



CSC Evaluation and Monitoring Programme

Empowering Ugandan Farming Communities through Bees and Black Soldier Flies

Deborah Ruth Amulen



Uganda is a land-locked country in East Africa with a rapidly growing population expected to reach 100 million people by 2050. Whilst the country can produce more food than it consumes, rates of malnutrition remain high, particularly for the rural poor. This has been attributed to a heavy reliance on traditional food systems, which often limits nutrition and diversity in diet and creates vulnerability to disruptions and shortcomings in local food systems. To address this issue, the government and NGOs have encouraged Ugandan farmers to diversify their sources of food and income.

One method of addressing this vulnerability is beekeeping. Uganda provides an excellent natural habitat for bees, however beekeeping as an economic resource largely remains untapped. For instance, in 2015 it harvested only 1% of its estimated production potential for honey. Driven by the economic prospects and potential for providing nutritional benefit and improving pollination, Ugandan farmers are being encouraged to take up beekeeping. Various organisations have also stepped in and offer funding and donate hives to support this effort. However, these initiatives are largely based on assumptions and lacked evidence of the value of beekeeping on the wellbeing of individual farming families in Uganda.

Deborah Ruth Amulen took up the mission to address this knowledge gap. She received a Commonwealth Split-site Scholarship to spend a year of research at Bangor University in 2013 and completed her PhD in Applied Biological Science in 2017. She focussed on the development of participatory approaches to improve honey production in Northern Uganda. She is a Lecturer in the Department of Livestock and Industrial Resources at Makerere University's College of Veterinary Medicine, Animal Resources & Biosecurity (COVAB). She is now one of the leading experts in the field of insect research and leads a research team at Research Center for Tropical Diseases and Vector Control (RTC), where she heads the RTC Pollinator Protection and Insect Research (RTC-PRI) group at COVAB. She has also established the Centre for Insect Research and Development (CIRD), which focusses on the use of honeybees and black soldier flies as tools to help improve livelihoods and food security.



Dr Deborah Ruth Amulen is a Commonwealth Split-site Scholarship alumna who spent a year in the UK in 2013 to conduct research at Bangor University as part of her PhD in Applied Biological Sciences. She is currently a Lecturer in the Department of Livestock and Industrial Resources at Makerere University, where she specialises in beekeeping and black soldier fly rearing. During her year at Bangor University, she examined the link between beekeeping and poverty alleviation and developed an interdisciplinary action plan for beekeepers in Northern Uganda. Upon her return home, she first established RTC Pollinator Protection and Insect Research group at Makerere University to initiate mentoring the next generation of scientists in insect research. Her research group is currently being supported by the USAID and Norwegian Agency for Development Cooperation. In 2019, Deborah received the African Futures Award from Michigan State University, enabling her to complete a Post-doctoral Fellowship at the Department of Entomology where she learned about the transformative potential of black soldier flies. She has also founded Centre for Insect Research and Development (CIRD), a centre of excellence for research and product development of beneficial insects in Uganda and beyond. The CIRD directly supports 30 women and youth waste collectors and has helped to establish over 560 insect farms across Uganda. CIRD works in collaboration with the USAID, Michigan State University, Earthbeat Foundation, VE Animal Health Solutions, and International Centre of Insect Physiology and Ecology (CIPE).

Promoting Beekeeping as a Source of Food and Income for Poor Families

Deborah was raised in a rural agropastoral Teso community in Uganda. It was here that she first observed the value of insects, which formed a key part of her food culture. She saw firsthand that insects could be transformative; they provided her community with a rich source of nutrition and a reliable source of income.

According to Food and Agriculture Organization of the United Nations (FAO), bees and their products enjoy widespread recognition while also offering sustainable livelihoods to numerous small-scale farmers and both rural and urban residents. In rural communities where access to income is limited, beekeeping presents significant potential with minimal initial investments and can contribute significantly to livelihood security. Unlike many agricultural pursuits, beekeeping does not require land ownership or rental. However, apiculture (beekeeping) and related trades often receive inadequate attention in both policy and planning. This oversight may stem from the prevailing emphasis on crop production and livestock rearing as the primary agricultural activities. As a commercial venture, beekeeping not only yields a variety of products like honey and wax and is a steady income source for farming households, but it can also offer supplementary services such as crop pollination. Additionally, bee products can contribute to improved nutrition and health for farming families.

Deborah was already an experienced beekeeper prior to her PhD and held a BSc in Animal Production Technology and Management, but she wanted to learn more about the uses of insects in rural development. This motivated her to apply for a PhD in Applied Biological Sciences at Makerere University, as well as her subsequent Commonwealth Split-site Scholarship that supported her to conduct a year of doctoral research at Bangor. She hoped that by gaining a doctoral degree, she would be better positioned to influence policy and empower local communities in Uganda.

Having established the need within the community, Deborah turned her attention to examining the link between interventions promoting beekeeping and poverty alleviation. She found that while there were farmers who had already been supplied with hives, beekeeping was not producing a meaningful impact on their household income. Moreover, beekeeping households generally reported lower wellbeing scores than their non-beekeeping counterparts: Deborah found that 42% of the beekeepers she surveyed reported experiencing prolonged food shortages of two months or longer.

'Most funders had supported beekeepers in Uganda for a long time. But they hadn't seen the benefits, and nobody had even tried to estimate the economic value of beekeeping in the context of Uganda in terms of livelihood.'

Respondents reported that they only took up beekeeping on the advice of the government or an NGO, and whilst these organisations were able to provide farmers with the hives that they needed in order to start beekeeping, many respondents reported that they lacked the practical skills and the protective equipment that was necessary to productively engage in beekeeping in the long term. Many farmers reported receiving just one day's training, with no practical element of instruction. A lack of confidence in bee husbandry meant that the provision of hives was not a sufficient intervention to meaningfully improve the wellbeing of farmers, and some abandoned the practice altogether.



RTC team: Deborah and students screening bee samples under gut microbiome IFS project.

Ultimately, Deborah's research did not suggest that beekeeping lacks the potential to improve livelihoods, but instead pointed to a critical need for ongoing support for farmers so that they could feel confident in their knowledge and approach to bee husbandry. In response to this need, Deborah collaborated with researchers at Bangor University and Ghent University to develop an interdisciplinary action plan for beekeepers in Northern Uganda. Rather than suggesting that the practice of beekeeping should be abandoned, she worked to develop a strategy by which farmers could learn to productively engage in beekeeping in the long term, providing a consistent source of food and income.

Commonwealth Scholarship as a Springboard to Influencing Beekeeping Policy and Trade

Following the completion of her Split-site Scholarship to do research at Bangor University, Deborah returned to Uganda and completed her PhD. She found that the Commonwealth Scholarship had opened many doors for her. She is one of only a handful of women in Uganda with expertise in beekeeping, meaning that she was immediately respected as a top source of knowledge on insects.

Deborah cites the opportunities that the Scholarship created as one of the most significant impacts that the award has had on her life:

'[It] opened a lot of doors for me as a woman, within my national mandate or within my institution and others, because it was a stepping stone to very many opportunities for me.

I am taken as an opinion leader, and I have so far sat in several national conferences within the country. To the extent that I'm the one who prepared the national policy brief on effect of agrochemicals on bees during the World Bee Day 2023 presented to the minister to protect bees from excessive agrochemical use. I also develop technical briefs and share those with the Ministry of Agriculture staff on insects. So, I think I gained a lot of respect in that sector.'

When Deborah returned to her post at Makerere University, she was instantly promoted to the permanent position of Lecturer. Deborah credits the Commonwealth Scholarship as playing a large part in this promotion.

In addition to her position as a lecturer, she is also the deputy manager of the Research Centre for Tropical Diseases and Vector Control (RTC) at Makerere University, where she leads a team researching on the theme of RTC Pollinator Protection and insects. Approximately 40 students are researching topics relating to tropical diseases and vector control, including research on pollinators and environmental protection.

'I coordinate a Master's programme now, which is Livestock Development Planning and Management, my role is to support these graduate students during graduate training.'

Furthermore, Deborah was also elected to the board of the Uganda National Agriculture Development Organisation (TUNADO), where she sits as a representative of communities in northeastern Uganda, the area where she was born. TUNADO is a membership body that unites individuals working across the honeybee industry and provides a forum for these individuals to collaborate with governments and NGOs with the goal of developing

Ugandan apiculture. Deborah feels that it was the relationships that she built during her doctoral research that led the community to place this trust in her.

'Farmers voted me to represent them because of the confidence, trust, and networking that occurred when I was collecting my PhD data. As a board member and director representing my region, I have been able to articulate issues affecting our farmers, advocate for favourable policies as well as attract funding to the region.'

At the continental level, Deborah is a team leader of the Bee Products Value Addition regional working group under the Apimondia Regional Commission for Africa. Other members are in Nigeria, Senegal, Zambia, Tanzania and Ethiopia. The main objective of Apimondia is to facilitate the exchange of information and discussions where beekeepers, scientists, honey traders, agents for development, technicians, and legislators meet to listen, discuss, and learn from each other.



Dr Deborah Amulen Presenting outputs of her work package at Ademnea Project Norad.

In addition to her role as a lecturer, Deborah began work on implementing the action plan that she developed whilst on award, working with beekeepers and farmers in northern Uganda. The policy documents she produced whilst on award formed the foundation of her future work, and some of her recommendations have been implemented into development strategies for the region. For example, Deborah was able to leverage the research she did during her PhD to secure funding from the Uganda National Council for Science and Technology (UNCST) in Uganda. This funding allowed her to conduct additional research into high-value bee products such as propolis, a non-conventional bee product that has many medicinal uses and which Deborah was able to develop into a propolis powder teabag, and she also wrote a policy brief on the potential of the propolis value chain in Uganda.



Deborah conducting Hive inspections in the field.

Furthermore, whilst in the United Kingdom on her Commonwealth Split-site Scholarship, Deborah had access to specialist lab equipment and experts at Bangor University which she used to analyse the bee products produced in Uganda and demonstrated that Ugandan bee products are of high quality. This has opened up new opportunities for trade, and the beekeeping sector in Uganda has grown steadily since 2013. In 2023, a key milestone was passed when Ugandan farmers were able to start exporting beeswax to Europe. Deborah says that taking an approach which operated in both academia and the community was crucial to her success.

‘Being anchored across research, teaching, and community outreach, I have been able to work with and give relevant information to the communities, as well as give students at the university with updated examples of application of research in local community. It has really enriched me.’

Deborah feels that the work she has done with the people in her community is the most significant change that she has been able to create:

‘Of all my work, I’m happy when I solve the problems in the communities. That is my best work ever, to leave smiles in the communities by addressing their actual challenges. If ranking my work, the topmost work I have done is the work that is involving communities, either in addressing the challenges in their insect businesses or being on the ground, training them physically.’

Most of my impact is in the products or services that I have given to communities, and the jobs and the opportunities that I have been able to create.’

Deborah has continued to work closely with her UK supervisor from Bangor. He is a frequent source of support for her on the international stage, and in 2020 he invited Deborah to collaborate with him on a conference, One Health: Insects as Food & Feed, which was due to be hosted in Finland. Whilst this conference could not

go ahead due to the Covid-19 pandemic, this has not prevented Deborah from representing her country on an international stage. In the coming year, she will be acting as a reviewer for the Insects to Feed the World conference, which will be hosted in Singapore. She will also be visiting Michigan State University where she has been invited to speak at the Excellence in Insect Science Symposium, which will focus on the key theme of leveraging insect science to address global challenges.

Expanding Horizons: From Beekeeping to Black Soldier Flies

Whilst Deborah had firmly established herself as a knowledge leader on bees in Uganda, she was keen to expand her understanding of insects beyond the beekeeping sector. In 2019, she decided to seek out a Post-doctoral Fellowship to advance her knowledge on beneficial insects and she was supported in this ambition by the professional network that she established whilst on award in the UK. Deborah’s UK supervisor was particularly supportive of her goals, and his advice and guidance contributed to her winning a place on the African Futures Research Leadership Program at Michigan State University, which enabled her to complete a Post-doctoral Fellowship at their Department of Entomology. This programme is aimed at promising early-career researchers, with the goal of training research leaders and addressing the gender gap of researchers in Africa.

‘My tenure at Michigan State University introduced me to black soldier fly - a second beneficial insect after honeybees which I studied during PhD. In black soldier fly farming we are generating alternative cheap protein and organic fertilizers while recycling organic waste which is spoiling the environment.’

During her time on the program, Deborah focussed on the development of a strategy for the promotion of insects for food and for animal feed in Uganda. This research introduced her to black soldier flies (BSF). Like honeybees, BSF are highly valuable insects. They are cheap to produce, and they provide a rich source of protein. They are an excellent organic fertiliser, and they can also be used to recycle organic waste. The larvae of the insect can be used as feed for poultry, pigs, and fish. According to the *Frontiers in Insect Science* journal, replacing more expensive conventional protein sources with insect-based feed in Uganda can generate USD 730 million of economic activity over 20 years, and can potentially lift 4.5 million people above the poverty line in the country. As a result, demand for this kind of animal feed is increasing, and Deborah immediately recognised that these insects had the potential to be transformative to Ugandan farming communities. Deborah saw this as a particularly good opportunity for enterprise for women and young people, particularly vulnerable groups in the community who would benefit the most from BSF farming.

Establishing the Centre for Insect Research and Development to Promote the Economic and Ecological Value of Beneficial Insects

When Deborah returned to Uganda after completing her Post-doctoral Fellowship, she was eager to share her newfound knowledge with colleagues and community. Her motivation for seeking out the Commonwealth Scholarship was that she felt it would enable her to influence policy and empower local communities in Uganda. It was with this goal in mind that Deborah established her NGO, the Centre for Insect Research and Development (CIRD). The CIRD's overarching goal is to provide a centre of excellence for research and product development for beneficial insects in Uganda and beyond, and it is now one of the leading insect-promoting organisations in Uganda.

Through the CIRD, Deborah's team has been conducting research that demonstrates the value of beneficial insects as a source of income for Ugandan farmers. To achieve this Deborah has leveraged the international academic networks that she has established around the world. For example, the CIRD has implemented community insect rearing trainings under collaborative projects with Michigan State and Makerere University. The project was upscaling the use of BSF larvae as a source of insect protein for animal production funded by the USAID Partnerships for Enhanced Engagement in Research (PEER) programme. CIRD has also continued to offer practical training and internships for agricultural institutions such as Makerere University, and the Bukalasa and Olio Polytechnic and Secondary Schools.

The CIRD is one of the leading black soldier fly training institutions in Uganda under the PROTEINAFRICA project funded by the the Australian government through the Australian Centre for International Agricultural Research's work with the International Centre of Insect Physiology and Ecology (ICIPE). Through the ICIPE's collaboration with CIRD, the project is expanding the BSF farm and supporting training of over 1,000 farmers in Uganda.



Deborah and CIRD team training BSF farmers under the USAID PEER FUNDING.

In her role at CIRD, Deborah provides essential training and resources to enable farmers to begin beekeeping and rearing BSF. This operation has had an impact across Uganda with the CIRD directly supporting approximately 568 insect farms and 30 women and youth waste collectors in the country.

Through its research and practice, the CIRD has been able to establish itself as a knowledge centre for information on BSF rearing. It has created a community of practice for stakeholders, including farmers currently engaged in black soldier fly farming and those with interest in taking up the practice.

'Moving with these two insects, we are beginning to see a significant contribution to the families or groups that we work with.'

Promoting the Role of Bees and Black Soldier Flies in Ecological Restoration

Deborah's research demonstrated the potential impact that beekeeping and BSF rearing can have on the wellbeing of farming families. However, these insects also have a transformative effect on the areas in which they are farmed. For example, honeybees can survive in very dry climates, and are therefore a desirable option when other farming practices are impacted by a lack of water. Farmers in these locales will often plant trees to improve the habitat of the honeybees which also helps to restore the local environment.

Black soldier flies also have a beneficial impact on the environment. BSF larvae can recycle organic waste that would negatively impact local environments without proper disposal. Organic waste, such as manure, brewer's waste, and other agricultural waste, is largely disposed in landfills, however more sustainable methods of treating it are needed. BSF cultivation offers an environmentally safe and cost-efficient solution to this issue. The larvae can recycle this waste into rich sources of protein for animal feed and into organic fertiliser to enhance soil quality. As a result, BSF rearing allows farmers to engage in a farming practice that is circular in nature, rather than linear. In addition to being an environmentally sustainable way of farming, it also has added economic value: Rather than paying for both animal feed and waste disposal, BSF rearing allows farmers to convert their biowaste into animal feed at relatively low costs.



Deborah with the group of women waste collectors directly supported by CIRD.

Recently, the CIRD has begun working with the Earthbeat Foundation, an international NGO focussed on the restoration of habitats destroyed by mining. The Earthbeat Foundation promotes beekeeping as a viable alternative source of income for communities that have typically relied on gold mining, a process which has a profoundly negative impact on the environment. Beekeeping can replace this lost income, whilst also restoring the environment through sustainable farming practices.

Looking Ahead: Educating the Next Generation

Deborah is enthusiastic to share her skills and experience with the next generation of Ugandan scientists. She is currently supervising eight graduate students, including six Master's students and two PhD students, and she has already supervised three other students to the completion of their degrees. Crucially, Deborah has been able to use her position and expertise to secure funding for seven of these students. The students have been funded by the NORAD research grant, as well as USAID's PEER, an international grants programme that funds scientists and engineers in USAID partner countries who collaborate with U.S. government-funded researchers to address global development challenges.

At present, one of Deborah's PhD students is working on establishing a value chain for bee propolis, a novel high-value product which could offer an additional source of income for beekeepers. The second is working on environmental factors, such as the assessing the impact of agrochemicals and land use changes on Ugandan bees to develop a mitigation strategy and protect the beekeeping industry.

In her role as a supervisor, Deborah has continued to rely upon the professional networks she established in the UK. Her UK supervisor from Bangor has helped her to connect Ugandan students aspiring to study in the UK with academics and universities that are able to support them in their studies. Aspiring Commonwealth Scholars often seek Deborah's advice on the application process and the experience of studying in the UK. Whilst the students research might not necessarily be in their field of expertise, Deborah's supervisor has continued to forge connections for aspiring Commonwealth Scholars, connecting them with other UK-based supervisors who are experts in their areas of interest.

As a supervisor, Deborah has strived to support young female scientists in Uganda to follow in her footsteps. She was only the second woman in the country to graduate with PhD in Applied Biological Sciences, and she is proud that the student she is currently supervising will graduate as the third. Deborah hopes to continue to promote the use of insects and train more scientists through her work:

‘The broader vision I have within the country is to be able to demonstrate to farmers the profitability of beneficial insects and ... build the next generation of scientists who can continue from where I stop so the knowledge base for utilisation of industrial or beneficial insects in African rural households is increased.’

‘I am immensely grateful to the Commonwealth Scholarship for the support that opened many opportunities for my career growth. Then Makerere University leadership for permitting me to study abroad and trusting that I will return to build the university’s research agenda and beyond. Ghent University for technical backstopping and Dr Paul Cross the UK supervisor from Bangor University for all research support during the PhD and beyond. Lastly, the RTC research team leader Dr Patrick Vudriko [for] mentorship.’

More about Deborah Ruth Amulen

Find out more by visiting the website of Centre for Insect Research and Development: <https://cird.co.ug/>

Access additional published work here:

High demand low supply: Strategies for increased utilisation of new propolis products in Uganda. Access here: <https://www.acts-net.org/images/SGCI/Pubs/High-demand-low-supply.pdf>

Policy brief: Strategies for increased utilisation of new propolis products in Uganda – SGCI (sgciafrica.org). Access here: <https://sgciafrica.org/policy-brief-strategies-for-increased-utilisation-of-new-propolis-products-in-uganda/>

For additional resources, please visit links given below:

[Makerere University’s School of Veterinary Medicine & Animal Resources Research & Service Centers](#)

[Dr. Amulen Wins Prestigious AAP African Futures Program at Michigan State University](#)

[African Futures Feature Series: Dr. Deborah Ruth](#)

[CoCIS Researchers to Automate the Process of Monitoring Bees & Fruit flies](#)

[The Black Soldier Fly Insect Larvae Enterprise for COVID-19 Livelihood Resilience Project Launched at CoVAB](#)

[Scaling cost-effective, safe, and quality black soldier fly insect larvae enterprise for COVID-19 livelihood resilience in Uganda](#)

[YouTube - BSF rearing in Uganda. Center for Insect Research and Development Production Unit.](#)

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