

**DOI: 10.18697/ajfand.76.16810****CONSUMERS' SALIENT BELIEFS REGARDING FOODS FROM EDIBLE  
INSECTS IN KENYA: A QUALITATIVE STUDY USING CONCEPTS FROM  
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## ABSTRACT

Population growth, urbanization and climate change, are among the factors that have created uncertainties and pressures on current global food and economic systems. Agricultural intensification can no longer support the increasing demand for food, especially of protein origin. Consequently, pressure is mounting on the supply side (private sector) to develop viable alternative sources of protein' foods. Insects as food and consumption of foods from edible insects (FEI) are being promoted as one potential solution to the declining access to protein foods. However, one of the challenges facing the private sector is to demonstrate the efficacy of FEI programmes in the face of limited information regarding consumer - psychographic characteristics including their attitudes, values, interests and beliefs. The aim of the study was to explore the salient beliefs underlying consumer attitudes towards FEI consumption in Kenya. To achieve this objective, six focus group discussions (FGDs) were conducted (n= 43), three with only female participants and the other three with a mixed gender. The FGD script was coded using the Theory of Planned Behaviour theoretical framework. The results show that, salient beliefs related to taste, availability, convenience, affordability and other benefits beyond nutrition, are the main determinants of the participants' intentions to consume FEI. Intentions are also influenced by the perceived feelings regarding the social referents, including family members, peers, religious leaders and health officials; and perceived behavioural control factors such as perceived risks on their food choices, perceived convenience and availability. While designing local programmes to promote FEI consumption, participants support the idea of small groups, but expresses concern about the time of day (evening preferred), length and location of the group session. However, many participants are not receptive to receiving telephone messages, although they are open to the idea of receiving phone calls. The study findings provide unique insights, among them, cultural beliefs that underlies consumer attitudes towards consuming FEI. Additionally, the results suggest possible approaches and practical interventions that can be used to promote FEI consumption in specific regions of Kenya.

**Key words:** Foods from edible insects, theory of planned behaviour, Salient beliefs



## INTRODUCTION

Large numbers of people in the developing world are currently facing food insecurity, and majority of these are smallholder farmers and the rural poor [1, 2]. Hunger in developing countries is an entrenched problem despite ample food production at the global level. The reasons for this are complex but ultimately these people have been systematically locked-out of development with few rights and little access to resources. Due to poverty and relative exclusion from cash-based economies, they, like many urban poor in developing countries, are food insecure [1, 3].

The concept of food and nutritional security refers to the ability of all people at all times to have physical and income access to sufficient, safe and nutritious food to meet their dietary needs for an active healthy life [1]. It requires food to be available in enough quantities, stable and accessible without which it leads to malnourishment that hinders individual performance. Food and nutritional insecurity is in part, due to small-scale farmers' inability to produce enough food for their own consumption and to sustain their communities. For that reason, any enhancement of food security calls for farmers' sensitization and encouragement to adopt strategic methods that will not only cater for food and nutritional security but also income at household level and sound management of the environment [4].

In order to address these challenges, scientists have tried new opportunities for increasing food production. As such, improvements in food production systems have been achieved through intensive farming techniques, genetic selection, and, recently by genetic engineering, for example, the development of genetically modified organisms (GMOs). However, increasing yields through agricultural intensification reduces environmental sustainability which, in the long run lowers the levels of food production. With the rising world population, the severity of climate change requires considerable attention in major policy discourses [5]. The call to increase food production in a sustainable way so as to halt the degradation of ecosystems is timely [6, 7]. While ecosystem functions and the loss of natural resources and biodiversity have become central to resource use decisions, much greater resilience, diversity and flexibility need to be built into food systems at both the local and global levels given the unpredictability and severity of ongoing climate change. If food security challenge is to be managed effectively and sustainably as the population grows, much greater participation of people in food systems' innovation is necessary [7].

Recently, policy makers, scientists and international organizations including the United Nations (UN) have called for diversification of the sources of food in the face of climate change to include foods from edible insects [2]. For example, the international conference on 'Insects to Feed the World' was organized jointly by Wageningen



University and Research Center (WUR) and the UN Food and Agricultural Organization (FAO) from May 14-17, 2014 [7]. In 2016, a follow up meeting ‘International Conference on Legislation and Policy on the Use of Insect as Food and Feed in East Africa’ was held in Kenya, to inform governmental regulatory authorities, policy makers and other stakeholders, the importance of insect’ value chains. The conclusion of these conferences underlined, among other things, the potential of foods from edible insects (FEI) to increase food production and diversity, especially of protein origin; the importance of addressing knowledge gaps in consumer acceptance; and for the African-governments to incorporate the management and protection of wild edible insects, including their genetic diversity, in natural resources conservation policies and legislation [8, 9].

The idea of eating FEI may be a challenging idea for many [8]. In Western societies, FEI do not readily enter the category of ‘edible’—instead they are an object of dislike and disgust [9, 10]. In other parts of the world, FEI form an important part of edible diversity: crispy fried locusts and crickets in Thailand, delicate ant larvae in Mexico, and raw termites in Uganda and western Kenya are only a few ways that the recorded 1,900 edible species are enjoyed [10, 11, 12].

Nutritionally, FEI can be a good source of protein, minerals, vitamins, fatty acids and fiber, especially in relation to conventional protein-sources like meat [11]. For example, the omega 3 fatty acid contained in mealworms is comparable to that in fish. The iron content in mopane caterpillars varies from 31–77 mg per 100 g of dry weight versus only six mg per 100 g of dry weight in beef, while special compounds (sterols) found in the locusts, grass hoppers (Nsenene in Uganda), and crickets can help fight some cancers and bad fat, which is the cause of heart problems [10, 12]. For the environment, they can present a series of benefits such as reduced land and water requirements, low greenhouse gas (GHG) emissions, little risk of zoonotic infections, and fewer problems with animal welfare issues [12].

Despite the documented benefits associated with consumption of FEI, few studies targeting FEI consumption behaviours have been conducted in Kenya [4, 6, 11]. These studies focused on potential for eating FEI, nutrient composition as well as product liking. Studies exploring consumers’ attitudes and underlying beliefs are lacking, particularly those seeking to determine consumers’ opinions and perceptions. Moreover, a number of studies [ibid] recommend additional research to explore the effect of various promotional initiatives and interventions on FEI consumption. This study, therefore, explores the salient beliefs held by consumers in Kenya on FEI using insights from the Theory of Planned Behaviour (TPB).

The Theory of Planned Behaviour (TPB) as described by Ajzen [13, 14] is a theoretical approach that has been adopted to predict a variety of behaviours [15, 16, 17]. According to TPB, perceived behavioural control (PBC), along with subjective norms (SN) and attitude, impacts a person's intention. The intention of an individual then influences their behaviour (for example, consumption of FEI). Attitude toward the behaviour is a person's overall positive or negative evaluation of the behaviour. The subjective norm reflects a person's belief about whether important people would approve or disapprove of the behaviour. Perceived behavioural control is the measure of perceived control over the behaviour, that is, how easy or difficult performing the behaviour will be. Perceived behavioural control can also have a direct impact on behaviour because performance of a behaviour not only depends on motivation, but also the individual control of the behaviour [18]. If an individual has limited control over an activity, the activity might not be implemented, even in the presence of strong motivational factors [19].

The TPB has been applied to a wide variety of dietary behaviours including breakfast consumption, fruit and vegetable intake, eating behaviours, dieting and fat intake, along with many others [19]. Although it has been used quantitatively in various studies, it has rarely been used in qualitative studies targeting dietary behaviours. In addition, few research initiatives implementing an intervention targeting nutrition related behaviours have used this theory [20]. Highlighted gaps in the literature signify the need to use the TPB to qualitatively explore nutrition behaviour, including FEI consumption, and further use the focus group data to assess theory-based interventions targeting this issue. The current study, therefore, explored the attitudes, subjective norms, and PBC related to FEI behaviours.

## METHODOLOGY

### Study design and participants' recruitment

The study was conducted in three counties<sup>1</sup> - Siaya and Vihiga (in western Kenya) and Machakos (in eastern Kenya). The western part was relevant for this study because consumption of edible insects is culturally rooted. Additionally, Siaya and Vihiga counties have hosted numerous pilot programmes for edible insect-products, especially cricket foods [6, 11]. To provide contrast, Machakos County, where little or no edible insects is consumed was selected. Machakos was a suitable contrast county because of the increasing interest in insects-rearing as fronted by the International Center for Insects Physiology and Ecology (ICIPE) [9]. The chosen areas suffer from high levels of poverty and high levels of food insecurity in Kenya [22]. Dominance of cane growing in western

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<sup>1</sup> A county is both a geographical and an administrative unit in Kenya with an elected devolved government

region and semi-arid climate in eastern regions have reduced dietary diversity and increased incidences of undernutrition. Indeed, low per capita consumption of protein is a problem for most occupants of the two regions [4, 22], as their staple foods are restricted to maize, sorghum and finger-millet [4]. It is envisaged that these communities will benefit from improved nutrition if flour from listed staples are enriched with insects-products like cricket-powder.

Data for this study were collected through focus groups, as well as a quantitative screening questionnaire, following the guidelines adopted by Zoellner *et al.* [19]. As is common in focus groups, a purposeful sampling protocol was executed. Community residents were contacted either in person or via telephone and the screening questionnaire was administered to determine eligibility. Upon completion of the screening questionnaire, individuals were informed if they were eligible or not, and the eligible individuals were given the opportunity to accept or decline the invitation to participate. Each eligible participant was later contacted with the date and time of the focus group. In total, six focus groups were conducted including, two in Siaya and two in Vihiga where insect consumption is a popular practice and two in Machakos County, where the practice is not popular. Three focus groups contained female participants only and the remaining three were a mixture of both male and female participants (mixed gender).

### **The screening questionnaire**

Two items from a food consumption questionnaire were used to screen individuals for participation in the focus groups. They included knowledge on FEI and demographic characteristics. Participants were eligible if they were knowledgeable regarding FEI, even if they had not consumed the commodity. Demographic variables included gender, age in years, highest level of education reported in years of actual formal schooling, and income level. Participants were included in the focus group if they were 18 years and above.

### **Focus groups**

Focus groups were conducted using methods suggested by Krueger and Casey [21]. Each focus group included 5-8 participants and lasted about an hour and a half. A trained lead moderator and four co-moderators led each of the six focus groups. The moderator was responsible for facilitating discussion, while the co-moderators took notes during the focus groups. When participants arrived, they were served refreshments and the moderator introduced himself and explained the general process and topic of the focus group. As part of the ethical requirements of the research reported in this article, participants were provided relevant information regarding the study and consent (Appendix B) was sought before the moderator could proceed.

A semi-structured script (see the appendix A for details) containing open-ended questions was used to guide data collection and probes were used to encourage elaboration of responses. Questions focused on each construct of the TPB. Examples of questions



include: 1) attitudes: “Tell me about the good/bad things associated with FEI”, 2) subjective norms: “Who are the individuals or groups who would approve or think you should consume FEI, and who would disapprove? Whose feelings would you take into account when deciding to consume FEI?” and 3), PBC: “Which factors or circumstances that would make it easy/difficult or enable/prevent you consume FEI?” The focus groups also investigated programmatic issues and presented scenarios including “Where do you learn about the benefits or harmful effects of certain food?” and “If a free program was offered in your community to educate and help improve FEI consumption, what would you want that program to look like?”

### Data analysis

The focus group data were obtained and analyzed using methods suggested by Zoellner *et al.* [19]. Field notes taken by the co-moderators to capture important information were re-read by the research team (moderator and the four co-moderators), to aid in providing leads for further data gathering. The co-moderators independently generated initial key themes throughout the notes, and then met with the moderator to resolve discrepancies and develop a distinct coding system. The team then identified meaning units (MU) throughout each field notes that supported the initial themes. Meaning unit (MU) can be referred to as a content unit, a keyword or a unit of analysis [19]. In this study, MU was considered as words or sentences containing aspects (themes) related to each other through their content and context. Finally, the total number of MU and focus groups to support each theme were counted to aid in interpretation of the data. Upon analyzing emerging themes, subcategories, and associated MUs, there were no meaningful differences between participants from western region and eastern region. Therefore, the data were collapsed and results subsequently reported across all six focus groups.

## RESULTS

### Participants

In total, 51 individuals were screened, of which 49 were eligible and 43 eventually participated. Ineligible participants included two who had not consumed any edible insect and had no knowledge regarding FEI, so were not eligible because they had little experience to share on the subject matter (see section on screening protocol/questionnaire). Four eligible individuals chose not to participate (never turned up for the discussions), while two (male participants) could not participate because they turned up for the female sessions. The 43 participants included 28 females and 15 males. Seven participants had attained primary school education, 16 had a high school education, 11 had some college or specialized training but no degree, and 9 had a college degree. Monthly income distribution indicated that 14 participants earned below Kshs<sup>2</sup> 10,000, 20 earned between Kshs10,000-20,000 and 9 earned between Kshs 21,000-50,000, per month.

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<sup>2</sup> At the time of the study, USD 1 was equivalent to Kshs 100

Chi-square and one-way ANOVA tests revealed that the 14 participants from eastern region were not statistically different from the 43 participants in terms of distribution in gender, age, education level, or income level. All the participants on, average, had consumed, at least, some kind of edible insects at some point in their lives. While most participants from western region observed that consumption of edible insects is a regular practice that is embedded within their culture as a side meal or a snack, those from eastern region noted that insects are normally consumed by children. Types of insects commonly consumed included termites, especially the white winged termites, grasshoppers and black ants. Participants from western region also reported that cricket and lake flies are common delicacies. However, while participants from western region were knowledgeable regarding artificial rearing of insects like cricket for processing into FEI, most participants from eastern were not aware, but were highly receptive of the idea and wanted to know more. They also offered to participate in community programmes to educate and help improve FEI consumption, under programmatic scenarios.

### Attitude

As illustrated in Table 1, numerous positive and negative attitudes were revealed. When asked about the good things associated with FEI, an overwhelming number of comments related to positive food attributes (n= 73 MU). This category included three most frequently identified sub-categories namely taste (n= 29 MU) mentioned across all four focus groups in western region. One participant said, *(I couldn't imagine a cricket in my mouth until a member of Majiwa women group prepared some for us. Hey, they were crunchy – G2, female)*. Convenience (n= 26 MU) as well as nutrition (protein and minerals) (n= 32 MU), which were talked about in all the six focus groups. The remaining sub-categories consisted of possibility of artificial rearing enhancing constant availability, general liking by people in western region and antioxidants. Three positive health outcomes comprising 13 MU were noted, including a hearty meal of cricket/locust could reduce some cancers and fight bad fat that causes heart problems (n= 8 MU) and leads to strong bone formation (n= 5 MU).

Cost was discussed as both a positive quality of FEI (n= 27 MU), especially with reference to the small space requirement, as one participant said *“Cheap to rear too. Can be reared on recycled materials on a very small space and less feed/water, so not very expensive”*, as well as a negative aspect (n= 11 MU), with one individual stating, *“I just think FEI price would be outrageous because insects are artificially reared.”* There were many additional negative statements about FEI that emerged. Of the identified negative FEI attributes (n= 57 MU), 24 MUs were about disgust, and this subcategory appeared in all the six focus group. Bad smell (n= 21 MU), ugly (n= 13 MU), and morphology (hard chitin and hairy; n=12 MU) were also common sub-categories. One participant said, *“I can't imagine the hairy-clawed appendages down my throat”*. Additional MUs which were mentioned in one or two focus groups included hard to rear them because

rats and poultry feed on them and noisy, as one participant said, “*I don’t think I would fall asleep as cricket cries throughout the night*”. Related to the 19 negative health outcome MUs, insects are pests so could be poisonous, and could cause allergic reactions emerged as the top negative health outcomes associated with FEI, providing 9 and 7 MUs, respectively.

### Subjective Norms

When asked about friends and family, the majority of responses (n= 23 MU) indicated that it was not important to consume the same foods as their friends and family. However, when asked about who or what influences their food choices, members of the household (n= 14 MU) was the most prominent theme. When asked what influenced the food choices of their family and friends, emerging themes included availability or convenience of a food (n= 15 MU), taste (n= 23 MU), nutrients (n= 21 MU) and health concerns (n= 26 MU). When asked how they felt about the recommendation by health officials/nutritionists “*that people consume FEI regularly*” a few participants (n= 5 MU) were unsure about the recommendation. However, the majority of participants (n= 23 MU) said it was a good suggestion as they were already meeting it, with one participant saying, “*Snails being consumed at the coastal regions of Kenya are worse. Hey, they are more ugly and very disgusting compared to crickets,*” although most comments suggesting this did not have a reason to back up this statement.

Regarding *motivation to comply* with the health officials/nutritionists’ suggestion that people consume FEI regularly, only a few responses (n= 11 MU) suggested that individuals were likely to follow this recommendation. Most participants (n= 29 MU) indicated a more neutral view as they thought it was a good recommendation, but would be hard to follow. They sighted issues related to availability, difficulty of creating awareness, lack of legislation and guidelines to regulate FEI value chains, amongst other challenges. The remaining responses indicated they were unlikely to meet the recommendation. When considering normative beliefs, health officials/nutritionists’ recommendation (n=17 MU), family members and peers (n= 15 MU), and teachers, especially to the school going pupils (n=14 MU), emerged as very important influences on FEI consumption as shown in Table 2.

### Perceived Behaviour Control

When asked what would make it hard to consume FEI, the majority of responses related to negative attributes (n= 31 MU). This category included, availability (n= 9 MU), bad smell (n= 4 MU), eating ‘whole insect’ as opposed to processed FEI (n= 6 MU), disgust/makes me sick (n= 7 MU). Some participants also stated that availability of other options like ‘*sossy*’ (functional food made from soya bean), made it unattractive to consume the FEI as recommended (n= 3 MU). Other participants expressed a more

neutral attitude, saying that it depended on the availability of FEI, peers and the general environment, as one participant expressed, “*If FEI are readily available and I see my family members eat regularly with passion, I would soon try it.*” As shown in Table 3, positive attributes (n= 27 MU) such as processing, adding flavours, creating awareness and attractive packaging would make it easy for many participants to consume the recommended amount FEI.

### Intentions

There was an overwhelming amount of responses when participants were asked about their intentions to consume FEI within the next month. Six MUs were provided for participants who had already consumed, particularly in western region. There were no additional comments from individuals who had not consumed, although they listed limited availability as a reason for not consuming. When asked their opinions about replacing conventional meat with FEI, a little more than half of the individuals said they would not be willing, as one participant in eastern region expressed, “*it would be better being a vegan than replacing meat with insects.*” However, the remaining participants (almost half) said they would be willing to meet the recommendation the following month if FEI were available.

### Informing program delivery

Additional questions and scenarios were provided to understand programmatic aspects of intervention development and delivery. When asked where they heard about the benefits and harmful effects of certain foods, many participants agreed they received their information through the media (n= 15 MU); but a few participants agreed that media advertisements influenced their food choices (n= 5 MU). All but a few responses indicated that weekly food sales and in-store promotions greatly impacted participants’ food purchases. Community programs and friends were also common sources of information. In addition, most participants agreed that health officials and nutritionists were the most respected and trusted when it came to dietary/nutritional information (n= 18 MU) and most of the participants agreed that their doctor had talked to them about the dietary benefits of certain foods like traditional vegetables. However, most participants, particularly in western region agreed that they have received information regarding FEI from scientists/researchers, but none from the trusted health officials.

When asked what a promotional program seeking to improve FEI consumption should look like, participants offered a lot of information about content issues. Majority (n= 23 MU) wanted it to be informative, interactive, and educational as well as provide visuals and positive alternatives. Individuals also offered insights regarding the structure (n= 16 MU) of a program noting that small groups, time of day, length of time, and location were each an important factor for promoting attendance. The influence of family and peer was also a strong theme (n= 12 MU), for example one individual stated “*My friends, somebody that would go with me. I don’t think I would just wake up and decide on my own to attend an unfamiliar discussion.*” Finally, incentives were another general theme

(n= 13 MU), as participants mentioned that the program should be free and provide coupons/free samples, new products, or other small giveaways to ensure participation.

Many participants were not receptive to receiving telephone messages, although they were open to the idea of receiving texts. These issues should be considered when designing campaigns to promote FEI. Participants observed that they receive numerous non-essential messages on their phones daily, most of which they discard. They feared promotions through short texts may suffer the same fate.

## DISCUSSION

Across all the six focus groups and theory-grounded questions (FGD script in appendix A), the most notable themes that emerged included taste, availability/convenience, cost, nutrition, health benefits/risks and disgust. Participants also continuously emphasized the importance of their health officials' advice and health concerns on their food choices, hence corroborate the findings of Godin and Kok [16], which emphasized the effect of normative beliefs and perceived behavioral control in food choices. Negative FEI attributes, as well as negative health outcomes also surfaced as perceived barriers to FEI consumption [8]. The presence of ambiguity, especially about the health consequences associated with FEI, warrants the need for debunking myths, for example, other participants said that FEI are pests so could be poisonous, cause allergic reactions and even pollute the food chain. Positive FEI attributes were more abundant (n= 73 MU) than negative attributes (n= 57 MU) demonstrating that participants recognize the health outcomes of their food choices [19], but that the positive FEI attributes outweigh the risks.

When asked what would make it hard to consume FEI, negative attributes, availability and convenience were the common responses across the groups. Participants stated it would be hard to consume FEI within the next month due to the limited availability of these foods, as well as lack of processing (that is, eating whole insect) and bad smell. Health outcomes were only common answer when participants were probed on their motivation to comply with the health officials' recommendation that people should consume FEI regularly.

In regard to programmatic factors, the influence of media on food purchase decisions appeared contradictory. The same result was reported by Zoellner *et al.* [19]. While most participants receive food information through the media (n= 15 MU), only a few of them (n= 5 MU) agreed that the media influences their food choices. However, a larger number of participants (n= 27 MU) supported the idea of promoting public awareness on FEI through the media. Participants supported the idea of small groups, but expressed concerns about the time of day (evening preferred), length and location of the group session. However, many participants were not receptive to receiving short telephone messages, although they were open to the idea of receiving phone calls. These are



important factors to take into account when designing interventions to promote consumption of FEI.

## CONCLUSION

This study has laid the groundwork for future efforts to promote FEI consumption in Kenya. The attitudes, subjective norms and behavioural capabilities addressed in the focus groups give insights for designing FEI interventions, which are culturally appropriate. The expected rise in protein requirement due to increase in population and the implied costs to the environment call for innovative interventions that promote dietary diversity. The study proposed FEI as a viable option given that edible insects are ubiquitous. The findings suggest that taste, availability/convenience, cost, nutrition, health benefits/risks and disgust factors, are major determinants of FEI consumption and also emphasize the role of the media, peers and health officials, in FEI choices. In addition, these results provide input from participants on what they would like to see in a FEI intervention. These results inform a theory-based intervention targeting FEI consumption and nutrition literacy, and ultimately increase the intake of FEI among the target population.

This study was conceptualized to identify potential differences in salient beliefs between participants from western region and those from eastern region, given that consumption of edible insects is popular in the western region. Yet no major differences emerged: the probable result of a small sample size, and the motivated nature of the participants from both regions, given the elaborate screening process. Although edible insects are popular in western region, they are not processed to a greater degree, so the idea of FEI was new to participants in both regions. These results give insight into potential consumers and the inclusion of their ideas will likely result in a more successful FEI-campaign.

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**Table 1: Participant opinions - Attitudes**

Theme	Category	Opinion (examples of MUs)
Attitude	Positive FEI Attributes [G = 6, MU = 73]	<ul style="list-style-type: none"> <li>✓ Taste good<sup>R1</sup></li> <li>✓ Provide cheap source of protein</li> <li>✓ Provide nutrients and minerals</li> <li>✓ People like eating them in this area<sup>R1</sup></li> <li>✓ Possibility of rearing guarantees availability<sup>R1</sup></li> </ul>
	Positive Attitude: Cost [G = 5, MU = 27]	<ul style="list-style-type: none"> <li>✓ Are convenient as opposed to whole crickets e.g., easy to handle, store, transport, market (can be labeled), etc.</li> <li>✓ Rearing requires small space/cost effective<sup>R1</sup></li> <li>✓ Low feeding costs, feed on wastes so cleans environment</li> <li>✓ Low feed &amp; water requirement so can easily be reared in this region<sup>R2</sup></li> </ul>
	Positive Health Outcomes [G = 4, MU = 13]	<ul style="list-style-type: none"> <li>✓ keep human hearts in good condition because the sterols fight the bad fat which causes heart problems<sup>R2</sup></li> <li>✓ Because of sterols, a hearty meal of cricket/locust reduce some cancers - antioxidants<sup>R2</sup></li> <li>✓ Good for strong bone formation (heard from radio)<sup>R1</sup></li> </ul>
	Negative FEI Attributes [G = 6, MU = 57]	<ul style="list-style-type: none"> <li>✓ Are disgusting/looks ugly and have bad smell</li> <li>✓ Exoskeleton is made of hard chitin so could be hard to eat</li> <li>✓ Difficult to capture enough quantities to eat/process</li> <li>✓ Morphology “<i>I can’t imagine the hairy-clawed appendages down my throat</i>”. One participant said<sup>R2</sup></li> <li>✓ Hard to create awareness &amp; promote FEI to people<sup>R2</sup></li> <li>✓ Hard to rear them because rats &amp; poultry feed on them<sup>R1</sup></li> </ul>
Negative Attitude: Cost [G = 3, MU = 11]	<ul style="list-style-type: none"> <li>✓ Long time required to change attitudes of people to consider FEI as food.</li> <li>✓ Ethical concerns e.g., age at harvesting is critical for acceptance.</li> </ul>	
Negative Health Outcome [G = 3, MU = 19]	<ul style="list-style-type: none"> <li>✓ Not available so could be expensive. <i>“I just think FEI price would be outrageous because they are artificially reared.”</i><sup>R2</sup></li> <li>✓ Crickets are noisy throughout the night so nuisance to rear</li> <li>✓ Are pests &amp; could be poisonous<sup>R2</sup></li> <li>✓ May cause allergic reactions</li> </ul>	

**Note:** G= number of groups (out of 6), MU= number of meaning units. FEI= Foods from Edible Insects; R1 implies region one (i.e., western), while R2 imply region two (eastern). Number of participants is 43

**Table 2: Participant opinions – Subjective Norms**

Theme	Category	Opinion (examples of MUs)
Subject Norms	Normative referents [G = 6, MU = 53]	<ul style="list-style-type: none"> <li>✓ Health officials and nutritionist [<i>especially if they demonstrate by eating FEI first</i>]</li> <li>✓ Family members, peers, workmates etc.</li> <li>✓ Local leaders and administrators [MP, MCA, Chief etc.]</li> <li>✓ Teachers [<i>very influential particularly to school-going children. If teachers promote consumption of crickets then pupils would pick it up on the spot. Some family members may reject the idea of eating FEI at first, but if you persistently eat yourself with profound enthusiasm, then they'll soon want to taste</i>]</li> <li>✓ If teachers promote FEI in schools, children will consume and convince their parents</li> <li>✓ Age is very important in promotion i.e., if children (young ones) are convinced, they'll spread the idea very fast to adults (e.g., parents).</li> </ul>
	Peer Influence [G = 6, MU = 15]	
	[Normative Beliefs] Health Officials/Nutritionists Recommendation [G = 6, MU = 17]	<ul style="list-style-type: none"> <li>✓ “<i>So I don't know, probably because we're all together all the time and we're going to peer pressure one another.</i>”</li> <li>✓ “<i>Well if I'm suffering from heart problems or cancer and my doctor tells me cricket/locust would help...., that would influence me, for sure.</i>”</li> </ul>

**Note:** G= number of groups (out of 6), MU= number of meaning units. FEI= Foods from Edible Insects; R1 implies region one (i.e., western), while R2 imply region two (eastern). Number of participants is 43

**Table 3: Participant opinions – Perceived behavioural control (PBC)**

Theme	Category	Opinion (examples of MUs)
PBC	a) what make it easy to consume FEI [G = 6, MU = 27]	<ul style="list-style-type: none"> <li>✓ Processing as ingredient as opposed to eating whole cricket.</li> <li>✓ Mixing with other flavours e.g., chilli source, to neutralize the cricket smell</li> <li>✓ Public awareness on what insects (crickets) add to the body, other than just proteins e.g., “<i>A hearty meal of locust is what experts are recommending for health-conscious Kenyans who want to keep their hearts in good condition and also keep some cancers at bay</i>”. By Gatonye Gathura: Monday, May 18th 2015 / the Standard (Kenya daily newspaper).</li> <li>✓ Packaging e.g., the way Sossy is packaged and advertised. One participant in Vihiga (R<sup>1</sup>) noted; “<i>Sossy advertisement through the Radio mimic a school end of term prize awards ceremony where one child dominates in both academic and co-curricular activities. When the mother is invited to comment on her daughter’s talent, she acknowledges it’s because she usually eat Sossy</i>”.</li> </ul> <p>Participants observed that in an effort to make their children perform better, most parents’ buy Sossy, and the same could be the results for FEI.</p>
	b) what make it hard to eat FEI [G = 6, MU = 31]	<ul style="list-style-type: none"> <li>✓ Bad smell; “<i>if flavours such as ‘tangawizi’ can be added to cricket so that it smell differently in the mouth, I’ll try it</i>”.</li> <li>✓ Negative awareness/pieces of information</li> <li>✓ Difficulty of assessing quality<sup>R2</sup></li> <li>✓ Consumption of whole cricket instead of processed ones</li> <li>✓ Poor rearing environment<sup>R1</sup></li> <li>✓ Poor handling of cricket (while rearing)<sup>R1</sup></li> <li>✓ Lack of information/knowledge on the preparation of FEI</li> <li>✓ FEI are not available</li> </ul>

**Note:** G= number of groups (out of 6), MU= number of meaning units. FEI= Foods from Edible Insects; R1 implies region one (i.e., western), while R2 imply region two (eastern). Number of participants is 43

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**Appendix A: FGD script*****Behavioral outcomes***

- (1) What do you see as the advantages of consuming Foods from Edible Insects (FEI)?
- (2) What do you see as the disadvantages of consuming FEI?
- (3) What else comes to mind when you think about consuming FEI?

***Normative referents***

When it comes to you consuming FEI, there might be individuals or groups who would think you should or should not perform this behaviour.

- (4) Please list the individuals or groups who would approve or think you should consume FEI.
- (5) Please list the individuals or groups who would disapprove or think you should not consume FEI.
- (6) Whose feelings would you take into account when deciding to consume FEI?

***Control factors***

- (7) Please list any factors or circumstances that would make it easy or enable you to consume FEI.
- (8) Please list any factors or circumstances that would make it difficult or prevent you from consuming FEI.

***Motivation to comply***

Sometimes, when we are not sure what to do, we look to see what others recommends/are doing. Now assume that nutritionists recommend that people consume foods from edible insects.

- (9). Tell us how you feel about this recommendation.

*[PROBE]: "Would you want to meet this recommendation? What would make it easy for you to meet it? What would make it hard for you to consume FEI?"*

**ENVIRONMENTAL**

- (10) Where do you learn about the benefits or harmful effects of certain foods?
- (11) Tell me about the person, group, or organization in your community that is most respected and trusted when it comes to nutrition or dietary information?  
*[IF NEEDED PROBE: Whose advice about nutrition or diet related issues do you follow?]*
- (12) Has anyone's doctor or another nutritionist ever talked to you about the nutrition or dietary benefits/risks of traditional foods (include FEI)?
- (13) Who or what influences the types of traditional foods that you normally consume/purchase?
- (14) I want you to think about media advertisements on the TV or magazines, tell me if these ads influence your traditional food choices.
- (15) Now I want you to think about weekly food sales ads or in-store promotions, tell me how these deals impact your consumption of traditional foods.

**[SCENARIO]**

"Now I want to offer a few scenarios and I want you to tell me what you like and don't like about these things. This is very IMPORTANT so ANY feedback you have will be helpful."

**ONE:** "Let's pretend that a free program was offered in your community to educate and help improve consumption of Foods from Edible Insects (FEI). What would you want that program to look like?"

*[IF NEEDED PROBE: What kind of program would it have to be to make YOU want to attend? E.g., small group classes, one-on-one sessions, telephone calls, brochures, etc.]*

*"Who (individual, group or institution) do you want (trust) to organize and lead that program?"*

**TWO:** "If a free program was offered and included small group education sessions on FEI, what would you like or not like about this type of program?"

*[IF NEEDED PROBE: What would attract you or people you know to a small group setting? What would make you or people you know NOT want to participate in a small group setting?]*

**THREE:** "If a program was set up and included multiple telephone messages, what would you like or not like about this type of program? This would be an automated message that would prompt you to different pieces of information on FEI."

## Appendix B: Informed consent for participants



Jomo Kenyatta University of Agriculture and Technology

Informed Consent for Participants: Focus Group Discussion

Assessment of Attitudes and Intention to Consume Foods from Edible Insects in Kenya

### I. Introduction and Purpose

Good morning and welcome. Thank you for taking time out of your busy schedules to meet with me. My name is Kennedy Pambo and I'm taking a graduate course at JKUAT. The purpose of this study is to assess consumer attitudes and intentions regarding foods from edible insects in Kenya. Your ideas and opinions will help me develop better questions for an opinion survey I will be conducting in the future. I will use this discussion to ensure the survey questions I ask make sense and address the issues and concerns on foods from edible insects. The results of the future survey will be part of a doctoral dissertation.

### II. Procedures

I have prepared a few questions, but am mostly interested in hearing about your thoughts and opinions. I want to remind you there are no right or wrong answers, only differing points of view. Your confidentiality is guaranteed. Feel free to say what you think, even if it is different from what was already said. It's important to hear when you agree and disagree with other participants. The entire discussions will take approximately two hours to complete. Discussion with other members in the group is encouraged.

### III. Benefits

You will have the opportunity to experience and understand the process involved in focus group research. The findings from this research may be used to develop programs and promote healthy behaviours for your community members, for example, developing edible insect value-chains. It is important to mention that no promise or guarantee of benefits have been made to encourage you to participate.

### IV. Extent of Confidentiality

We will take photographs/pictures during group session just to show evidence that the discussions took place. We may share the photos only among the 'project' members, but you are free to decline our request to take your picture. The research is confidential. We'll also collect your names but will not disclose your information to other people. Only the research team will know that you participated in this study.

### V. Compensation

In return for your input, we will provide you with a token of Kshs. 300, majorly as a refund to your transportation costs. Even if you decide not to continue with the focus group study, you will still receive the token. Refreshments are also provided.



**VI. Freedom to Withdraw**

If you decide not to participate, please inform the researcher. If you start to participate and then change your mind, you may stop at any time and notify the researcher. If you choose to withdraw, you will not be penalized.

**VII. Subject's Permission**

I have read the Consent Form and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

**Subject**

Name \_\_\_\_\_ Sign \_\_\_\_\_ Date \_\_\_\_\_