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Knowledge Brief 2: Improved Formulation of Fish Feed

Insights from the Global Alliance Africa Aquaculture Knowledge Exchange and Showcase Event

January 2023, Ekiti State, Nigeria

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Introduction

A focus of the Showcase Event was to look at the use of alternative proteins, locally available feed ingredients and improved formulation in aquaculture feed production for Ekiti State.

The Nigerian fish feed industry, as is the case globally, is faced with the challenge of high costs for feed ingredients; especially proteins that were traditionally supplied through the inclusion of fishmeal. Contributing factors such as a poor exchange rate that affects the prices of imported ingredients, and the erratic supply of electricity are exacerbating the problem.

Feed manufacturers have been challenged to find alternative ingredients such as plant-based proteins, aquaculture and fisheries bi-products and insect meals, while simultaneously developing innovative technologies and new means of feed formulation for sustainable growth of the sector. Choosing the right protein source(s) to fulfill the nutritional requirements of fish can be complicated.

It is therefore imperative for aquaculture stakeholders in Ekiti State to introduce new innovations and technologies, together with locally available feed ingredients to ensure that local feed prices remain competitive.

Innovate UK KTN, a member of the UK's Innovation Agency, through the Global Alliance Africa initiative organised an Aquaculture Knowledge Exchange and Showcase Event in Ekiti State, Nigeria, in January 2023, sought to enable the sharing of knowledge and technology around the use of alternative proteins, the use of locally available feed ingredients, and means by which to improve feed formulation. The Knowledge Exchange consisted of presentations of innovations and technology, followed by roundtable discussions on the specified focus area. The solution providers from UK, Nigeria and Pan-Africa who presented the work around new feed ingredients and technologies included:

biol∞p

<u>Bio Loop</u>

Innovation and investment



Fly Box Formerly Mana Biosystems Insect protein technology company



<u>Mag Protein</u>

Insect larvae to reduce cost



Dr Brett Glencross Alternative ingredients

These stakeholders shared their knowledge and expertise around the use of alternative proteins, locally available feed ingredients and improved formulation that could be adopted in Ekiti State, Nigeria.



Insights & Opportunities

The table below captures the insights from the roundtable discussion that focused on alternate proteins, locally available feed ingredients and improved formulation in aquaculture feed production for Ekiti State:

Challenge Details	Solution/Ideas	Potential Participants
1. Stakeholders around the aquaculture feed challenges in Ekiti are not well organised.	- Arrangements should be made to allow farmers to form an Ekiti State level association that can meet with feed producers and distributors to discuss and determine the best way forward with regard to feed quality and cost, alternative ingredients, on-farm application and testing of feeds.	 Smallholder farmers CAFFAN¹ TADAN² Government Ministry FADAMA³
 2a. From an ecosystem that had more than 500 farmers, many have ceased farming due to high costs. 2b. Farmers suffer from inconsistent harvests. 2c. Farmers do not have access to information. 	 2a. Bring Government, NGOs and feed providers to a round table with farmers to deliberate the high costs of feed and to seek solutions. 2b. Address inconsistent harvest by skilling Government and private extension services to mentor farmers around best practices that should include addressing the need for high quality fingerling stock and best feeding practices. 2c. Address access to information through the same extension services above and develop a farmer mentoring and training programme. Also seek business partnerships, encourage cluster farming and involve financial institutions. 	 Smallholder farmers Government Ministry NGOs Financial institutions
3. There is a lack of applicable research and access to research information is poor.	 Researchers and research funders must pay more attention to precise research needs of the sector, and to effective dissemination of research information. There is a critical need for better access and more collaboration on research around high- quality broodstock, genetic management and the production of high quality fingerlings. 	 Universities and other research institutions Research funders
4. Locally produced feeds are not of an adequate quality.	- All sector stakeholders should collaborate to set local feed standards that are measurable and that will not be compromised when including locally available ingredients (this can be adopted from existing international standards).	 Smallholder farmers Universities Feed millers and distributors CAFFAN TADAN Government Ministry FADAMA



Challenge Details	Solution/Ideas	Potential Participants
5. There is a need for alternative proteins for inclusion into fish feeds.	- Investigate alternative plant and animal proteins that can be sourced locally or that can be produced locally. Using existing international research, determine the most suitable sources and formulate feeds accordingly.	UniversitiesFeed millersAlternative protein suppliers
6. Energy is inconsistent and contributes to the cost of feed.	- Engage engineers and international knowledge partners around alternative energy sources.	 Engineers International knowledge partners Universities

Summary of Discussions

Given the recent trends in fish feed formulation and the inclusion of alternative protein sources to decrease the dependency on fishmeal, it is important to evaluate the implications of this paradigm shift for fish growth, fish health and the welfare of fish and its consumers.

Potential feed ingredients that are available or that could be produced in Ekiti State, and which were proposed during the showcase event include black soldier fly larvae, maggots, blood meal and hydrolysed feather meal.

Black Soldier Fly (BSF) has been touted widely as a suitable alternative protein source for fish feeds, yet inclusion levels of more than 50% is not yet possible given the high related content of chitin in this insect based protein. Yet, BSF larvae is a strong candidate for further focus given that much research has already been done on its use in aquaculture, it is not a vector of any disease pathogen and poses no public health risk, it is easy to produce and it is already being produced commercially as a feed ingredient in Nigeria and other African countries.



Mucuna seeds, soy beans, lima beans and pigeon peas were some of the plant protein sources that were identified. Some of these require treatment to remove anti-nutritional factors, while some lack essential amino acids associated with animal proteins. This therefore increase costs when compared to the BSF solutions that were presented.



Discussions at the showcase indicated that there are many plant and animal protein sources for fish feed in Ekiti State and there is opportunity for aquaculture researchers to be engaged in investigating these ingredients for good quality fish feed. It was also highlighted that it is imperative to have quality control methods in feed manufacturing to ensure that internationally accepted minimum standards are met.

The discussions also identified additional innovation opportunities for Nigerian engineers, feed millers, universities and other relevant roleplayers to partner with international and national solution providers to look into production practices of alternate protein that can lead to or support the local manufacturing of feed mill equipment, and the use of alternative energy sources such as solar power.

Conclusion & Recommendations



The use of locally available feed ingredients is expected to reduce the cost of locally manufactured fish feeds and bring about a corresponding reduction in the costs in fish production. Hence, the following concluding recommendations were made:

- As research has been conducted globally on all of the alternative feed ingredients, this information should be collected and analysed for its domestic applicability in Ekiti State to enhance the affordability and quality of locally manufactured aquaculture feeds.
- Private sector players should be encouraged to partner with smallholder farmers to set up joint ventures.
- Engineering departments in academic institutions should help in the local fabrication of feed mill equipment such as extruders and pelleting machines.

- Researchers from academic institutions should collaborate with the likes of Dr Brent Glencross of the University of Stirling to standardize feed ingredients and formulations.
- Government Ministries should be encouraged to improve the skills and capacity required in efficient extension services and mentoring programmes.
- Existing black soldier fly producers should be encouraged to set up facilities in Ekiti State to supply larvae to feed producers and farmers.



Thank you

We would like to thank those who contributed to this brief, specifically Etienne Hinrichsen, Mosunmola Lydia Adeleke and Owoeye Odunayo Afolabi.

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