

# Food Policies in Kenya: Policy Constraints and Opportunities in the Edible Insect Value Chain for Improved Nutrition and Food Security

<sup>1</sup>M. K. Chizanga, <sup>2</sup>C. O. Gor, <sup>3</sup>M. Orinda

<sup>1,2,3</sup>Jaramogi Oginga Odinga University of Science and Technology, P.O. Box 210-40601, Bondo, Kenya  
Corresponding Author E-mail: [michelle.chizanga@gmail.com](mailto:michelle.chizanga@gmail.com)

**Abstract - Food security for an ever-growing population is a challenge especially in most developing countries. Insects have proven to be an alternative protein and micronutrient source to human diet. However, Insects are still recorded in most governmental Acts as pests or food contaminants, these records affect consumer perception on the novel food. At the moment, there seems to be no clear policies in the Agricultural sector supportive of insect farming. This study investigated policy constraints on edible insect value chain and explored opportunities to formulate favourable policies for edible insects farming. The research focused at the 4 segments of the edible insects' value chain and relevant agricultural related policies that would promote the use of insects as food and feed leading to food security in Kenya. Advocacy research design was used. Fischer's formula determined the sample size and purposive sampling for study participant selection; data collection tool was interview schedules. The data was analysed using statistical package for social scientists (SPSS) version 26. Findings on constraints: inadequate production materials, inadequate insect training personnel, poor insect processing techniques, inadequate value addition to the insect, poor insect market systems and slaughtering of insects. Opportunities are that when policy makers address these constraints: consumer acceptability will be increased, improved market for insects and increased insect farming. These opportunities will lead to improved food security.**

**Keywords:** Food security, policy constraints and edible insects.

## I. INTRODUCTION

The population growth worldwide requires that the food supply matches the growth rate (Godfray et al., 2010). Globally, regionally and nationally the food systems are expected to always be adequate in order to ensure food security. Variety in food sources for dietary needs in both human and animal consumption is important for their health benefits. Protein among others is among the most important

dietary needs (Boland et al., 2013). Meat is the largest source of high-quality animal proteins, and in some countries its annual supply is as high as 100 kg or more per capita (Ritchie & Roser, 2017). In developing countries alone meat consumption is growing at a rate of 5 percent per year (Ritchie & Roser, 2017). On the other hand, high average consumptions of both red meat and poultry yield a number of unwanted consequences. Fortunately, enough, insects are alternative protein source (FAO, 2013). In order to meet this demand insects have been identified as a suitable candidate to supplement animal-based proteins in addition to new/existing plant-based protein sources (Azagoh et al., 2015). In Kenya, much research from scholars such as Pambo et al. (2016); Alemu & Olsen (2018); Roos (2018); Kinyuru and Ndung'u (2020); and Okello (2021) has been and is being carried out to expand knowledge on the use of insects as food and feed. Particular attention is being focused on the nutritional benefits of this novel food and still no legislation to govern this practice and the rearing of insects as mini-livestock.

Africa's economic growth and its potential to address hunger, poverty and inequality is to a greater extent dependent to its success and growth in the agriculture sector (Hoeffler, 2011). Governments and donors have a direct impact on whether the agriculture sector develops or stagnates. A lot of research is being done with donor support to enhance knowledge on the benefits of using insects as food and feed, for example, World Bank is currently funding university programs such as INSEFOODS for students to carry out research on the use of insects as food and feed. However, Van Huis et al. (2013) mention that more can be done in research to broaden the use of insects industry, among which is the regulating of the insects farming and more particularly the commercialization of insects and insect based products. Elaborating frameworks and adjusting for insect-inclusive food laws is of vital importance in ensuring that this sector thrives in agriculture. Insects as food whether in raw or processed form makes them subject to food safety legislation at national and sub-national level. Generally speaking, the processing and storage of insects and products of insect origin

have to follow the same health and sanitation regulations as conventional foodstuff (Pali-schöll et al., 2018).

Entomophagy is not a new concept to the African people. Niassy and Ekesi (2017) mention that over 2 billion people worldwide now partake in insect consumption. African ancestors practiced the use of insects as food for decades mainly due to the fact that they were easily accessible and others took it as a cultural practice. The most common method was harvesting from the wild (Hanboonsong et al., 2013). While the insects were already being consumed in most parts of Africa, they were not yet being domesticated. This was due to the fact that there was need for extensive research into the characteristics of insects that can be domesticated. Wild harvesting method is not reliable or sustainable for large quantities as it faces challenges of seasonality and difficult in collection (Durst et al., 2010). Kenya Wildlife Services (KWS) is an organization with a mandate to conserve and protect the wild flora and fauna. Their Wildlife Conservation and Management Act manages Kenya wildlife and environments through enforcing the laws and regulations stipulated in the Act. KWS plays a vital role in ensuring that wild harvesting does not affect bio-diversity and eco-systems in any way. Consequently, insect farmers need to collaborate with KWS to be permitted to harvest insects that can be domesticated and measure for sustainable harvesting to avoid draining the genetic base for those insects that cannot yet be domesticated. This dual control between the KWS and the farmers will give a basis on just how much should be protected as it is difficult to interpret (Waithaka, 2012).

The increase in consumption and knowledge on entomophagy has shed some light on the use of insects as an alternative protein source in dietary needs. This opened the door to the concept of rearing insects as mini-livestock as opposed to harvesting them from their natural habitats. Insect farming enables assessment of their potential impact on health, environmental hazards and biodiversity (Van Huis & Oonincx, 2017). According to Kewuyemi et al., (2020) to attain food security in Africa, insects for food and feed must be measurable with the four dimensions of food security: availability, access, utilization and stability. These dimensions are better attainable with the adoption of large-scale farming insect as mini-livestock. Therefore, policies and investment programs for edible insects should aim to play on these four dimensions of food security for positive outcomes (Vantomme et al., 2012).

Governmental policies and regulations are essential as they become a voice for the insects on matters of rearing and consumption. On the other hand, they also enhance consumer trust on insect based products (Giotis & Drichoutis, 2021). Many African countries, including Kenya, formulate their

food policies and regulations in a manner that coincides with the international standards and guidelines (Oloo, 2011). Organizations such as Food and Drug Administration - FDA (USA); European Food Safety Authority - EFSA (Europe) and the Codex Alimentarius Commission are some of the influential authorities or organizations that promote use of Hazard Analysis and Critical Control Points (HACCP) or Codex Alimentarius to improve safety of food and feed products. Principles and application guidelines of the Hazard Analysis and Critical Control Points (HACCP), CODEX among others is the beacon of policy formulation worldwide. Food safety, processing and preservation must be highly considered and the Hazard Analysis Critical Control Points (HACCP) system would make a significant positive impact in ensuring it. Al-Busaidi, Jukes and Bose (2017) mentions that the HACCP system is a worldwide known scientific and procedural tool used to identify specific hazards and ensure that protocols are in place to ascertain food safety. In addition, the use of HACCP can provide assessment by regulatory authorities and stimulate international trade in the form of increasing assurance in food safety (Al-Busaidi, Jukes & Bose, 2017). For these reasons, the adoption of HACCP throughout the insect supply chain will be a determining factor in the success and development of the edible insect sector (FAO, 2013). However, for as long as influential food safety principles such as HACCP and CODEX view insects as a nuisance and a form of contamination there will always be slow development in the sector of using insects as food and feed.

The gap in policy formulation to address the needs of insect farmers and promote its consumption can be addressed by identifying the loopholes in the current agricultural policies particularly in the context of selected edible insect value chain analysis. This will call for looking at the 4 segments of the selected edible insects' value chain and requisite policies to unlock the potential for insect farming as a viable enterprise in the provision of alternative protein for human and animal consumption. Organizations such as World Bank have already started bank rolling projects and research in the sector, what remains to doubt is the concerted efforts required to advance adequate agricultural policies responsive to insect farming. Kenya's agricultural policy is built around goals aimed at increasing productivity and income growth particularly for smallholders; to improve food security and equity, accentuate on irrigation and instigate stability in agricultural yield, commercialization and increase of production particularly among smallholder farmers; appropriate, participatory policy formulation and sustainability of the environment.

## II. MATERIALS AND METHODS

The study was implemented in selected riparian counties in the Kenyan Victoria Basin, namely Siaya, Kisumu and Homabay where there was high concentration of edible insect farming and consumption. In these areas there is high entomophagy rate and insect farming and processing. Participants were chosen on purposive sampling technique.

## III. DATA COLLECTION

This study employed advocacy research design, seeking to gain in-depth knowledge on the constraints and opportunities that hinder the regulation of insects for food value chain. Study participants comprised: producers, input suppliers, marketing individuals, consumers and some policy makers.

Sample size was 139 participants in all the three counties. Focus group discussions and interview schedules were used for data collection. The study took 15 days to complete.

## IV. FINDING AND DISCUSSIONS

### Inadequate production materials

#### i) Insect eggs

Most of the insects being reared by insect farmers there start up eggs were sourced from other farmers and non-governmental organisations like JOOUST who rear insects. This limited source of insect eggs is negatively affecting dissemination of insect rearing because there are no centralised government institutions responsible for production of good quality eggs of insects and neither is the private sector actively involved in the insect production activities. This was as reported by participant (letter D).

#### ii) Source of insects

It was noted that most of the insects are sourced mostly from the wild for instance in bush or collected from the lake. Another source is other insect farmers mainly those involved in cricket and Black soldier fly (BSF) because there is limited documentation on the rearing methodology of other insects. Fields are an alternative source of insects where they can be collected. As reported by (number 3) and (letter A) Similar findings by Durst et al. (2010) found that insects are collected from the wild and also noted that collection of insects from wild is negatively affected due to seasonality and difficult in collection thereby affecting availability of the insects.

#### iii) Insect feed

There are still no clear insect feed formulae created, most reared insects are just fed alternative food which is not

yielding mass production of insects. This was as interviewed (letter C) There is still need for further studies to formulate appropriate feed for insects so as to increase production. Similar findings by Gahukar (2016) found that for mass production there is need for formulating insect special feed well balanced and biofortified.

#### iv) Rearing infrastructure of insects

The study also noted that insect smallholder farmers have limited production capacity in that they do not have well sophisticated production equipment's thereby producing inadequate insects and due to limited production methodology farmers only rear a limited species which have well documented production methods and leaving the other species underutilised. These findings correlate with Gahukar (2016) which noted that infrastructures for rearing insects need to have controlled temperature, humidity and photoperiod and mitigated parasitoids to increase insect production.

### Inadequate insect training personnel

Training personnel competent with skills and knowledge in insect production are limited and smallholder farmers who rear insects mostly obtain none of production advices, sometimes weekly and even yearly. These insect extension services are obtained from non-government organisations, which illustrate the gap in government services handicapping insect production growth and entomophagy. This was as reported by participant (number 1). According to Gahukar (2016) noted that there is need for further empowerment of extension workers and smallholder farmers with knowledge and skills on insect production and that government involvement that insect production should be emerge valuable.

### Poor insect processing techniques

The study noted that most insects processing does not involve inspection of food safety, little or even no inspection is conducted when the insects have already been collected and rarely, they are tested for potential contamination when they are harvested and ready for consumption or to be sold. This is in agreement with participants (letter C) and (number 4). These findings correlate with FAO (2013) which stresses on success of entomophagy there is need to assess all the supply chain with usage of HACCP so that the insects are certified safe for consumption which will promote entomophagy around the world. Unnevehr & Jensen (1999) noted as well that there is need for adoption of HACCP to regulate and certify food safety of insects to consumers.

### **Inadequate value addition to the insect**

Most insects are sold in raw unprocessed form: alive or less slaughtered to consumers which is causing the reduction in demand in that many consumers have a negative perception on entomophagy with a misconception of insects being poisonous and causing allergic reactions. These negative perceptions are not based on nutritional facts. There is little private sector involvement in value addition and insect processing which is causing reduced entomophagy in that insects are not added value leading to reduced demand and promotion on the market. Similar report given by participant (number 3), these findings corroborate with study findings of Pambo (2016) which found consumers view insects as inedible poisonous and causing allergy the study further noted that consumers refrain from entomophagy based on perception and not nutritional stand.

### **Poor insect market systems**

Most insects after collection have no commercial markets like other conversional livestock, they are sold in traditional markets. This local market of insects attracts little value addition to the insects and potential to be exploited into the intensive commercial markets, this inadequate value addition to insect is so because of little involvement by the private sector in marketing and production of insects and government has also not formulated policies on the insect production, processing and marketing systems making the enterprise to remain underdeveloped. Common buyers of insects are consumers, poultry farmers who use them as feed and other insect farmers. This was according to participant (number 6) and (letter A). According to Pali-schöll et al. (2018) found that for insects to excel on the market there is need to certify them as healthy and hygiene foodstuff whether they are in processed or unprocessed for, and development of insect food policies that will enable them to thrive on market.

### **Slaughtering of insects**

It was noted that insects are slaughtered via several techniques: boiling in hot water, frying them in oil and killing jar. These techniques are effective but there is still need for further studies to determine which techniques are suitable for certain insects and their effect on nutritional content of the insect. This is as interviewed by participant (letter A). These findings correlate with Dossey et al. (2016) which noted that insects slaughtered via these conversional techniques is have high levels of pain and that there is need to use a lesser pain method of chilling which kills the insect without consciousness.

### **Poor report system**

There are challenges in reporting issues faced by insect smallholder farmers, the commonly report to livestock and veterinary extension workers whom are mostly not competent in insect production but other livestock production. Another problem is that these extension workers come once in a while to the farmers. This was according to participant (number 4) and (letter E).

## **V. DISCUSSION AND CONCLUSION**

The purpose of this study was to identify policy constraints and explore opportunities to formulate favourable policies for edible insects farming. It was noted that the major constraint is that government has not created policies on insect production and entire chain which is negatively affecting production. Once there can be proper market structure it will enable smallholder farmers to generate income by having readily available market for the insect products which will act as an incentive to boost insect production. Another opportunity of formulating proper market structure policy will enhance value addition to the insect products by innovating them into food, feed and use them in recycling of organic waste which will aid to mitigate climate change. When policies on insect production are created it will create awareness among insect smallholder farmers, consumers and the general public on the value of insects in the ecosystem, importance of sustainably harvesting and conservation of the insects. For government to formulate effective and efficient policies there is need to involve insect smallholder farmers, non-governmental organisations, governmental bodies and non-parastatal universities so that everyone is on board to ensure sustainability on insect production and that the insect value chain functions effectively. For government to achieve this there is need for investment in research so that the policies are formulated on well informed decision to boost the economy of the smallholder farmers and the country.

### **Conclusion**

There is limited insect production by smallholder farmers because government has not formulated policies on insect production which also negatively affect consumer acceptability. There is need for intensive research so that government generates effective and efficient policies on insect production; there is need for involvement of diverse stakeholders in policy formulation.

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APPENDIX

Inadequate production materials theme

Sub-themes	Participant number or letter	Quotation	Summary remarks
Insect eggs	1	“We normally get eggs after we captured the adult insect from the wild and we kept them for some time and they start to breed so the eggs start to be available.”	Limited capacity in production materials due to inadequate resources, in that there is no proper supply of good quality insect eggs, insects, feed and poor rearing infrastructure.
	D	“Farmers are normally provided with eggs of cricket and Black soldier flies when they are in contact with the university and are also trained on how to rear them”	
Source of insects	A	“Given eggs by the university and we rear them until they hatch”	
	3	“Collect insects from the wild and start to rear them”	
Insect feed	C	“They are fed food remains from the house”	
	F	“We were instructed to fed them chicken feed but it is costly so mostly they are just fed what we eat”	
Rearing infrastructure of insects		“The Black soldier flies are just kept in a net which has some metallic stands to support the net that the insects at least are comfortable”	
		“Crickets are reared in buckets covered with a net; we do not have big special infrastructure for keeping them”	

Inadequate insect training personnel theme

Participant number or letter	Quotation	Summary remarks
1	“Whenever we have problems on keeping insects, we report to the university where they give guidance.”	Most government extension workers are not competent with skills and knowledge on farming
C	“Sometimes when we ask the government extension officers, they do not know how we should farm our insects”	

Poor insect processing technique’s theme

Participant number or letter	Quotation	Summary remarks
4	“Usually, we just collect and sell the insects to the university, we do not do any disease test”	Value chain of insects there is no food safety inspection which is a limitation in certifying insects as certified foods to consumers to boost demand.
5	“Collected flying termites are just taken direct to the as long there are dried or deep fried”	
C	“As long as collected crickets are reared in a clean environment, they have less contaminant and we just fry them before we make cricket biscuits”	
1	“To run such processes right now the capacity is not adequate due insufficient resources”	

Inadequate value addition to the insect theme

Participant number or letter	Quotation	Summary remarks
3	“Flying termites are just sold at the market the way we collected them, only fried or sundried”	The insects are sold mostly in their raw form with such there is less demand from consumers
A	“We sell cricket to the university the way they are”	
F	“When we make cricket added value products currently, they are sold within the university only”	

Poor insect market systems

Participant number or letter	Quotation	Summary remarks
6	“The only place where our insects are sold are at the market”	There is no proper market for both farmed and wild collected insects, they are just sold in local markets and in homes. There is need to create a proper market with value addition to the insects to boost consumer demand on commercial market
2	“I collect flying termites for my home consumption”	
A	“Our crickets are bought by JOOUST but of recent we are not producing as we planned because our crickets are facing many challenges like ants are killing our farmed crickets”	
D	“When I collect flying termites, we sell them house to house or sometimes just put them by the road side along my home”	

Slaughtering of insects

Participant number or letter	Quotation	Summary remarks
A	“Normally we kill flying termites by frying them in pan or sometimes just sun drying them”	Insects are slaughtered via several ways: sun drying, fried on fire and drowning them in water.
1	“Water is poured on the veranda at night they stick and die in that water and in the morning, they are just fried”	
3	“These flying termites when put in a peel they just die on there on after sometime and then after are dried”	

Poor report system

Participant number or letter	Quotation	Summary remarks
E	“Livestock extension officers are the ones we seek advise from on how to farm insects”	Government extension workers are not competent in insect farming, there is need for capacity building.
4	“These government agriculture workers come here and there so it is tough to get help from them”	
2	“When asked on how to farm other insects they mostly just give advises which is discouraging sometimes they just will get back to you”	

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