Project Update

Project title (Acronym):	Improving Community Health-Nutrition Linkages through Solar Energy Based Fish and Crop Integrated Value Chains- ("ICH LIEBE FISCH")
Geographical focus:	Malawi
Call reference:	"Forschungskooperationen zu Welternährung" Research cooperation for global food security and diversified agriculture for a balanced nutrition in Sub-Saharan Africa.
Cooperating partners:	1. Fraunhofer Research Institution for Marine Biotechnology and Cell Technology (EMB) 2. Association for marine aquaculture mbH (GMA) 3. Lilongwe University of Agriculture & Natural Resources, Aquaculture and Fisheries Science Department (LUANAR-AQF) 4. Lilongwe University of Agriculture & Natural Resources, Department of Human Nutrition and Health (LUANAR-HNH) 5. Lilongwe University of Agriculture & Natural Resources, Department of Food Science and Technology (LUANAR-FST) 6. Quantum for Urban Agriculture and Environmental Sanitation (QUALIVES) 7. Innovative Fish Farmers Network Trust (IFFNT)
Duration:	1. März 2016 – 31. Mai 2021
Budget:	1.708.071,20 €

Objectives of the project:

Traditionally, Malawi is a nation where a lot of fish is consumed. However, maize porridge has become the staple food. The overfishing of Lake Malawi since the beginning of the 1990s has made the tilapia species *O. karongae*, or "chambo" in the local language, hardly affordable for most people in Malawi. Against this background, the project "I love fish" aims to improve the supply of fish and vegetables to the rural population. In detail, the project aims at: i) improving the production of indigenous tilapia species through improved rearing conditions and the production of "all male" fingerlings, ii) the construction of a larval rearing facility powered by solar energy in order to increase the supply of *O. karongae* (Chambo) fingerlings, iii) the application of integrated aqua-agriculture (IAA) to use the nutrients produced by the fish for crop production, iv) the implementation of training courses to impart expertise and knowledge in the rural communities, v) the investigation of the health status and nutritional habits of families in rural areas, especially those of children and elderly people, before and after the implementation of the project activities, and vi) supporting the establishment of a network and a knowledge platform to promote exchange between the different communities and thus ensure the sustainability of the project activities even after the end of the implementation by the project. The project has also addressed another significant problem area, which is the lack of high quality feed for juvenile and adult fish. One option is the production of insect larvae, which can be used in Malawi for the production of very low-cost animal protein. This approach has now been pursued in the last year of the project until the end of 2020 and will be completed by the end of May 2021. Using larvae of the "Black soldier fly" (Hermetia illucens, BSF) for the generation of animal

protein is a procedure that has already been tried and tested many times and a path to be considered realistic to supply high quality protein, using locally available organic recyclables, for the production of feed in Malawi.

This project profile only considers the results of sub-project 2 (topic "*Production of insect proteins in Malawi for the production of high-quality fish feed*"). An overarching project profile with an overall view of the entire project will be presented with the final report.

Results by the end of 2020:
In overview, the following activities have taken place and the following goals have been achieved in 2020. After the final meeting in September 2019 for subproject 1, a start meeting for the final project phase "insect proteins" was organised for subproject 2. The work in subproject 2 was started immediately after this and is now well advanced; however, due to corona conditions, the completion of all tasks will not be achieved until end of May 2021.

The end-line survey was completed by the end of 2019, but results could not yet be presented in the interim report 2019; some of the most important findings are therefore briefly presented in this project update.

a) The training courses on optimised pond management and the support with materials and feed have led to a 4-7-fold increase in fish production efficiency per season, depending on the region. The results on breeding selection have also contributed to the increase in fish production.
b) The implementation of training courses on integrated aqua-agriculture (IAA) has led to a significant improvement in vegetable production among rural aquaculture farmers when applied consistently. The village communities participating in the project were found to have a significantly higher standard of living when the end-of-project survey data was analysed, compared to the data from the initial survey.
c) In practical exercises, it was shown which different foodstuffs can be produced from fish, maize and cassava in order to improve the acceptance of fish and thus the nutritional conditions, especially among young children. Through these measures, a considerable increase in dietary diversity could be achieved among the participating village communities.

The 2020 results in key words:

- The end-line survey results show that project activities have achieved a significant improvement in livelihoods and tenure in the participating communities, compared to the status from the baseline survey.
- Arrival of materials for the construction and operation of the BSF pilot plant in Lilongwe.
- Successful application for customs exemption for the technical project material from Germany on arrival in Malawi
- Internship of Malawian students at Hermetia Baruth GmbH in Baruth, Germany (originally planned for 4 weeks in April 2020, duration 5 months due to Corona)
- Participation of two German colleagues as freelancers in the project during the construction and commissioning of the BSF pilot plant
- Assembly of the insectarium and larvarium
- Trap construction to collect fly eggs to establish a BSF brood stock
- Construction and operation of a solar dryer for BSF larvae and fruits
- Development of strategies for sustainable procurement of organic residues for BSF breeding and processing

- Implementation of the planned research tasks on BSF breeding within the framework of a Master's thesis
- Final meetings with the communities involved in the "I love fish" project (Dissemination Meetings).

Key messages and policy advice:

The "I love fish" project has achieved a number of important successes in areas where significant deficits have prevented more efficient aquaculture production. These were mainly the lack of sufficient tilapia fingerlings for the ponds of rural communities (especially of the species *O. karongae*, "Chambo"), the lack of knowledge on pond and fish stock management, and the problem of the permanent failure of the public electricity grid with the consequence that intensive fingerling rearing in well-controlled "indoor" holding tanks has not been possible so far. Furthermore, the project has successfully established the technology and operation of aquaponics systems in Malawi and convinced many farmers of this way of producing vegetables through practical knowledge transfer on integrated aqua-agriculture (IAA). Nutritional counselling with cooking courses on the preparation of "child-friendly" meals with fish have improved awareness of healthy nutrition among rural farming families. The problem of poor feed quality among rural aquaculture farmers for growing and adult fish has been addressed in the project extension. A pilot plant for the exemplary production of high-quality proteins from insect larvae of the black soldier fly was set-up up at Bunda College, which will then serve as a training facility for rural farmers.

A fundamental problem in sub-Saharan Africa that goes beyond the achievable goals of this project is still the loss of food through rotting. A quote from the first UNEP "Food Waste Index Report" which states: "If food loss and waste were a country, it would be the third largest source of greenhouse gas emissions.", clearly shows that this is also a very serious global problem.

The FAO estimates that about 37% of food is lost to consumption due to poor preservation methods in African countries. Since the rural population in Malawi does not have refrigeration or freezing facilities, there are almost no possibilities to preserve food for a longer period of time. Due to the strong seasonality, fruits and vegetables in particular are only available for a short period of time. Another important step towards a secure basic supply of healthy food is the implementation of preservation methods in Malawi. This would have various positive aspects, such as the production of jams and sun-dried fruits which could not only be produced for own consumption, but also sold. In addition, the daily time needed to procure fresh food could be reduced.

But even if the first goal must be to supply food directly for consumption, there is now increasingly the fantastic possibility of returning rotten food to the food cycle through the cultivation of BSF. The "I love fish" project can now contribute to triggering and intensifying this cycle in Malawi.

This year, UNEP started to establish regional food waste working groups in Africa, Asia-Pacific, Latin America and the Caribbean and West Asia to support member states in developing baseline data and strategies on preventing food waste. There may also be opportunities for Germany to contribute through the "One world, no hunger" initiative.

Below are some impressions of the activities in the project in 2020 (on request, the following pictures can also be made available in a larger resolution):

Internship at Hermetia

Substrate processing at Bunda

Mating house with cages

Mating house

Drying potato peels & fruits

BSF larvae incubation

Solar dryer

Substrate processing

Mating cage with eggies

Trap to attract wild BSF

Rotten Mangos – good substrate

Maggots on the balance