# Indigenous Knowledge as a Determinant of Household Food Security in Baringo County, Kenya

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**Abstract**

*Food security is a major concern of households in Arid and Semi-Arid Lands (ASALs) that are frequently affected by climate variability. Establishing the determinants of food security is important so as to develop appropriate interventions strategies. This paper sought to establish whether indigenous knowledge was a determinant of household food security in Baringo County, Kenya. The study adopted the descriptive survey research design. Purposive, census, proportionate and simple random sampling techniques were used to select 120 household heads, 12 Extension staff and 8 key informants. Data was collected using Household heads and Extension staff questionnaires, Focus Group Discussion guide and an Observation checklist. Face and content validity of the four instruments were examined by Supervisors and experts in the Department of Agricultural Education and Extension of Egerton University. The household heads questionnaire was piloted for reliability. The instrument yielded a reliability coefficient of 0.78 and was thus deemed reliable. Data was summarized and described using frequencies and percentages. The results indicated that majority of households often used indigenous knowledge in crop and livestock production. The results also indicated that majority of the households had stable food security status. It was concluded that Indigenous Knowledge was a determinant of household food security. The paper recommend that Indigenous practices which enhance food production be documented and incorporated in agriculture extension service to compliment scientific knowledge.*

***Key words**: **Indigenous knowledge, food security, determinant, production***

## Introduction

*Food security*

Food security is not only a human right but is essential for good health (Manikandan, 2018; Chipungahelo, 2015). Food security has been defined as a situation in which all people, have physical, social and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life at all times (FAO, 2000). The definition identifies four dimensions of food security as; availability, access, utilization and stability (Klennert, 2009). Food security thus means that all persons have means to access at all times food which is nutritionally adequate in terms of quantity, quality, variety and is acceptable within a given culture.

*Food security situation*

Many households globally are vulnerability to hunger despite the fact that food is recognized as a human right (International Food Policy Research Institute [IFPRI], 2014). Although many countries have tried to put in place mechanisms to end hunger, the number of chronically hungry people worldwide in 2017 was 821 million, with around one out of every nine being undernourished (FAO, 2017). The world's estimate of chronically hungry people in 2013 were 842 million, out of which two thirds were from South Asia and Africa (IFPRI, 2016; IFPRI, 2014; FAO, 2013). In Africa, over 300 million rural people still struggle to feed themselves and their families while one third of the population is chronically undernourished (Macharia et al., 2010; Forest Society of Kenya [FSK], 2010; IFPRI, 2014). It was estimated in 2009 that 3.8 million people in Kenya, representing 10 percent of the population, were food insecure (FSK, 2010). According to United Nations Economic Commission for Africa (UNECA) (2010) estimates, in 2009, 51 percent of Kenya's population lacked access to adequate food and the little that was available was of poor nutritional value. The food insecurity in the country has been aggravated by downturn in agricultural growth.

Food security is also a challenge to many household in Baringo County (World Vision Kenya [WVK], 2013). The challenge has been attributed to climatic conditions in the county. Baringo is classified as Arid and Semi-Arid (ASAL) region (Bartenge, 2013; Kipterer & Ndegwa, 2014). The county suffers from drought, floods, and unpredictable weather patterns, which are factors that negatively affect food security (Baringo Food Security Report [BFSR], 2013). The food insecurity in the county has attracted aid from external agencies such as World Vision Kenya (WVK) and World Food Programmes (WFP) (Saina et al., 2012). Baringo is also under Protracted Recovery and Relief Operation (PRRO) and food is provided through General Food Distribution (GFD), Supplementary Feeding (SF) and Food for Assets (FFA) programmes (BFSR, 2013).

*Determinants of food security*

Studies (FAO, 2017; Aulakh & Regmi, 2013; UNECA, 2010) have shown that food security depends on many factors. FAO (2017) and Beyene (2010) assert that agricultural technology, available knowledge systems, political, and economic factors, are key determinants of food security. Sigei (2014) demonstrated that there was a significant strong relationship between extension services and food security among households. Danso-Abbeam et al. (2018) contend that extension programmes help increase farm productivity, revenue, and reduce poverty thus minimizing food insecurity. Aulakh and Regmi (2013) observe that food availability and accessibility can be enhanced by increasing production, improving distribution and reducing post-harvest losses. According to the United Nations Conference on Trade and Development (UNCTAD) (2017), climatic changes such as extreme temperatures, floods, drought and unpredictable weather patterns affect agriculture and food security.

Diversification of agricultural enterprises, access to credit and market, availability of agricultural inputs and effective extension services are other key determinants of household food security ((Beyene & Muche, 2010; Kaegi, 2015; Sigei, 2014). Food insecurity has also been attributed to factors such as; effects of climate change, insecurity, rising food prices, reduced productivity, and effects of pests, parasites and diseases (UNECA, 2010). Indigenous knowledge has also been cited as one of the key factors for guaranteeing food security of rural communities (FAO, 2014; Awuor, 2013).

*Indigenous Knowledge and Food Security*

Indigenous knowledge is defined as local knowledge unique to a given culture which has been acquired through the accumulation of experiences, informal experiments and intimate understanding of local environment (Shukla et al., 2017). Indigenous knowledge systems are bodies of knowledge, skills and beliefs produced locally using traditional methods and transmitted orally from generation to generation through socialization within a cultural and household context (Dlamini & Kaya, 2016; Singh & Kumar, 2014). Melchias, (2001) described indigenous knowledge as what indigenous people know and do, and what they have known and done for generations. Indigenous knowledge comprises of practices that evolved through trial and error, which are flexible enough to cope with change. Kamwendo and Kamwendo (2014) defined indigenous knowledge in food security domain, as knowledge about soil fertility, disease resistant and quick growing crops, soil conservation, weather forecast, pest and disease control, food preservation, processing and storage as well as water management techniques. Indigenous knowledge is thus one of the knowledge bases from which agricultural information is obtained by farmers.

Literature (Rankoana, 2017; Asogwa et al., 2017; Singh & Singh, 2017) reveals that there is a significant association between food security and indigenous knowledge. Gaoshebe (2014) study conducted in South Africa noted that food security depended to a great extent on cultural strategies a community or cultural group has developed. Chege et al. (2018) observed that there was a significant relationship between food security and indigenous knowledge and concluded that it was a key determinant of food security. Asogwa et al. (2017) argues that promotion and utilization of indigenous knowledge of food systems is one way of tackling the challenge of inadequate food for a healthy and active life. Tanyanyiwa and Chikwamba (2011) contend that indigenous knowledge technologies and know how have an advantage over science in that they rely on locally available skills and materials and are thus often more cost effective than introducing exotic technologies from outside sources.

*Speculation and Purpose*

The foregoing literature has demonstrated that indigenous knowledge is one of the determinants of food security. The food security challenges faced by households in Baringo County could be as a result of low adoption of indigenous knowledge. The objective of this paper was to establish whether indigenous knowledge is one of the factors that affect food security in Baringo County. The paper focused on application of IK in the production of crops and livestock given that the two were the main sources of food for households. Gaoshebe (2014) and Ponge (2013) noted that, rural communities mostly rely on locally produced food, strategies and mechanisms to cope with uncertainties to achieve food security. The study was deemed necessary because the value of Indigenous Knowledge in enhancing household food security in Baringo County has not been given sufficient attention despite of it being part of the global knowledge base.

## Methodology

*Research Design*

The study used the descriptive survey research design. The design is mainly concerned with examining phenomena, events and issues as they are (Mugenda & Mugenda, 1999). It is also concerned with making accurate assessment of distribution, influence and relationship between variables or phenomena (Edwards, 2006). The design was deemed appropriate because it enabled collection of data at one point in time and examine them without manipulation of variables as required by the study objective.

*Location of the Study*

The study was conducted in Baringo County, which is one of the 47 Counties of Kenya. The County borders Nakuru County to the South, Laikipia and Samburu to the East, Turkana County to the North and Elgeyo Marakwet to the West. Administratively, it has six Sub Counties namely; Baringo South, Mogotio, Koibatek, Baringo Central, Baringo North and Tiaty Sub Counties (Kipterer & Ndegwa, 2014). The six sub counties have a total of 30 wards. Temperatures in the county range from a minimum of 10°C to a maximum of 35.0°C while rainfall varies from 1000 to 1500 mm in the highlands to 600 mm per annum in the lowlands.

The County covers an area of 11,015 $km^2$ and has a population of 609,910 persons (KNBS, 2009). The number of households in the County is 110,649 while the population density is 50 people per square kilometer. The county is inhabited by the Pokot, Tugen and Njemps communities whose main occupations are subsistence farming and livestock keeping (Kiptum, 2016). Baringo experiences droughts, floods, and unpredictable weather patterns and is considered as an Arid and Semi-arid (ASAL) land (Bartenge, 2013; Kipterer & Ndegwa, 2014). The region is also characterized by poor infrastructure, high levels of poverty rates and food insecurity (Bartenge, 2013). The location was selected because of high prevalence of food insecurity among households. According to Saina et al. (2012), persistent food insecurity in the county has attracted food aid from external agencies such as World Vision Kenya (WVK) and World Food Programmes (WFP).

Target Population

The target population comprised of 27 extension staff and 35, 758 smallholder agro pastoral households in Baringo North and South Sub Counties of Baringo County (KNBS, 2013). The accessible populations were 12 extension staff and 18,613 households from Barwessa and Saimo Kipsaraman wards of Baringo North Sub County, and Marigat and Illchamus wards of Baringo South Sub County (SID, 2013: GOK, 2015). The household heads were selected because they are the providers of food to their families. They are thus best placed to provide information on food security of households. The extension staff were involved in the study because of their training in agriculture, frequently interaction with farmers as they train them. As a result, the extension staff were in a position to provide data on agricultural practices in household farms in their areas of operation. The choice of the four wards was based on cultural diversity and security reasons given that the area is prone to attacks by bandits/cattle rustlers. The distribution of the accessible population by ward are presented in table1.

**Table 1**

*Distribution of study sample by Ward*

| Sub County | Wards | Households | Extension staff |
|---|---|---|---|
| Baringo North | Barwessa | 4,943 | 3 |
| | Saimo Kipsaraman | 4,154 | 3 |
| Baringo South | Marigat | 6,615 | 3 |
| | Illchamus | 2,901 | 3 |
| Total | | 18,613 | 12 |

Source: KNBS & SID (2013) & GOK (2015)

*Sampling Procedure and Sample Size*

All the Twelve (12) extension staff from the four selected wards were involved in the study. This means the census method was used to select them. The number of the household heads who participated in the study was determined using Nassiuma's (2000) formula.

$n = NC^2 \div C^2 + (N-1)\ e^2$

Where;

n is Sample size

N is Population Size

C is Coefficient of Variation

e is Margin of Error

The calculations were conducted at 20 percent coefficient of variation (C) in order to yield a large sample size that ensured low variability while 2 percent margin of error was used to minimize sampling error (Nassiuma, 2000). The sample size obtained from the study population was:

$n = [18{,}613 \times 0.2^2] \div [0.2^2 + (18{,}613 - 1)\ 0.02^2]$

$n = 99.47$

The sample size was rounded to 100 respondents. Goodrich and St. Pierre (1979) in Borg and Gall (1989) recommended a 20 percent increase of the calculated sample to level out attrition and non-response. The actual sample of the household heads was thus 120 in line with the recommendations of Goodrich and St. Pierre. A multistage (four-stage) sampling technique comprising of purposive, census, proportionate and simple random sampling were used to select the sample who participated in the study. Purposive sampling was used to select Baringo North and South Sub Counties. Census was used to select the extension staff. Proportionate sampling technique was used to apportion the number of households expected to participate in each of the selected four wards. Simple random sampling was used to select the actual household heads who participated in the study. The distribution of the samples is summarized in Table 2.

**Table 2**

*Distribution of the Sample*

| Sub County | Wards | Household's | Extension staff |
|---|---|---|---|
| Baringo North | Barwessa | 32 | 3 |
| | Saimo Kipsaraman | 27 | 3 |
| Baringo South | Marigat | 43 | 3 |
| | Illchamus | 18 | 3 |
| Total | | 120 | 12 |

*Instrumentation*

Data was collected using the household heads (HHQ) and extension staff (ESQ) questionnaires. Both instruments had sections for generating background information of the respondents, data on indigenous knowledge, food production and security. The instruments were constructed using both close and open ended items. The close ended items were included in the instruments because they were easy to fill, took little time to complete, keeps the respondent' focused on the subject and are easy to tabulate and analyze (Frankfort & Nachmias, 2009). Open ended items were included in the instruments because, as observed by Biemer and Lyberg (2003), they allow a researcher to build rapport, encourage respondents to participate in a study and elicit additional information by asking follow-up questions.

*Validity and reliability*

Experts from the department of Agricultural Education and Extension of Egerton University examined the face and content validity of the Household heads and Agricultural Extension staff questionnaires. The suggestions of the experts were used to improve instruments before they were used in the field to collect data. The household heads questionnaire was piloted for reliability and its coefficient estimated using the Cronbach method. The instrument yielded a reliability coefficient of 0.78, and was deemed reliable.

*Data Analysis*

The collected data was screened for errors, cleaned and coded. The Statistical Package for Social Sciences (SPSS) was used to prepare a data file and the coded data was keyed into it. Responses to close ended items in the instruments were described and summarized using frequencies and percentages. Qualitative data generated by open ended items were organized in themes pertinent to the study objective and also summarized using frequencies and percentages.

**Results and Discussion**

*Indigenous Knowledge*

The study examined areas where Indigenous Knowledge was applied in crop and livestock production and frequency of use. The results indicated majority (97.4%) of the household heads were aware of indigenous knowledge. Data from the extension staff showed that 45.5% of households used modern knowledge, 27.3 percent used indigenous knowledge while 27.3 percent applied a blend of both indigenous and modern knowledge in their farms. This means that more than a half (54.6%) of farmers used both indigenous and modern knowledge in their faming activities, perhaps to gain the benefits associated with the two knowledge bases.

The household heads also indicated the areas where they apply indigenous knowledge when carrying out their farming activities.

**Table 3**
*Areas where Household Heads apply Indigenous Knowledge*

| Areas | Frequency (n=117) | Percentage |
|---|---|---|
| Weather forecasting | 107 | 91.5 |
| Crop farming | 117 | 100.0 |
| Water conservation | 91 | 77.8 |
| Keeping livestock | 116 | 99.1 |
| Pests and diseases control | 112 | 95.7 |
| Storage and preservation of produce | 104 | 88.9 |

Table 3 shows that all (100.0%) household heads apply indigenous knowledge in crop farming while 99.1% use it in their livestock keeping activities. Other areas where majority of the household heads use indigenous knowledge include; pest and disease control (95.7%), weather forecasting (91.5%), preservation and storage of produce (88.9%) and water conservation (77.8%). The findings supports those of a study conducted in South Africa by Ndwandwe (2013) which noted that farmers used IK in all areas of agriculture from land preparation, soil fertility management, seed selection, pests, diseases and weeds control, post-harvest preservation and storage. Rankoana (2017) also observed that indigenous knowledge practices were used by farmers to improve soil fertility and structure, seed selection and storage. These results reveal that households utilize indigenous knowledge in all areas of farming such as crop and livestock, pests, parasites and diseases control and storage of produce. This could be an indication that application of IK in farming activities yielded positive results.

*Use of Indigenous Knowledge in crop and livestock Production*

Data on crop and livestock production activities where indigenous knowledge was applied was provided by extension staff. Table 4 give a summary of the activities.

**Table 4**
*Crop Production Activities where Households Apply Indigenous Knowledge*

| Activity | Frequency | Percent |
|---|---|---|
| Planting (broadcasting seeds, use of uncertified seeds, spacing) | 2 | 18.2 |
| Pests and diseases control (ash, magadi, neem leaves-soke) | 7 | 63.6 |
| Land preparation (burning, use of hoes and oxen) | 4 | 36.4 |
| Seed selection (according to size) | 2 | 18.2 |
| Selection of agricultural practices (Crop rotation, shift cultivation, mixed farming) | 5 | 45.6 |
| Weeding (use of hoes, burning) | 3 | 27.3 |
| Weather forecasting (behaviour of certain trees) | 2 | 18.2 |
| Produce storage/preservation (drying, soot, ash, herbs) | 3 | 27.3 |

The results reveal the main areas of IK application as; pest and disease control (63.6%), crop rotation (45.6%) and land preparation (36.4%). It is evident from the results that IK is used across all the crop production chain from land preparation to harvesting and storage. Indigenous Knowledge is thus an important component of food production and security of households. The results support those obtained from the household heads which revealed that pest and disease control was among the areas where indigenous knowledge was used. The results are also in harmony with those of Nnadi et al. (2013) who observed that extensive usage of indigenous knowledge such as; mulching, organic manure, sun drying, roasting and frying food, use of sacks, mixture of red pepper and hanging harvested crops under fire in crop production in Nigeria. Similarly, Abioye et al. (2011) also noted that most rural household utilized indigenous knowledge in land preparation, planting materials, maintenance of soil fertility and harvesting and storage.

Indigenous knowledge practices that farmers use in agriculture involve improvement of soil fertility and structure, maintenance of crops and seed selection and storage helpful in the achievement of household food security. It is perhaps the impressive results of IK coupled with the time tested practices together with its cost effective nature that has made it popular among rural communities in ASAL areas as a solution to perennial food insecurity.

*Livestock production activities where indigenous knowledge is applied*

The extension staff also indicated the livestock production areas where household heads applied indigenous knowledge. Table 5 presents summary of the results.

**Table 5**

*Livestock Production areas where Household Heads apply Indigenous Knowledge*

| Area | Frequency(n=11) | Percentage |
|---|---|---|
| Parasites and diseases control (herbs, hand picking) | 6 | 54.4 |
| Breed selection (castration) | 4 | 36.4 |
| Housing (cattle shed, use of log hive) | 2 | 18.2 |
| Weather forecasting (behavior of animals, internal organs) | 2 | 18.2 |
| Feeding (free range, tethering) | 5 | 45.6 |
| Storage/preservation of livestock products (drying, salt) | 2 | 18.2 |

The results show that the main livestock keeping activities where indigenous knowledge was applied include; parasite and disease control (54.4%), feeding (45.6%), breed selection (36.4%), weather forecasting (18.2%), livestock housing (18.2%) and storage and preservation of livestock products (18.2%). These activities are key determinants of livestock productivity as they influence the quantity and quality of livestock products which further influence household food security. The results show that, as in the case with crops production, indigenous knowledge was applied in a wide range of areas in livestock production chain. This demonstrates the value and confidence with which indigenous knowledge is held by the communities. The results support those of Ndwandwe (2013), who noted that farmers in South Africa controlled pests and livestock parasites using indigenous knowledge practices comprising the use of concoctions with sharp odour which had the potential to repel and/or kill them. Siambombe et al. (2018) also observed that farmers used free range and tethering to feed their animals while use of Ash, urine, acacia leaves and pepper were used to control pests and diseases in the farms.

*Application of Indigenous Knowledge*

The frequency of utilization of IK in crop and livestock production is summarized in Table 6

**Table 6**

*Use of Indigenous Knowledge in the production of Crops and Livestock*

| Application of IK | Percentage (n = 100%) | | | | |
|---|---|---|---|---|---|
| *Crop* | VO | OF | OC | RA | NE |
| Clearing the farm by burning | 27.6 | 33.6 | 24.1 | 7.8 | 6.9 |
| Use of hoes to dig | 33.3 | 29.1 | 7.7 | 23.9 | 6.0 |
| Use of oxen to plough | 0.9 | 0.9 | | 21.4 | 76.9 |
| Plants own preserved seeds | 17.5 | 28.1 | 27.2 | 19.3 | 7.9 |
| Use of compost manure when planting | 8.5 | 11.1 | 10.3 | 26.5 | 43.6 |
| Practices inter cropping | 31.6 | 35.0 | 22.2 | 8.5 | 2.6 |
| Using hoes to weed | 39.7 | 20.7 | 11.2 | 23.3 | 5.2 |
| Maintains soil fertility through mulching, rotten grass , leaves | 6.0 | 26.7 | 19.0 | 34.5 | 13.8 |
| *Livestock* | | | | | |
| Selects local breeds | 7.8 | 25.9 | 23.3 | 28.4 | 14.7 |
| Use of free range feeding | 58.4 | 22.1 | 8.0 | 10.6 | 0.9 |
| Use of crop stovers to feed livestock | 32.8 | 37.9 | 22.4 | 4.3 | 2.6 |
| Average | 24.0 | 24.6 | 17.5 | 19.0 | 16.5 |

Legend: VO= Very Often, OF= Often, OC =Occasionally, RA =Rarely, NE =Never

The results (Table 6) reveal that intercropping (66.6%), use of hoes to dig (62.4%), clearing land by burning (61.2%) and using hoes to weed (60.4%) were often utilized IK practices in crop production. However, use of oxen to plough (98.3%) and compost manure to plant (70.1%) were rarely/never used in crop production. The results further show that free range (80.5%) and use of stovers (70.7%) were often used in livestock production while a reasonable high percentage (43.1%) of the household heads rarely/never selected local breeds.

The findings further indicate that clearing land by burning, use of hoes to dig and weed, and intercropping were IK practices used in crop production while free range and use of stovers were used in livestock production. The results support those of WORD (2015) which reveal that rural communities apply IK strategies such as mixed cropping to ensure continuous harvest of food crops to meet family needs. The findings are also consistent with the assertion by Tweheyo (2018) that local farmers plan their land use to sustain food production using their indigenous practices.

On average nearly a half (48.6%) of the household heads often used IK in their farms, 17.5% occasionally utilized IK while the rest (35.5%) rarely/never used it. The findings show that majority of household heads often/occasionally used indigenous knowledge strategies in their farms to produce food. The results supports a study by Abioye *et al* (2011) which established that households used indigenous knowledge in a wide range of farming activities which include; land clearance, weeding maintaining soil fertility, controlling pests and diseases and feeding livestock. Indigenous agricultural production practices such as crop diversification, soil fertility maintenance using manure and control of pests and diseases enhances yields and household incomes. The practices thus ensure food is available and accessible, which are crucial for the achievement of household food security.

**Food Security**

Food security of household was examined with respect to sources of food, crops and livestock production and food security status.

*Sources of food*

The household heads provided the sources of food for their families as summarized in Table 7.

**Table 7**

*Sources of Food (n = 117)*

| Food source | Frequency | Percentage |
|---|---|---|
| Produced | 114 | 97.4 |
| Bought | 105 | 89.7 |
| Relief | 20 | 17.1 |
| Gathered | 40 | 34.2 |
| Relatives/well wishers | 63 | 53.8 |

Table 6 reveals that, the main sources of food for households are those produced in their farms (97.4), purchased (89.7%), relatives and well-wishers (53.8%). Other sources of food were gathered (34.2) and from relief programmes (17.1%). The results indicate that households obtain food from several sources. The results are consistent with the observations of Gaoshebe (2014) and Ponge (2013) which revealed that households in rural areas had several food sources. The findings indicate that slightly over a half (51.3%) of the household heads gather and/or are provided with relief food. This suggests that majority of households are food insecure implying that, what is produced and or purchased do not meet their nutritional requirements.

*Food Crops grown by the Households*

Household heads were asked to state the food crops that they grow. The results are presented in table 8.

**Table 8**

*Food Crops Grown by the Households (n = 117)*

| Crop | Frequency | Percentage |
|---|---|---|
| Maize | 101 | 86.3 |
| Beans | 90 | 76.9 |
| Millet | 74 | 63.2 |
| Sorghum | 26 | 22.2 |
| Cassava | 12 | 10.3 |
| Green grams | 9 | 7.7 |
| Cow peas | 11 | 9.4 |
| Sweet potatoes | 9 | 7.7 |
| Fruits | 7 | 6.0 |
| Vegetables | 6 | 5.1 |

The results reveal that maize (86.3%), beans (76.9), millet (63.2%) and sorghum (22.2%) are the mainly grown foods. Other food crops grown in the county were cassava (10.3%), cow peas (9.4%), green grams (7.7%), fruits (6.0%) and vegetables (5.1%). The results indicate that households grow a variety of cereal crops which doubles up as staple food crops. WORD (2015) contend that, growing a variety of cereals, fruits and vegetables ensured a continuous harvest of food crops to meet family needs. It is also noted that the listed crops like cassava, millet and sorghum are drought resistant and were suitable for ASAL areas, a characteristic of the study site. The households therefore seem to have knowledge of their environment in terms of what does best as far as their food security is concerned. This could perhaps be due to IK as noted by Mafongoya and Ajayi (2017) who contend that communities in hazard prone areas have developed a good understanding and knowledge of disaster prevention and mitigation measures because indigenous knowledge is based on facts that are known or learnt from experience or acquired through observation and practice and is handed down from generation to generation.

*Livestock kept by household heads for*

Data on livestock kept was sought from the household heads since a significant portion of food for families in ASAL regions is animal related. Table 8 presents the livestock kept by the households for food production.

**Table 8**

*Livestock kept for food production (n = 117)*

| Animal | Frequency | Percentage |
|---|---|---|
| Cattle | 113 | 96.6 |
| Sheep | 103 | 88.0 |
| Goats | 107 | 91.5 |
| Chicken | 87 | 74.4 |
| Bees | 5 | 4.3 |

Most of the households (Table 8) kept cattle (96.6%), sheep (88.0%), goats (91.5%) and chicken (74.4%) while a few (4.3%) kept bees. The results show that the households kept livestock besides crop farming hence practicing mixed farming. According to Ponge (2013), crop production and keeping animals is a characteristic of indigenous farming systems which aims at improving food security through diversification. Keeping of a variety of livestock types is also a diversification strategy to enhance household food security. Diversification in both crops and livestock enterprises in the study site is an indication of strategies for improving both food production and diet diversity besides reducing risks and uncertainties associated with climate and weather variability.

*Households' Food Security Status*

Household heads were requested to rate their food situation as a way of measuring their food security status. The results are presented in table 9

**Table 9**

*Food Security status of Households (n = 117)*

| Rating | Frequency | Percentage |
|---|---|---|
| Very good | 17 | 14.5 |
| Good | 34 | 29.0 |
| Moderate | 43 | 36.8 |
| Poor | 14 | 12.0 |
| Very Poor | 9 | 7.7 |

Table 9 reveals that the food security status of nearly two thirds (80.3%) of the households range between moderate to very good. The rest (19.7%) had poor and very poor food security status. The results are therefore a reflection of a stable food security status of households perhaps because of the beneficial effects accruing from the application of indigenous knowledge practices.

*Food Security Index*

Food security index of households was measured using a set of 21 close ended items. The items were based on how frequent Household heads experienced specified indicators of food security. The responses to the items were scored using a five point rating scale (Never:5, Rarely:4, Occassionally:3, Often:2, Very often:1). The mean of each item was computed and the average mean from all the items translated into Food Security Index (FSI). A mean of 3.00 and above from individual item was an indicative that the practice was not popularly applied by the households. An overall mean average of 3.00 and above indicated that on average the practices were not undertaken which also implied that the households were food secure. The results of the food security index are summarized in Table 10.

**Table 10**

*Food security index*

| Practice | N=117 | Mean | SD |
|---|---|---|---|
| Borrowing food | 116 | 1.94 | 1.00 |
| Relying on less preferred or less expensive food | 116 | 2.75 | 1.04 |
| Seek help from a relatives/friends to access food | 117 | 2.24 | 0.96 |
| Purchasing food on credit | 115 | 2.26 | 1.04 |
| Gathering food (wild fruits, hunt, harvest immature crops) | 117 | 2.04 | 1.14 |
| Consuming seed stock held for next season | 114 | 2.44 | 1.20 |
| Sending household members to eat elsewhere | 116 | 1.56 | 1.00 |
| Sending household members to beg | 115 | 1.48 | 0.99 |
| Limiting amount of food eaten during meals | 114 | 2.21 | 1.06 |
| Restricting consumption by adults in order to allow children to eat | 117 | 1.99 | 1.07 |
| Reducing the number of meals eaten in a day by the household | 117 | 2.32 | 1.06 |
| Going for an entire days without eating | 116 | 1.72 | 0.93 |
| Worried that the household does not have enough food | 115 | 2.73 | 1.37 |
| Family members not able to eat the kinds of foods they prefer | 117 | 1.85 | 0.99 |
| Household eating limited variety of food | 116 | 2.50 | 0.99 |
| Family eating food that they do not want to eat | 117 | 1.85 | 0.99 |
| Eating smaller quantities than needed | 117 | 2.23 | 0.87 |
| Forced to eat fewer meals in a day | 116 | 1.97 | 1.01 |
| No food for the house hold | 115 | 1.74 | 0.97 |
| Household going to sleep at night hungry | 116 | 1.72 | 1.00 |
| Household going for a whole day without eating | 117 | 1.64 | 0.93 |
| **Food Security Index** | 117 | **2.06** | **0.64** |

Table 10 indicate that individual item mean range between 2.75 to 1.48 which fell below the midpoint of 3.00 implying that the practices were applied more often. The overall mean (2.06) is also lower than the midpoint thus suggesting that the households are food insecure. The standard deviations of the individual means are relatively low implying that the practices are comparable. In addition, the overall standard deviation is low (0.64) indicating a low variations among households in terms of the practices, hence comparable. The results are consistent with findings of Saina et al. (2012) who established that Baringo county is on many occasion dependent on food aid programme due to food insecurity.

## 4 Conclusions and Recommendations

*Conclusions*

This study concludes that indigenous knowledge is widely used by households in Baringo County in carrying out crop and livestock production activities. The results further indicated that majority of the households sourced their food from own production as well as through purchase. The main crops grown for food by the households were maize, beans and millet while majority of them kept cattle, sheep, goats and chicken. Most of the households in the study site have stable food security status. There was empirical evidence that frequent usage of IK in crops and livestock production by households was the reason behind the stability of food security status. The study further concluded that Indigenous Knowledge is a determinant of household food security among rural communities of Baringo County, Kenya.

*Recommendations*

This paper established that Indigenous Knowledge is a determinant of food security of households in rural communities. Despite the advantages associated with it, Indigenous knowledge alone cannot be a remedy to food security. However, it could form a crucial foundation for resilience to food insecurity. The paper recommends that indigenous knowledge practices, especially those that contribute positively to sustainable agriculture, be documented and incorporated in extension services provided to rural farmers. The paper further recommends that Indigenous Knowledge and innovation, be embraced and incorporated in food production to compliment scientific knowledge.

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