Food & Business Knowledge Platform

NWO

Factsheet final findings Global Challenges Programme Call 2

ILIPA: Improving livelihood by increasing livestock production in Africa: An agribusiness model to commercially produce high quality insect-based protein ingredients for chicken, fish and pig industries

Summary

Inclusive business models involving insects as feed ingredients may contribute to solving socio-economic and environmental problems. With low initial capital investments, smallholder insect farmers have good opportunities to increase productivity, improve their livelihood and contribute to food security and a circular economy. Poultry, pig and fish farming are the fastest growing agribusiness activities in East Africa. However, poor availability and high cost of feed protein ingredients (fishmeal, soy bean, seed cakes and several other grains), which represents 60 – 70% of total cost of production, greatly hampers profitable gains for small and medium-holder farmers in these sectors. In addition, it is becoming unsustainable to rely on fishmeal, soybean and cereals as protein sources in feed production, as these ingredients also compete with human nutrition. This project researches the need for alternative sources of low-cost protein in feed supplements. The potential of insects, mainly the black soldier fly (BSF, *Hermetia illucens*) in the commercial production of a low-cost, high-quality protein ingredient to substitute or replace the expensive fishmeal in the animal feed sector, becomes crucial, due to their high crude protein and fat content as well as rich amino acid profiles. Through the consortium partners, the project promoted the establishment of community-led agro-enterprises for commercial production of safe and high-quality insect-based protein feeds for poultry, pig and fish industries to improve livelihood and promote youths and women employment through capacity building on the use of insects as a source of protein in feeds for livestock production.

Final Research Findings

In response to the lack of a clear and comprehensive legal framework at the international and national level to pave way for more investment in insect-based enterprise, the project jointly organized an “international conference on legislation and policy on the use of insects as food and feed in East Africa” held at Kisumu, Kenya with effective participation of 105 participants from 13 countries worldwide to formulate a common roadmap with policymakers. Results from the ILIPA project were instrumental in creating an enabling environment for the development of standards and legislation for the use of dried insect-based protein ingredients in compounding animal feeds, thus opening new markets and opportunities for large-scale production and commercialization of insect-protein based products. Surveys conducted in Kenya revealed that more than 90% of men and women farmers and more than 75% of feed traders and producers are willing to use insect-based feeds. Market demand analysis in Kenya revealed that 50% substitution of the animal protein in feeds with insects-based proteins would have a market value of around US$36,000, creating 22,500 potential new green jobs, if each entrepreneur produces 2 MT of dry insect per year. BSF proved to be a valuable replacement of fishmeal in feed for pigs, poultry and fish with a beneficial return on investment. For awareness creation, most of the project training activities were featured in several media houses, radio and newspapers, in both English and Kiswahili.

Final (outcomes) achieved

A total of 1 PhD and 4 MSc students were involved in this project. Mass rearing protocols of BSF, nutrient value and safety quality on different substrates have been successfully established. Over 35 different feed formulations have been formulated and tested on-station on poultry, pig and fish (tilapia and catfish) production with excellent results compared to

conventional fishmeal-based feeds. Biofertilizer production from BSF residues has shown excellent growth performance and yield on all three crop species investigated. These technologies are now available for promotion and upscaling to facilitate employment creation and income generation opportunities for farmers (mostly women and youths) thereby improving livelihoods and economic development in Kenya. Over 675 (64% men and 36% female) farmers, young entrepreneurs, policymakers, feed traders and processors have been trained on insect rearing for integration into animal feed.

Messages to

A) Actors from private sector:

- Private sectors with ready organic waste streams are strongly encouraged to adopt insect-based protein technologies to convert their organic waste streams into high-quality nutrient biomass for animal feeds and biofertilizers for improved soil health and crop yield.
- An inclusive business environment is crucial to link up with local institutions and businesses as well as to share their knowledge with other stakeholders.

B) Civil society and practitioners organizations:

- Collaborative network with the private sector is instrumental in scaling out insect-based protein technologies in Kenya and beyond.
- Community-based demonstration sites for insect farming with women and youths in leadership roles would facilitate awareness-creation of gender to identify joint opportunities and development of collective strategies, beneficial at individual, household and group level.

C) Policy makers:

- Enforced policies that aimed at creating opportunities for small-scale micro-enterprises to trained farmer groups on insect farming through collaboration with Kenyan microfinance companies and the vulnerable populations.
- Strengthen inclusive business development through gender sensitive lens - awareness policy measures and instruments.

Knowledge products

- Article Effect of dietary replacement of fishmeal by insect meal on growth performance, blood Profiles and economics of growing pigs in Kenya, in *Animals*, by Chia et al. (2019)
- Article Effects of waste stream combinations from brewing industry on performance of Black Soldier Fly, *Hermetia illucens* (Diptera: Stratiomyidae), in *PeerJ*, by Chia et al. (2018)
- Article "Threshold temperatures and thermal requirements of black soldier fly Hermetia illucens: Implications for mass production", in *Plos One*, by Chia et al. (2018)
- Project highlights, icipe (2018)
- Article "Internationally funded project behind insect feed approval push in Kenya and Uganda" in Feed Navigator, by Jane Byrne (2017)
- KTN News Kenya on YouTube "Kiambu County turns to breeding insects for proteins and quality feeds" (2017)
- Thought leadership column "Leadership in insects for food and feed research", icipe, by Dr Segenet Kelemu (2016)

Co-creation

- Consultative meetings, exchange visits and knowledge sharing has been encouraged among farmer groups, local government, private sector (SMEs) and other community-based grass root organization stakeholders.
- Communication among the consortium partners, with other stakeholders as well as with related projects - based on the existing project framework - has been used to ensure information feedback and deliberation on challenges and opportunities between the different parties.
- Advocacy on insect-based protein ingredients has created more awareness of possible solutions to fishmeal concerns raised by farmers and feed manufacturers.
- Biofertilizer developed from BSF frass has raised a lot of interest among different stakeholders and provided new opportunities in insect-based enterprises.
- Institutional variables, notably membership of farmer associations, extension access and credit access, have enhanced farmer participation in insect-based protein value addition.

Future research & activities

Given that insect-based protein technology is a very new initiative, there is need to develop the infrastructural requirements, build capacity, and transfer knowledge to scale and transform the insect-based feed industry into a viable business venture with the private sector. Future research will focus on (i) supporting the development of markets and marketing channels for insect-based protein feed using different business models at community levels; (ii) developing an interactive mobile platform as a small marketplace where the actors along the value chain can sell their dried insect-based products and (iii) assessing the potential for employment generation and economic benefits of insect-based protein enterprises.

Consortium Partners

- WUR Laboratory of Entomology (NL)
- Sanergy Ltd (Kenya)
- Kenya Agricultural and Livestock Research Organization (KALRO) (Kenya)
- International Centre of Insect Physiology and Ecology (icipe) (Kenya)
- Solidaridad East & Central Africa Expertise Centre (SECAEC)

Other organizations involved	TechnoServe (Kenya) - Kenya Marine and Fisheries Research Institute (KMFRI) - Kenya Bureau of Standards (KEBS) - Kenya Wildlife Service (KWS)
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Project websites	F&BKP Research Project page - ILIPA website - WUR project website