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Original Article

Effects of Social, Cultural and Economic Factors on Consumption of Edible Insects for Household Food Security

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ABSTRACT

Edible insects have been identified as a possible sustainable food source not only because they are rich in proteins and other nutrients required by the body, but they can also cheaply and sustainably support the hungry, the malnourished and the poor. Indisputably, people have been slow to embrace the consumption of edible insects across the globe and narrowly in Siaya County of Western Kenya. Few studies have been conducted to provide information on low uptake and consumption of edible insects in the county, especially pertaining to social, culture and economic factors. A multistage random sampling technique was used in the selection of the respondents in this study, followed by a systematic data collection using a digital questionnaire coded and configured in ODK Collect. A descriptive study design was adopted whereby a semi-structured questionnaire was used to collect data on key variables. Additionally, a key informant interview guide was also used to collect data mainly for triangulating information received from the respondents on enabling and limiting factors (social, cultural, and economic variables) on the consumption of insects as a household food security source. Descriptive statistic such as frequencies, percentages, means and standard deviations and graphics were used to report the analysis and visualization of the collected data. An ordinal regression model was used to assess the effects of social, cultural, and economic factors on the consumption of edible insects in the county. It was found that there was no significant association between formal education and insect consumption, family size and insect consumption rate or between age and insect consumption. However, the findings revealed that economic activities of the participants do influence the consumption of insects in households, although the land owned by respondents did not significantly influence the consumption of insects. Insect consumption in the region of study, was also impacted by the cultural beliefs and values of the respondents.

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INTRODUCTION

Unlike most other regions in the world, insect-eating is relatively common in Africa. Africa reportedly has the most extensive diversity of edible insects, with over five hundred species ranging from Coleoptera (beetles) to Heteroptera and Homoptera (bugs), Hymenoptera (bees and ants), Orthoptera (crickets, grasshoppers, and locusts), Isoptera (termites), and Lepidoptera (caterpillars) (Loiacono et al., 2016). The African countries dominating insect-eating include South Africa, Nigeria, Zimbabwe, Zambia, Uganda, Cameroon, the Central African Republic, Congo, and the Democratic Republic of Congo. The majority of edible insects are sourced from the wild. However, as in most other places, not much effort has been put in Africa to find if the mass production of insects and their use as a protein source is possible (Loiacono et al., 2016).

The adoption of edible insect consumption as an alternative food source is also likely to face challenges. The influential factors act as limiting agents to the adoption of this novel practice that out of many research works done has been realized to be of great importance towards the provision of food and nutritional security. For instance, Halloran et al. (2018) and Hlongwane et al. (2020) found edible insect to be of high nutritional content.

Consumption of edible insects in Kenya is low despite the entomophagy among several ethnic groups in the country. A growing number of countries are facing increasing levels of acute food shortages, rendering futile the previous decades of developmental strides. Even before corona virus pandemic disrupted supply chains and reduced incomes, acute and chronic hunger were on the increase for numerous reasons such as pests, climate change, natural hazards, and harsh socioeconomic conditions. These, together with the impact of COVID-19, have resulted in widespread and severe elevations in worldwide food insecurity, impacting vulnerable people in virtually every nation, with the effects speculated to extend well through 2021 and into 2022 (Bose, 2021). The core threats of food insecurity are felt at the country level: reduced incomes, combined with hiked retail prices, mean that every day more households are compelled to cut down on the quality and quantity of food they consume (Bose, 2021). The retail sector is encountering high inflation in food prices in most countries, reflecting lingering distractions in supply, courtesy of currency devaluations, the COVID-19 measures on social distancing, the war in the

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Ukraine and other factors. Increasing food prices has more profound impacts on citizens of middle- and low-income countries like Kenya, considering a larger portion of their income is spent on food than individuals in wealthier countries and with the above unsustainable living conditions. People are expected to embrace the novel ways of survival for instance insect consumption.

In Kenya, the food security situation is no different and about 1.3 million Kenyans are presently grappling with cases of acute food shortage. Many regions in the country, especially the drought-prone arid and semi-arid lands (ASALs), have seen exacerbated vulnerabilities and extreme emergency needs, thanks to the high acute malnutrition rates and food insecurity (Kusia et al., 2021). In Western Kenya, the situation is not any different. With the hardened economic times brought about by the COVID-19 pandemic, families are struggling to obtain and maintain livelihood, an effort made even worse by the increasing vulnerability brought about by climate change. The significance of entomophagy has been recognized and edible insects are often considered to be more nutritious, sustainable, and the best substitute for meat and other protein sources. Despite the numerous sensitizations in the area, adoption of this intervention is still low. Furthermore, the effects of the major factors underlying consumption of the edible insects for household food security still remains unexplored in this area. This study therefore sought to understand the effects of social, cultural, and economic factors on household consumption of edible insects for food security in Western Kenya.

MATERIALS AND METHODS

Study Area

This study was conducted in Bondo Sub-County, one of the six sub-counties of Siaya County in western Kenya. The county has an approximate area of 2496.1 square kilometres and lies between latitude 0˚ 26˚ to 0˚ 18˚ north and longitude 33˚ 58˚ east and 34˚ 33˚ west. It is bordered by the Kakamega and Vihiga county to the northeast, Busia County to the north and Kisumu County to the southeast. Bondo sub-county was selected for this study because unlike several other places in the region, it has received interventions aimed at promoting the consumption of edible insects. This implies that the area was rife with unbiased information (Siaya County Development Office, 2018).

Research Design

Descriptive research design was used as described by Kombo and Tromp (2006. Descriptive design describes the state of issues as it exists (Kothari & Gaurav, 2014). The design embraced the administration of semi-structured questionnaires to obtain data on the effects of social, cultural, and economic variables on the consumption of edible insects in Bondo Sub-County. The questionnaire was administered by relevant enumerators who understood what data collection entails. The information that was obtained was used to answer the research questions that this study intended to answer.

Sampling Procedure and Data Collection

A multistage random sampling technique was used in the selection of the respondents in this study, followed by a systematic data collection using a digital questionnaire. The questionnaire was coded and configured with ODK Collect which is an open-source Android app used in survey-based data collection. The questionnaire was divided into four main sections. Each section contained questions as per the specific objectives under study. Data was collected by trained enumerators through face-to-face interviews using well-formulated structured digital questionnaires in an ODK Collect. The electronic questionnaire was formulated in English. Enumerators were persons who understood the respondents' language and were trained on how to

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translate the questions in the case ambiguity and English language problems. A key informant interview guide was also used to collect data mainly for triangulating information received from the respondents on enabling and limiting factors (social, cultural, and economic variables) on the consumption of insects as a household food security source. Additionally, the edible insect species in the area of study are normally wildly collected; Lake flies, 'agoro' termites, black ants, crickets, and grasshoppers, form part of traditionally consumed meals in the western part of the country.

The sample size of this study was determined using a formula developed by (Israel, 2009):

$n = N\ 1+N(e)2$

Where n – is sample size, N - is the population size, e- is the margin of error (0.075), Using this formula, sample size was 178 participants out of the population of 157,522.

Data Analysis

The data collected was consolidated and entered the R version 4.1.2 software in preparation for analysis and ran to establish the general trends in each of the variables measured. Descriptive analysis was done concerning participants place of residence, age, sex, ethnic background, household income, highest attained education level, and current employment status with regard to insect consumption. The Chi-square test of association was used to establish the association between the consumption of edible insects (crickets, locusts, grasshoppers, and termites) and socio-demographic variables and establish their significance towards consumption. While regression was conducted to ascertain the strength of associations.

Ethical Approval

This study was permitted by the Ethical Review Committee and Board of Postgraduate Studies of JOOUST. Permission to collect data from the study site was obtained from Board of Graduate Studies. Consumers who took part in the study completed consent forms and were assured of anonymity.

RESULTS

Socio- Demographic Characteristics

From the *Table 1* below, most of the households were headed by a male, 153 (86%) and 24 (14%) were headed by women. A greater proportion of the participants were middle aged, 103 (58%) and youth were 74 (42%). About 90 (51%) had a primary school qualification, 63 (36%) had attained secondary school level, 18 (10%) had no formal education, 4 (2%) had a tertiary level certificate and the remaining 2 (1.1%) had a university degree. The largest religious group was Christianity 175 (99%) and Islam 2 (1%). Across the gender groups, a greater proportion, 131 (74%) earned up to 10,000 KSh ($82 USD), 44 (25%) earned above 10,000 to 20,000 KSh ($82 - $164 USD) and only 2 (1%) earned above 30,000 KSh ($245 USD) monthly

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Table 1: Distribution of socio-demographic characteristics by gender of the household head

Variable		Male		Female		Total		χ^2(df)	P-value
		N	%	N	%	N	%		
Age	Youth	72	41%	2	1%	74	42%	12.7879(1)	0.0003
	Middle age	81	46%	22	12%	103	58%		
	Total	153	86%	24	14%	177	100%		
Education	Informal	16	9%	2	1%	18	10%	3.113(4)	0.5392
	Primary	80	45%	10	6%	90	51%		
	Secondary	51	29%	12	7%	63	36%		
	Tertiary	4	2%	0	0%	4	2%		
	University	2	1%	0	0%	2	1%		
	Total	153	86%	24	14%	177	100%		
Religion	Christian	151	85%	24	14%	175	99%	0.317(1)	0.5732
	Muslim	2	1%	0	0%	2	1%		
	Total	153	86%	24	14%	177	100%		
Monthly income	<=10000	111	63%	20	11%	131	74%	1.389(1)	0.4993
	10001-20000	40	23%	4	2%	44	25%		
	200001-30000	2	1%	0	0%	2	1%		
	Total	153	86%	24	14%	177	100%		

From *Table 2* below, average household had 6 members; some families had up to 15 members. Land ownership according to 166 participants ranged between 0.25 acres to 9 acres, averaging 1.79 acres. The consumption rate of insects was 19.77 kg per month on average; Other families consume up to 60kg of insets per month.

Table 2: Summary statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Household members	172	0	15	6.06	2.603
Land size	166	0.25	9	1.79	1.268
Monthly insect consumption(kg)	177	0	60	19.78	15.386

Socio-Economic Activity

From the *Figure 1* below, the main source of income for the family which is also the socio- economic activity of the household head was farming. It is practiced by more than 40% of the families. Casual labour is the second leading economic activity followed closely by bodaboda business, then the normal business consisting of retail and other businesses and a very small proportion are on formal employment and some families only depend on remittance from other family members.

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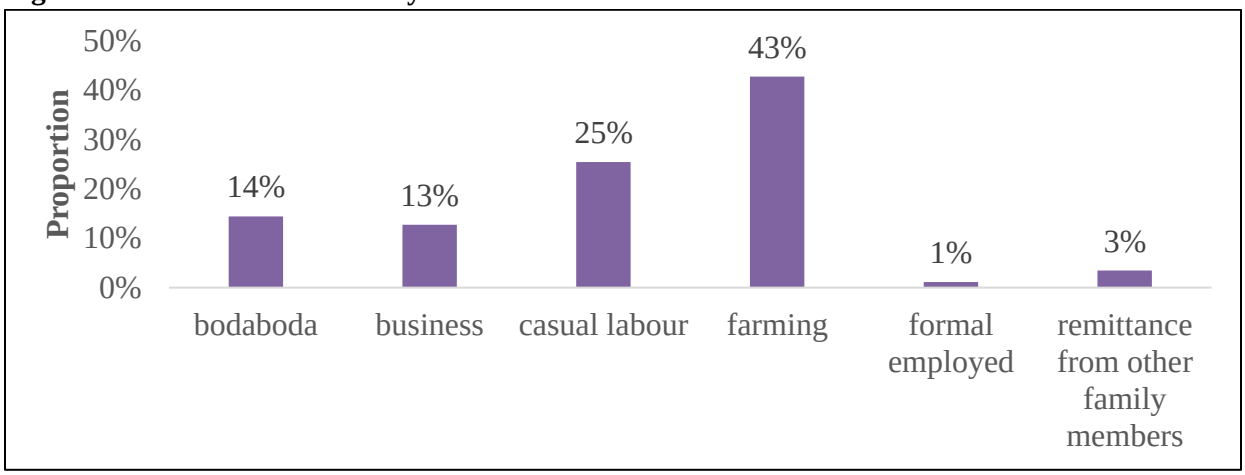
Figure 1: Socio-economic activity of household head



Note 1: Farming: crop, livestock, mixed farming; casual labour: Fishing and casual labour; Business: business, retail, and cobbler.

Cultural Activity

In *Table 3* below, most Christians and Muslims have no cultural beliefs and taboos prohibiting insect consumption. However, about 30% of Christian participants believe that there are beliefs restricting consumption of insects whereas 10% are indifferent of existence of such rules. Additionally, 1% of the Muslim participants are not bound by insect consumption while 0% never accounted the existence of restrictions. There is however, no association between religious group and the cultural factors; beliefs and taboos.

Table 3: Availability of cultural beliefs and taboos across religious groups

Variable		Christian		Muslim		Total		χ^2(df)	P-value
		N	%	N	%	N	%		
Cultural beliefs	Yes	53	30%	0	0%	53	30%	1.381(2)	0.5013
	No	102	58%	2	1%	104	59%		
	I do not know	18	10%	0	0%	18	10%		
	Total	173	99%	2	1%	175	100%		
Taboos	Yes	42	29%	0	0%	42	29%	0.827(1)	0.363
	No	101	70%	2	1%	103	71%		
	Total	143	99%	2	1%	145	100%		

Insects Consumption

Figure 2 indicates the most popular species in vernacular, consumed in the region; onyoso (Edible black ants) whose popularity is 32%, ng'wen (flying termites) at 31%, onjiri (crickets) at 19%, dede (grasshoppers) at 10%, sam (lake fliers) 4% and the least popular being oyala (termites), 1%. Most of the participants cited that they were comfortable consuming and serving insect food at any time, motivation being cheap availability, for heath and nutritional value as well as source of alternative food sources**.**

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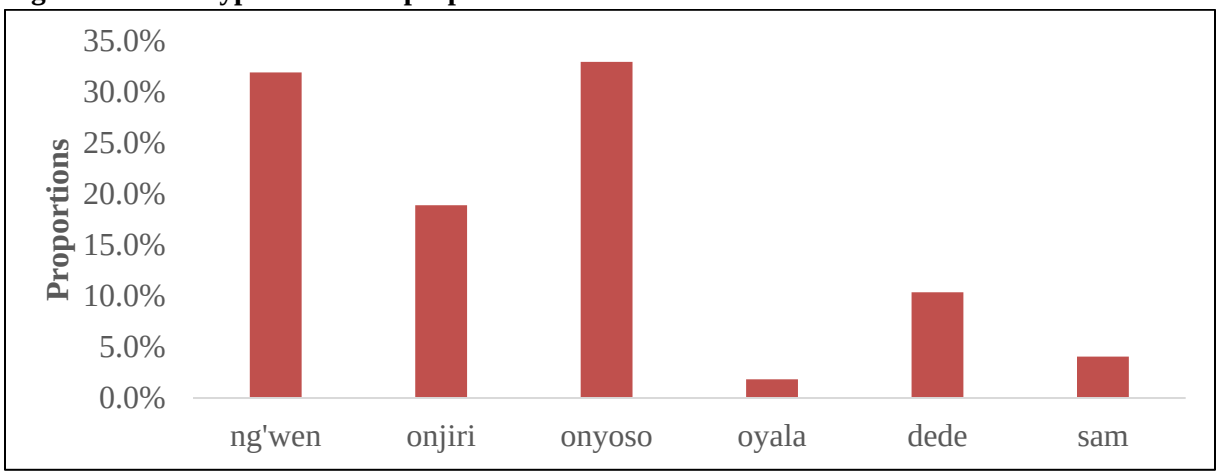
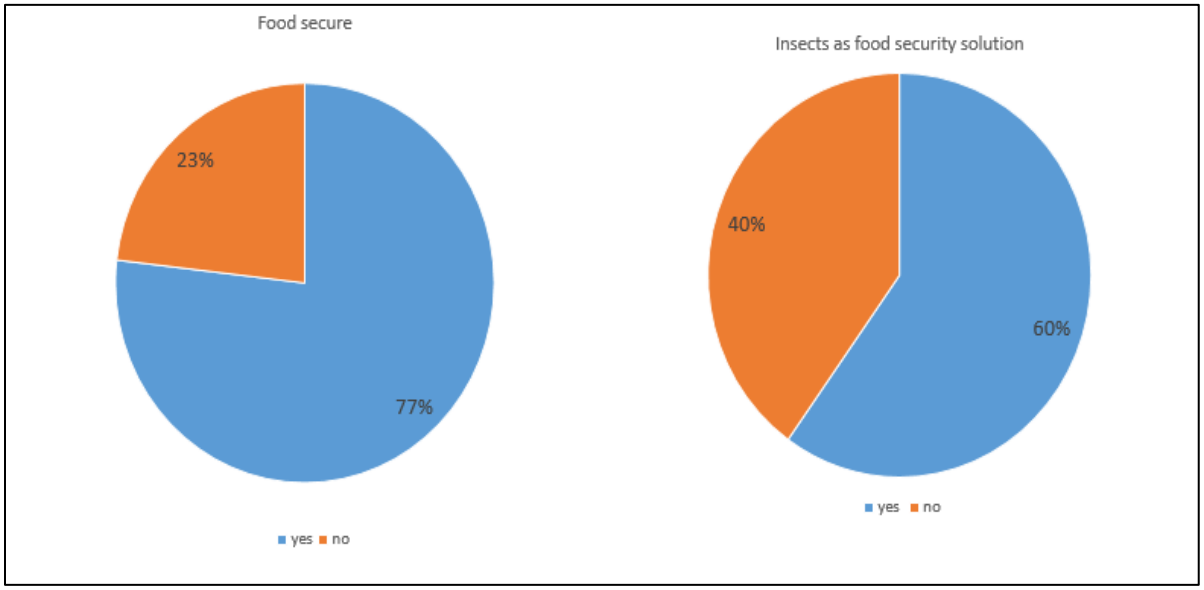
Figure 2: Insect type consumed proportions



Food Security

Most families in the region are regarded as food secure also most of the participants do believe that adopting insect consumption could be a solution to food security. The parameters that people use to measure food security is the availability of food in stores, good health, and hard work. Those who were food insecure had inadequate food and faced low production challenges. Adopting insects could assist boost food security since it is readily available an alternative source of food and if motivated its consumption could improve. Some of the drawbacks cited for insects improving food security is its seasonality nature and low distribution. A chi square test further conducted indicated that there is an association between food security and insect consumption being a food security solution as indicated in *Figure 3*.

Figure 3: Proportion of food security and consumption of insects as a food security solution



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Relationship Between Insect Consumption and Social, Cultural and Economic Factors

Social Factors

Table 4 shows the Chi-Square analysis where about 90% of the participants received formal education however there was no significant association between formal education and insect consumption. Equally there was no significant association between family size and insect consumption rate, (2) =1.538, p=0.463. Similarly, no significance association between age and insect consumption.

Table 4: Social, economic, and cultural factors distribution by insect consumption rate

Variable		Low		High		Total		χ^2(df)	P-value
		N	%	N	%	N	%		
Age	Youth	47	27%	27	15%	74	42%	0.569(1)	0.451
	Middle age	71	40%	32	18%	103	58%		
	Total	118	67%	59	33%	177	100%		
Education	Informal	12	7%	6	3%	18	10%	3.521(3	0.318
	Primary	57	32%	33	19%	90	51%		
	Secondary	43	24%	20	11%	63	36%		
	Tertiary	6	3%	0	0%	6	3%		
	Total	118	67%	59	33%	177	100%		
Family size	Small	59	34%	34	20%	93	54%	1.538(2)	0.463
	Medium	48	28%	20	12%	68	40%		
	Large	6	3%	5	3%	11	6%		
	Total	113	66%	59	34%	172	100%		

Economic Factors

Table 5 indicates the logistic regression analysis conducted. Those earning up to Ksh. 10000 had a significantly lower consumption rate compared to those earning between 10001 and 20000. Despite the higher difference in consumption rates, the lowest income earners had no significant difference with the highest income earners while land had no significant impact on consumption rate.

Table 5: Logistic regression results on the impact of economic factors; land and income on insect consumption.

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	1.130	0.301	3.76	0.000*
Income (10001-20000)	-1.330	0.399	-3.333	0.001*
Income (20001-30000)	14.577	1029.122	0.014	0.989
Land in acres	-0.035	0.143	-0.247	0.805

*Dependent variable consumption rate *implies significant at 5% level of significance*

Cultural Factors

Christianity was the most dominant religion. All Muslims in this study were heavy insect consumers. There existed an association at 5% level of significance between religion and insect consumption, (1) =4.4046, p=0.044. The knowledge on cultural beliefs had no significant impact on the rate of insects consumed. A greater proportion of participant belief that there are no taboos underlying insect consumption, some belief that they do exist but the remaining 18% do not know about taboos existence. Insect consumption is affected by existence of cultural taboos, (1) =16.387, p<0.001 as shown in *Table 6.*

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Table 6: Cultural factors distribution by insect consumption rate

Cultural factors		Low		High		Total		χ^2(df)	P-value
		N	%	N	%	N	%		
Religion	Christian	118	67%	57	32%	175	99%	4.046(1)	0.044
	Muslim	0	0%	2	1%	2	1%		
	Total	118	67%	59	33%	177	100%		
Cultural beliefs	Yes	39	22%	14	8%	53	30%	5.278(2)	0.071
	No	71	41%	33	19%	104	59%		
	I do not know	8	5%	10	6%	18	10%		
	Total	118	67%	57	33%	175	100%		
Taboos	Yes	16	11%	26	18%	42	29%	16.387(1)	0.000
	No	76	52%	27	19%	103	71%		
	Total	92	63%	53	37%	145	100%		

Regression Model

From the *Table 7*, tertiary level education had a significantly lower mean insect consumption compared to the informal. As the number of family members increase, the amount of insects consumed increases significantly. Higher income members consumed more insects compared to the low-income earners. In households where insects are prohibited, the rate of consumption is higher compared to households where there are no taboos prohibiting consumption.

Table 7: A multiple linear regression of amount of insect consumed on social, economic, and cultural factors

Variable	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	0.295	6.702	0.044	0.965
Age(youth)	2.944	2.140	1.376	0.171
Education(primary)	2.101	3.830	0.549	0.584
Education(secondary)	-2.908	4.007	-0.726	0.469
Education(tertiary)	-13.370	6.118	-2.184	0.031*
No of family members	1.392	0.430	3.240	0.002*
Income	0.001	0.000	2.986	0.003*
Cultural beliefs(no)	2.864	4.489	0.638	0.525
Cultural beliefs(yes)	-5.031	4.148	-1.213	0.227
Religious group (Muslim)	3.964	8.752	0.453	0.651
Taboos prohibiting insects(yes)	7.333	3.371	2.175	0.031*

Dependent variable: Insect consumption (continuous variable)

DISCUSSION

Socio Demographic Characteristics

The study consisted of 178 participants where 86% were male and 14% were female. A high percentage of the participants were male, a finding that corresponds with the conclusion made by Gray (2014). According to Gray (2014) and Nyberg (2020), men have a low fear for trying new things such as eating insects and have a high level of curiosity and interest compared to women, therefore, were more willing than women to participate in the study. The middle aged dominated the study with 58% turnout as compared to the 42% youth group. According to Megan and Emma (2021), middle aged and youthful individuals are adventurous, love new sensations, and have a high spirit, therefore are open to trying new experiences. A finding that corresponds to the current study,

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whereby all the participants were youths and from middle-aged.

In terms of education attainment, most of the participants had attained primary school level education, 36% with secondary education, and 3% advancing to tertiary levels and university; however, 10% had informal education. With a high percentage of the participants 39% having obtained secondary and tertiary education, they had adequate and relevant information and knowledge required to make informed decisions of insect consumption for their households (Elena et al., 2019). Christians were the largest religious group, 99%, as a result a high percentage of the population in the study area were Christians. Land sizes ranged between 0.25 to 9 acres (M=1.79, SD=1.268). The number of insects consumed however averaged 19.78 kg per month per household where the average number of people per household was 6 members.

Socio Economic Activity

The main source of income of the participants was informal employment. About 60% of the household heads are farmers, 16% were casual laborers, 13% constituting boda-boda operators, 9% in business and the remaining 1% on formal employment. Most households depended on farming as their source of income, 25% depended on casual labour. Boda-boda and business were the main source of income for 14% and 13% of the households respectively; 3% of the households depended on other family members remittances, and 1% on formal employment. In terms of income 74% of the participants earn less than 10,000 KSh and 1% earning above 20,000 KSh. ($82 and $164 USD). According to the current study findings a high percentage of the participants had low incomes to spend on food and other basic needs. According to Kamau et al., (2018), low economic status plays a significant role in limiting access to sufficient foods. Notably, the low socio-economic status of the participants had an impact on insect consumption of insects in households**.**

Insect Consumption and Food Security

There has been an increasing demand for meat and meat products. However, due to the increase in the world's population and changes in climatic conditions and patterns, there is a decrease in the availability of agricultural space and productivity of available land. Insects as a source of food have been strongly endorsed to be an alternative food product due to their high nutrition level and sustainability (van Huis, 2015). A study carried out by Payne et al, (2016) revealed that insects have a high protein content compared to other sources of protein, such as milk, meat, and eggs. Therefore, insect consumption can play a significant role in combating the issue of food security in households**.**

Insect consumption is practiced by most households, such as ng'wen (31%), onyoso (32%), onjiri (19%), oyala (1%), dede (10%) and sam (4%). Despite the consumption, most people do prefer consuming insects because of the following benefits: cheap availability, health benefits and it's an alternative food supplement. In comparison to the current study, where 30% of the participants cited cheap as a reason for insect consumption while 21% of the participants cited cheaply availability as a motivation for comfortability serving of insects. In addition, insects are harvested from the environment, therefore there is no cost incurred in rearing them or harvesting them. In that case, there are no finances involved in obtaining them for food purposes. Also, insect harvesting is mainly done by children, hence, parents' time allocated for economic activities is not spent in insect harvesting for household consumption, making insects further cheap (Durr & Ratompoarison, 2021).

However, others do not prefer consuming insects due to their taste or they do not naturally like them. Potential edible consumer cite they find insects and insect-based foods distasteful, therefore, they are not motivated to consume them. Unacceptability of insect consumption is a result of insect dislike. The dislike for insects is commonly contributed to

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disgust towards eating of insects, neophobia, unfamiliarity, and fear of hygiene, contamination, and safety of the insects and insect-based foods. Another drawback to insect consumption is seasonality and low distribution. According to Durr & Ratompoarison, (2021), numerous edible insects are not found all year round, hence, are seasonal. However, insect seasonality does not mean that there is a time in a year, insects are not available it means that different species are found at different times around the year. Additionally, the availability of insects however being cheap and readily available, they are not high in supply to satisfy the demand and also are found only in select areas, hence, their low distribution affects their consumption in households**.**

Food insecure people are seen as the lazy, those with poor health or malnutrition and have little food in their stores. From the pilot test conducted on the leaders, it was observed that above 90% stated that the food security situation was poor. The underlying reasons for the food security situation was poverty, drought and famine, poor agricultural practices, climate change, and lack of technology and innovation techniques. Some of the remedies suggested to address food security were deployment of extension officers, the government providing farm equipment and more employment opportunities. The high cost of living however has made more people be on poor diet situation.

Social Factors Affecting Insect Consumption

In this study, some of the social factors that were believed to affect insect consumption rate were age, education, and family size. There was no association between insect consumption and all the social factors. Insect consumption does not vary depending in age, education, and family size according to a chi square test conducted.

Comparatively to the current research, a study done by Onyaro et al. (2022) indicated social factors such as family size and education did not have any association to the acceptance of consumption of insects. The level of education one had attained and the number of family members in a household, did not influence the insect consumption or the quantity of insects consumed. However, this finding is in contrary to other studies done by Cicatiello et al. (2016); Durst and Hanboonsong (2015); Dhanai et al. (2019); Mwiinga et al. (2022) which showed that educational level was strongly associated to the consumption of insects in households. On the contrary, findings from a study done by Onyaro et al. (2022) found that age played a significant role in influencing the consumption of insects and insect-based foods.

Economic Factors Affecting Insect Consumption

There are several factors affecting insect consumption economically. In this analysis, a focus was on monthly income and land size. Income was observed to have a significant impact on the amount of insects consumed. A logistic regression further conducted indicated that having income between 10000 and 20000 had a significant impact on consumption. In comparison with the current study, studies carried out by Flight et al. (2003); MacNicol et al. (2003) concluded that individuals with a high-income level had a low level of neophobia compared to individuals with a low level of income. Individuals with high levels of income are exposed to many and diverse cultures as a result, their growth and knowledge in a range of stimuli, including diets, results to a low level in the fear of insects and insect consumption.

The current research findings revealed that the size of land owned by participants did not have any significant impact on the consumption rate of insects in their households. Currently, there are awareness campaigns in the country and worldwide promoting and encouraging farmers to embrace insect farming in their farms. Various institutions and individuals have established insect farming systems with the aim of dealing with the issue of food security and sustainability in households (Kelemu et al., 2015). However, despite awareness

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of insect farming, many farmers in the region of study have not embraced insect farming, thus, the size of their farms do not have an impact on insect consumption in their households.

Cultural Factors Affecting Insect Consumption

An in-depth analysis of religion, cultural beliefs, and taboos indicated that taboos and religion have a significant impact on insect consumption. A Chi-square conducted further however indicated that none of the variable coefficients were statistically significant for prediction. From the study, cultural factors have an association with insect consumption however the size of impact cannot be quantified. Comparative to the current study, research conducted by FAO (2013) concluded that culture plays a significant role in influencing food practices as a result of their religious beliefs. Eating insects has been a practice in various religious beliefs, such as of Islamic, Christian, and Jewish faiths. In the bible, Christians are allowed to eat insects. In Leviticus, the bible states that flying insects walking in all fours should not be consumed. However, it allows the consumption of flying insects, walking on all fours, with jointed legs and hops on the ground. These insects include, crickets, grasshoppers, locusts, and katydid *(Leviticus XI: 20-25)*. The New Testament describes the source of protein for Saint John was locusts *(Mark I: 6)*.

In comparison with the current study, despite the size of insects in households not being quantifiable, a study conducted by Ayieko, (2013) indicated that cultural practices influence insect consumption. Most of the participants cited that there were no cultural values they knew of regarding the consumption of insects, hence, they were not restricted from eating insects. On the contrary, the small percentage of participants who cited having knowledge of cultural practices that prohibit insect consumption, had a low acceptability of insect consumption. On the other hand, a study carried out by Van Huis (2015) indicates that various African clans do not consume some insects because they believe they are sacred and used for community totems or fetishes.

Consequently, taboos have an influence in the consumption of insects. Some participants believed that there are taboos associated to eating insects. Resultantly, insect consumption in their households is unacceptable. On the other hand, other participants did not cite any taboos restricting consumption of insects, therefore, consumption of insects in their households was acceptable. Consumption of insects for some people is normal while for other is considered as a taboo. Some cultures, for instance, the western cultures believe that eating insects is a taboo especially eating small-sized termites one risks to be deaf once consumes. Insect phobia, is also a result of the belief that insects are terrible and harmful and are responsible for problems such as disturbances, diseases, and injuries. Other beliefs associated to insect consumption is that it is a poor man's diet, hence it is unacceptable to consume insects in their households (McDade & Collins, 2019).

CONCLUSIONS

The research findings revealed that economic activities of the participants influenced the consumption of insects in households (Onyaro et al., 2022). It was evident that the size of land owned by respondents did not significantly influence the consumption of insects in households. Insect consumption in the region of study was also impacted by the cultural beliefs and values of the respondents. Some respondents stated that they were aware of various cultural beliefs and values that prohibited the consumption of insects while other respondents stated that they were not aware of any cultural beliefs that restricted insect consumption. In addition to cultural beliefs, religious practices of the respondents were not cited as a factor the restricted consumption of insects (Cicatiello et al., 2016; Durst and Hanboonsong, 2015; Dhanai et al., 2019). Resultantly, based on religious beliefs and lack of awareness of any

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cultural practices that restricted insect consumption, the practice was acceptable in the various households. In addition, taboos, played a significant role in the rate or pattern of consumption of insects. Finally, social factors as per the findings affected the consumption of insects in their households. Education, age, and family size influenced consumption of insects. The looming problem of food insecurity in many households, require that individuals accept and embrace the consumption of insects. To achieve this is it important that attention is directed towards the cultural, economic, and social factors that are associated with poor reception of consumption of insects. First, it is recommended that farmers, despite their land sizes are encouraged to rear and farm insects. Rearing and farming insects does not require an extensive area and is not financial intensive. Therefore, insect rearing in cheap and sustainable and when coupled with consumption, it is highly beneficial (Kelemu et al., 2015).

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