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Economic Viability of Small-Scale Aquaculture in Malawi

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Key Messages

- Small-scale aquaculture in Malawi is profitable, despite the challenges faced by fish farmers such as a lack of access to high quality feed, fingerlings, relevant extension services, and well-structured output markets.
- On average, fish farms make a profit of MK 116,258 (median = MK 25,500). Although this value is likely too low to attract many new entrants to fish farming, the average productivity in terms of profit per hectare is MK 3.2 million per hectare or approximately USD 3,888 per hectare, which exceeds the average productivity per hectare of crop farming.
- Commercial and homemade feed account for the largest share (54.9%) of the cost of production.
- There is potential to improve the profitability of small-scale aquaculture by investing in feed and fingerling production, identifying lower cost alternatives to conventional fish feed (such as insects), investing in aquaculture extension services, and promoting best practices in fish farming.

Introduction

Small-scale aquaculture in Malawi has the potential to enhance rural livelihoods, improve food and nutrition security, and reduce the country's dependence on capture fisheries and fish imports to meet the demand for fish. Despite this potential, the sector accounts for just 5% of the total fish production in the country. Small-scale fish farmers are impeded by a lack of access to high quality feed, fingerlings, relevant aquaculture extension services, and well-structured output markets, in addition to stresses introduced by climate change.[1] In the face of these challenges, the profitability of small-scale aquaculture is in question.

The profitability of any enterprise determines its growth, the likelihood of farmers' adoption of new technologies, and the ability of financial service providers to offer credit to farmers.[2] Profitability, in turn, is determined by internal factors, such as good farm management practices, and external factors, such as the physical environment and policy environment. Farming experience, pond size, access to credit and loans, cost of inputs, and distance to fish markets have all been found to influence the profitability of fish farming.[3]

This brief presents the first detailed, large sample analysis of small-scale aquaculture profitability in Malawi, with data of fish farms across the country.

Data

This study uses the MwAPATA Aquaculture Survey (MAS), which was conducted by the MwAPATA Institute in 2021 and collected information on farm operations and production of 732 small-scale fish farms from 10 districts across Malawi with a large presence of aquaculture, namely Machinga, Mchinji, Mulanje, Mzimba, Nkhatabay, Nkhotakota, Ntchisi, Phalombe, Thyolo, and Zomba. The data set includes both individually owned farms and community farms, which are collectively managed. Survey weights are used in analysis, such that the sample can be considered loosely representative of the population of small-scale fish farms in these districts.

Measurement of farm profits

We use Gross Margin Analysis to determine the profitability of the aquaculture enterprise for small-scale fish farmers. The gross margin of a fish farm is calculated using the following formula:

$$GM = TR - TC \quad (1)$$

where GM is the annual gross margin (profit), TR is the total revenue, and TC is the total cost of production.

Total revenue (TR) is the value of fish production, inclusive of all that was harvested in the year-long reference period. Fish that were consumed, gifted, or lost are valued at the median per-kilogram price observed for a given species for the smallest geographic unit for which at least 10 sales were observed in the data set. Total cost (TC) includes variable costs such as the cost of fingerlings, feed (commercial and homemade), fertilizer (organic and inorganic), lime, medication, energy (used for homemade feed preparation), hired labor, and transport. Fixed costs are not accounted for in this analysis, though these seem to be marginal, based on respondents' estimates of the costs incurred when establishing their farms. It must be noted that only pecuniary costs are considered in this analysis; thus, expenditures on hired labor are included while the value of family labor is not.

Profits are calculated at the farm level and are also scaled down to determine the profits of a typical pond. The analysis is also disaggregated by region, farm type, production system, fish species, and the production of fish versus fingerlings.

Results

Most fish farms (81.5%) realized positive profits, with a mean of MK 116,258 and a median of MK 25,500 (**Error! Reference source not found.**). This implies that small-scale fish farming is profitable in Malawi. When this profit is scaled to the size of a "typical" pond (with an average size of 299.5 m^2), the average pond-level profit was MK 97,041. This is equal to MK 3.2 million per hectare or approximately USD 3,888 per hectare, which far exceeds the per-hectare value of crop production in Malawi for maize, soya beans, groundnuts, and pigeon peas.[4]

Feed (both commercial and homemade) accounted for the largest share of average production costs (54.9%), while hired labor accounted for 12.0%, fingerlings accounted for 11.0%, fertilizers accounted for 7.2%, and other costs were smaller. It follows that the cost of fish feed, fertilizer, fingerlings, and hired labor are important factors to consider when venturing into fish farming.

Variation in the gross margin of fish farming may be due to differences in fish species cultivated, stocking rates, types and rates of inputs used, production of fish versus fingerlings, pond size/farm size, and various challenges faced by fish farmers. Farmers devoted some ponds primarily to fingerling production (with some fish also produced) and others primarily to the production of fish (with some fingerlings also produced). When ponds devoted primarily to these two purposes are treated as two separate enterprises, the average gross margin for fingerling production was over four times that of fish production. However, these two activities had roughly equal returns per typically sized pond.

Table 1. Gross margins and productivity of fish farming in Malawi (mean values, MK)

	All production		Fish production		Fingerling production	
	Mean	% of cost	Mean	% of cost	Mean	% of cost
Harvest value	147,027		139,770		206,269	
Fingerling revenue	18,744		6,030		339,164	
TR	**165,444**		**145,799**		**545,433**	
Commercial feed	11,752	23.9	9,842	22.5	51,773	39.4
Homemade feed	15,224	31.0	14,906	34.0	9,851	7.5
Energy cost	18	0.4	187	0.4	0	0.0
Organic fertilizer	1,318	2.7	1,254	2.9	1,838	1.4
Inorganic fertilizer	2,211	4.5	1,956	4.5	6,969	5.3
Lime	1,419	2.9	1,197	2.7	6,030	4.6
Medication	0	0.0	0	0.0	0	0.0
Fingerlings	5,417	11.0	4,555	10.4	23,374	17.8
Hired labor	5,924	12.0	5,016	11.4	15,147	11.5
Other inputs	2,873	5.8	1,838	4.2	12,091	9.2
Transport	3,215	6.5	3,070	7.0	4,298	3.3
TC	**49,186**		**43,821**		**131,370**	
GM (TR-TC)	**116,258**		**101,979**		**414,063**	
GM/299.5 m^2 pond	**97,041**		**99,177**		**92,780**	
Observations	**732**		**728**		**24**	

Source: MAS 2021

The same analysis for different farm categories is presented in **Error! Reference source not found.**2. Individually owned farms had much higher average gross margins and profits per typically sized pond (MK 128,012 and MK 108,525) than community fish farms (MK 38,876 and MK 21,945). Note, however, that this analysis implicitly assigns no value to household labor.

On average, farms that followed production cycles incurred much higher costs than those that practiced continuous production, but they also saw higher annual profits per typically sized pond (MK 101,980, compared to MK 95,274). With regard to farm size, it is not surprising that smaller farms tended to have much smaller gross margins. However, there is an inverse relationship between farm size and productivity (profits per typically sized pond). Specifically, average profits per pond were higher on farms of 0–200 m^2 (MK 126,057) than those of 200–1,000 m^2 (MK 63,238) or those larger than 1,000 m^2 (MK 96,165).

As shown in **Error! Reference source not found.**, the profit per typically sized pond in the Southern Region was much higher (at MK 112,956) than in the Central (MK 75,784) or Northern (MK65,560) Regions. This is partly explained by higher water temperatures in the south of the country, as well as a small outbreak of Epizootic Ulcerative Syndrome (EUS) in the Central region.

This analysis is repeated at the species level (Table 2). As multiple species can share a pond, the costs of pond-level inputs are divided equally amongst the species. Average productivity (gross margin per typically sized pond) was highest for chambo (MK 105,517), followed by chilunguni (MK 84,957).

Table 2. Gross margins for various categories (mean values)

Category	Gross margin (MK)	GM per pond of size 299.5 m²
By farm type		
Individually owned	128,012	108,525
Community farm	38,876	21,945
By production system		
Continuous production	62,765	101,980
Production cycles	262,509	95,274
By species		
Makumba	79,440	79,146
Chilunguni	106,113	84,957
Chambo	54,942	105,517
Mlamba	247,884	66,051
By region		
Southern Region	124,487	112,957
Central Region	47,502	75,784
Northern Region	142,083	65,560
By farm size		
0-200 m^2	34,516	126,057
200-1,000 m^2	91,771	63,238
>1,000 m^2	693,008	96,166

Source: MAS 2021

Conclusion and recommendations

Results show that small-scale fish farming in Malawi is generally profitable, although the total annual production of most fish farms is low. We recommend the following for small-scale aquaculture development in Malawi:

Promote best practices in fish farm management and invest in aquaculture extension services. Small-scale fish farmers can expand their profits by following recommended fish farming practices, such as practicing a system of production cycles rather than continuous production. Relatedly, the survey team observed a need to train more fisheries and aquaculture extension agents with expertise and technical know-how specific to fish farming.

Improve access to high quality fish feed and consider lower cost alternatives to conventional fish feed. There is a need for Malawi to manufacture its own floating (commercial) feed so that it will be affordable and widely accessible. The Centre of Excellence for Aquaculture and Fisheries Science (Aquafish) at LUANAR, the National Aquaculture Centre (NAC), and MALDECO Fisheries can potentially manufacture floating feed if they are properly equipped and capacitated. There is also a need to explore the cost effectiveness of alternative types of fish feed, such as Black Soldier Fly (BSF).

Encourage fish farmers to embrace farming as a business. Although the quantities produced on small-scale fish farms in Malawi tend to be low, small-scale farming can serve as an entry to commercial aquaculture. There is therefore a need for farmers to regard fish farming as a profitable business. Along these lines, small-scale fish farmers with entrepreneurial characteristics can be considered "fishpreneurs"[5] whose ambitions should be cultivated.

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