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Insects for Food! Factors Influencing Consumer Acceptance and Quantity Consumed of Edible Winged Termites

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Abstract

Developing countries are faced with increased population growth and urbanization resulting in high demand for food, especially animal based protein. The dilemma is how to meet the rising demand for animal based protein in the face of climate change. Utilization of edible insects as food offers a possible sustainable solution to meet the rising protein demand besides its high nutritive value. Edible winged termites (EWT) consumption and commercialization is gaining popularity among consumers in Western Kenya. Despite EWT having economic, nutritional and environmental benefits, information on factors influencing its acceptance and demand is scanty among rural and urban consumers. The aim of this study was to assess consumers' socioeconomic, institutional and EWT characteristics influencing its acceptance and quantity consumed. Multistage sampling procedure was used to sample 384 rural and urban consumers in Western Kenya. Data were collected through face to face interviews using pre-tested semi-structured questionnaire by well-trained enumerators. Data was analyzed using factor analysis and Craggit models. Consumer's perception of EWT was categorized into three: EWT attributes convenience and culture. Acceptance and demand of EWT was influenced by gender, education, higher number of children below 5 years, income, household being a native of western Kenya and EWT attributes among rural and urban consumers. The study recommends more education on use of edible insects as food, with much emphasis on its benefits and desirable attributes. This can be done through established cultural centers and "food clinics" to create awareness among consumers to enhance the commercialization of EWT value chain. Further, there is need to in cooperate entomophagy in formal education curricula to promote the transfer of knowledge to future generations.

Key words: Consumer acceptance, Craggit model, Demand, Edible winged termites, Factor Analysis.

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Introduction

The World particularly developing countries are facing increased population growth, urbanization and incomes (FAO, 2013). These coupled with a surging urban population have resulted in increased food demand, specifically animal-based proteins (Lensvelt and Steenbekkers, 2014). The dilemma is how to sustainably meet the rising animal-based protein demand in the face of climate change, environmental degradation as well as the scarcity of land and water (Lensvelt and Steenbekkers, 2014). For these reasons, innovative and sustainable solutions need to be researched and explored. Entomophagy the collection and consumption of insects as food could be a possible advantageous solution for developing economies, Kenya included (Alemu et al., 2017). Insects are nutritious, many in numbers, always available, efficient in feed conversion, less water and land dependent, they emit less greenhouse gasses and ammonia, pose a low risk of transmitting zoonotic diseases, some species have the ability to convert organic wastes to high-quality protein food and feed, their harvesting or rearing is a low-capital investment option thus offer diversified livelihood opportunities for poor households (FAO, 2013). Edible insects' value chain has been subsistent in Kenya (Alemu et al. 2017), but there is developing trend in Western Kenya to commercialize it particularly for EWT, with increasing consumer awareness on its nutritional benefits. There has been increasing demand for the termites with some consumers indicating greater willingness to pay premium prices. Despite entomophagy having nutritional, economic and environmental benefits, there is limited empirical evidence on its consumer's perception, acceptance and demand determinants. This study provides empirical evidence comparison on how consumers socioeconomic and institutional as well as product characteristics influence acceptance and quantity consumed of EWT in rural and urban consumers to cater for spatial heterogeneity in the population.

Material and Methods

The study was conducted in Kimilili Sub-County, Western Kenya. The multistage sampling procedure was followed to select Kimilili Township and Nabikoto sub-locations of Kimilili and Kamukuywa wards to represent urban and rural consumers respectively. Simple random sampling technique was used to select 192 respondents from each Sub-Location. Cross sectional data on consumers' socioeconomic, institutional and termite characteristics were collected using a semi-structured pre-tested questionnaire administered through face-to-face interviews by trained enumerators. Factor analysis and Craggit models were used for analysis. The dependent variables were acceptance of EWT consumption and quantity of EWT consumed.

Results and Discussion

Factor analysis results indicate that rural and urban dwellers perceived EWT positively as food with important attributes, convenient and culturally appropriate with explained variances of 56%, 5% and 5% respectively. Table1. Presents results of acceptance (APE) and the expected quantity of EWT consumed (UAE) for rural and urban households. The increase in the decision maker's age increases the probability of acceptance and the expected quantity consumed of EWT among urban consumers. This finding could be explained by elderly familiarity with EWT consumption and accumulation of resources to increase their purchasing power respectively. This finding corroborates that reported by (Pambo et al., 2016) on demand for edible insects. The food purchase and consumption decision maker being a male reduces the likelihood of acceptance in the rural households as well as the expected quantity of EWT consumed in both rural and urban households. The possession of adequate knowledge on EWT collection and preparation methods by females could explain this finding. Alemu et al. (2017) when studying consumer preferences for insect-based products found similar results. In rural and urban consumers, an increase in the number of years spent in formal education increases the probability of acceptance and expected quantity of EWT consumed. Formal education could have developed knowledge on the nutritive,

economic and ecological benefits of using insects as food among participants which positively influenced their attitudes and perceptions towards EWT consumption. Education is important in instilling ethics, understanding, transmitting knowledge and information among consumers (Ayuya et al., 2015).

Table 1. Determinants of acceptance (APE) and quantity of EWT consumed (UAE)

	Rural consumers		Urban consumers		Rural consumers		Urban consumers	
Variable	APE	Std. Err.	APE	Std. Err.	UAE	Std. Err.	UAE	Std. Err.
Consumers' socioeconomic characteristics								
Age	0.001	0.001	0.001***	0.019	0.007	0.036	0.006***	0.014
Gender	-0.003**	0.023	-0.002	0.274	-0.113**	0.027	-0.106**	0.150
Education	0.012**	0.080	0.008**	0.088	0.029**	0.065	0.013**	0.157
Hmeover5	0.01	0.154	0.006	0.092	0.018***	0.098	0.005	0.095
Chlbelow5	0.037	0.221	0.024	0.204	0.176***	0.164	0.126**	0.396
Income	-0.134***	0.526	-0.086**	0.495	0.442***	0.483	-0.266***	0.248
Native	0.018**	0.368	0.011	0.15	0.073**	0.382	0.049***	0.095
Edible winged termite characteristics								
Termats	1.010***	2.557	0.650***	3.911	2.322***	2.066	1.035***	2.987
Convenience	0.192	1.029	0.124**	1.605	0.339**	0.948	0.098**	0.988
Culture	0.042***	0.247	0.027	0.189	0.148***	0.198	0.094	0.113

Note: ***, **, *Significant at 1%, 5% and 10%, respectively.

Standard errors have been calculated by the delta method.

An increase in the number of household members aged above 5 years increases the expected quantity of EWT consumed among rural respondents. Most collections are in the rural areas thus households with more members are able to collect and consume more EWT. Presence of many adults in the household increases the food demand (Ayuya et al., 2015).On average, an increase in the number of children below 5 years in the household increases the expected quantity of EWT consumed in both rural and urban dwellers. The consumers' awareness of the termite nutritional benefits and the importance of proper nutrition to their children could explain this finding. Children require nutritious diets with all the necessary macro and micro elements for proper physical growth and mental development (FAO, 2013). Failure to get these elements at the required early life stage leads to deficiency physical and mental disorders that can never be corrected at later life stages (Looy et al., 2014).

The increase in monthly income reduces the probability of EWT acceptance in rural and urban consumers. Probably the consumers viewed EWT as food for the poor so as their incomes increase they opt for other animal protein sources that they perceived fit for their income levels. However, an increase in income increases the expected quantity of EWT consumed in rural households while it reduces in the urban. The perception of edible insects as food for the poor could reduce the likelihood of consumption as income increases (Looy et al., 2014).The decision maker being a native of the area increases the likelihood of EWT acceptance among rural consumers as well as the expected quantity consumed in rural and urban households. Perhaps natives had developed an insect-eating culture that had been learned and passed from one generation to another thus increasing the acceptance likelihood and expected quantity of EWT consumed. Distinct cultural groups of people living in the same ecological region eat the same food (Looy et al., 2014).

On average, the perceived EWT attributes increases acceptance likelihood and the expected quantity of EWT consumed in rural and urban households. This finding could be explained by the increase in consumers' awareness of the nutritive, economic and environmental value of EWT consumption. Perceived taste, naturalness, freshness and nutritional value are considered the most

important attributes of novel food products by consumers (Alemu et al., 2017). Perceived convenience of EWT increases acceptance likelihood among urban consumers and the expected quantity of consumed by a household among rural and urban dwellers. The EWT could have fitted well into consumers' trends and needs of saving time and generating income for others. According to Pambo et al. (2016), convenience plays an important role when consumers have to decide whether to consume a certain food product or not. In rural households, culture has a positive effect on EWT acceptance and quantity consumed. This finding could be attributed to rural respondents' perception of EWT consumption as a more culturally appropriate practice and most EWT collections being in the rural areas. Fitness of novel food into consumer norms, beliefs and customs facilitates preference and increase the willingness to consume more units of the food product (House, 2016).

Conclusions and Outlook

Edible winged termites' consumption has been accepted in both rural and urban dwellers thus there is potential for the value chain development and positive perception of EWT attributes is the major determinant of acceptance and quantity consumed. This study recommends more education on use of edible insects as food, with much emphasis on its benefits and desirable attributes. This can be done through established cultural centers and "food clinics" to create awareness among consumers to enhance the commercialization of EWT value chain. Further, there is need to in cooperate entomophagy in formal education curricula to promote the transfer of knowledge to future generations. This study was limited to EWT that are seasonally collected and difficult to rear on farms. Therefore, further similar research can be conducted using crickets or grasshoppers that are easier to produce in commercial farms.

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