

Broiler-Grown Meat from Chicken fed Insect Meal Coming Soon to a Table Near You

Introduction

As a response to the call for climate action by transforming our food systems, the use of insect-based products in commercial farming is gaining momentum in sub-Saharan Africa (SSA), including Kenya. With special emphasis on the black soldier fly (*Hermetia illucens*) larvae (BSFL), the insect possesses unique attributes such as high crude protein of at least 46%, low carbon footprint, contribution to a circular economy model and low initial investment costs. Thus, its commercial rearing will reduce pressure on marine and land resources, ensure food and nutrition security as well as improve livelihoods especially for youth and women through income generation. Several milestones have been achieved on its use in livestock production particularly in the rearing of commercial poultry. Although insects have historically been an integral aspect of raising poultry, the use of BSFL in the commercial sphere is quite novel (Figure 1).



Figure 1: Broiler chicken feeding on live insect product

In this regard, understanding farmers' readiness to use it as well as its economic benefits becomes fundamental in order to upscale this novel innovation to the wider population and to accommodate more livestock production. Kenya has made huge milestones in terms of being among the first countries in SSA to establish standards stipulating the type of insects and in which forms they are permitted in the feed value chain, including the BSFL.

Key findings

A combination of field trials and farmer survey studies to establish the economic benefits and readiness to use insect products in poultry production, respectively, was conducted in Kenya. A total of five diets with increasing levels of insect meal including a control diet were used in the farmer field trials. Looking at the feed formulation (Figure 2), feed millers will spend less financial resources to formulate feed that integrates insect meal as the protein source, whereby the cost of formulation decreases with increasing levels of BSFL.

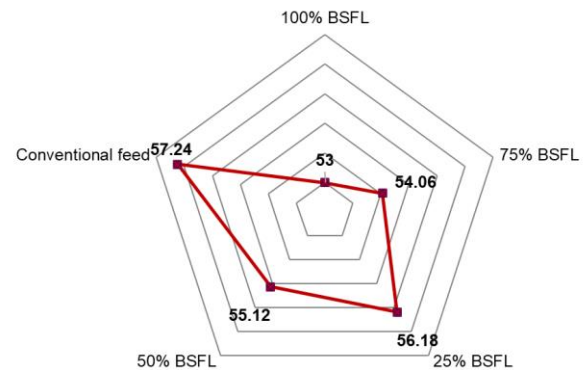


Figure 2: Cost of formulating the diets containing varying level of insect meal (BSFL) in Kshs

Moving from the feed miller to farmer level and, depending on the duration of feeding preferred by farmers (Figure 3). Broiler chickens reared on conventional feed registered the highest feed intake with feed efficiency greater than 2.5 at the end of six, seven and eight weeks of rearing. Feed intake was significantly reduced with the partial inclusion of BSFL with acceptable levels of FCR.

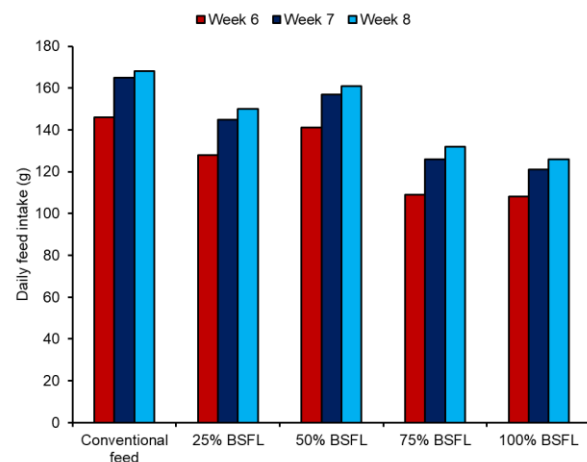


Figure 3: A comparison of the daily feed intake of broiler chicken across the diets after 6, 7 and 8 weeks with their respective feed conversion ratios (FCR).

Consequently, birds reared with conventional feed were heavier in weight (Figure 4), and a similar trend is seen across the three time periods. Even at partial replacement of fish meal, the weight of broilers is comparable to that of conventionally fed broilers whereas the latter had lower feed intake levels. The birds can attain a live weight of at least 1.5kg in all diets further reinforcing the fact that insect meal can be a substitute of fishmeal protein.

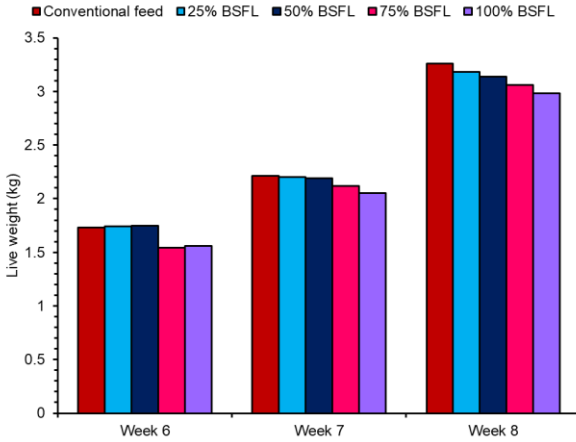


Figure 4: A comparison of the live weight of broiler chicken reared on varying levels of insect meal (BSFL) at the end of 6,7 and 8 weeks in kilograms (kg)

Once the birds have attained the ideal market weight (Figure 5), smallholder farmers often resort to farm-gate sales as their preferred marketing channel because of the low transportation costs involved. Since the main aim of the farmers is to maximize profit and minimize variable costs, partial replacement at 25% BSFL will guarantee the farmers' objective is met (Figure 6). Compared to the remaining diets, 25% BSFL inclusion rate accords the farmer gross margins (GM) that are greater than the total variable costs (TVC).

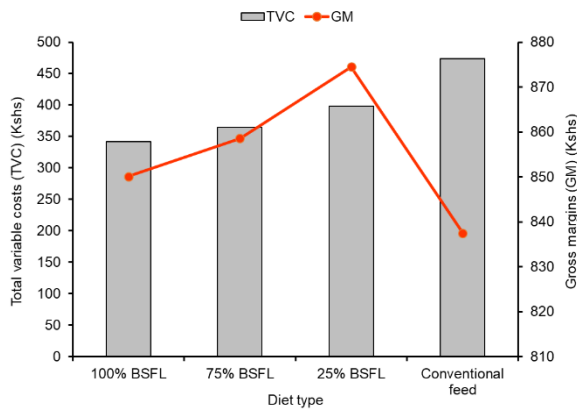


Figure 6: A comparison of the gross margins (GM) against the total variable costs (TVC) involved with feeding broiler chicken on varying levels of insect meal in Kshs. The 50% BSFL diet is excluded due to its high TVC and low GM.

Importantly, there is overwhelming consensus among both male- and female-headed households that indeed insect-based products will lead to sustainable livestock production and there is readiness to purchase these products once they are commercially available (Figure 7).



Figure 7: Market ready size of broiler chicken fed diet with insect meal.

Additionally, farmers' purchasing behavior is based on principal features of insect products which form a critical component in informing their decision-making. These four features revolve around: the *performance* of the feed in terms of provision of sufficient nutrients to the livestock; *social acceptability* considering that innovations are guided by beliefs and social dynamics of the people; *versatility* in the usage of the feed on different species of livestock depending on their growth stages; and *marketability* of the livestock products reared on insect products.

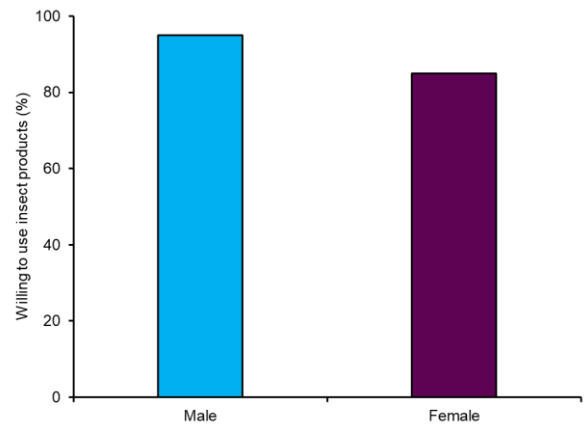


Figure 7: Gendered comparison of farming households' willingness to use insect-based products in Kenya

Besides these features, farmers have further expressed their willingness to economically trade-off the physical attributes of the feed by placing a monetary value on the product (Figure 8). Farmers showed the highest preference for the *physical form* of the feed, that is, pellets or mashed feed

depending on the growth stage of the poultry followed by feed with *explicit logos* indicating that they contain insects. Moreover, insect feed that is *mixed with conventional protein sources* and that which is *darker* in color would be more appealing to farmers, the former reiterating that indeed partial inclusion of insects gives the highest returns.

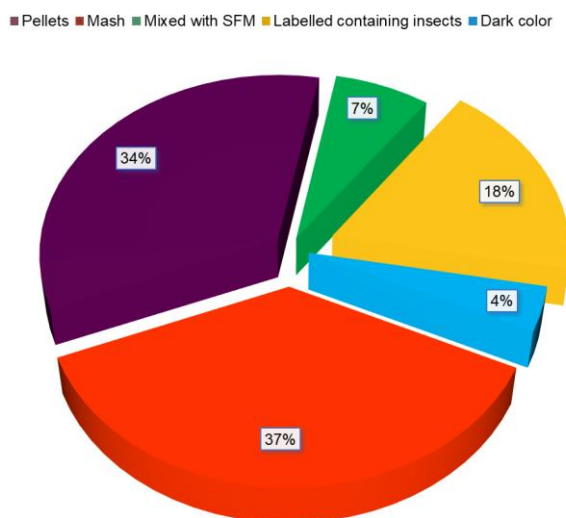


Figure 8: Farmers' willingness to pay for various commercial insect-based feed attributes; SFM means soybean and fishmeal, the current protein sources used in feed formulation.

Current challenges

There is limited supply of insects to facilitate their use in livestock production particularly in feed formulation. This is attributed to the lack of funds to set up mass production enterprises that would produce insects on an industrial scale. Therefore, the need to provide financial assistance to both small-scale and large-scale farmers to enable them to set up insect rearing facilities is required. This can be done by establishing specialized funds for insect-rearing and attaching favorable terms and conditions that will attract both the youth and women.

Inadequate capacity building because of low training and sensitization of the population on the benefits of insect products. Further to this is the low number of organizations offering free and affordable training on insect rearing and education on the benefits of insects to the environment and the wider circular economy. Creating awareness on this matter to the population through partnerships with various media outlets and agricultural extension will act as a way of attracting public and private investments to facilitate the provision of regular trainings and information on insects.

There is lack of a harmonized regulatory environment. Currently, there are high transaction costs associated with the establishment of insect rearing facilities, much to the discouragement of potential investors in the enterprise. Thus, engaging the various stakeholders involved in the regulatory processes to create a single platform to ensure efficient and cost-effective registration process is needed.

Defatting of insects to reduce fat content is currently difficult because of the lack of specialized machinery to perform the task. This has led to poor digestibility of feed with high content of insects especially for poultry. To realize complete replacement of conventional feed for high economic gains, the government could liaise with local artisans to fabricate the equipment using minimal costs.

Way forward – policy implication

It is evident that insect-based products can lead to transformation of livestock production towards a more sustainable undertaking, as well improve livelihoods by assuring farmers of maximum returns through partial replacement of conventional protein sources. For these reasons, farmers are ready to adopt the novel insect products once they are available in the market for purchase. This will be a step closer to realization of a circular economy to the benefit of various stakeholders in the public and private sectors. Concerted effort is therefore required from individuals in these institutions to put in place relevant measures which could take various forms, among them the establishment of an umbrella insect body. Having a parent organization that is solely mandated with setting and enforcing coherent standard operating procedures for insect utilization in food systems will not only assure autonomy and limit duplication of roles by other organizations but also ensure the realization of an insect policy through its advocacy roles. Moreover, the overarching body will ascertain that quality insect products are released into the market through registered and verified marketing outlets. Creating marketing platforms for farmers who supply livestock fed on insect products will encourage more farmers to venture into insect rearing due to the assured markets. In addition to research institutions conducting training to promote upscaling of insect production, monitoring and evaluation assistance would ensure these start-ups take off and have a longer life-span. Further situational analyses of the existing mass insect producers ought to be conducted to understand their needs which will inform and strengthen the policy framework around insect production.