


## Edible insect value chains in Africa

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EDITORIAL

This special issue was organised in the context of the 22<sup>nd</sup> meeting of the Association of African Insect Scientists (AAIS), in Wad Medani, Sudan in 2017. The aim was to 'support impactful research that will yield genuine edible insects products and sustain value chains that enhance food and nutritional security and support sustained livelihoods in Africa.' The issue is composed of contributions from the following countries: Kenya, Uganda, Burundi, Nigeria, Mali, Burkina Faso, Cameroon, Malawi, and Zimbabwe. The issue attempted to strengthen the traditional inventory and perception studies and emphasise on contributions that explore entrepreneurial developments of insects use as food and livestock feed. The issue also looked at emerging R&D and innovations to enhance the use of insects to improve food and nutritional security and as a major sector in economic development in Africa.

To assure food security remains the major challenge for Africa. The use of insects as food and feed could contribute to the continent's attainment of the millennium goals, in particular considering the global increase in protein demand. Everywhere across sub-Saharan Africa, insects are consumed and used for various purposes, and there are commonalities in terms of perceptions, methods of harvesting, and processing between countries (Kelemu *et al.*, 2015; Niassy *et al.*, 2016a,b; Van Huis, 2003). At the forefront, the debate is animated by researchers, academics, and donors, as well as several private sector enterprises. Hundreds of research papers have been published on the topic over the past four years. We contributed to the knowledge of insects as food and feed in the special issue 'Insects as food in Africa' of this journal (Volume 2, No. 3, 2016), following the symposium at the 21<sup>st</sup> meeting of AAIS in Cotonou, Benin, in 2015.

Since then, we have noted several on-going and start-up initiatives with significant increases in funding, both in projects and in direct entrepreneurial investments. We estimate that an overall research and development aggregate of USD 25 million has been injected into Africa over the past eight years from various donors and institutions, including the Food and Agricultural Organization of the United Nations (FAO), European Union (EU), Danish International Development Agency (DANIDA), Swiss Agency for Development and Cooperation (SDC), Netherlands Organization for Scientific Research (NWO), Federal Ministry of Economic Cooperation and Development Germany (BMZ), International Development Research

Centre (IDRC), Institute of Research for Development (IRD), and Department for International Development (DFID).

Multinational companies such as McDonald's are considering insects as feed for chickens at a global level (Byrne, 2018). In Africa, companies such as Agriprotein in South Africa and Sanergy in Kenya are promoting the production of black soldier fly in organic side streams. The Aspire Food Group supports palm weevil production with local communities in Ghana. The EU-funded ProteInsect and IFWA, implemented in Ghana and Mali, have endorsed the production of flies in the aquaculture and poultry sectors. Likewise, a FAO-led project has supported a similar initiative in Democratic Republic of Congo (DRC). Farms for Orphans, in collaboration with the Rocky Mountain Foundation, has also promoted insect farming to fight malnutrition among children in DRC. The FasoPro company supports the harvesting, processing and commercialisation of the edible caterpillar *Cirina butyrospermi* in Burkina Faso. The flying food project of TNO works in Kenya and Uganda, promoting insect-rearing designs for crickets. GREEINSECT (mass-rearing insects for greener protein supply), ILIPA (improving livelihood by increasing livestock production in Africa), EntoNutri (development and implementation of insect-based products to enhance food and nutritional security in sub-Saharan Africa funded by BMZ/GIZ), INSFEED (insect feed for poultry and fish production in sub-Saharan Africa) and several other projects on insects as food and feed have been implemented on the continent.

All these aforementioned efforts have undoubtedly put insects as food and feed in the limelight, with the potential of convincing policymakers that insects can indeed be an alternative sustainable source of food and protein in animal feed for income generation, employment (especially among youth), entrepreneurship and private sector development for economic growth. Some of the arguments that have contributed to this progress include the recognition that insects are rich sources of proteins and other vital nutritional components. Additionally, compared with other plant and animal protein sources, insects are often more efficient in utilising feed; e.g. on suitable diets, the Argentinean cockroach (*Blaptica dubia* (Serville); Dictyoptera: Blaberidae) and the black soldier fly (*Hermetia illucens* (L.); Diptera: Stratiomyidae) have been shown to utilise protein in feed more efficiently than in poultry and pigs (Oonincx *et al.*, 2015). In the pharmaceutical industry, the demand for insects as sources of bioactive compounds with medicinal properties is increasing (Tonk and Vilcinskas, 2017). This and the huge demand for protein in the livestock industry, provides a substantial and attractive opportunity to venture into edible insects as a field of interest. Besides, it is a promising sustainable approach considering less pressure on land, fewer greenhouse gas emissions, less water demand, and the possibility of bioconversion or organic waste recycling (Van Huis and Oonincx, 2017). Momentum has been generated and insects are now perceived as being a potential solution to food insecurity, and income and job creation among the youth, particularly in the feed industry. In that regard, one of the most outstanding developments happening in Africa at the moment is the creation of standards in Kenya and Uganda for the use of insects as feed (Fiaboe and Nakimbugwe, 2017).

Nevertheless, the entire edible-insect value chain has not revealed its potential and still requires governance in terms of research, business incubation, and above all, legislation and regulations (Niassy *et al.*, 2018). Several other challenges still hinder the commercialisation of edible insects. This is a paradox, as it contradicts previous findings that 500 edible insects are reported to be consumed in Africa (Kelemu *et al.*, 2015). For the continent the development of suitable and sustainable technologies to increase quantities of insects for use on an industrial scale is a major challenge. The best strategies that could be envisaged to sustainably create a viable industry in insect utilisation as food and feed would include large-scale insect production through mass rearing, and conserving and maximising harvest from the wild in a sustainable manner, coupled with the development of appropriate post-harvest handling practices.

The production side should be equally supported by a vibrant local and international demand for insect products, which in some instances is already available, but for others, innovative products have to be formulated from insects through market-driven innovative approaches.

In the current circumstances, several studies have been conducted in the African region to document insects as food and feed (Chavhunduka, 1975; De Foliart, 2002; Kelemu *et al.*, 2015; Van Huis, 2003, 2013) and report nutritional composition (Alamu *et al.*, 2013; Amadi and Kiin-Kabari, 2016; Igwe *et al.*, 2011; Musundire *et al.*, 2014a,b, 2016). Other studies have reported the optimisation of rearing of edible insects for use as feed and the sustainable harvesting of insects from the wild. Most of the reported research studies still lack the details required for robust commercial-scale industrial production in Africa. Additionally, few studies on the continent have focused on the development of value chains which are a necessary requisite for advancing marketing opportunities related to edible insects and their products, especially in Africa.

Compared with the previous issue, the current special issue presents different facets of research on edible insects in Africa, considering them either as feed for poultry and fish, or as food. The topic remains relevant, and African entomologists are working towards improving uptake by entrepreneurs and private sector companies. Although standards have been developed for the first time in Kenya and Uganda, there is urgent need to address safety-related issues and strengthen regulatory mechanisms to ensure the sustainable use of insect as food and feed on the continent.

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