

Identification of Traditional Foods with Public Health Potential for Complementary Feeding in Western Kenya

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Abstract

The diversity of traditional foods in Kisumu West District of Western Kenya was assessed with an aim to identify the foods with a potential for complementary feeding. Leaves were the most consumed plant part amongst vegetables, while a few fruits were consumed together with their seeds. *Amaranthus cruentus* L. was found to be consumed as a leafy vegetable while another variety, *Amaranthus hybridus* L. was found to be consumed as a grain. Four species of winged termites, a grasshopper, black ant and *dagaa* fish were also identified. Twelve of the traditional foods were found to be associated with nutritional and health benefits as perceived by the locals. Traditional food processing methods such as boiling, fermentation and sun drying were identified. Thus exploitation of the species possessing nutrient, health and processing benefits needs to be explored in complementary feeding.

Keywords: Traditional, Nutritional, Health, Availability, Acceptability

1. Introduction

Kenya has a diverse traditional food system with important dietary contributions and therefore the importance of wild and semi-domesticated food sources for subsistence farmers cannot be over-emphasized (Ogoye-Ndegwa & Aagaard-Hansen, 2003). Persistent use of a large number of these traditional foods plays an important role in the continued adaptation of the communities of Western Kenya, to the particular economic and ecological conditions (Orech *et al.*, 2007a).

Traditional foods may be described as a large and heterogeneous group of raw and processed foods which include; wild indigenous plants and animals collected from uncultivated land and forest (e. g. leafy plants, roots, berries, small rodents and insects) and from aquatic environments (e. g. fish, frogs and snails); semi-domesticated indigenous plants and animals, for example gardening of indigenous plant species such as amaranth in Africa and culture of indigenous fish species in rice fields in Asia; locally available staple foods processed using traditional processing technologies (Ogoye-Ndegwa & Aagaard-Hansen, 2003). Traditional foods have some features in common; they are culturally acceptable, may be an integral part of local food habits, may have no or low commercial value and may either be collected for consumption or traded locally.

Plants provide most of the foodstuffs consumed by peasant farming communities in tropical countries. Communities in Western Kenya, depend on many plant products for subsistence and for generation of cash income. Sizeable areas are dedicated to the cultivation of dietary staples and crops, many of which are not traditional (Johns & Kokwaro, 1990). Traditional foods may contribute to a nutritionally balanced diet by supplying essential vitamins and minerals (FAO, 1988). Moreover, traditional foods adapted to local conditions contribute to the diet in periods of seasonal scarcity (Ogoye-Ndegwa & Aagaard-Hansen, 2003; Orech *et al.*, 2007a), thus contributing to an important traditional buffer against periodic famines that are becoming increasingly prevalent in other areas of the tropics.

Traditional foods may play a very crucial role of providing macronutrients and micronutrients (Ogoye-Ndegwa & Aagaard-Hansen, 2003; Kinyuru *et al.*, 2009; Kinyuru *et al.*, 2010a; Kinyuru *et al.*, 2010b) and may more importantly be utilized to alleviate childhood malnutrition (Roos *et al.*, 2007). This is in addition to their ecological, agronomical, cultural (Geissler *et al.*, 2002; Ogoye-Ndegwa *et al.*, 2002) and medicinal values (Lindeberg *et al.*, 2003).

Although traditional foods have huge benefits to human health, they are generally uncultivated and underutilized (Abukutsa-Onyango, 2003; Kiambi & Atta-Krah, 2003). This study was aimed at identifying and documenting traditional foods with public health potential for complementary feeding in Western Kenya.

2. Methodology

2.1 Study area and population

The study was conducted in the rural areas of Kisumu West District namely: Kanyoto, Kapuonja "A", Karateng West, Marera, Ong'io, Meronda, and Karateng' East villages of Maseno Division and Seme, Reru and Kaura villages of Kombewa Division. Kisumu West District lies between a latitude of -0.25 ($0^{\circ} -15' 0$ S) and a longitude of 34.92 ($34^{\circ} 55' 0$ E), with a land area of 919 km^2 , with an approximate population of 1 million according to the 2009 population and housing census (KNBS, 2010). Majority of the inhabitants in the District are people with Luo ethnic background whose main economic activities are fishing and subsistence farming; maize, sorghum, and fresh vegetables. With an approximate altitude of 1580 meters above sea level, Kisumu West District is part of the extension of the humid tropical zone of central Africa into western Kenya. Oral consent to participate in the study was sought from all the participants.

2.2 Study design

It was a cross-sectional study with random sampling used in order to allow the generalization of conclusions. The methodological protocol closely followed a multidisciplinary approach combining botanical inventorying; collection of voucher plant specimens and taxonomic assessment; semi-structured and informal interviews (Martin 1995; Grenier 1998) which came up with a list of Luo (vernacular) names of the different foods mentioned. Secondary data on the nutritional potential of the foods was collected from food composition tables was also evaluated.

2.3 Data collection methods

2.3.1 Field survey

The field survey targeted women in child bearing age and fathers. Farm plots of some interviewees were surveyed for food plant species and samples collected. Older persons were sought for historical use aspects and some few individuals encountered by chance were also considered in the course of the field study.

2.3.2 Key informant interviews

Six (6) key informants were purposively selected with the help of interviewees, elders and the chiefs (local administrators). The interviewer read out names of foods and sought explanation why those foods were eaten. The survey tool included a list of all plant and animal foods originating from the field survey described above. The objective was to find reasons why the earlier listed foods were consumed and determine whether the consumption of these foodstuffs was linked to nutritional and/or health benefits. Common phrases such as, 'increase of blood levels', 'addition of energy', 'enhancement of breast milk by lactating mothers' from the informants were noted. Availability of the foods was also probed. Cooking methods of the foods was also probed.

2.3.3 Secondary data

Literature on iron and zinc content of the food was sought. The Kenya food composition database (Sehmi, 1993) was used to ascertain the iron content of the foods. Since the Kenya food composition database lacks zinc content values for the foods tabulated, Tanzania food composition tables (Lukmwaji *et al.*, 2008) were used to ascertain the zinc content of the mentioned foods.

2.4 Data analysis

Vernacular names of the foods were annotated with scientific names. Foods were separated according to food groups namely; fruits and vegetables, cereal grains, pulses, seeds, tubers/roots and animal foods. Foods with perceived nutritional and health benefits were tabulated.

3. Results

3.1 Traditional food groups and the edible parts

Among the plant source traditional foods, 25 fruits and vegetables (Table 1), 6 cereal/legumes, 1 starchy root/tuber (Table 2) were identified. Traditional plant species were collected from vegetation types such as scrubs, thickets, grasslands as well as from kitchen gardens, farmlands, built-up areas, hedges and wastelands. Leaves were the most consumed amongst the traditional vegetables while a few fruits were consumed together with their seeds. One (1) vegetable, *Odielo (Commelina Africana)* is consumed as a whole plant. *Ododo (Amaranthus hybridus L.)* was found to be consumed as a leafy vegetable (Table 1) while its grain species (*Amaranthus cruentus L.*) was found to be consumed as a grain (Table 2). *Amaranthus cruentus L.* was found to be a tall plant to the height of an adult man while *Amaranthus hybridus L.* grows only up to knee height of an average adult man. Cassava leaves were consumed as a vegetable while the tubers were also found to be consumed. Some of the fruits were consumed together with the seeds.

Most of the vegetables and fruits presented in Table 1 grow abundantly and are easy to procure in large quantities from various habitats of the local environment, during both short and long rainy seasons. Some of the species such as *Mussaenda arcuata*, *Biden pilosa*, *Amaranthus hybridus*, *Asystasia mysorensis*, *Bidens pilosa*, *Commelina africana*, *Corchorus trilocularis*, *Launaea cornuta* and *Solanum nigrum* are invasive weeds in cultivated fields, and thus are uprooted and burnt or fed to domesticated animals by the local farmers. They are abundant all year round and hence, are important food resource during periods of drought or poor harvests. The vegetables *Amaranthus spp.*, *Asystasia mysorensis* and *Gynandropsis gynandra* are self sustaining and once planted, persist in the field through self-seeding for many years.

According to the interviews informants, *Sorghum bicolor*, *Eleusine coracana*, *Zea mays* and *Amaranthus cruentus* were mentioned as the cereal grains traditionally utilized in the area (Table 2). However, there reported promotion interests of *A. cruentus* grains as a nutritious by the Government of Kenya for complementary feeding and even for lactating women *vis a vis* the previous traditional utilization of the leaves alone. *Sorghum bicolor*, *Manihot esculentum* are perennials of local abundance. None of the cereal grains reported are harvested from the wild, they are all cultivated. *Vigna unguiculata* was mentioned as pulse while *Ipomea batatas* and *Manihot esculentum* were adversely mentioned as tubers with special attachment to the community. *M. esculentum* (cassava) was mentioned as an important food especially during dry spells due its ability to withstand harsh environmental conditions. Simsim (*Sesamum indicum*) is consumed as a seed and it was considered to be very nutritious.

Among the traditional animal source foods, 6 edible insects and 1 fish (Table 3) were identified. Of the edible insects, four (4) species were edible termites; one (1) was of long-horned grasshoppers (*Ruspolia differens*) and the winged black ants (*Calebara vidua*). The edible insects are collected from the wild. The termites were reported to be harvested during the rainy seasons. Some of the species were reported to make termite moulds and thus harvesting is done near the moulds while others simply emerge from the ground while it rains. Some traditional harvesters are able to detect possible emergence sites for the insects.

Some interviewees could not differentiate the different species of termites with some referring to them as *ng'wen*, a common Luo name for termites in general. However, the common termite species were *Macrotermes subhylanus* and *Macrotermes bellicosus* while *Pseudocanthotermes militaris* and *Pseudocanthotermes spiniger* were considered scarce. The locals considered *M. subhyalinus* as the most delicious followed by *P. militaris*. Although the *M. bellicosus* are generally larger than those of *P. militaris*, the former was reported to cause running stomach. All the insects are consumed whole with some people de-winging them except *C. vidua* whose fatty abdomen is the preferred delicacy. However, some respondents mentioned that it is also consumed whole or de-winged. It was revealed that *C. vidua* is currently facing extinction with very few emergencies reported with only a few interviewees confirming to have consumed the insect.

Dagaa fish (*Rastrineobola argentea*) is harvested from Lake Victoria in large numbers. *R. argentea* was reported to be very popular food around the study area since it borders the lake. Harvesting of *dagaa* is a demanding activity and the methods used include scoop net, seine net and catamaran or lift net. The harvesting of *dagaa* employs a lot of people along the lake carrying activities of fishing, preservation and selling. The fish is consumed whole with no de-gutting reported by the interviewees.

3.2 Nutritional, health benefits and availability of selected traditional foods

Key informants interviews, 12 traditional foods were selected based on the health and nutritional benefits that the local people associated with consumption of the foods by mothers and their infants (Table 4). The most common benefits included provision of energy as well as increasing blood in the human body. Other health benefits included prevention of stomach pains, bloating and constipation. Amaranth (*Amaranth sp.*) was said to increase breast milk in lactating women. The winged termite (*Macrotermes subhylanus*) and *dagaa* fish (*Rastrineobola argentea*) were said to have a body building function and enhancing good health.

Availability of most of the foods mentioned ranged from moderate to high, however, availability for jute (*Corchorus olitorius*) and oxalis (*Oxalis latifolia*) was rated to be low and therefore amassing enough amounts for product development would be a challenge. The winged termites were also reported to be widely available during different seasons of the year with *dagaa* fish (*R. argentea*) being highly available. Traditionally termites were never fed to weaning children but rather eaten by grown, walking, children. A key informant lamented a decline in availability of the termites and associated decline of this food resource with increased farming especially with a surge in use of insecticides.

3.3 Food preparation/processing methods

Different food preparation methods were recorded (Table 5). Traditionally, food was prepared by the mother alone who is acquainted with good cooking skills and maintains high hygienic standards. The interviewees argued that the father has no skills and knowledge on good preparation of food. Most vegetables were consumed after boiling. Most cereals were traditionally prepared into porridges while seeds and legumes were pounded. The selection of flour for porridge preparation depends on available food types, largely influenced by the agro-ecological zone. As an example, millet was mentioned as the basic weaning porridge while maize flour is used in later weaning stages. The preference for millet is attributed to its dark color which is attributed to a rich nutritional value. Traditionally one food was prepared alone; it was common that a mother would stick to one cereal millet, sorghum or even maize. Preparation of termites for consumption involves mostly frying or

sun-drying fresh harvests, which are dried for consumption as snacks or sauces of various types. Consumption of live termites with or without salt, and preparing a sauce of fresh (not dried) alates were also reported to be common.

4. Discussion

Secondary data indicated that among the cereal grains, amaranth (*Amaranthus sp.*) had the highest iron content (21mg/100g) while among the leafy vegetables, spider plant (*Gynandropsis gynandra*) had the highest (30mg/100g). Winged termites (*M. subhylanus*) had the highest iron content (21mg/100g) among the animal source foods. Amaranth grain has been promoted as a cereal grain in Nyanza region for the past five years by the Kenya Government (Kinyuru & Muchui, 2009) and has been widely accepted as a nutritious food especially for infants and immune depressed persons. White maize has significant iron content (4.76mg/100g) and high energy (Sehmi, 1993) as well as its availability. Termites have high iron content (Sehmi, 1993), zinc content (Lukmwaji *et al.*, 2008). Termites emerged as widely consumed, among target communities with distinct availability seasons associated with long and short rains. They are available in local markets when in season and harvesting is easily done when in and out of season. *Dagaa* (*R. argentea*), a small pelagic fish species, most popularly known as *omena* in the Luo language, has significant iron content, 7 mg/100g (Sehmi, 1993), zinc content (Lukmwaji *et al.*, 2008) in addition to high availability and consumption within the study area.

The communities in Western Kenya are small-scale farmers who adhere mostly to traditional subsistence agricultural practices and therefore most families continue to depend on crops for subsistence (Johns & Kokwaro, 1991; Orech *et al.*, 2007a). The retention of knowledge by the local people on the use of edible traditional foods attests to the continuing importance of these resources for subsistence and as part of the cultural heritage of the Luo. However, in the past, most locals were knowledgeable about traditional foods both domesticated and wild. Unfortunately, this trend is slowly changing (Abukutsa-Onyango 2003; Ogoye-Ndegwa & Aagaard-Hansen 2003) with fewer people able to recognize the foods leave alone cook and consume them. Encouraging production and consumption of the traditional vegetables may help tackle the problem of dwindling popularity (Ruel & Levin, 2000).

In general, people in Luo areas are well versed in the native names of traditional plants used for both food and medicine (Johns & Kokwaro, 1991; Orech *et al.*, 2007b). Traditional food plants are particularly important in the driest regions, which are most vulnerable to drought (Orech *et al.*, 2007a). According to Johns & Kokwaro (1991), the vegetable species namely *Amaranthus hybridus*, *Basella alba*, *Gynandropsis gynandra*, *Cucurbita maxima*, *Solanum nigrum*, and *Vigna unguiculata* are of critical importance both in the days of food shortage and days of abundance. Unfortunately, the vegetable species have continued to become rare. For example, *G. gynandra* is presently rare, but if found only prefers fertile loamy and clay soil around abandoned homes, home gardens, farmlands or cattle pastures.

Currently, there are efforts to domesticate some of the plants to avoid extinction and at the same time help fight food insecurity and malnutrition. This has been boosted by numerous research conducted around them. Traditional crops in this area have received a considerable evaluation related to their nutritional, pharmacological, and toxicological properties (Abukutsa-Onyango, 2003; Ogoye-Ndegwa & Aagaard-Hansen 2003; Orech *et al.*, 2007b). Most of them are a major source of micro-nutrients and are, at the same time, toxicologically safe. According to Orech *et al.*, (2005), some traditional vegetables contain possible agents that can cause acute or chronic toxicities when consumed in large quantities or over a long period of time. However, it was reported that Luo women know such species and prepare them using traditional cooking methods to make consumption of the vegetables safe.

Similarly, traditional animal foods have received their fair share of interest in the scientific world. Edible insects have been evaluated for their distribution and abundance in Lake Victoria region of Western Kenya (Nyeko & Olubayo, 2005; Ayieko *et al.*, 2010) in addition to their consumption and associated cultural values (Ayieko & Oriaro, 2008; Ayieko & Nyambuga, 2009). A modern trap to harvest *agoro* winged termites has also been developed and tested (Ayieko *et al.*, 2011). Recently, a lot of interest has also been directed at evaluating the nutritional potential of some insects consumed among the Luo of Western Kenya. Some insects have been found to be a rich source of minerals, fat soluble vitamins and even highly digestible proteins (Christensen *et al.*, 2006; Ayieko, 2007; Kinyuru *et al.*, 2010a; Kinyuru *et al.*, 2010b). Use of edible insects as a novel ingredient in conventional food products has also been documented. Kinyuru *et al.*, (2009) developed baked wheat-termite buns with a significant portion of the ingredients being edible termites while other varied products have been developed by Ayieko *et al.*, (2010). Research has shown that consumption of edible larva of *Cirina forda* (Westwood) in Nigeria does not pre-dispose neurotoxicity or hepatotoxicity to study animals (Akinawo *et al.*,

2005). This can be further complemented by the fact that no insects consumption related toxicity disaster has been reported by the consuming communities in Kenya.

The *dagaa* (*R. argentea*) has played a very important role in job creation, nutrition, income generation and food security, especially during the dry seasons when agricultural activities are reduced to a minimum (Bille & Shemkai, 2006). There are, however, considerable quality losses of these tiny fish as a result of the lack of modern fish processing and preservation methods (Abila & Jansen, 1997). They are still processed and preserved by the traditional sun drying method (Bille & Shemkai, 2006). Consumption of *dagaa* could be greatly enhanced if they are processed using modern and improved preservation and processing methods. Their use in complementary foods will have to be carefully considered because of the fact that they quickly lose quality leading to a bitter and soapy taste and as such contributing to low acceptability (Dampha *et al.*, 1995). Their superiority in micro-nutrient density, fatty acids and proteins makes them a suitable food for complementary feeding. Currently, cottage industries have gone into blending *dagaa* with other flours for use by infants.

Grain amaranth has the potential to contribute to the nutritional needs of vulnerable individuals because of its high protein content, superior protein quality, high content of essential fatty acids and micronutrients (Tagwira *et al.*, 2006). Amaranth has been associated with aiding recovery of severely acutely malnourished children and an increase in the body mass index of people formerly wasted by HIV/AIDS (SRLP, 2005; Tagwira *et al.*, 2006). Consumption of amaranth has also been associated with higher milk production among breast feeding mothers (Muyonga *et al.*, 2008).

In conclusion, the Luo of Kisumu West District are small-scale farmers who adhere mostly to traditional subsistence agricultural practices. In the past, most village folks were knowledgeable about both domesticated and wild traditional leafy vegetables. However, presently only a few individuals are likely to recognize all traditional leafy vegetables. The study showed traditional foods diversity, with nutritional and health potential to the local communities. Traditional food processing methods identified that could be further improved and exploited. In order to exploit the species possessing potential to provide nutrient, health and economic benefits, further analysis on nutrients and anti-nutrients needs to be done.

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Table 1. Vegetables, fruits and their edible parts according to interviewees

Local name	Common name	Scientific name	Edible parts
<i>Anyuka</i>	Forest star	<i>Mussaenda arcuata</i>	Fruit with seed
<i>Apilo</i>	Pepper	<i>Capsicum frutescens</i> L.	Leaves & fruits
<i>Nderma</i>	Climbing spinach	<i>Basella alba</i> L.	Leaves
<i>Onyiego</i>	Black jack	<i>Bidens pilosa</i> L.	Leaves
<i>Oganda</i>	Common bean	<i>Phaseolus vulgaris</i> L.	Leaves
<i>Ododo</i>	Amaranth	<i>Amaranthus hybridus</i> L.	Leaves
<i>Ododo</i>	Amaranth	<i>Amaranthus cruentus</i> L.	Leaves
<i>Awayo</i>	Oxalis	<i>Oxalis latifolia</i> Kunth	Leaves
<i>Onyulo</i>	Sesame	<i>Sesamum calycimum</i> Welw. var. <i>angustifolium</i> (Oliv.)	Leaves
<i>Ochuoga</i>	Bush plum	<i>Carissa spinarum</i> L.	Fruit with seed
<i>Atipa</i>	-	<i>Asystasia mysorensis</i> T. Anderson	Leaves & fruits
<i>Akeyo/Dek</i>	Spider plant	<i>Gynandropsis gynandra</i> (L.) Briq.	Leaves
<i>Omwogo</i>	Cassava	<i>Manihot esculentum</i> Crantz.	Leaves
<i>Budho</i>	Cucumber	<i>Cucumis africanus</i> L.	Leaves
<i>Apoth</i>	Jute, Jew's mallow	<i>Corchorus olitorius</i> L.	Leaves
<i>Susa budho</i>	Pumpkin	<i>Curcubita maxima</i> Duchesne ex. Lam.	Leaves & fruits
<i>Osao</i>	Egyptian riverhemp	<i>Sesbania sesban</i> L.	Leaves
<i>Kandhira</i>	Wild Mustard, Ethiopian cabbage	<i>Brassica juncea</i> (L.) Czern.	Leaves
<i>Mitoo</i>	Slender leaf rattlebox	<i>Crotalaria ochroleuca</i> G. Don.	Leaves
<i>Osuga</i>	African nightshade	<i>Solanum nigrum</i> L.	Leaves
<i>Bo</i>	Cowpeas	<i>Vigna unguiculata</i> (L.) Walp.	Leaves
<i>Mapera</i>	Guava	<i>Psidium guajavum</i> L.	Fruit with seed
<i>Rabuon nyaluo</i>	Sweet potato	<i>Ipomoea batatas</i> (L.) Lam.	Leaves
<i>Odielo</i>	Wandering jew	<i>Commelina Africana</i> L.	Whole plant
<i>Nyim</i>	Simsim	<i>Sesamum indicum</i> L.	Leaves
<i>Achak</i>	Wild lettuce	<i>Launaea cornuta</i> (Hochst. Ex Oliv. & Hieron) C. Jeffrey	Leaves

-^a : Common names lacking

Table 2. Cereal grains, pulses, seeds, tuber/root foods and their edible parts to interviewees

Local name	Common name	Scientific name	Part consumed
<i>Bel</i>	Sorghum	<i>Sorghum bicolor</i> (L.) Moench	Grains
<i>Omwogo</i>	Cassava	<i>Manihot esculentum</i> Crantz.	Tubers
<i>Kal</i>	Finger millet	<i>Eleusine coracana</i> Gaertn.	Grains
<i>Rabuon</i>	Sweet potato	<i>Ipomoea batatas</i> (L.) Lam.	Tubers
<i>Rabuon nduma</i>	Yam	<i>Dioscorea alata</i> L.	Tubers
<i>Oduma</i>	White maize	<i>Zea mays</i> L.	Grains
<i>Nyim</i>	Simsim	<i>Sesamum indicum</i> L.	Seeds
<i>Ng'or</i>	Pigeon peas	<i>Vigna unguiculata</i>	Pulses
<i>Ododo</i>	Amaranthus	<i>Amaranthus cruentus</i> L.	Grains

Table 3. Traditional animal source foods and their edible parts to interviewees

Local name	Common name	Scientific name	Edible parts
<i>Sisi</i>	Winged termite	<i>Pseudacanthotermes militaris</i> (Hagen)	Whole; de-winged
<i>Riwo</i>	Winged termite	<i>Macrotermes bellicosus</i> (Smeathman)	Whole; de-winged
<i>Agoro</i>	Winged termite	<i>Macrotermes subhylanus</i> (Rambur)	Whole; de-winged
<i>Oyala</i>	Winged termite	<i>Pseudacanthotermes spiniger</i> (Sjostedt)	Whole; de-winged
<i>Onyoso</i>	Winged black ant	<i>Carebara vidua</i> (Smith)	Abdomen; de-winged; whole
<i>Tsenesene</i>	Long-horned grasshopper	<i>Ruspolia differens</i> (Serville)	Whole; de-winged
<i>Omena</i>	Dagaa fish	<i>Rastrineobola argentea</i> (Pellegrin)	Whole

Table 4. Nutritional and health benefits, availability of selected foods according to key informants

Common name	Scientific name	Nutritional & health benefits	Availability of the food	Iron ¹ (mg/100g)	Zinc ² (mg/100g)
Finger millet	<i>Leusine coracana</i> Gaertn.	Source of energy	High	20.0	1.2
Sorghum	<i>Sorghum bicolor</i> L.	Source of energy	High	13.0	0.8
Amaranth grain	<i>Amaranthus cruentus</i> L.	Increases breast milk in mothers; Increases energy & blood; Reduces constipation	High	21.0	-
Simsim	<i>Sesamum indicum</i> L.	Body building & source of energy	High	9.5	7.8
White maize	<i>Zea mays</i> L.	Source of energy	High	4.5	1.8
Jute	<i>Corchorus olitorius</i> L.	Increases blood and energy	Low	25.0	-
Oxalis	<i>Oxalis latifolia</i> Kunth	Enhances appetite; Source of energy	Low	28.0	-
Cassava leaves	<i>Manihot esculenta</i> Crantz	Source of energy	Moderate	7.7	0.4
Spider plant	<i>Gynandropsis gynandra</i> (L.) Briq.	Prevents stomach pains and bloating; Prevents difficult deliveries in pregnant women; Increases blood and energy	High	30.0	-
Commelina	<i>Commelina africana</i> L.	Source of energy & increases blood; Reduces constipation	Moderate	28.0	-
-	<i>Asystasia mysorensis</i> Anderson	Prevents stomach pains and bloating; Reduces joints pains & increases blood	Moderate	6.0	-
Winged termite	<i>Macrotermes subhylanus</i> (Rambur)	Body building; Increases blood	Moderate	21.0	2.5
Dagaa fish	<i>Rastrineobola argentea</i> (Pellegrin)	Body building ; Promotes good health	High	7.0	5.2

¹Source: National food composition tables and the planning of satisfactory diets in Kenya (Sehmi 1993); ²Source: Tanzania food composition tables (Lukmwanji *et al.*, 2008); - : Common names or values missing

Table 5. Traditional food preparation methods of food groups according to interviewees

Food group	Preparation method
Vegetables	Boiling
Cereals	Milling, boiling to a porridge
Roots/tubers	Pounding, fermenting
Legumes	Pounding
Seeds	Pounding
Insect	Sun-drying, frying
Fish	Boiling