⁰. The physical state of the Tugen hills determined not only the course of clan settlement but also their mode of subsistence.



Challenges man encountered as he adapted to the environment

As man progressed through the centuries, he developed new ways of exploiting his environment. This was necessitated by climatic fluctuations and changes which were very complex. There were changes associated with events outside the earth, those generated within the terrestrial system and those caused by man himself²¹. Some of the changes are slow and gradual, others are sharp and marked by abrupt events. The most critical extra-terrestrial influence on climate is the sun. Variations in the energy output of the sun, caused by different types of solar disturbances, can lead to variations in global temperature levels. The transparency of the atmosphere to either the incoming solar radiation or the outgoing earth radiations may be significantly altered by volcanic dust in the atmosphere following massive volcanic eruptions. Such eruptions produce significant cooling and related effects on climate lasting several years or decades.

Human activities, particularly farming, industrialisation and urbanization, have significantly altered the terrestrial environment, which has affected climate, certainly at local and regional levels. The clearing of forests cover from vast tracts of land for agriculture and settlement has affected local patterns of rainfall and temperature. Modification of climate on local scale has also resulted from the building of cities, the creation of artificial lakes and extended areas of irrigation and the diversion of river systems.

Since the beginning of the industrial revolution the human capacity to alter or substantially affect the climate of the world as a whole has increased. The combustion of fossil fuels, such as coal, oil and gas has led to a steady rise in the quantity of carbon dioxide in the atmosphere. Now with planetary warming occurring at a breakneck pace, human adaptability is likely to face its biggest test. Man has been dealing with climate change ever since. The problem though is that it is happening now over a short time scale. And that makes it very hard to predict whether or not man will be able to respond and at what cost.

The quantity of man-made aerosols particles has also risen. Rising concentrations of carbon dioxide and other greenhouse gases are expected to lead to an unprecedented global warming, which will change temperature and precipitation patterns with serious implications for agriculture and natural ecosystems. Depletion of the earth's protective ozone layer by chlorofluorocarbons which are used as a propellant in spray and aerosol cans and as a refrigerant in cooling devices, would allow more harmful radiation to reach the earth surface, thereby harming both human health and delicately balanced natural systems.

Successive governments in Africa on attainment of independence, have continued to encourage the decline of indigenous technology through the uninhibited importations of all forms of foreign technology. There has been the tendency towards the establishment of wholesomely imported technology which is unviable within the culture and environment of the African society. On the other hand, several factors such as local raw materials and local skills were ignored and left to idle away. The result has been a perpetuation of technological dependence.

Droughts of the nineteenth century provoked the emergence of colonial conservation ideologies whose implementation led to the gradual erosion of African control over natural resources, especially land. The intense competition between the settler and African communities over



natural resources ensured that any state attempt to regulate the environment became a deeply politicized issue.

The decline of rainfall and occurrence of droughts was attributed by the colonial scientists to the removal of vegetation. In the nineteenth century it had been recognised that European agricultural methods were specifically responsible for deterioration in soils and pastures and the destruction of forests. Africans were removed from their land and taken to the reserves. Africans found themselves being denied not only of land for cultivation, but also seasonal grazing and hunting. Hunting was restricted to the settler elite and imperial adventurers who were seeking sporting pleasure.... the idea of forest reserves soon gave way to that of native reserves which provided both the means and justification for settler seizure of African lands.

On the part of Africans, the general feeling of inferiority (generated by this massive importation syndrome) has given rise to negative ideas about products of indigenous technology while foreign products are seen as superior. The transfer of supposedly sophisticated international technology, has resulted in a dualistic situation whereby growth is concentrated in a relatively small modern sector but does not percolate through to the rest of the economy to any significant extent. This has had the harmful effects of displacing previously existing and still very relevant forms of technology without serving as an adequate cultural substitute.

Since the colonial era, many African countries, have been saddled with inappropriate systems of technology arising from the fact that the relative scare factors of production like foreign exchange, were intensively dissipated. An appropriate technology for Africa is one which takes into account our society's particular stage of economic growth, social development, development goals and resource endowments.

The large quantity of discarded machinery which litters maintenance yards all over Africa and the huge array of inefficiently operated plants in factories and workshops, copied to the finest details from advanced countries, cannot solve all or even most of our technological problems. Naturally, this situation has made enormous demand on the environment. In fact, man has had to help nature in many ways. This literature shows that the Tugen used a wide variety of strategies to prevent, adjust to, recover from the changes. The preventive strategies include the diversification of cultivation the rotation of fields, crops and pastures, intercropping and planting of drought resistant crops, grazing herds on different locations etc. Adjustment to actual food shortages also takes various forms, such as increasing trade, substituting staple foods with irregular and gathered foods, reducing sizes of communities, households and herds etc.

Conclusion

The main thrust of this article is that we need to work out a technological system that is economically efficient as well as appropriate to our resources. Such a system would require an African scientific system which is directly applicable to our changing societies. To do this appropriately, we have to digest the facts of our histories properly and then use these facts to offer suggestions for the moulding of our collective future. Researchers and other technical experts in Africa must find time to develop research proposals that seek to up-grade our indigenous skills. By so doing, we will be stimulating growth in areas of chronic stagnation as



well as bringing strength and utility to cultures at the verge of extinction. And more importantly rededicate ourselves and pursue vigorously and more realistically, the processes of technology synthesis and hybridization of the host technology and the guest technology.

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