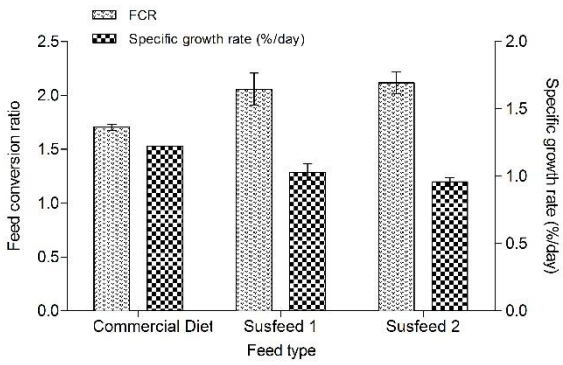
Food Security in Ghana: Addressing the high Fish feed Cost

Executive Summary

High feed cost threatens the vision of the Ghanaian government's aquaculture development plan and overall sustainability of the aquaculture industry. Cutting feed costs requires the use of 'cheap' but quality products in making feeds. Several studies have shown that the nation has a vast supply of agro-by products which are in most cases underutilized; a problem with these resources however, is that they are usually of lower quality compared currently used ingredients in the industry. To make use of this underused resource, the research team on Sustainable Fish Feed Project "Susfeed" conducted a series of experiment that helped improve the quality of various locally available agro by-products and ultimately developed two cost-effective tilapia diets for pond and cage culture. Although, the diets require improvement to enhance floatability, our research findings show that they compared favourably with a commercial control during field testing in tanks, cages and ponds and overall had a less nutrients released into the environment. It is anticipated that the development of Susfeed will be a vital and positive step resulting in major changes in current feed production practices and aquafeed research and help sustain growth in the aquaculture industry while at the same time cutting down on agricultural wastes and ensuring food security in Ghana.

Introduction

Feed accounts for 40-60% of production cost in aquaculture in Ghana. In order to reduce feed cost, the Department of Fisheries and Watershed Management, KNUST in partnership with DTU Aqua has developed two feeds from local oilseed meals for tilapia culture, through a series of controlled experiments and field trials. The oilseed meals were: palm kernel cake, soybean meal, copra meal, cottonseed meal, groundnut meal and husk. Anti-nutrients in these ingredients were reduced to tolerable levels by soaking and fermenting which also improved the nutritional quality of the ingredients. The ingredients were screened for availability, price and nutritional quality. To ensure a more balance protein source, the selected ingredients were combined to obtain the best performing tilapia feeds which are of low-cost, promote optimum growth and have minimum environmental impact. Soaking and fermenting improved the protein, amino acids profile and fat availability of cottonseed and groundnut meals. These ingredients were better digested and consumed by tilapia when they were singly tested.



Feed utilization and growth of fish fed Susfeed diets in comparison with a commonly used commercial feed

Generally, results from the project showed the potential for inclusion of the selected oilseed meals in tilapia feeds even to the extent of total replacement of fish meal in some cases. The extruded tilapia diets that contained more than 20% soybean meal and copra meal and less than 20% cottonseed meal and groundnut meal resulted in optimum growth and less environmental effects. These diets were slightly higher in profit than the

commercial control diet used.

Ponds used in field testing the 'Susfeeds'

Background

Due to the large demand for fish in Ghana, aquaculture has become a priority on Ghana's economic development agenda. As a result, a national policy on aquaculture was adopted in July 2013 with the objective of increasing aquaculture production by 100,000 tons by the end of 2018. However, growth of the sector is hampered by high feed cost and environmental concerns about effluent discharge. The feeds available on the market are mainly imported or if made in Ghana, the some or most of the raw materials are imported. The major cost component in the feed industry is protein, mainly from fish meal. Alternative sources of protein and local production of these ingredients will directly reduce feed cost. Also, the availability of cost effective feeds coupled with efficient feeding strategies can contribute to the realisation of the growth potential in the aquaculture sector in Ghana. Ghana has large quantities of potential raw materials for feed development i.e. soybean cake (145,935mt), groundnut cake (520,000mt) copra cake (223,977mt) and palm kernel cake (402,473mt). However, these agro by-products contain some antinutritional properties that hinder their utilisation as fish feed as effective processing techniques and formulations remains to be developed. Research in fish nutrition has focused on existing commercial feeds or farmer-made feeds which do not float. The made in Ghana feed to be developed, is envisaged to float and with partnership with a local feed manufacturer, it is hoped that it would be on the market and compete favourably with the imported or fishmeal based feeds.

Results:

This research strongly demonstrates that it is possible to achieve low-cost high quality tilapia feeds that do not impact negatively on the environment by totally replacing fish meal protein with mixtures of soybean meal, copra meal, cottonseed meal and groundnut meal. A feed named "Susfeed" is being fine-tuned for commercial production. Through this project, the staff improved their research and student supervision capacities, developed a framework for postgraduate studies, and established networks with academia and industry players. The research capacity of KNUST is increased through the construction of a state-of-the-art laboratory (lab) for testing feeds and fish growth and acquisition several equipments which has helped us upgrade our nutritional lab. The researchers have also gained invaluable experience in project management which has served and continues to serve as leverage for other projects. The students on the project (2 PhD and 3 MSc) have acquired skills in standard feed formulation techniques and the use of laboratory equipment, experimental design techniques and are able and ready to support the industry. Other students in the Department have also benefitted from the project with several of them getting the opportunity to undergo hands-on training in the new lab and the use of the various equipment. This has resulted in marked improvement in the undergraduate and post graduate nutrition course and resulted in much improved nutrition projects both at the undergraduate and graduate levels.

Laboratory testing to improve nutritional quality of agro by-products used in formulating 'Susfeed'.

Conclusions:
Ghana has available nutrient-rich agro by-products that can be used in fish feed for tilapia with a little treatment. North-South research collaboration has led to the development of fish feed using agro by-products. This feed competes favourably with fishmeal based commercial feeds on the Ghanaian market. The comparatively positive effect of "Susfeed" on environmental quality of waterbodies that receive aquaculture effluents makes it plausible to increase fish production and ensure a clean environment with a low carbon footprint.

Implications:
"Susfeed" has the potential to trigger growth of the aquaculture industry and capacities exist to support this growth. This implies that the industry stands to gain tremendously if the needed attention is given to commercialize the "Susfeed". This would be a major contribution by KNUST for Ghana achieve its national policy target of increasing aquaculture production by 100,000 tons and would strengthen the small-medium scale fish producers in the country. The low-cost of the feeds relative to the commonly used commercial feed presents saving opportunities for farmers to increase their income and improve their livelihood and hopefully tickle down to lower costs of fish for consumers. Adoption of the "Susfeed" formula by local feed manufacturers has beneficial effects for the entire aquaculture value chain through creation and increase in aquaculture ventures, job creation and income generation; thereby contributing to reduction in unemployment and poverty. Producing feed from the selected raw materials also implies a reduction on the reliance on capture fisheries for the production of fish meal; the main source of protein in aquafeeds.

Recommendations
To support the growth of the industry, government needs to support local manufacturers of fish feeds especially those using local agro by-products. These infant industries need to be given tax incentives and easy access to capital to sustain the growth and compete with the imported feeds on the market. Continuous research services (universities and research institutions) are needed to provide the needed cutting-edge technologies to local manufacturers. To this end, there is the need to strengthen collaboration between the universities and the nascent feed factories.The Ministry of Fisheries and Aquaculture Development should champion the transfer of this knowledge and skills to feed manufacturers and fish farmers.