



Fingerling Delivery and Hatchery Production to Support SME Aquaculture

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Abstract

The success of commercial aquaculture in Africa has largely focused around the growth of large, internationally-invested, vertically integrated companies. But for aquaculture to fulfil its potential there needs to be strong development of small and medium enterprises (SMEs), both at the farm and through service provision. We must practice African Aquaculture with a big contest of ideas, devoid of “there is us and there is them”

A critical part of the supply chain is fingerling supply. Governments and international donors have spent millions of dollars trying to kick start smallholder aquaculture industries in many African countries, but with little lasting success. Diverse commercial sectors in Nigeria and Egypt have grown because of the concentration of producers in specific areas. But how do you grow an industry when the customer (farmer) base is dispersed?

Experience from East Africa shows that you need a mix of opportunities. Being able to supply into some of those donor-funded projects helps hatcheries (and other service providers) to survive. Sporadic supplies to vertically integrated farms, when they have production limitations, is also useful business. But hatcheries need a diverse customer base that demands product throughout the year. The growth of several independent, medium-scale cage operations has created a meaningful market. Some ponds farmers are now regularly demanding fingerlings. The development of distribution networks provides additional business opportunities and gives

smaller-scale producers confidence that fingerlings will be available more easily and at competitive prices. Has the industry now reached a scale and diversity that can sustain commercial hatchery and fingerling distribution businesses?

Introduction

Aquaculture production levels suggest that the role of smallholder farmers is crucial to future fish supplies and increasing food and nutrition security for consumers. Aquaculture sustainability includes ecological, economic, and social aspects (Bosma & Verdegem, 2011). Thus, it is necessary to develop and adopt systems that optimize the use of natural resources, increase production efficiency, generate income, and distribute wealth to local populations, while maintaining the integrity of the surrounding ecosystems (Valenti, Kimpara, & Preto, 2011; Valenti, Kimpara, Preto, & Moraes-Valenti, 2018).

The success of commercial aquaculture in Africa has largely focused around the growth of large, internationally-invested, vertically integrated companies. But for aquaculture to fulfil its potential there needs to be strong development of small and medium enterprises (SMEs), both at the farm and through service provision. African Aquaculture must be practiced with a big contest of ideas, devoid of “there is us and there is them”.

A critical part of the supply chain is fingerling supply. Governments and international donors have spent millions of dollars trying to kick start smallholder aquaculture industries in many African countries, but with little lasting success. Grants

and subsidies alone can never be the basis of business planning and should only be used to temporarily address gaps on the way to a self-sustaining business (Kassam *et al*, 2011). Smallholder hatchery business must be done in the context of an economic vision with clear investment goal(s). Even where external assistance is involved and/or is required an exit strategy should be considered with a goal to leave behind a functioning enterprise operating as a business.

Diverse commercial sectors in Nigeria and Egypt have grown because of the concentration of producers in specific areas. But how do you grow an industry when the customer (farmer) base is dispersed? Experience from East Africa shows that you need a mix of opportunities. Being able to supply into some of those donor-funded projects helps hatcheries (and other service providers) to survive. Sporadic supplies to vertically integrated farms, when they have production limitations, is also useful business. But hatcheries need a diverse customer base that demands product throughout the year. The growth of several independent, medium-scale cage operations has created a meaningful market. Some ponds farmers are now regularly demanding fingerlings. The development of distribution networks provides additional business opportunities and gives smaller-scale producers confidence that fingerlings will be available more easily and at competitive prices. Has the industry now reached a scale and diversity that can sustain commercial hatchery and fingerling distribution businesses?

Methodology

The scoping review methodology and systematic review approach were adopted in the present study to generate a comprehensive literature review on the production of tilapia fingerlings and delivery in Kenya. A field survey was conducted to determine the delivery fingerling production and delivery in one farm each in Eastern and Central Kenya and five hatcheries across Western Kenya where most of the tilapia fingerlings production is done and the managers and/or owners interviewed. A semi structured questionnaire with both closed and open-ended questions was used as the survey instrument. The current paper is a result of the interviews with the fingerling producing farms in Kenya, a review of production and delivery systems at Jaweta Fish Farms and research publications that met the inclusion criteria for the review paper

Discussion

To achieve a rapid transformation of the Nile tilapia culture industry, there is a need to upscale modern technologies, innovations and management practices. Since aquaculture is fast growing, there is a need for the development of new production technologies in aquaculture to maximise production and profits. Fish seed production is a highly specialized activity. Hatcheries are often clustered in locations where suitable environmental conditions and specialized technical knowledge exist. As a result, fish seed is often traded over long distances from hatchery clusters to farm clusters (Belton, 2012) Specialized fingerling traders deliver seed over distances of

several hundred kilometres to fish farms who stock them for grow-out. Smaller farms are especially dependent on seed traders to supply fingerlings. Larger farms sometimes collect fingerlings directly from distant hatcheries. However, as reported by respondents, transporting fingerlings over long distances can stress them, resulting in high post-stocking mortality and economic losses for farms. There is also scarcity of fish seed supply at times. As a result, some of the largest farms in Kebbi have vertically integrated hatchery operations to produce their own fingerlings to overcome scarcity and ensure adequate supplies of seed. Some of these large farms are reported to sell surplus fingerlings to smaller farms during peak season, creating local spillovers.

Scarcity of fish seed and high mortality rates for seed transported over long distances have prompted some farms in Ebonyi to learn fish breeding skills and produce their own fish seed. Association of aquaculture producers located in many African countries play key roles such as information transfer, knowledge exchange, and facilitation of aquaculture-related activities (Satia, 2017). The formation of clusters of fish farmers has efficiently contributed to support services delivery, economies of scale, reduction of transaction costs, and competitiveness (Satia, 2017). These key aquaculture producers experienced remarkable growth in the past decade because of several factors such as capacity building in critical subject areas, embracing good governance, research and development, access to credit facilities, and mainly because of the promotion of private-sector-led aquaculture development (Satia, 2017). Private-sector-led initiatives gave rise to investments in sound management, emerging production systems, the formulation and utilization of aquafeeds, and the emergence of dynamic and robust producer associations and service providers (Adeleke *et al.*, 2020; Satia, 2011).

Jaweta Fish Farms Case Study

Our success in Hatchery Operations as Jaweta Fish Farms Ltd (formerly Jewlet Fish Farms Ltd) is a positive attitude and the willingness to accept changes by the new industry. As we believe "You can't do today's job with yesterday's methods and be in business tomorrow". This included production of Nile tilapia (*Oreochromis niloticus*) post-fingerling as a niche market. This has been the "the missing gap" since most hatcheries are unable to effectively produce this product. Most clientele like this product since they can produce two-cycles of 6 months each in a year as opposed to 11 months growth cycle period. Investment needs to be provided with the right skills including in management as a means of also reducing risks and generating significant social and environmental benefits for SMEs. We invest in capacity building, transferring technology to both our staff and some of the customers as part of 'after sales service'. We have been also giving rewards in terms of free fingerlings and fish feeds to best performing farmers. Our success has also been in our business principles, thinking differently about our business environment and how to ensure we stay ahead of the competition. Dynamic aquaculture enterprise operates on a technologically dynamic platform that need constant research innovation and technical support to

farmers and we take great pride in developing our products and view the success of each as a direct reflection of our own company's skills and consummate reputation. On this we have focused on:

1. Sustained quality seed. This involves brood-stock improvement based on GIFT technology, improved efficacy in sex reversal (tilapia mono-sex) between 97% to 98% of all-male fingerlings besides better survival rate of seeds by providing a more robust fingerlings and proper handling.
2. Sustained Marketing. We have become a household name in Kenya and the East African region due to quality of our fingerlings. This is coupled with 'after-sales service' and training all calibre of stake holders for publicity thereby creating a strong belief in our products.
3. Efficient Hatchery Production. We work on every aspect of production efficiency from determining number of brooders including male:female ratio, interval and duration per spawn and average fecundity of our females.

It is essential to ascertain that your hatchery business concept is sound. Ask the following questions: Are there adequate and profitable markets for fry or fingerlings? Do you have a suitable site for seed production? Do you have the expertise to produce what the market requires? Are there essential support services -extension service, materials needed. Successful hatcheries have good Marketing plan. It must address the following question. Where will I sell my fingerlings? Serious producers should ask and get answers to this question well before they go into production. Any successful hatchery enterprise must target a specified market(s). A serious fingerling producer will produce what matches the needs and wants of the customers they wish to serve. A decision on production must be based on what the customers want. Economically sustainable businesses must choose appropriate market channels as well as produce crops efficiently (World Fish. Policy Brief 2022-07 The World Fish Center, May 2011 © 2011 The World Fish Centre)

Commercial SME Hatcheries have to contend with the following distribution channels.

1. Directly to fish farmers

a). Mostly large farms. This is feasible on transportation because many of such farms may require in excess of 100,000 fingerlings in a single order due to their financial base. However, building such markets often requires a sufficiently high-quality product to sell in sufficiently large quantities. This category of farmers may require that hatcheries invest in Research and Development (R&D), such as the development of higher yielding fish strains, improvements and efficiencies in farm productivity. These may include measures ensuring access to quality brooders and feed; reducing environmental impacts; preventing or timely treating disease(s); or facilitate adoption of better farm management practices or environmental standards.

b). Small scale farmers. They cannot afford quality fish if distance is long but can afford through group orders so as to make transportation easier for that cluster of fish farmers. They can also be supplied through smaller hatcheries that act nurseries. These in-turn buy from relatively larger hatcheries like ours (Jaweta of 1.2 million a month up-scaling currently to 2.5 fingerlings million per month) and boost fish to larger sizes (5 to 15g) closer to the small-scale fish farmers. Improving horizontal linkages so that smallholders can form groups or cluster, and establishing vertical arrangements with fingerlings buyers and sellers is of necessity. Smallholder aquaculture becomes sustainable through a shift to a more business-oriented approach, as well as access to services and better functioning value chains connecting farmers to input and output markets. Collectively, farmers can create economies of scale for access to goods and services and improve bargaining power, improve management systems, build social capital and create more equitable relations with input and output markets. This may include the development of networks that facilitate knowledge sharing and cooperative business structures.

2. Contractual arrangements

Can sell same size (end of sex reversal-0.3 to 0.5g) tilapia mono-sex and/or any other sizes as stipulated in the contractual agreement(s). This is done directly to the commercial fish farms or groups of cooperative smallholder farmers or to nurseries that buy end of sex reversed tilapia 0.3g to 0.5g, boost the fry to fingerlings and/or post-fingerlings and sell at higher prices in the 'niche' market. This usually need proper contractual arrangements.

Conclusion

Whilst there are a number of pathways for successful delivery and hatchery production for SME it requires significant investment to realize social, economic and environmental benefits. Networking arrangements can produce greater economies of scale and the sharing of experiences across wider networks can be used to advocate for greater awareness and change in smallholder aquaculture. Improvements in internet access and mobile communications platforms are opening opportunities for innovations that could connect large numbers of smallholder aquaculture enterprises at scale with the services needed to facilitate improvements and business sustainability.

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