

AGIKUYU WOMEN'S INDIGENOUS KNOWLEDGE SYSTEMS ON FOOD CROP PRODUCTION IN PRE-COLONIAL SOUTHERN KIKUYULAND UP TO 1902

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ABSTRACT

This paper examines the various Agikuyu Women's Indigenous Knowledge Systems (AWIKS) on food crop production in pre-colonial Southern Kikuyuland (current Kiambu County). The Agikuyu women traditionally contributed to the subsistence food crop production through the proper use of their indigenous knowledge systems on food crop production. A study was conducted in Kiambu County in 2017 to examine the role of AWIKS on food crop production prior to 1902. The study was premised on the basis that in the pre-colonial setup the Agikuyu women of Kiambu ensured enough food production in their households through the proper use of indigenous knowledge systems. The study used a descriptive research design and the main source of information was oral interviews, archival records and secondary data. The target population was 15,047 people who were aged 65 years and above from Kikuyu, Lari and Limuru Sub-Counties. The study used purposive and snowballing technique to get the respondents with the most relevant information until the data reached saturation at 68th respondent. The study used in-depth interview guide as instrument of oral data collection, oral data was corroborated with archival records and secondary data analysis. The study used the Women and Development (WAD) theory to recognize the role of AWIKS on food crop production. The study established that in pre-colonial period the Agikuyu women of Kiambu grew a variety of seasonal food crops which demanded intensive labour and availability throughout the year. Therefore, commanded detailed indigenous knowledge systems in weather observation and prediction, identifying quality seed varieties for planting, improving soil fertility and suitability, they had knowledge on reducing weed growth in the farm, indigenous farming methods, knowledge in storage and preservation of food crops. All these knowledge systems helped the women to increase food crop productivity in their farms and to improve food supply in their households. Therefore, there is need for more recognition and integration of some of AWIKS on food crop production in modern food production systems and in policy issues related to mitigation of hunger in order to ensure sustainable supply of food crop in Kiambu County.

Keywords: Pre-colonial, Agikuyu Women, Food Crop Production, Kiambu County

INTRODUCTION

Background Information of the Agikuyu People

The Agikuyu people are Bantu speakers and their migrations, movements and settlement in Southern Kiambu have been documented, as part of Bantu migration from Central Africa into the woodlands of Southern Sudan and then across the Congo forest into Katanga region (Were and Wilson, 1984). From Katanga, they passed through Tanzania mainland, and later moved along the Coast to settle in Shungwaya. They then moved up to Tana River and settled around Mt. Kenya (Guthrie, 1967; Muriuki, 1974).

However, it is also argued that they may have originated from Western Niger-Cameroon highlands, Nigeria and Benue Valley and later migrated to the Southern part of Africa before migrating upwards northwards to East Africa where they split into two branches around 3000 BC (Vansina, 1990). According to Guthrie (1967), the Agikuyu are classified geographically and culturally as Central Bantu with their neighboring communities such as the Akamba, Aembu and Ameru. Lambert (1956) provides the likely dates when the Agikuyu may have entered into their present land: Chuka 1300 AD, Embu 1425 AD,

Fort Hall 1545 AD, Meru 1750 AD, Kiambu 1800 AD. Muriuki (1974) argues that by the 15th Century, the Kikuyu together with the Chuka, Mbeere, Embu, Ndia and Gicugu had consolidated themselves at Ithanga and Mbeere regions before the Kikuyu moved to the famous Mukurwe wa Gathanga in present-day Murang'a District where they continued to evolve to be a distinct group; they then expanded into *Gaki* (Nyeri) and later into *Karura* (Kiambu). It is here at Karura (Kiambu) that the Kikuyu were thought to have taken agriculture as a way of life probably due to climatic suitability (Cognolo, 1933; Muriuki 1974).

According to Were & Wilson, (1984) the migration and settlement did not happen at once but it seems to have come in several waves and from different sources. The Southern Kiambu land that was occupied by the Agikuyu was naturally (inelastic) in an agricultural sense. On the South-East it is bounded by lava covered plain unsuitable for crops, to the west it was hemmed in by arid grazing area that composed many volcanic dust and to the North it rises to a forest covered mountain Aberdare ridge too high to support crops (Muriuki, 1974).

Before they come into *Karura* (Kiambu), the land was occupied by hunters and gatherers whom they termed as *Asi/Athi* or *Dorobo* and *Agumba*. The Agikuyu people acquired the land from the *Athi* or *Dorobo* and *Agumba* through negotiation and in exchange for goats, grains, yams, and bananas (Routledge and Routledge, 1910; Muriuki, 1974, Waikwa, O.I 2017). The *Dorobo* and *Agumba* did not cultivate anything or build permanent huts, they were hunter-gatherers who gathered wild food plants especially green leaves, fruits, nuts, tubers they also consumed wild game, honey, birds and insects.

The immigrants such as the Agikuyu people later assimilated some of these indigenous practices and some were lost (Eliot, 1910). This implies that some of the Agikuyu food crops such as maize, millet, sugarcane, arrowroot, yam and bananas may not have originated from Kikuyu land. The Agikuyu adapted them from the aborigine communities like the *Dorobo* and *Agumba*, while others were introduced in 17th and 18th century by the Portuguese and other communities during trade contact with the Coast (Posnansky, 1975).

Agikuyu Traditional Economic Organization

Kenyatta (1965) states that the chief economic occupation among the Agikuyu was agriculture, both the rearing of livestock and subsistence food crop production. The Agikuyu traditional land tenure system was based on the extended family or lineage-*Mbari* and each family (man and his wife or wives) had its piece of land. Land was a major means of production among the Kikuyu and an important source of livelihood for them and therefore the Kikuyu land tenure system was, therefore, complex and dynamic (Muriuki, 1974). Prior to official European settlement in Kiambu in 1902 family group with enough land to cultivate was considered as self-supporting in the subsistence economic unit. Agikuyu men had both rights to own and use the land but women had no right to own land but only they had the right to access and use it for subsistence food crop production. Men and women worked harmoniously with a view to satisfy their immediate livelihood needs and to accumulate wealth (Lambert, 1956; Kenyatta, 1965).

The Agikuyu people of Kiambu had an elaborate system of subsistence economic organization based on family as the center of production. Within this subsistence economy food crop production there was a clear division labour in food production. On one hand women were responsible for seasonal foods crops (*irio cia Kimera*) such as millet, sorghum, legumes (beans, cowpeas, green grams), vegetables, fruits, which were labour intensive and required detailed knowledge to produce. On the other hand, men cultivated certain perennial crops (*irio cia menja*) like bananas, sugarcane, yams and cassava,

pumpkins, and gourds (Middleton, 1953; Davison, 1988; Musalia, 2010). Therefore, through the proper use of various AWIKS on food crop production, the Agikuyu women played a very important role in improving food crop productivity in order to increase food supply in their households.

The problem this study sought to address was that during the pre-colonial period in Kiambu, the Agikuyu people relied on subsistence agricultural economy where food crop production tasks were organized on basis of sexes. Both men and women had different ranges of indigenous knowledge and expertise in agricultural production. The Agikuyu women were mainly responsible for producing seasonal food crops and household activities, which had to be performed daily or as seasonal routine to ensure enough food supply in their households.

Due to this intensive agricultural workload that required women to be available throughout the year, they probably commanded detailed indigenous knowledge on the weather observation, quality seed selection, weeding and crop protection, harvesting, storage and preservation. Through the proper use of indigenous knowledge and skills on food crop production, they may have played a very important role in influencing the amount of food supply in their household, to improve their livelihoods and that of their community.

However, these extensive Agikuyu women's indigenous knowledge systems on food crop production have not been properly documented, and have not been used intensively utilized to enhance food crop production and to ensure enough food supply in the household. Therefore, this research paper focused on examining the role of the AWIKS on food crop production in pre-colonial Kiambu up to 1902. This helped to trace and document the pre-colonial women's indigenous knowledge systems to ensure that information is available for proper utilization. It also brought to view the important role of Agikuyu women in food crop production using their Indigenous Knowledge Systems (IKS) to ensure sustainable food supply in the households.

Thus the main objective of this paper was to explore the role of the Agikuyu women's indigenous knowledge systems on food crop production in Pre-colonial Kiambu up to 1902

This paper sought to answer the questions titled: what was the role of the Agikuyu women's indigenous knowledge on food crop production in pre-colonial Kiambu up to 1902?

The significance and scope of the study was as described below. This study shed light on the traditional role of Agikuyu women's indigenous

knowledge systems on food production in ensuring enough food supply. It brought into view the important role Agikuyu women played in proper utilization of indigenous knowledge systems on food crop production, which is a very important theoretical contribution to the Neo-Marxist feminism that tries to recognize the role of women in the economic development of their societies.

The recommendations of this study could certainly enhance the policy questions related to mitigation of hunger in Kenya because some of the traditional Agikuyu women's indigenous knowledge systems could be integrated into the modern food crop production agricultural practices. This could go a long way towards realization of Sustainable Development Goals (SDGs) 1 on 'eradicating extreme poverty and hunger', Kenya's Vision 2030 (GOK, 2008) and Constitution of Kenya 2010 (GOK, 2010) that guarantee every person right to be free from hunger, and to have adequate food of acceptable quality.

This study covered the AWIKS in pre-colonial period up to 1902. The pre-colonial period in this study provided the date before colonialism in Kiambu when the Agikuyu may have arrived in the Southern Kikuyuland (the present Kiambu County). Lambert (1956) and Muriuki (1974) estimated that probably it was from 1890s when the Agikuyu were settling in the area between Karura and Kabete and took agriculture as a way of life due to climate suitability. The research stopped at 1902 because is a landmark in the history of Kenya as far as the European settlement in the Kiambu is concerned. It was the year when Crown-Land ordinance was passed, which allowed the colonial government to officially lease land to the Europeans a move that probably may have had considerable of implications on the AWIKS.

LITERATURE REVIEW

Indigenous Knowledge System in Food Crop Production

Indigenous knowledge systems in Africa (as similar to other indigenous societies around the world) were traditionally applied in harmony with the natural and spiritual world. These traditional farming practices were creatively designed to address local ecological limitations by maintaining a sustainable utilization and protection of commonly shared natural resources (Musembi and Cheruiyot, 2016).

They acted as a community's protective mechanism against unexpected environmental and climate changes and it manifested community's resourcefulness. Traditional famers used indigenous knowledge systems as a key component in addressing the challenges of droughts and subsequently reduced their negative impacts

(Chikare, 2018). In agricultural production, African women used their indigenous knowledge as an effective resource to raise agricultural productivity and in the life of rural people.

Yonah and Gaoshebe (2014) viewed that African women used their IKS as an effective resource to raise agricultural productivity and in the life of rural people. For example, the women's use of indigenous knowledge in Ethiopia played a significant role in use of an oxen-drawn plough to prepare land for farming (Haile, 2004). In addition, Olatuku (2009) reported that majority of rural women of Ogur community in Nigeria were illiterate famers but they had vast knowledge of traditional culture of food preservation among other skills. These studies highlight the nature and types of indigenous knowledge used by other communities in Africa which is a significant insight to the current study. But, the current study will find out the types of IKS on food crop production that were held by Agikuyu women and their important role in ensuring reliable food supply in their households.

Bennett (1963) stated that it was a natural duty of the Agikuyu women to produce, prepare and cook the food as they had vast knowledge of when, where and what to plant in order to sustain food production in their homestead. In addition, Leakey (2007) reported that most burden of food production activities in the pre-colonial set up fell heavily on women. This gave the Agikuyu women some degree of negotiation that integrated them into the Agikuyu traditional political economy (Kenyatta, 1965; Ahlberg 1990). Furthermore, Middleton (1953) reported that according to the Agikuyu custom no man would dare to indulge in women's domestic activities except in a case of emergency. All these writers only show how the Agikuyu women generally influenced pre-colonial agricultural production and enhancement of food supply in the community. The present study explored the AWIKS on food crop production and showed how such knowledge system enhanced food crop productivity.

Theoretical Framework

This study used Women and Development (WAD) theory (Rathgeber, 1990) which draws its ideas from Neo-Marxism and dependence theory. WAD argues that women have always played important role in the economies of their societies as both productive and reproductive actors and they have been part of development processes since pre-colonial time. It accepts women as important economic development actors in societies and that women's work in the public and private domain is central to the maintenance of their societies structures and in ensuring a self-supporting subsistence economy. WAD stresses that it was how women were integrated into global capitalism that explains their

current marginalization and dependency on men (Parpart, 1989; Rathgeber, 1990). WAD theory helped this study to look at how the Agikuyu women traditionally played an important role in agricultural production of their society through the use of indigenous knowledge systems on food crop production. This ensured enough food supply in homes and hence AWIKS should not be ignored.

RESEARCH METHODOLOGY

Research Design

This research used descriptive research design. According to Kothari (1985), the purpose of descriptive research is to give narrative descriptions of the state of affairs as it exists. Descriptive research design does not fit precisely into the definition of either qualitative or quantitative research methodology but instead it utilizes elements of both in the same study (Glass & Hopkins, 1984). This design enabled this study to organize data on the role of AWIKS on food crop production into common patterns that emerged during data analysis then those patterns were used to give an in-depth descriptive analysis of the situation during the pre-colonial period of Kiambu.

The Target Population

The target population of this study involved both male and female respondents' residents of Kiambu. The target population were 15,047 people aged 65 years and above from Kikuyu, Lari and Limuru Sub-Counties who were the bearers of most relevant information to this study because they are senior members of the society and may have experienced the firsthand or secondhand indigenous knowledge transmission from the previous generations.

The sample size was based on the minimum sample size recommended by Kathuri and Pals (1993) in the table of population sizes with their corresponding sample sizes. In case of the three sub-counties of Kiambu (Kikuyu, Lari, Limuru) that have approximately a total of 15,047 people aged 65 years and above (KEBS, 2015), the table suggests that a universe population size of 15,000, at the confidence level of 95% and sampling error of 5%, the recommended sample size is 375.

However, not all the respondents in the recommended sample size by Kathuri and Pals (1993) were interviewed because the researcher also applied the concept of data saturation in an in-depth interview based research which states that when information reach saturation and begins to be repetitive meaning that it is unlikely that conducting more interviews will reveal new information (Morse, 2000). Using the purposive and snowballing sampling technique, the data reached saturation at the 68th respondent.

Research Instrument

Open-ended interview questionnaire was used for oral data collection since this was a historical study that endeavors to reconstruct the past. Section A of the interview guide covered the demographic data of the respondents and section B included questions on the role of AWIKS on food crop production.

Data Collection Procedure

In determining the role of AWIKS on food crop production during pre-colonial period in Kiambu, oral sources and secondary data were gathered. The in-depth interview guide questionnaire obtained information from key respondents' firsthand account and secondhand account of historical event. The oral information was then corroborated with archival records analysis from the Kenya National Archives and also with secondary data which were derived from various libraries and documentary centers.

Data Analysis Procedure

After data collection, the recorded interview (in Kikuyu language) was transcribed and translated into English. It was then categorized through coding and tabulation. Data was analyzed using the Statistical Package for Social Scientists (SPSS) and presented using basic simple descriptive statistics such as the percentages, frequencies tables. Historical analysis was then conducted which involved a rational historical corroboration of sources though criticism and evaluation of oral sources, archival records and secondary documents.

RESULTS AND DISCUSSION

The study conducted 68 in-depth Oral Interviews (O.I) and their respective interview questionnaire guide filled. An overwhelming majority of the respondents were female at 60.2% as they are key holders of AWIKS on food crop production while the male registered 39.7% as shown in (Table 1).

Table 1: Gender and age representation

Gender and Age	Frequency	Percentage (%)
Male	27	39.7
Female	41	60.2
Total interviews	68	100
65-70 years	41	60.3
71-80 years	17	25
81-90 years	6	8.8
90 and above yrs	4	5.8
Total interviews	68	100

The age of the respondents fell in four categories; 65-70 years, 71-80 years, 81-90 years, and 90 years and above (Table 1). Majority of respondents were aged 65-80 years of age while 90 years and above had the least numbers, which can be attributed to life expectancy and memory loss. The majority age group 60-80 years can be attributed to the fact that they had most relevant information on the AWIKS

since they may have had either first-hand or second-hand experience in traditional practices, which was transmitted from one generation to another.

The study shows that most of the respondents came from three sub-counties of Kiambu West (Limuru, Lari, Kikuyu) (Table 2).

Table 2: Frequency of respondents in study areas

Study Areas	Frequency	Percent
Limuru	19	27.9
Lari	22	32.4
Kikuyu	24	35.2
Others (Githunguri)	3	4.4
Total interviews	68	100.0

There was almost even distribution of respondents among the three sub-Counties. Kikuyu Sub-County led with 24 (35.2%) followed by Lari Sub-County at 22 (32.4%) and finally Limuru Sub-County with 19 (27.9%) and 3 (4.4%) from Githunguri Sub-County. Majority of the respondents came from these three Sub-Counties that are in the Upper Highland zone which is highly fertile with plenty of rainfall for food crop production (Table 2).

Gendered Agikuyu Traditional Food Crop Production

In the traditional Agikuyu set up, there were also men and women's crops. Fifty-seven (83.8%) of the respondents agreed that men and women grew different crops and (9)13.2% said some crops were grown by both men and women (Table 3).

Table 3: Response on whether men and women grew different crops

Response	Frequency	Percentage
Yes	57	83.8
No	2	2.9
Both	9	13.2
Total interviews	68	100

The respondents in this study stated that the Agikuyu women traditionally grew varieties of millet, sorghum, Agikuyu traditional maize, beans and vegetable, while the male counterparts grew cassava, sugar cane, yams, tobacco, arrow roots and sweet potatoes and bananas. Similarly, Tignor (1976) and Musalia (2010) reported that indeed the Agikuyu traditional food crop production was gendered. Women were responsible for seasonal foods crops (*irio cia Kimera*) such as millet, sorghum, legumes (beans, cowpeas, green grams), vegetables, fruits and others which were labour intensive and required special skills while on the other hand, men cultivated certain perennial crops (*irio cia menja*) like bananas, sugarcane, yams and cassava, pumpkins, and gourds.

In the historical description of the socio structure of the Agikuyu community, Hopley (1967) and Leakey

(2007) corroborated the respondents' views on how the Agikuyu people grew a variety of African traditions food crops: cereals such as maize (*mbembe ya githigo*, *Nyamukuru*, *Nyamuthaka*, *Njeru*), the varieties were small combed and quick to mature. Sorghum (*muhia*), Bulrush millet (*mwere*), foxtail millet (*mukombi*), finger millet (*mugimbi*), legumes such as alblab bean (*njahi*), pigeon or bush pea (*Njugu*), cowpeas (*thoroko*), green gram (*ndegu/ Ngina*), navy bean (*Noe*) and kidney bean (*mboco*), Tubers and root crops such as sweet potatoes (*Ngwaci*), yam (*Gikwa*), arrowroot (*Nduma*), cassava (*mwanga*), as well as pumpkins (*marenge*) and gourd.

Some of these crops and others provided form of green leaves vegetables (*nyeni*) in such edible vegetables were like *terere* (Amaranthus), *togotia* (*Erucastrum arabicum*), *kigerema* (*Coccinea trilobata*), *thabai* (stinging nettle leaves), and *managu* (*Solanum nigrum*). Additionally, they had edible fruits varieties such as *Ngawa*, *Matuya* (sweet apple), *Ndare* (black Berries), *Nathi*, *Thigio* and *marigu ma gikuyu* (bananas). All these food crops were regarded as principle sources of food in households and Agikuyu women used them to provide balanced diet in t families (Wanjiru, O.I 2017; Mbiyu, O.I 2017).

In most cases, the food production that was mainly done by women was used to rate the family wealth status and the husband's influence in the socie'ty. This gave the Agikuyu women some degree of negotiation that integrated them into the Agikuyu traditional political economy (Kenyatta, 1965; Ahlberg 1990). This shows women have played important role in economies of their societies as active production actors.

The AWIKS on Food Crop Production

The clear division of agricultural roles and land use patterns on food crop production meant that within the traditional subsistence economy, women basically had immense responsibility in food crop production and subsequent food supply in the household. Due to this heavy workload, the traditional Agikuyu women probably commanded detailed indigenous Knowledge systems on producing various seasonal food crops

AWIKS in Observing Weather Change

The study observed that the Agikuyu women used either one or more local indicators of weather change that were used on forecasting the onset of rainfall. Wind patterns, movement of cloud and position of stars and moon cycle were cited by majority of the respondents at 89.7%, 91.2% and 89.2%, respectively (Table 4). The identified the appearance of thick white-grey cloud which slowly changed into dark-grey colour on the sky of Aberdare ridges

horizon, the cloud then slowly moves towards *Kirima kia Njahi* which is now Mount Longonot, when the cloud from Aberdare ridges and Mt. Longonot met, it was an indication that it would very soon rain.

Table 4: Response on unique knowledge and skills of women in observing weather change

Indigenous (IK) Indicator	Knowledge Frequency	Percent
Wind patterns	61	89.7
Movement of cloud	62	91.2
Position of cluster of stars and moon cycle	61	89.7
Appearances of frogs, ants and other insects	48	70.6
Movements of birds and behavior of calves	48	70.6
Plants shedding leaves or emerging of new leaves	47	69.1
Total interviews	68	100.0

They also identified the appearance of a cluster of stars that was observed on the sky horizon of sunset at 7 pm in October (*mweri wa Kihu gia keru*) and the appearance of full moon which was an indication of onset of short rains. Forty-eight (70.6%) revealed critical indicator such as movements of black birds such as *thungururu* and crying eagle (*githima mburi*), white butterflies, many dragon flies on the ground and the appearances of frogs, ants and worms signaling it could very soon rain. Women also observed cow calves jumping around happily in the field. Koistinen (2002) observed that the migration of birds and the jumping of calves was a sign of sensitivity to change in temperatures and an indication that farmers should start preparing land for planting. *Migaa* trees shedding leaves in this area was mentioned by 47 (69.1%) of respondents as an indicator of rains coming soon.

Residents of Kikuyu-Karai and Limuru-Ndeiya mentioned that indigenous women observed plants shedding leaves and flowers as a commencement of dry season and when the new leaves start to emerge towards the end of the dry season, was an indication of long rains coming soon. The Agikuyu women masterly of indigenous knowledge of such indicators and variation of weather conditions helped them to come up with an elaborate seasonal calendar which enabled them to know when to prepare land for planting, which crops to plant on long or short rains, when to weed and/or harvest. They also knew which rain season was sufficient enough for sustaining the growth of various crops to maturity.

Cognolo (1933) and Hobley (1967) reported that basing on observed changing weather patterns, the Agikuyu women devised seasonal and lunar calendar for crop production activities. Knowledge of local

calendar often provided important information about local farming systems. Women used the word "*kimera or mwaka*" which is now applied to the English word "year" to mean a period from one rainy season to another, which is usually about six months each year in English. There were two "*Miaka (pl)*", one of these was the *kimera kia njahi* to mean a season when alblab bean (*njahi*) was planted followed by the *kimera kia mwere* a season when Bulrush millet (*mwere*) was grown. Each season (*kimera*) had divisions roughly corresponding to lunar months but they were considerably shorter varying from 20 to 30 days.

Taylor (1970) pointed out that using this local calendar the Agikuyu women came up with four major seasons and two harvests in a year. *Mbura ya njahi* -the season of long rain for growing alblab bean, from March to July, *magetha ma njahi* the season for harvesting the alblab beans, *mbura ya mwere* short rain season for growing millet and *magetha ma mwere* the season of harvesting Bulrush millet. Therefore, Agikuyu women had special indigenous knowledge and skills on interpretation of climate variability and prediction that helped them to know when to plant, when to weed and when to harvest. This sustained the food crops to maturity and resulted in increased food crop production in farms. Therefore, such Agikuyu women's distinctive knowledge, skills should be recognized as the backbone of food crop production.

AWIKS on selection of quality seeds for planting

Most of the Agikuyu women had knowledge and skills of identifying and sorting out quality seed varieties of grains, cereals and root crops for planting and only used the best in order to get good yield. Sixty (88.2%) respondents observed that the Agikuyu women selected most of the seeds especially grains for planting based on their size, health, and texture, while 33(48.5%) of respondents mentioned that the early matured and strong seeds were isolated from the rest to avoid people from eating them (Table 5).

Table 5: Indigenous Knowledge (IK) Knowledge to determine good quality seed variety

IK indicators of good seed	Frequency	Percentage
Observe the Size, health and texture	60	88.2
Biting or pinching	58	85.2
Color observation	9	13.2
Maturity and strength	33	48.5
Early flowering & maturity in garden	2	2.9
Total interviews	68	100

Leakey (2007) attested that cereals and grains were selected during the harvesting or soon after they were

harvested either at home or in the field. During harvesting, women used their indigenous skills to identify the best (healthiest) grains such as maize, beans, legumes and they were set aside for seed, the damaged (spoiled by insect, rotten or moldy) or broken ones were not suitable for seed selection (Njeri, O.I 2017). Furthermore, 58 (85.2%) of the respondents viewed that the Agikuyu women determined the moisture content of the maize and beans by biting the seed with teeth or by pinching it with fingers. The soft grain was too moist and not suitable for planting. Nine (13.2%) respondents said that women looked at the color of the grain and selected the best well dried and not discolored or faded ones. This was done after winnowing to separate seeds for planting and grain crops for consumption and to remove chaff, dust and other rubbish from the best grains.

Routledge and Routledge (1910) and Cognolo (1933) indicated that winnowing was mostly done by elderly women who were well versed in indigenous knowledge systems, and because it does not demand a lot of energy. They spent the whole day selecting seeds while winnowing and physically picking out under-sized and off coloured grains, sand and small stones to clean, sieving was also done to separate main grains and weed.

Hosken (2013) pointed out that women were excellent observers and they have many reason such as taste, nutritional, ceremonies and medicine in mind when selecting seeds. Two (2.9%) observed that women also selected seed from healthy standing food crops prior to harvesting and for early maturity by marking the plants that flowered first during flowering period and also identified the healthy slips of sweet potatoes that were suitable for planting. Indeed, Hosken (2013) point out that the selection of good seed was at the heart of ensuring good harvest and sustainable food production. As a result, Agikyu women were able to plant quality seeds that significantly ensured better yield and enough availability of food in their household.

AWIKS farming practices and crop production

When the Agikuyu people were given permission by the *Ndorobo* to occupy the land, they broke the land, separated the soil from tangled roots, piled and burned after this was done; the other work was done by women. Each year this process was repeated until sufficient land had been brought under cultivation.

Majority of the respondents identified the indigenous fallow farming, shifting cultivating and intercropping as the major indigenous farming skills that were used by the Agikuyu women. Sixty-one (89.7%) and 62 (91.2%) of the respondents identified indigenous fallow systems and shifting cultivation as common farming methods that were used by the traditional

Agikuyu women as deliberate natural resource management systems. They mentioned that in many instances exhausted fields was left fallow for two to five years to help the soil regain its fertility.

During fallowing period, cattle, sheep and goats were grazed in that field and that their droppings added to soil fertility. Fallowing enabled Agikuyu women to improve on their food crop production through this natural process of soil regeneration. In addition, 61 (89.7%) of the respondents stated that intercropping especially of maize and beans was commonly used by the Agikuyu women. They cited that the method helped to reduce exposure of the food crop farms to sun heating and hence preserve moisture. Forty-eight (70.6%) said that mixed cropping was also used, where women planted more than two food crops at the same time and the sowing of seeds is done haphazardly and simultaneously by hand in the same field (Table 6).

These two indigenous practices maximized growth of all crops at the same time in the same field. Respondents also claimed that this system increased the productivity of land and improved yield since it provided food crop diversity and a range of output. The succession of plant growth provided cover during heavy rains when leaves of crops protect the soil (Wairimu, O.I 2017; Wangeci, O.I 2017). Rankoana (2016) corroborated with the respondents as he stated that intercropping and mixed cropping maximized the growth of all crops and allowed cropping system to reuse their own stored nutrients.

Table 6: Indigenous knowledge and skills in farming Practices

Indigenous knowledge	Frequency	Percent
Fallow farming	61	89.7
Shifting cultivating	62	91.2
Intercropping	61	89.7
Mixing cropping	48	70.6
Soil moisture protection	55	80.9
Use of crop protection skills	40	58.8
Farming hand tools	67	98.5
Use of seasonal calendar	64	94.1
Total interviews	68	100.0

In addition, 55 (80.9%) of the respondents agreed that the indigenous women protected the soil from erosion (Table 6). For example, some crops like sugarcane were planted on sloppy grounds and cover crops such as sweet potatoes, and cereals to prevent soil erosion. They also mentioned that the burning bushes was used as a way of adding nutrients to the soil and this was well suited for soil with

insufficient nutrients. These were deliberate natural resource management systems which followed the natural Agikuyu calendar cycle. Kenyatta (1965) stated that men broke the land into sods together while the women worked on the sods behind the men with their short digging stick (*muro*). They harrowed (*Kuhukuria*) the sod or broke them up, shook out the roots of the grass and bushes and put these into piles for burning.

Respondents (Waikwa O.I 2017; Njoroge, O.I 2017; Njeri O.I 2017) pointed out that the traditional harrowing skill was important in adding soil fertility and to minimize the growth of weed in the field. Women used this knowledge system because they knew that if roots or little bits of grass were left in the soil, they would soon grow again and compete for nutrients and water with their planted food crops resulting to low crop yield. In addition, during the planting of food crops, the Agikuyu women used organic manure from the domestic animals (cattle, sheep, goats, chicken etc) to increase soil nutrients which facilitated the growth of the food crops.

A total of 40 (58.2%) respondents added that women used various skills to protect the food crops. They used ash to control pests from destroying food crops in the farm, while women and children were responsible for chasing away birds from eating and destroying the food crops (Table 6).

Sometimes they used to make scare-masks, which were put in the farm to make noise and scare the birds away. Leakey (2007) and Routledge & Routledge (1910) observed that sometimes the Agikuyu people used to protect their food crops from thieves by calling in the aid of blacksmith (*muturi*) who prepared a trap (*mutego*), a method that was particularly used to protect sugarcane field since they were not visited regularly by the owners.

According to 98.5% of the respondents, the Agikuyu agricultural farming tools were rudimentary (Table 6). In preparation for planting men used their cultivating knives (*hiu cia mengere*) and axes to clear the bush wood and bigger trees ready for burning. They then broke the land using a big digging stick called *Munyago*, this was a long pole sharpened to a point at one end. It was about 6 ft long and 2-inch diameter of a hardwood such as *muhugu*, *mutamaiyu*, *mugucwa* or *mutikani* (Huxley, 1967; Waikwa O.I 2017). Maize, lablab bean, cowpeas, sorghum and beans were normally planted using a short digging stick (*muro*). Women had root-digging sticks to dig root crops and baskets were used to carry away the harvested crops.

Respondents (Waikwa, O.I 2017; Wangari, O.I 2017; Wairimu, O.I 2017) mentioned that women using

their knives and short digging stick (*muro*) did the weeding using indigenous knowledge systems. For example, weeding commences when the crops were about four weeks old. Women carefully removed weeds by hand or hand-hoe to avoid breaking them and to reduce moisture competition with the weed. They also revealed that Agikuyu women used previous harvest residue in the form of maize stalks, dried bean husks for mulching food crops in the farm as it was good soil stabilizer. The residue was tilled with the soil to improve moisture retention, fertility of the soil and reducing weed growth and enhancing the appearance of the farm.

In addition, 64 (94.1%) respondents observed that the Agikuyu women had elaborate indigenous knowledge on seasonal calendar, and when it was suitable to plant a certain food crop, depending on the amount of rain available in a given season (Table 6). Some respondents specifically stated that the Agikuyu women planted most of traditional food crop cereals and legumes during short rains. They knew from experience that if planting was done during long rains they would be fully mature before the onset of dry season they could rot before they are harvested resulting to low yield and decrease in food supply in the household (Mbiyu O.I 2017; Muturi O.I 2017; Waithaka O.I 2017).

This was corroborated by Musalia (2010) who observed that women planted sorghum (*muhia*) only at the beginning of long rains. The sorghum did not mature until after the short rains were over. It was harvested at the same time with varieties of millet although it was planted 10 months earlier. Both foxtail (*mokombi*) and finger millet (*ugimbi*) were planted during short rains through broadcasting method or by scattering seeds over the ground followed by digging the ground. Bulrush millet (*mwere*) was planted in the lower field of the land during the short rains.

AWIKS on Harvesting, Storage and Preservation of Food Crops

The study established that the Agikuyu women had special indigenous knowledge on harvesting, storage and preservation of food crops. Sixty-five (95.5%) pointed out that women observed the changing of colour of leaves for the cereals such as beans, drying leaves and stems, 61 (91.2%) of the respondents mentioned that the bending of stem such as in bananas, drying up of milky liquid inside maize and of maize silks also signaled maturity. Forty-one (60.2%) respondents mentioned that in cases of sweet potatoes, women observed the cracking of ground planted with sweet potatoes, whereas protruding on the ground for arrow roots pointed at readiness for harvest (Table 7).

Table 7: Indigenous knowledge (IK) and skills on harvesting, storage and preservation of food crops

IK and skills on plant ready for harvest	Frequency	Percent
Change of plant color	65	95.5
Bending of crops	62	91.2
Cracking of ground	41	60.2
Total interviews	68	100
IK and skills on storage and preservation	Frequency	Percent
Sun drying	61	89.7
Mixing with ash	56	82.3
Smoking	44	64.7
Salting	36	52.9
Storage in Granary, pots, drum and baskets	46	67.6
Total interviews	68	100

Respondents also identified special knowledge or skills that the Agikuyu women used to store and preserve food crops to ensure enough food supply in their families. The methods identified by (61) 89.7% of the respondents included sun drying for vegetables and cereals (Table 7). Waringa (O.I, 2017) and Wamoro Wa Nderi (O.I, 2017) specifically stated that most cereals and legumes such as millet (*mwere and mukombi*), pigeon pea (*njugu*) cow pea (*thoroko*), labla bean (*Njahi*), Navy bean (*Noe*), Kidney bean (*Mboco*), maize (*mbembe*) underwent air and sun drying. There after they were kept in carrying bags (*ciondo, Nyamikwa*), clay-pots (*Nyungu*), various calabashes (*Kiuga, Giitirira, Kiihuri*), gourd (*ndigithu & Nyanja*), in sisal sacks and then put in the granaries (*Ikumbi*) to protect them from harsh weather conditions. Forty-four (64.7 %) respondents observed that there was smoking for millets and sorghum after drying by hanging in kitchen smoke which produced bitter taste that prevented insects attack. Furthermore 56 (82.3%) mentioned mixing pumpkins with ashes, leaving dried cow peas with covers stored in clay pots and drums.

Besides some of the grains were also treated with ash mixture which was sprinkled on sorghum, millet, maize, and thoroughly mixed it was also sprinkled on the floor and outside of the granary in which the grain will be stored. This practice was based on the women's indigenous knowledge and skills that the bitterness of the ash mixture kept pests, rats and weevils off from destroying the grain which enabled them remain for years until the next planting season. Sugar cane, maize, millet and sorghum dried, tied, hanged and smoke coated inside kitchen's ceiling until the next planting season.

Women knew that smoke soot produced a bitter taste which deters the attack by pests and rodents. Routledge & Routledge (1910) indicated that other food crops such as Arum (*nduma*), cassava (*mwanga*), yam (*gikwa*), sweet potato (*ngwaci*), Bananas (*marigu*), Sugar cane (*kigwa*), green pumpkin (*marenge*) were kept in shades under granary's shelves or outside the kitchen (*kimbasha*)

because they were for immediate use. The Agikuyu women knew that if root and tuber crops were exposed to the sun for long, they would be damaged by sun burn (*kurota*) and become unfit for consumption

Varieties of fruits such as *Matuya* (sweet apple) and *marigu ma gikuyu* (bananas) were kept in baskets and placed on upper shelf where there were low temperatures and enough air circulation, this allowed the evaporated moisture to escape. Other fruits such as *Ngawa, Ndare, Nathi, Thigio* were kept in small airtight pot almost filled with water to prevent bacteria damaging them, then they were stored on granary shelves others were hanged on thread in a shelve with enough air circulation (Waikwa O.I 2017). Gathingira (1934) reported that vegetables freshness was also preserved by submerging them in water with high concentration of salt and those that were not for immediate use were sun dried to remove the moisture

CONCLUSION

From the ongoing discussion, it is clear that in the traditional setup, the Agikuyu women had huge responsibility in food crop production. Therefore, they commanded detailed indigenous knowledge systems on food crop production. They had indigenous knowledge on weather observation and prediction which in return helped them to come up with an elaborate seasonal calendar which enabled them to know when to prepare land for planting, when to weed and/or harvest. They had IK on quality seed selection which enabled them to plant quality seeds and get better food crop yields. They also used a variety of indigenous farming methods such fallow farming, shifting cultivating, mix cropping and intercropping, traditional harrowing skill as the major indigenous farming skills. These methods added soil fertility, in soil moisture retention, to minimize the growth of weed in the field and maximized the growth of all crops at the same time in the same field. In addition, they IKS on harvesting, storage and preservation of food crops such as observing the changing of colour of leaves for the cereals. Preserve

food crops by drying on sun, mixing with ash, salting and store them in well-ventilated granaries. Others were dried, tied, hanged and smoke coated inside kitchen's ceiling until the next planting season. All these skills helped Agikuyu women to increase food crop productivity in their farms and to improve food supply in their households. Therefore, some of the women's indigenous knowledge systems could be integrated into the modern food crop production agricultural practices in order to reduce the community's vulnerability to drought.

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