

Technical brief #3:
Kenyan consumers' preferences, attitudes
and intentions to consume insect-based
food products



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This brief compiles information on Kenyan consumers' preference and attitudes toward the use of insects as human food, as well as consumers' willingness to pay for insect-based food products. As part of the GREEINSECT project, studies were conducted including house crickets (*Acheta domestica*) and termites (*Macrotermes subhyalinus*). House crickets have been selected due to their promising potential as a farmed species in Kenya (Ayieko et al., 2016) and termites due to their recorded history of consumption in Western Kenya (Kinyuru et al., 2013). Insects have traditionally been consumed in the counties of Kisumu, Siaya and Kakamega. In addition to these counties, Machakos and Nairobi counties in the eastern and central regions were also included to represent areas where there is no insect eating tradition. Rural and urban consumers were also sampled by the inclusion of Nairobi, Kisumu and Machako counties into the studies.

Consumer preferences for termite-based food products

A choice experiment survey based on a representative sample of Kenyan consumers from the areas mentioned above was conducted to study the factors that influence Kenyan consumers' preferences for termite-based food products (TBFPs). The TBFPs tested were whole termites fried and salted, and powder made out of grinded termites. The results generally show that most consumers are familiar with insects as human food and that insects can have positive nutritional properties. The results also revealed that consumers have an overall positive attitude to TBFPs. However, there is high variation in consumers' preferences for termite powder. This could be related to the fact that products made from processed termites are more unfamiliar to Kenyan consumers than whole termites.



Figure 1: A dish of whole, fried and salted termites (*Macrotermes subhyalinus*) served with Ugali.

—Source Alemu et al. 2017

The factors that affect consumers' choices of both TBFPs are high nutritional value, high food safety standards, and if authorities would recommend consumption. Further a positive image in the media and from peers was mentioned as an important factor affecting the decision to consume TBFP's. Unlike whole termites, the experiment indicated that consumers would be willing to buy termite powder from kiosks and supermarkets rather than from local markets. According to the participants this should ensure that processing has been done under controlled hygienic conditions. This implies that for a processed product like termite powder where the insect as such is not visually recognizable from the final product, consumers may distrust the production system, e.g. suspecting that the product might not be what it claims to be. From a consumer standpoint, the place of purchase is therefore another quality assurance in order to avoid potential health hazards from the product. This indicates that consumers are likely to seek more information from official authorities about the way the termites were processed and are more interested in provided product information.

Consumer willingness to pay for buns with cricket powder (BCP)

Another experiment has been conducted to investigate the overall attitude and willingness to pay for new insect-based products by Kenyan consumers. In this respect, buns containing 0%, 5% and 10% cricket powder (*Acheta domestica*) as a replacement of some of the standard wheat flour were developed and provided to participants in the experiment in order to be evaluated for taste and to assess its potential for commercialization.

The results show that consumers generally prefer and are willing to pay more for buns with 5% and 10% cricket powder than regular buns without cricket powder. However, buns with 5% cricket powder were preferred for their taste and overall liking over the buns with 0% and 10% cricket powder.

The field experiments also involved investigating the impacts of product tasting as well as the influence of observing other peoples' taste preferences. In the



Figure 2: Buns containing 0%, 5% and 10% cricket powder (Left to right). —Photo: Mohammed H. Alemu

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Figure 3: Product development, packaging and field experiments. —Photo: Mohammed H. Alemu

experiment, participants who have tasted the different bun products depicted in figure 2 are willing to pay up to 50% more than participants who did not taste the products. These results show the importance of gaining food experience (taste, smell, visual impression) with cricket powder to increase consumer willingness to pay and thus acceptance of cricket powder buns in the market.

Market share prediction analysis

Market share predictions were performed based on the probability of each product being chosen by consumers at a certain price range. When regular buns and one of the buns with cricket powder (0% and 5% vs 0% and 10%) were assumed to be available on the market, buns with 5% or 10% cricket are likely to capture a higher market share than regular buns unless the price of the cricket powder buns is set too high. Figure 4 shows that even if the price of the cricket powder buns is double

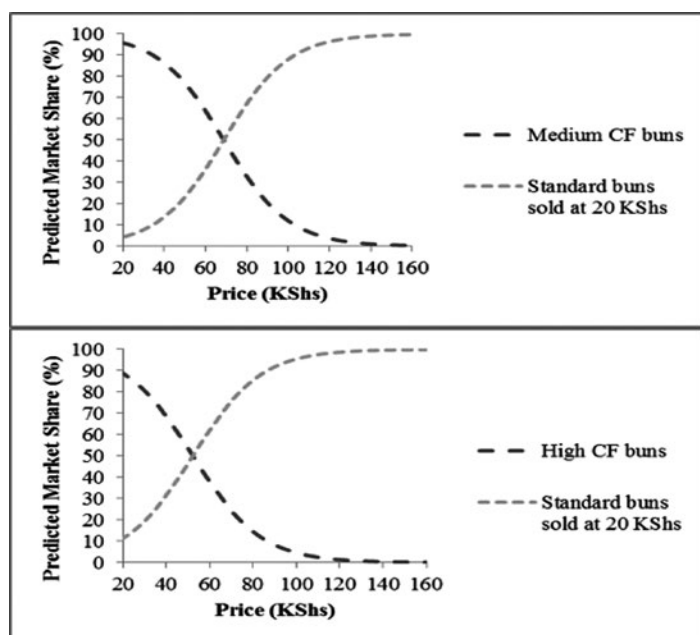


Figure 4: Predicted market share of alternative market scenarios for two bun products. — Source Alemu et al. (2016)

that of the standard buns, they are still likely to obtain a higher market share.

In another market scenario where all three products (0%, 5% and 10%) are assumed to be present in the market, Figure 5 shows that the market share of each cricket product decreases as compared to the scenario with two products only. This can be explained by the fact that due to the increase of products, market competition also increases, and this leads to a general decrease in market share for all products. The findings indicate that buns with 5% and 10% cricket powder are likely to capture higher market share than regular buns with 0% cricket powder, until a certain price level. According to the results and in line with the taste and willingness to pay results, buns with 5% cricket powder would capture a higher market share than other bun products.

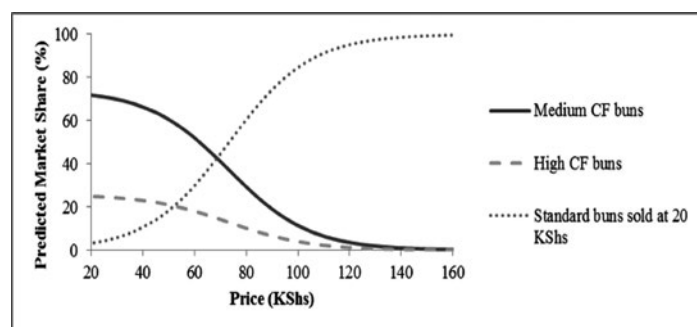


Figure 5: Predicted market share of alternative market scenarios for three bun products. — Source Alemu et al. (2016)

The finding that consumers prefer bun products with cricket powder over the traditional buns without cricket powder would imply that insect-based food products such as buns or other bread products including cricket powder can be used as a new source of animal protein to support food and protein security specifically in areas where there is a high prevalence of food insecurity and undernutrition.

Consumer intentions regarding buns with cricket powder

In another experiment the intention to consume buns baked with cricket powder of Kenyan consumers was investigated. In line with Ajzen (2002), consumer intention was defined as “The willingness and motivation of a consumer to perform a behaviour, which will lead to direct action”, and in the current case that direct action would be to consume edible insects.

The results showed positive intentions to consume buns with cricket powder in general. As expected, participants from regions where insects are consumed already were

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generally more willing to try these buns. Results also revealed that consumers with more positive attitudes towards foods containing insects had higher intentions. However, consumers had difficulties establishing clearly defined social reference points i.e., people/institutions in society whom they could emulate for foods including edible insects. Consumption intentions were also positively influenced by increased knowledge regarding benefits of insect consumption among individuals who are less familiar with edible insects. However in communities, where eating insects is already part of the culture, individuals tend to discern the practice as they become more educated. This could be linked to the fact that with increased education the individuals consider insect eating traditions as being 'primitive'.

Personal involvement and emotions of buns with cricket powder

The buns with cricket powder were further assessed for "personal involvement". This included assessment of consumers' perceptions of the indicated product attributes. "Personal involvement" refers to how a person is involved with or attached to a product, i.e. consumers who are highly involved with a product will actively search for and use information about the product to make informed choices. Product involvement, therefore, leads to greater perception of its attribute differences and greater commitment to its choice which could ultimately increase its demand (Zaichkowsky, 1985).

Moreover, the emotions that consuming buns with cricket powder evoke in consumers were investigated. The results revealed moderate levels of involvement implying that foods from edible insects are moderately important to the consumer's relation to the product. This suggests that consumers were largely not aware of buns with cricket powder. Therefore, marketing strategies aimed at improving the consumers' knowledge about food products based on edible insects would be commendable.

Sensory attributes of buns with cricket powder

Marketing strategies (promotional strategies) to increase consumer acceptance of insect products, need to include the assessment of sensory attributes of the buns with cricket powder. Just-about-right (JAR) scaling, i.e. not too little or too much, was adopted to assess the expected and actual appropriateness of six sensory attribute characteristics. These attributes included sweetness/sugary; smell; colour; texture/softness; taste; and crumbliness/ease of handling, and

were scored on a 5-item JAR scale ranging from 'much too little' to 'much too much'. Before tasting the buns with cricket powder, consumers expected sweetness to be on the upper scale of appropriateness (i.e., expected too sweet). However, actual tasting revealed a balanced rating. Therefore, it was concluded that the opportunity to taste cricket powder buns had an immediate positive influence on participants' attribute-ratings. Actual tasting of buns with cricket powder significantly improved the consistency of evaluating of all the six attributes suggesting a general liking. However, ratings for 'colour' and 'smell' attributes were marginally JAR. This finding is relevant for product research and development purposes to consider how to combine promotion-information and actual tasting during product marketing.

Mood and feelings while consuming insect products

Consumers are becoming increasingly dynamic and seek emotional experiences received from a product through sensory perception. Evaluating products only by measuring overall liking on the sensory attributes of a product rarely yield sufficient outcomes. The level of emotional responses elicited by the sensorial experience while consuming a product is also vital.

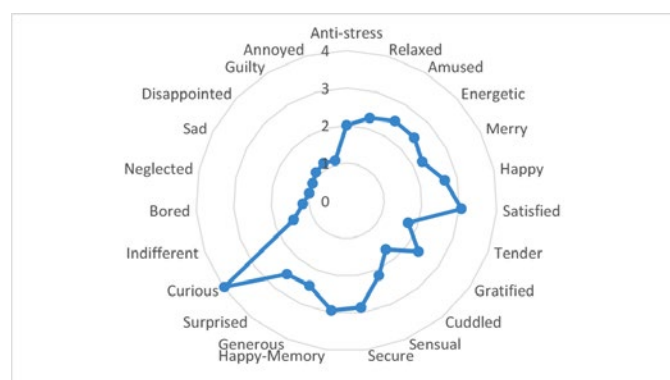


Figure 6: Presentation of the mean emotional responses - general feelings after eating cricket-scones.

— Source Pambo et al. (2016)

Emotional evaluation results (Figure 6) revealed a noteworthy dominance of positive emotions (items to the right of the figure) over negative emotions (items on the left side). The results showed that curiosity, followed by satisfaction and happy childhood memories were ranked as the most positive emotions, whereas indifference was the most negative emotion. The top ranking of curiosity suggests a possible mismatch between expected and actual experience. On the other hand, results showed limited emotional variations amongst participants suggesting that they generally liked the buns with cricket powder.

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