

Review

# The contribution of Indigenous Knowledge Systems (IKS) on food security in Mbokomu ward, Kilimanjaro Region, Tanzania

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Received 13 October, 2017; Accepted 11 November, 2017

This paper focuses on the contribution of Indigenous Knowledge Systems (IKS) on food security in Mbokomu ward. The main objective of this paper is to ascertain the use and application of IKS on food security and document methods used in food preservation. Various ethnic groups have different methods of preserving food and use it during the food shortage. Thus, people in Mbokomu ward used several methods in preserving food items and ensure food security throughout the year. The research used different methods in collecting information regarding the application of IKS on food security such as key informants interviews, focus group discussions and observations methods. Secondary information was collected to get familiarisation with the IKS while primary information was collected in the field to ascertain the role of IKS on food security. Purposive sampling technique was used to select community leaders and clan elders who had indepth knowledge of traditional practices used in preserving food crops. People have used traditional systems in preserving food items, drying on the sun, using medicinal plants, using fire and smoke. The findings showed that people have used different systems like hanging maize to dry on trees or hanging meat on the roof close to kitchen to dry slowly with fire or smoke and peeled bananas dried on the sun and kept in the house roof for many years without being damaged. The study recommends that, there is a need to document all IKS knowledge used in preserving food. The IKS is preserved in the elders' memory, thus, serious effort and regulation must be made to document IKS before elders with IKS knowledge passed away or died.

**Key words:** Food security, Indigenous Knowledge Systems (IKS), Chagga, food preservation.

## INTRODUCTION

Since time immemorial, indigenous knowledge systems (IKSs) was used in Africa and the rest of the world for various purposes depending on the needs of the society

(Chiwanza, Musingafi and Mupa, 2013). Indigenous knowledge system is drawing attention of many researchers, higher learning institutions, governments

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and Non-Governmental Institutions (NGOs). However, IKS has gained popularity over the last 15 years (Nawe and Hambati, 2013). The current interest on indigenous knowledge has been motivated by an appreciation of its importance in contributing to sustainable livelihood systems (Liwenga and Lyimo, 2006). Indigenous knowledge system is applicable and used at the local level by communities as basis for decisions pertaining to food security, human and animal health, education, natural resources management and other vital resources (Gorjestani, 2000).

The development of most African countries has been based on knowledge generated in laboratories, research stations and universities.

The World Intellectual Property Organisation has recognised the application of traditional knowledge and appraised of local systems of innovation and intellectual property (Eyzaguirre, 2001). This observation helps to protect the local systems against new innovations. Research anchors IKSs as an integral part of food security, promotion and utilisation of local production systems.

Several innovations related to food consumption, preparation and preservation have been developed. Some of the innovations are, preserving food in the refrigerator or using pesticides. The aim of this manuscript is to ascertain the use and application of IKS on food security and document the methods used.

This paper starts with the definitions of key concepts used in this study which include indigenous knowledge systems, culture and food security. It further presents a historical background of the Chagga ethnic group in Mbokomu ward and provides the justification for carrying out this study. The paper also gives a brief review of related literature, presentation of the findings, discussions and finally, conclusion and recommendations.

## **Definition of concepts**

### ***Indigenous Knowledge Systems***

Indigenous Knowledge Systems can be called IKS, local knowledge; others indigenous knowledge while others prefer traditional knowledge. According to Nuffic and UNESCO/MOST (2001), the definition of indigenous knowledge differ depending on the case at hand and even on the specific aspect authors would like to emphasise. Indigenous knowledge is refers to the knowledge identified by ethnic group.

Indigenous knowledge is the local knowledge which is unique to a defined culture or society or ethnic group. IKS refer to the complex set of knowledge and technologies existing and developed by communities, residing in a defined geographical location. Thus, it is knowledge held by local people, outside the formal scientific domain.

### ***Food security***

There are several definitions of food security. Food security means, families or communities both in rural and urban areas which are able to produce food, preserve and store it for future use (Khumbane, 2004). Food security exists when all people, at all times, have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 2003). However, food security implies a situation where all people at all times have access to nutritionally adequate food and safe water (Chirimuuta and Mapolisa, 2011).

The World Food Summit of 1996 viewed food security in the context of access to safe and nutritious food (Chirimuuta and Mapolisa, 2011). All in all, there are four factors which determine food security; availability of food, access to food, stability of supply and utilisation of dietary food. Thus, a household is considered to be food secure when its occupants do not live in hunger or fear of starvation.

### ***Culture***

Everything humans perceive, know, think, value and feel is learned through participating in a cultural system. It is a pattern of responses discovered, developed or invented during the group's history of handling problems which arise from interactions among its members, and between them and their environment. These responses are considered as the correct way to perceive, feel, think, and act, and are passed on to the new members through immersion and teaching. Culture determines what is acceptable or unacceptable, important or unimportant, right or wrong, workable or unworkable. It encompasses all learned and shared, explicit or tacit, assumptions, beliefs, knowledge, norms, and values, as well as attitudes, behaviour, dress, and language. Culture is important in shaping society, thus culture can influence IKS.

### ***The significance of IKS and food security***

According to the Tanzania National Bureau of Statistics (TNBS) (2012) 48% of Tanzania's population of 45 million people is unable to meet basic food and non-food needs. The high poverty level is attributed to income inequality and a relatively low rate of economic growth in rural areas (TNBS, 2002, 2005a). Tanzania's economy depends heavily on agriculture (farming and livestock keeping). Agriculture accounts for 45% of GDP and 60% of export earnings. It also provides livelihoods for about 82% of the population (TNBS, 2005b).

Ethnic groups have different methods of producing,

preserving food and use it during the food shortage or drought seasons. This article is designed to document and ascertain different methods used by Chagga people of Mbokomu ward in Kilimanjaro Region to grow and preserve food for the future use. There is a claim that, Chagga people had different methods of preserving food items and use them during food shortages or drought seasons. Despite this claim, there is no document available in explaining the role of indigenous knowledge system on food security in Tanzania.

The general objective of this article is to examine the contribution of Indigenous Knowledge Systems on food security in Mbokomu ward. Specifically, this article dwells on exploring the potential contribution of indigenous knowledge systems on food security; document methods used on food preservation and suggest measures in addressing the threat to IKS. People in Mbokomu Ward have a rich history of IKS on different areas including food security. This IKS will disappear if not pro-actively conserved, documented and promoted.

## Literature review and theory implications

### *Indigenous Knowledge System: An overview*

IKSs are primarily based on local experience of the specific society which have evolved over time and transmitted from generation to generation by word of mouth or by practice (Das-Gupta, 2012). Knowledge is a philosophical term and can be conceptualised as a set of various facts and information traits. Knowledge is categorised into two types which are scientific and indigenous. Scientifically proven knowledge is the scientific knowledge, whereas knowledge of the indigenous peoples' is indigenous knowledge (IK). IKS is the actual knowledge of a given population that reflects the experiences based on traditions (Das-Gupta, 2010).

Indigenous knowledge is the local knowledge that is unique to a given culture or society. Culture aids in moulding indigenous knowledge of a particular society. IKS have survived since time immemorial (Mapara, 2009) and have originated locally and naturally (Altieri, 1995). Mapara (2009) pointed out that, IKS is a body or bodies of knowledge of the indigenous people of a particular geographical area that have survived for a very long time. IKSs are the adhesive that binds society as they constitute communicative processes through which knowledge is transmitted, preserved and acquired by man.

### *Theory implications in IKS*

Knowledge and technology are not static. Ancestors used crude methods of farming, traditional medicines, eating-

raw and uncooked food and wild fruits. The earlier people lived by eating wild food gathered from the forest. They were eating raw-food and uncooked food because they had no knowledge of making fire. As time elapsed things changed and people discovered fire used to cook their food and started living in one place for a long time, they stopped nomadic life, and practised sedentary life due to population increase.

Population growth stimulated environmental change and the food produced traditionally became insufficient. According to Thomas Malthus in the 18th century, population is increasing at geometric progression while the supply of food expands at arithmetic progression. The main assumption is that technology is constant and fixed. Boserup (1971), gives some criticism by arguing that population pressure stimulates technological change especially in agricultural sector. Unlike Malthus's theory of population growth, Boserup theory considers demographic pressures as the cause of positive change in land-use and agricultural development. This article shows the relationship between increased population and agricultural intensification which appears to be complex one due to presence of a number of other factors, influencing the performance of a particular farming system leading to food insecurity. The increase in population has influenced societies to switch on to science and technology and leave indigenous knowledge systems. Now people are eating hybrid crops or genetic modified crops.

### *IKS and food security in Tanzania*

The study by Kikula and Mwalyosi (1994) found that before colonialism, in Tanzania there were sound conservation and management measures, which were built in the indigenous agricultural practices that were quite effective. Toima (1997) in Monduli District, found that, the practices of IKS were intended to improve land resources and agricultural production, and in the long run improve the quality of life. The Maasai and Barbaig societies practiced IKS on livestock keeping, milking, preserving milk and meat for future use.

There are several traditional management measures of resources. Some of the traditional measures include: the *Ngoro* (Matengo pit) system in Mbinga, the *Ukara* mixed farming system in Ukerewe, *Iraqwi* intensive farming in Mbulu, *Ufipa* mound cultivation system in Rukwa, and the mixed farming and zero/stall grazing of the Chagga (Kerario, 1996; Kikula and Mwalyosi, 1994; Nawe and Hambati, 2013). These systems were practised among the crop cultivators and mixed farmers. All these systems aimed at improving environment and food security. Other practices include the *Ngitiri* (*ngitiri* is a *sukuma* word denoting the tradition of setting aside pasture for use in drought periods) system in Shinyanga, Mwanza and

Tabora Regions that involved traditional rotations of grazing, and the *Ndobindo* or *Mbugha* in Singida to avoid or control overgrazing.

The traditional knowledge of pastoralists and farmers has enabled people to survive in difficult times and often changing environments throughout history. Despite its potential, indigenous knowledge is often unrecognised by development initiatives, leading to household food insecurity amongst groups. Access to adequate food is a basic human right and is catalysit to the realisation of all other rights (FAO, 1998).

The twentieth century witnessed exciting initiatives in revitalising technologies owned by local resource users in developing countries. It is obvious that, IK is a knowledge held by local people, outside the formal scientific domain. According to WCED, indigenous communities are “repositories of accumulated traditional knowledge and experience, after known as Traditional Environment Knowledge Systems (TEKS), which large societies could learn from managing complex ecological system” (WCED, 1987). Before the invention of science and technologies of preserving food, different societies had their own means of preserving food. Traditional methods used in preserving food will be covered in this article.

### ***Importance of Indigenous Knowledge System in food security***

IKS have several benefits including maintaining nature and palatability of food. IKS act as a community’s armour against environmental shocks and manifests community’s resourcefulness (Madebwe et al., 2005). It can be used in alleviating poverty as it is locally manageable and does not require confiscated technology. Indigenous knowledge can increase and enhance livelihood options, revitalise agriculture, increase food security, improve health and promote sense of cultural pride within the community (Madebwe et al., 2005). Indigenous knowledge helps the communities to cope with periodic food shortages by, utilising the traditional know in preserving food and increase food production which then ensure food security for all people.

Marginalisation of the IKS has resulted in rapid loss of traditional seed varieties best suited to the prevailing agro-economic conditions. The introduction of hybrid seeds which produce more crops has influenced people to abandon traditional seeds, yet these were drought resistant and more nutritious than the modern ones. The introduction of new seed varieties has led to the cultivation of unsuitable crops for marginal farming areas (Winniefridah and Mukoni, 2013). Traditional ways of seed selection and preservation are no longer a priority after years of dependence on commercially produced high yielding varieties.

Several studies have been undertaken on modern

methods of processing to improve acceptance and utilisation of overall food security (Winniefridah and Mukoni, 2013). Traditional methods of production, processing, preservation and storage have been ignored in most societies.

The ignoring of the IKS have led to dissapearing of knowledge of preserving food in different parts of the world. Now people are producing genetic modified crops which have negative impacts on human body. Refrigerator, pest-cides and insecticides are the most used for preserving and storing food. Very few societies are are using traditional methods of preserving and keeping food.

### ***Threats to Indigenous Knowledge Systems***

Everything has merits and demerits. For this, IK is threatned by several factors. Mapara (2009) pointed out that indigenous knowledge is mostly stored in people’s minds and passed on through generations by word of mouth rather than written form. IKS is vulnerable to change and disappear if no efforts are made to keep and preserve it.

There are number of factors contributing to the loss of Indigenous Knowledge System. For example, development process, rural-urban migration and change of population structure, epidemics, displacement or war, contributes to loss of indigenous knowledge. Innovation and technology also contribute to dissapearing of IKS. Indigenous knowledge is under threat from modern technology because even in remote areas the power that push global or just non-local content such as radio and television broadcasting and advertising among others, are much stronger than pulling local content. There is a need to protect indigenous traditional knowledge systems by any cost as it is a simple, affordablr and does not need heavy investment.

Madebwe et al. (2005) noted that marginalisation of IKS has resulted in rapid loss of traditional seed varieties best suited to the prevailing agro-economic conditions of specific regions. It has also led to the cultivation of unsuitable crops for marginal farming areas (Winniefridah and Mukoni, 2013).

Traditional ways of seed selection (Excerpt 1) and preservation are not considered as a priority after years of dependence on commercially produced high yielding varieties.

Traditional methods of production, processing, preservation and storage have been ignored. Millennium Development Goals (MDG) 2014 cites that maize is the staple food in Zimbabweas; hunger is commonly associated with its shortage in the country. The same is applicable to Tanzania, where maize is the most popular crop grown in Tanzania which is grounded into flour used to prepare thick porridge (*madidaluji*) and *ugali*.

### **Excerpt 1. Seeds selection for planting in the next season**

*“Traditionally, people in Mbokomu ward had their own knowledge and system of selecting and preserving seeds to be planted next season. They used to select the big and nice looking seeds of maize and beans, to list some, for planting or grown next seasons. The seed selection was done by the elders (mother/father/grandparents) soon after harvesting period. The selected seeds were dried either on the sun, hanging on the roof close to the fire or kitchen to dry slowly. These seeds stayed for long time without being damaged and they used no chemicals of any kind to preserve them. These seeds were resistant to drought, diseases and grow a little bit longer compared to hybrid seeds which grow for a few months. Now, this system of identifying and preserving seeds is no longer in use as people prefer buying seeds from the shops. Sometimes, people are late in planting seeds as most seeds are brought in the shops late, after planting seasons”.* Said a farmer in Tema village.

### **The study area and research methodology**

This study was undertaken in Mbokomu Ward, in Kilimanjaro Region of Tanzania. Mbokomu ward is located in Moshi Rural district. The ward consists of three villages, namely Tema, Korini-Juu and Korini-Chini. This study was carried out in all these three villages. Mbokomu ward is among the wards making Moshi-Rural district. The ward is boarded by Moshi Urban in the south, Tela village in the East and Uru in the west, in the north is boarded by Government Forest known as Kisao Forest (part of West Kilimanjaro Forest). The ward is located in the highlands of Kilimanjaro region. The Chagga is the dominant ethnic group in the Mbokomu ward.

Agriculture is the major economic activity in the ward. Agricultural economic activities in the Mbokomu ward comprise crop cultivation and limited livestock keeping mostly undertaken by small-holder peasant farmers. Farmers have been living in the area since in late 18th century. The kinds of food crops grown in the ward are: maize, beans, pulses, cowpeas, pigeon peas, sweet potatoes, cassava, finger millet, plantain (banana), yams, fruits and vegetables. Arabica coffee type is the major cash crop in the ward. There are two types of coffee which are Arabica and Robusta. Arabica is the type of coffee growing in Mbokomu Ward. The area has very fertile volcanic soil which support farming of different crops. In lowland areas where Korini-Kusini village is situated maize, beans and finger millet are the important sources of income.

People in Mbokomu ward keep small number of small stock like cattle, goats, sheep, pigs, chicken, ducks,

rabbit and guinea fowls. Zero grazing is practised in these areas due to the nature of the land which is characterised by highland and steep slopes. Steep slopes hinder animal free grazing nature and lack of free land for grazing. Livestock production is done only on a small scale and which does not contribute much to the rural economy.

Livestock are kept to provide manure, eggs and milk. Pigs are kept for sale to provide income, but the number of people keeping pigs is very low, very few people are keeping pigs, despite the fact that not all are muslims. Moreover, it should be borne in mind that there are some christian sects whose members do not keep piglets. Other economic activities include handcrafts (toiloring and carpentry), small scale businesses and local brew preparation. Few people are civil servants because there are few employment sectors in Mbokomu ward such as secondary schools, primary schools and two disepensaries. Most employees in these institutions are from other wards, very few people in this ward have required qulaifications to be employed in these sectors.

Different sources and methods were used in collecting information regarding the application of IKS on food security. Secondary information was collected to get some familiarisation and food security at local, regional and global level. Secondary information was also obtained from books, journals, newspaper reports and internet resources. Primary information was collected to ascertain the role of IKS on food security. Since the study focused on IKS the target respondents were aged people, thus, key informants interviews, focus group discussions and direct observation were used in data collection. Purposive sampling was used to select community leaders and clan elders who are believed to have indepth knowledge of traditional practices used in production and preservation of food.

### **Presentation of findings and discussions**

The historical investigation showed that life of people passed through different ages from stone age, iron age to scietific age including agrarian revolution and industrial revolution (science and technology age). Rural people applied wide range of indigenous knowledge techniques including land management, forest conservation, water mangement and food preservation etc. Over centuries several ethnic groups including Chagga people in Mbokomu ward have developed a useful indigenous knowledge system of natural resources and preservation of food for future use. The findings show that, in the development process, the technology of preserving and storing food items was changing as time passed away. IKS is bequethed from one people to another as pointed out by an old woman aged 94 years old, living in Mbokomu Ward, Tema village.

Her comment was:

*"IKS is a traditional knowledge inherited from one generation to another, from our ancestors. People were taught by imitating or copying from others. IKS was used in different areas including forest conservation, irrigation, farming and food preservation. People used different methods of storing food items for the future use."*

Ethnic groups have traditional methods of keeping and preserving food for use in time of shortage and drought seasons. Ethnic groups were prepared in advance for difficult seasons, preserving enough food to use in case of food shortage. Studies showed that several technologies were used in preserving food which include Scientific Knowledge System and Indigenous Knowledge System ((Das Gupta, 2012; Nawe and Hambati, 2013). People have different methods of producing and preserving food. Some of the traditional methods used in the preservation of food items include drying grains in the sun, using smoke, keeping food items on the roof of their houses, hanging maize and banana to dry slowly on the trees and roof. The other method used in preserving food include hanging meat on the roof close to the kitchen to dry slowly by heat and smoke from the fire.

Food is the main source of energy in human body. People are supposed to eat a balanced diet which contain protein, carbonhydrates and vitamins; without which the human body becomes weak and susceptible to diseases. The availability of food is determined by the ability of the society to access, afford and to produce enough food to use, and other for the next season. The remaining food should be properly preserved and stored for future use; these processes ensured food security in the family and society at large. Farrington and Martin (1988) observed that, throughout human history, human survival has depended on seizure of whatever survival potential is available in the surrounding. Meeting livelihood needs including food needs has not always been an easy task to individuals in various communities and environmental practitioners in the world (Amanor, 1991).

Traditional methods used in keeping food had no negative impact on human body as, no chemicals were used in treating, keeping and preserving food as it is used today. The findings showed that most of the traditional methods used in food preservation are no longer in use.

An elderly man of 69 years from Tema village said that:

*"Traditional methods of preserving food are no longer in use due to technology. We use pesticides and insectised to store maize and beans."*

The abandonment of the use of traditional method in

food preservation is due to invention and technological development. People are now using different technologies in preserving food by ignoring the traditional methods. The traditional knowledge or IKS was affordable and not harmful to human beings as it is experienced today. The people interviewed and consulted listed different methods of preserving food items. The technology or system used vary depending on the type of food or crops stored, and the food and method also varied from one ethnic group to another. The succeeding section tries to present different traditional methods used in preserving different crops among the Chagga people.

### **Maize and beans**

Maize is the staple food for the people in Mbokomu ward and in Tanzania in general. Maize is grown in areas with fertile soils and moderate rainfall. Mbokomu ward is located in an area with moderate rainfall and volcanic fertile soil which support the growth of maize, beans etc. Maize is the main cereal crop for making flour used in making *ugali* and porridge.

According to the interviewed conducted by Mzee Shadrack Foya in Tema village:

*"it is very rare for a day to elapse without taking ugali or porridge". Porridge is prepared and consumed in the morning as breakfast, while ugali is used in the afternoon as lunch. Eating ugali provides calories and energy to work on the farms." Foya continued by saying that, "To us maize is life, maize is very important for the survival of people in this ward."*

This old man was emphasising the importance of maize. In 1950s to 1970s people had bumper harvests of maize, dried them on the sun or hung them on the tree without removing the cover. Maize stayed hanging on the tree for more than 5 years without being damaged or getting rotten. This system of preserving maize was affordable and simple as it required only rope and knowledge of arranging maize and putting banana leaves on top as cover against rainfall.

A mother of four children in Tema village narrated that:

*"Maize was harvested once matured and dried on the sun without removing the cover. After drying, it will be stored inside the kitchen hung in the roof by arrangement. The well-dried maize could be stored in the roof for more than six years. The smoke which came from the fire place acted as both an insect repellent and a preservative, which enabled the maize to be kept for so many years without any harm from weevils and other pests".*

Maize stored in this way can be used as seeds during

planting season, projected to a bumper harvest. The selling of maize from the previous season provided room for storing for the new harvest and also acted as an income generating project used to buy other necessities and pay for labourers who till the land. Other families built granaries known in Kichagga as *mbeshe* and in Kiswahili as *kihenge*, of round shape using poles and withies, plaster the hut with mud and cow-dug.

Once the *mbeshe* is complete people used it for storing maize and beans. The maize stored in the *mbeshe/kihenge* could last for more than five years without being eaten by rats or damaged by insects or pests. Banana and cassava was also stored in this way. Banana was harvested from the farm, then peeled off, sliced into small pieces and dried in the sun. The peeled cassava and banana was cut into small pieces, dried thoroughly on the sun and stored on the roof for future use. The well dried cassava and banana can be preserved in that way for more than six years. Dried cassava and banana was kept or stored close to the fire or kitchen by some families. The storing or keeping of cassava and banana close to the fire preserve it against insects, pests, rodents and make it last long. This system of storing food items close to the fire result in preserving of cassava and banana without the use of chemicals. In preparing food, grounded dried maize mixed with maize or cassava was used to make *ugali* or porridge. The flour obtained from mixing dried maize and cassava was preferred because of its sweetness and energy type of food.

An old man of ninety years old interviewed in Korini-Juu village commented that:

*"In 1960s and early 1970s all household in Moshi had mbeshe or granaries for storing cereals. In those years the first thing you see during visitation is mbeshe. The architectural knowledge of building mbeshe at family level was an art of women. Mbeshe was roofed by leaves of banana. For roofing of mbeshe, women prepared banana leaves used in roofing granary. In roofing, women did not use nails or rope. They had traditional knowledge of roofing in such a way that during the rain seasons no single drop of water or rain penetrated into mbeshe. The leakage was controlled, women used very high knowledge in roofing. In constructing mbeshe, men were responsible for building the structure while women do the roofing. The mbeshe had a very good shape and pattern. The granaries were plastered with cow-dung. Cow-dug acted as a preservative and insecticide such that the cereals stored or kept in mbeshe (granaries) stayed very long without being damaged or rotten".*

### **Cassava, banana and beans**

Cassava, beans, yams, sweet-potatoes and banana are

some of food crops grown in Mbokomu ward. Banana and cassava were peeled, sliced into small pieces, dried in the sun, dried using smoke and treating crops using medicinal plants. These crops were kept for a long period of time. Others were keeping these crops in granaries. Most cereal crops once harvested were dried on the sun. The dried banana and cassava were mixed with maize to make flour. Flour can be used to make *ugali* and porridge.

In other families dried cassava and banana were kept on the inside rooftops of the houses for a long time and used during the drought time or shortage of food. The peeled and dried banana were tied on a rope and the rope was tied on the roof like someone arranging clothes to dry. As time goes on, cassava and banana get dried which remain there (on rope) for many years. The dried banana can be stored in the granaries or *kihenge* (*kihenge* is a Kiswahili word meaning granary). The same procedure was applied by other ethnic groups for storing fish and groundnuts. Among the Chagga people, dried banana is known as *mangolo* and undried one is *maruu*. *Mangolo* is the food used during the food shortage seasons (Box 4). When a family is consuming or eating *mangolo* it is a sign of, lack of *maruu*/banana in the farm. This means that the area is experiencing food shortage. Thus, *mangolo* is used when there is no *maruu* available in the farm.

### **Excerpt 2. Preparation of mangolo**

*"Mangolo is a dried banana mainly kept for use in case of food shortage. There are two ways in which mangolo are prepared before consumed. You grind the mangolo to get flour which can be used to make ugali or porridge. Second, you can mix mangolo with beans then boil and eat. This type of food is more preferable to children". An old woman interviewed in Tema village".*

A woman interviewed in Korini-Kusini village retorted that:

*"Our children do not know how to preserve or store cassava and banana for the future use." The researcher probed more by asking why? The woman proceeded saying, "technology and life style have contributed a lot. Our children prefer to eat fresh food obtained directly from the farm or gotten from the shops, markets and supermarkets."*

A young lady aged 25 years old residing in Korini-Juu village. When asked why not the youth use traditional methods of preserving banana or food items in general? She had this to say:

*"Why should I trouble myself since every thing is available in the shops provided you have money, above*

*all my parents have not trained or showed me how to preserve cassava or banana locally or in a traditional way? Of course I used to see my parents drying banana and cassava in the sun, once it gets dry they keep them in sacks and use them during food shortage or drought seasons”.*

Development of science and technology has influenced people to ignore or abandon the traditional methods of preserving food items. The traditional methods used for preserving food is no longer in use nowadays. People nowadays prefer keeping food in the refrigerator or using chemicals like pesticides and insecticides to preserve food items.

Beans is another food crop grown in Mbokomu ward. Beans is used as vegetable to supplement other food like *ugali*, polished rice and banana. Banana is a favourite food for people in Mbokomu ward. Boiled banana is known as *machalari* in Chagga language. Banana can be boiled with beans or meat. Beans is stored or kept in *kihenge* or granaries as maize.

To show the place of preserving bananas among the Chagga people one informant had this to say:

*“All the matured bananas that are ready for harvest are not harvested once. The family normally cut the bunch or part of banana which is enough for that time while others are kept for future use”.*

These happen because the remaining part of the ripe banana can also be used as a fruit, people use ripe bananas to supplement main menu. Leaves and stem of the banana are used as a fodder for animals and roofing houses while others use stem and leaves to make mulch.

This kind of preservation and maximum utilisation of the banana plant ensured that, there is enough food for the family and also for feeding animals. It ensured food security, material for building granaries, acted as a supplement to the food diet as fruits. Through the traditional methods of harvesting and preserving bananas, the Chagga people ensured constant food supply by, not seeking foreign aid to supplement their diet, thereby becoming food secure without the help of others.

### **Meat**

People in Mbokomu ward engaged both in farming and animal keeping. Animal kept in the ward include cattle, goats, sheep, pigs and poultry. Poultry comprised of chickens and ducks. These animals provide people with meat, milk, hides, eggs and manure. Meat is an important part of food in different parts of the world. People interviewed have different experiences about meat.

A man interviewed in the Mbokomu wards commented

that:

*“families do slaughter animals together, animal slaughtered may not finished immediately or at once. After slaughtering animals people eat part of it, the family do boil or cook the remaining part of the meat, dry it on the fire and keep it for future use.”*

When boiling or cooking the meat, much salt is boiled with it. Salt helped to protect meat from rotting.

Another man of 69 years old, added that:

*“meat and skin is also dried on the sun and stored for many years. Once the skin is dry it can be used as food during the drought seasons. But before skin is prepared, you soak in water for some hours in order to become soft before cooking.”*

Meat is very important for many people. Various ethnic groups have different means or ways of preserving meat for future use. After slaughtering animals, meat is boiled in water with high content of salt, once it is ready, you placed close to the fire containing hot charcoals to dry slowly until it becomes dry. It is stored in a cool dry place to prevent it from rotting. When ready for use, you soaked in a hot water to make it soft and tender. The tender meat will be cooked with banana or prepared as a soup to eat with *ugali*. The well prepared and dried meat can be stored for three to six years without being damaged. This demonstrates that the indigenous Chagga people had their own ways of preserving perishable foods like meat before the invention of the refrigerator. Their traditional method of preserving meat even lasted longer than the modern refrigerator which cannot preserve meat for up to six years as compared to dried meat.

### **Milk**

Milk can be used whilst it is still fresh or fermented to get sour milk. *Nduwi* is a Chagga word meaning container for storing or keeping milk for future use. In other words *nduwi* is *kibuyu* in swahili. *Nduwi* was a special container for storing fresh milk until it ferments. The fermented milk is very delicious and can be used for eating banana, *ugali* and for drinking.

One elderly woman of seventy one years old, said that:

*“Fermented milk can be used with smashed banana. You just take banana, boil banana (maruu), smash them, then mix the smashed banana with maruu. Then you eat smashed banana mixed with milk. This is a very delicious food.”*

If you want to continue using fresh milk you boil the milk when ever you want to use it. Boiling of milk frequently



deter the process of fermentation. The traditional Chagga methods of preserving and processing food ensured a frequent supply of a balanced diet among family members and in a way enhanced food security among different house holds.

### Threats to the use of IKS on food security

Several factors have been identified as the hindrance to the use of IKS. Thieves is the first threat identified by the people interviewed in Mbokomu ward. Maize was stored outside the house hanging on the trees. This system was simple and good as maize was stored hanging on the trees for several years without damage. As life styles changed, most youth did not want to work on farms, they started stealing the maize hanged on the trees. This situation forced people to stop the traditional knowledge or technology of preserving maize in this way.

Development of technology was another reason why people stop using IKS. Using of technology like pesticides, containers or tin for keeping maize, beans and sorghum has had an influence of not using traditional knowledge of keeping food crops. People just treat crops and store them in ready made containers. Technology of refrigerator has influenced people to keep food in it rather than using IKS. However the new technology of pesticides gradually harms the body, which result in people suffering from diseases like cancer and diabetes whilst the traditional preservation methods did not have such harmful effects. Also food items stored in a refrigerator still go bad, it is only the bacterial process that would have been retarded but not completely stopped, food stored in refrigerators cannot last for more than 3 years as compared to traditional methods of preserving foodstuffs. The current power shortages in most African countries has resulted in loadshedding which means that the food stuffs kept in refrigerators can go bad easily. Therefore the traditional methods of preserving food come in handy as are not affected by power shortages.

Changing of life style is another bottleneck to the use of IKS. People do not keep or store food for the future. Food is available in the shops provided one has money to buy it. Other reason is the quantity produced. People produce less which suffice for a short period of time. This situation leaves people with nothing to store or preserve for the future.

One women interviewed narrated about less harvest as follows:

*“Our soil is infertile; our grand-mother and grand-father used the same land. They had water for irrigation which is not available today. All natural streams and canals have dried up due to human activities and lack of maintenance. The same land used since time*

*immemorial is the same land cultivated today. Do you think we will harvest enough to use today and remain with something or surplus to keep for future that is two or more years to come? No! thank you. I am now old, unable to cultivate, my children have migrated to urban areas. This is why most people in Tema village are harvesting less, they do not have money to pay someone to assist in farming, weeding and harvesting”.*

Streams and canals have dried-up due to irrational cut of trees around the water sources and poor maintenance of canals. Climate change have contributed to the drying of springs and streams. All these have contributed to decline of harvest. Most people living in rural areas are women and old people, youth have migrated to urban areas looking for jobs and so called better life. In Mbokomu ward only the old people are there, they can not work on farms and produce enough food.

### CONCLUSION AND RECOMMENDATIONS

IKS is a knowledge held by local people in mind. IKS is a cornerstone of food security for many societies. During the communalism or stone age, people were living by depending on nature, on the environment. They played with nature to survive. Life was depending on hunting and gathering of animals and wild plants, respectively. In this stage, people were using traditional methods to preserve food crops by using traditional knowledge. A report from the United Nations Food and Agriculture Organisation (2003), warns the dangers posed by developmental initiatives that ignore indigenous knowledge. The research claims that the loss of this knowledge exposes communities residing in rural areas to food insecurity.

Indigenous knowledge is a critical factor for sustainable development. Innovative mechanisms for the protection of indigenous knowledge need to be developed and preserved. Many indigenous knowledge practices can at the same time be integrated into local, national, regional, or even global development efforts. This is paper recommends the following;

- i) There should be efforts to conduct researches that document the IKS knowledge available in different groups, societies and ethnic groups in Tanzania. Without documenting IKS, the next generation will not know how the ancestors used IKS in preventing food insecurity.
- ii) IKS should be used in conjunction with Modern Knowledge Systems.

### CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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