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Full Length Research Paper

Profitability analysis of small scale aquaculture enterprises in Central Uganda

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The study had three overriding objectives. Firstly, to assess the profitability of small-scale aquaculture production enterprises in central Uganda; secondly, to ascertain the factors affecting profitability; and thirdly, to identify the constraints to fish farming in the region.The data were collected through a survey questionnaire administered to a random sample of 200 small scale fish farmers in the three major fish farming districts of Mpigi, Mukono and Wakiso in central Uganda. The analysis was carried out using descriptive statistics, enterprise budgeting and ordinary linear regression. Although the results show small-scale aquaculture enterprises to be profitable in the study region, the estimated profit margins are relatively small. Farming experience, fish price, record keeping, feed cost and volume of fish harvested were the most influential factors in explaining profitability. The key factors identified as hindrances to aquaculture development in the region included predators, unavailability of credit facilities, expensive feeds, shortage and poor quality of fingerlings.

Key words: Aquaculture, enterprise budgets, profitability, Uganda, small farmers.

INTRODUCTION

Uganda's fisheries sector has recently been recognized for its vital contribution to the food and nutritional security of over 30 million people and for providing income for millions of households engaged in fish production, processing and trade (MAAIF, 2004). The sector is comprised of both capture and culture (aquaculture) fisheries with the former contributing most of the total production (FAO, 2011). Capture fishery is basically artisanal while aquaculture which was first introduced in the country in the 1950s—with the first experimental station established in 1953 at Kajjansi, Wakiso District (Balarin, 1985; King, 1993) which is primarily produced by farmers who practice fish farming as one of the many other farming activities (FAO, 1996; NARO/MAAIF, 2000). Until recently, the technology has not flourished.

The reasons for its mediocre performance have largely been socio-economic, at both the macro and micro levels (Isyagi, 2007). Particularly, most fish farmers were poor people in villages who practiced aquaculture for subsistence with ponds of usually less than 500 m² constructed using family labor (Jagger and Pender, 2001; Nyombi and Bolwig, 2004; Isyagi, 2007). These were low or no input production systems, with little or no need for routine management. However, with rising fish prices and domestic and regional demand, along with reports of dwindling fish stock in Lake Victoria (Uganda's main source of capture fisheries), adoption of improved aquaculture technology has increased and farmers are beginning to build more and larger ponds of 1,000 m², and using higher stocking densities (Bahiigwa et al., 2003; Department of Fisheries Resources, 2005; FAO, 2010).

Uganda's aquaculture industry has also benefited from efforts of the various international development agencies [such as Food and Agriculture Organization (FAO), United States Agency for International Development (USAID), United Nations Industrial Development Organization (UNIDO)] and advanced research institutes

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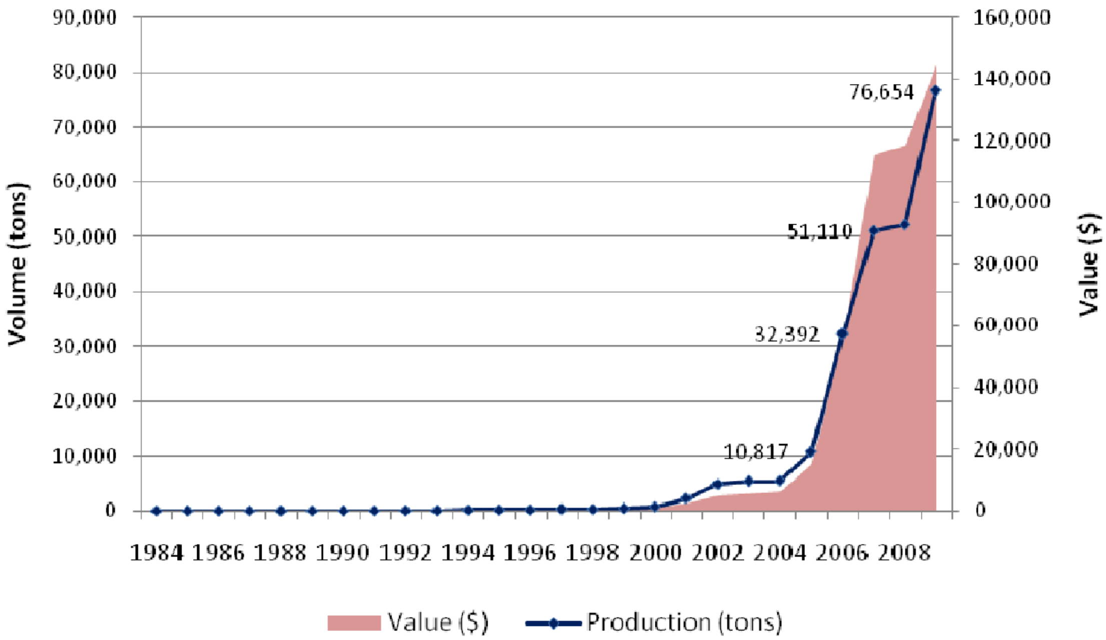

Figure 1. Aquaculture production and value in Uganda, 1984 to 2009. Source: created by authors using data from FAO Fish Statistics (FAO, 2011).

(such as Oregon State University, Auburn University) which have increasingly promoted aquaculture technology within the context of integrated agriculture and have begun addressing socio-cultural and economic factors that have in the past stalledaquaculture development in the country (FAO, 2010; Auburn University, 1999; USAID-FISH, 2009; USAID-AQUAFISH, 2009; UNIDO, 2009; Oregon State University, 2007). These efforts combined with Uganda government's renewed commitment and increased awareness of the potential for aquaculture to contribute to domestic fish production, improving food security and as a means of supplementing income for rural families have attracted interest and investment from both the private sector and public institutions in the country (NARO/MAAIF, 2000; UIA, 2005; UNIDO, 2009). This is observed through the increased aquaculture production over the last 10 years from less than 5,000 tons in 2000 to over 76,000 tons in 2009 (Figure 1). Although this trend is projected to continue, further growth and development will depend on the profitability of the selected aquaculture production systems.

Considerations in the selection of an appropriate production system include its potential for economic returns (Hebicha et al., 1994; Aguilar-ManjarrezandNath, 1998; Nanyenya et al., 1999; Isyagi, 2007). There are limited studies conducted on the economic evaluation of aquaculture production in Uganda. As a result, most production decisions are based on comparable studies conducted in neighboring countries (Nanyenya et al., 1999; Omondi et al., 2001; Veverica et al., 2001; Okechi, 2004). It is against this background that the present study was undertaken to assess the profitability of small-scale aquaculture production in central Uganda, ascertain the factors affecting profitability and identify the constraints to fish farming in the region. Particularly, estimates of economic returns are essential for both prospective producers and financing institutions to evaluate the risk and potential profitability in comparison to alternative enterprises (Tisdell, 2003; Okechi, 2004; Njuki et al., 2007). If aquaculture can be demonstrated to be profitable at the small scale level, entrepreneurs may take it up at the commercial level and produce for large scale markets and export (Okechi, 2004).

MATERIALS AND METHODS

The data for this study are drawn from a field survey conducted in June to July 2010 on 200 fish farms in three major fish farming districts in Uganda: Mukono, Mpigi and Wakiso districts. The districts were part of a study area (central Uganda) selected for a two-year small-scale aquaculture project funded by USAID-Aqua Fish Collaborative Research Program[1] (CRSP). Prior to administering the questionnaire, the instrument was pre-tested at 5 fish farms in Wakiso district. Extension personnel from the National Fisheries Resources Research Institute (NaFIRRI) played a major role in identifying and setting-up the pre-testing activities. Responses from the pre-test were used to develop the final

[1] The small scale aquaculture CRSP project in Uganda started in 2009 under the collaboration of three US institutions (Auburn University, University of Georgia and Alabama A and M University) and two Uganda institutions (National Fisheries Resources Research Institute [NaFRRI] and Makerere University).

Table 1. Estimated average costs for small scale fish farms in central Uganda.

Cost type	Average cost (Ushs.)	Average cost (US$)*	Percentage
Seeds	514,324	257.162	29.8
Feeds	428,264	214.132	24.8
Labor (production)	514,720	257.36	29.8
Labor (harvesting)	13,163	6.5815	0.8
Net purchase	120,460	60.23	6.9
Net rental	5,100	2.55	0.3
Transportation	6,100	3.05	0.4
Total variable costs (TVC)	1,602,131	801.0655	92.8
Total fixed costs (TFC)	125560	62.78	7.3
Total costs (TVC+TFC)	1,727,691	863.8455	

*Exchange rate: US$1 = Ushs 2000.

questionnaire. The pre-survey activities included reconnaissance for the pilot survey, revision of survey instrument and preparation of the sampling frame. Farmers were selected using stratified random sampling based on production systems (pond or cage culture). Thefinal sample was fairly distributed among the selected districts with the majority from Mpigi (69) followed by Wakiso (68) and Mukono (63) districts.

Survey enumerators were university students who were trained by social scientists (from Makerere and Alabama A and M Universities) and by extension educators and aquaculturalists (from NaFIRRI), thus were knowledgeable about primary data collection methodology and fish farming practices.Data collection exercise started on June 14, 2010 and ended on July 15, 2010. The interviews, lasting about two hours, solicited information on number of years in the aquaculture business, allied industries, type of operation, species, product forms, marketing strategies and income generated from aquaculture. Other information collected included: characteristics of the farmer, production cycle, credit accessibility, group linkages, record keeping and access to extension services. The data were coded and analyzed[2] using LIMDEP 9.0 econometric software (LIMDEP, 2011).

Socio-economic characteristics

Based on the 200 fish farmers who responded to the questionnaire, over 70% were new entrants with less than 10 years of fish farming experience. More farms cultured tilapia and catfish compared with any other fish species. When asked to indicate the species grown for their previous harvest, the majority (82%) reported tilapia. Most farmers (70%) produced fish for family consumption, but often sold off surpluses at local markets. The majority (61%) of the farms surveyed solicited additional labor (hired 1 to 5 people) during harvest. The average smallest table fish harvested was less than 500 grams while the average largest market fish ranged between 500 and 1000 grams. This appeared to be related to fish species, pond size and the target market. A good number of the respondents fed their fish with maize bran (47%), followed feeds manufactured by Ugachic (24%), but a sizeable proportion (about 8%) also used crop leaves and pellets. Nearly all of the farmers interviewed cultured fish in ponds rather than cages. A high number of farmers (64%) owned between 1 and 2 ponds and used rented harvesting nets.

The day-to-day management of the ponds on 67%of the surveyed farms was under family labor with an average pond size of approximately 500 m^2. Survey responses reveal that most small scale fish farmers in the region used fingerlings from a variety of sources with the most common source being Kajjansi fisheries institute (58%), followed by Mpigi and Umoja fish farm. The stocking density of fingerlings ranged between 100 and 9,000/pond depending on pond size with most farmers stocking between 351 and 550/pond. Compiled data from follow-up discussions with respondents revealed that most farmers were not aware of the recommended stocking density. Consequently, some ponds were overstocked while others were under stocked. Only 45% of the farms surveyed reported making a profit from the previous completed harvest. Although many farmers regarded fish farming as a source of income, it was not considered as important as other income sources, but rather one that could be used sporadically. The majority of the farms (60%) sold live fish and over 90% of the farms used personal funds to finance their production enterprises. The majority (75%) of the respondents were not associated with any farmers' organization. Only 48% of the farms kept some form of written records, related mainly to production costs. Half of the respondents (50%) reported using extension specialists with the other half relying on their own experience or advice from other farmers. The length of the production cycle (from stocking to harvest) ranged between 6 and 9 month for the majority (60%) of the farms surveyed.

The cost structure

The cost structure for the 200 fish farms surveyed is presented in Table 1. On average, total production costs for one stocking cycle amounted to approximately US$864, of which 93% (US$801) represent variable costs while fixed costs account for only 7 percent (US$63). The observed cost structure in central Uganda is comparable to the cost structure observed in other Sub-Saharan Africa countries (Ugwumba and Chukwuji, 2010) showing higher variable costs (98.06%) and low fixed costs (1.94%). Approximately 85% of all variable costs in the study region were spent on seeds, production labor and feeds.

Profitability analysis

Profitability analysis is based on enterprise budgets developed using data collected from the 200 fish farms and secondary

[2] Correlation analysis and variance inflation factor (VIF) were used to check for multicollinearity. The low estimated correlation coefficients across variables and the low VIF estimate of 1.67 revealed no multicollinearity problems.

Table 2. Profitability results for small-scale aquaculture farm in central Uganda.

Variable	Ushs.	US$*
Total costs (TVC+TFC)	1,727,691	863.8455
Total revenue (TR)	1,809,229	904.6145
Gross margin (TR-TVC)	207,098	103.549
Net farm income NFI (GM-TFC)	81,538	40.769
Net return on investment (NFI/TC)		0.05

*Exchange rate: US$1 = Ushs 2000.

sources. Particularly, enterprise budgets provided a representation of estimates of specific inputs and outflows associated with aquaculture production system. These estimates included profits in the form of cash receipts (revenues) and costs associated with production cycles pertinent to small-scale fish farming in central Uganda. The computed margin were of the form:

GM = TR – TVC (1)

where, GM = Gross Margin; TR = Total Revenue; TVC = Total Variable Cost

Net Farm Income (NFI) = GM-TFC or TR-TC (2)

Where, TFC= Total fixed costs; TC=Total costs

Net Return on Investment (NROI) =NFI/TC (3)

In the above equations, (GM) is defined as the difference between total revenue and total variable costs while NFI is the difference between gross margin and total fixed costs.The profitability results are reported in Table 2, indicating that on average, a small-scale fish farm (500 m^2 average pond size) in central Uganda generated US$104 in gross margin and US$41 in net farm income per pond during the 2009/2010 production cycle. Since a positive NFI means that an enterprise is profitable and worth undertaking, the results suggest that small-scale fish farming in central Uganda is a viable enterprise. The estimated net return on investment is estimated at 0.05, indicating that for every US$1 invested in small-scale fish farming, US$0.05 is generated in return. Although positive, the observed net returns on investment are too low to attract potential investors in the aquaculture sub-sector. It is necessary therefore, to identify the factors that might influence gross margin of small-scale aquaculture enterprises in the region.

Determinants of profitability

The previous section used enterprise budgeting to examine the profitability of small scale aquaculture production in central Uganda. requirements. As previous studies have noted, farm records are the This section employs linear regression model to examine the factors that influence profitability as measured by gross margin.
The estimated linear equation takes the form:

$$\pi_I = \beta X_I + \varepsilon_I \quad (4)$$

Where the dependent variable (π) represents estimated gross margin for the 200 selected small-scale fish farms in central Uganda, β are coefficients to be estimated, i represents the farm/farmers surveyed, X is a vector of independent variables hypothesized to influence gross margin and ε represents the error term assumed to have a zero mean and constant variance. Definitions and descriptive statistics of the selected independent variables are presented in Table 3. They include pond size, feed cost, number of fingerlings stocked, presence of hired pond manager, length of production cycle, membership to farmers' association, access to extension services, record keeping, years of experience, fish price and harvested volume.

First, pond size is one critical variable upon which output in fish farming depends. This variable is measured by the reported average pond size on each of the surveyed farm, and was hypothesized to have a positive effect on profitability. Feed cost is another important factor in aquaculture production that affects economic potential. The most important factors affecting feed cost per pound of fish production include the price of feed and feed conversion ratio. As Rubino (2008) has noted, the effect of feed costs per pound of fish vary depending upon the type of feed, species, feeding technology, and other factors affecting growth and survival rates of fish, including water quality. He posits that two opposing trends are likely to affect future feed costs per pound for aquaculture. On one hand, the price of feed may increase as rising feed demand puts upward pressure on prices of fish meal and fish oil, which are major inputs to feed production. On the other hand, rising prices of feed will increase farmers' incentives to reduce feed costs by improving feed conversion ratios. This may be done in a number of ways, such as reducing fish mortality, developing better feeds that fish are able to utilize more efficiently, improving the timing and method of feeding, utilizing more vegetable-based feeds, and shifting production from carnivorous species to non-carnivorous species (Rubino, 2008). In this study, feed cost was represented by the reported cost of feeds during the last harvest and was hypothesized to have a negative effect on profitability.

Record keeping is another variable included in the profitability model. Records for fish farming are not just a means by which one assesses total inputs and outputs. They are the only source of information by which farmers can adjust daily management only most reliable way, of evaluating performance and making in management are improving production performance and future plans (Killan et al., 1998; Pomeroy, 2003; Mwangi, 2008; Auburn University, 2010). Farm records can demonstrate if changes the farms' economic returns (Auburn University, 2010). In this study, record keeping is measured using a dummy variable coded 1 if the farmer kept farm records, 0 otherwise. The variable was hypothesized to have a positive influence on profitability. The number of fingerlings stocked was another independent variable included in the model and was hypothesized to have a positive influence on profitability.

Predators can cause significant economic losses by creating

Table 3. Descriptive statistics and variable definitions.

Variable	Mean	Std. Dev.
Gross margin (US$)	247.929	828.990
Pond size (m^2)	519.577	471.577
Number of fingerlings stocked	3177.800	8955.240
Hired pond manager (1=yes, 0 otherwise)	0.328	0.471
Production cycle (months)	11.330	11.619
Membership to a farmer group (1=yes, 0 otherwise)	0.250	0.434
Access to extension services (1=yes, 0 otherwise)	0.510	0.501
Record keeping (1=yes, 0 otherwise)	0.480	0.501
Fish farming experience (years)	7.655	6.505
Price of a unit of fish (US$/kg)	1.268	0.607
Volume of fish harvested(kgs)	1376.440	1521.000
Cost of feeds (US$)	155.953	133.192
Predators (1 if ranked 1st as major constraint, 0 otherwise)	0.180	0.385

direct economic costs to farmers through damage to nets, loss of stock and feed as well as posing a risk in terms of spread of disease. Bird predators for instance, may cause significant losses to aquaculture production by transmitting or transporting diseases, weed seeds, and parasites from pond to pond or from one facility to another (Curtis et al., 1996). This variable enters the model as a dummy variable coded 1 if the farmer reported predators as a major constraint to fish farming and is hypothesized to have a negative effect on profitability.

Managerial experience is expected to have a positive effect on profitability and entered the model as a dummy variable coded 1 if the farm is managed by a hired manager, 0 otherwise. Access to production and marketing information was measured using two variables: membership to group associations and access to extension services. Each of these variables was hypothesized to have a positive effect on profitability and was represented by a dummy variable coded 1 if the farmer reported membership to a farmer group or, group associations; had access to extension services during their last completed production cycle, in case they had access to extension services; and 0 otherwise. Other variables including length of the production cycle (months), volume of fish harvested during the last completed production cycle, price of a unit of fish sold and number of year in fish farming,were all hypothesized to have a positive effect on profitability.

RESULTS AND DISCUSSION

The results of the ordinary least squares (OLS) regression are presented in Table 4. The estimated measure of goodness of fit (R-square) indicates that the model explains approximately 66% of the variability in profitability of the aquaculture enterprises. In case of the explanatory variables, the model revealed that eight of the twelve hypothesized variables were statistically significant at $p<0.05$ level or higher including pond size (+), predators (-), feed cost (-), volume of fish harvested (+), record keeping (+), years of experience (+), and price (+), all with the expected signs. Each of these variables is discussed below.

The positive contribution of pond sizeto profitability is accentuated by the regression results. Since profitability is a function of both price and fish yield, the results concur with previous studies (Islam, 1987; Islam and Dewan, 1986; Khan, 1986; Inoni and Chukwuji, 2000) which showed pond size to be a significant factor in explaining fish yield. The positive and significant effect of pond size implies a direct relation between the variable and profitability. That is, as pond size increases given other inputs, profitability will increase. Therefore, if other inputs are available to expand production, the farmer will have to expand the size of the pond if existing ponds are stocked to their optimum capacity to increase profitability.

In line with previous studies (Isyagi, 2007; Mwesigwa, 2008), the estimated coefficient for the fish price variable has the hypothesized positive effect and has the strongest effect of all the significant variables in the model. This finding has some implications for aquaculture producers in central Uganda. Firstly, the latest data show local fish prices to be rising as a result of the low fish supply, whereas ten years ago fish was the cheapest source of animal protein in the country; it is now as expensive as beef (Auburn University, 2010). Secondly, although the current fish price trends are making aquaculture more economically viable than it was few years ago, the cost of inputs is also rising. Therefore, fish farmers must closely follow prices and have contingency plans for times when input costs rise faster than market price (Auburn University, 2010).The effect of input costs on profitability is represented by the variable feed cost.The estimated coefficient for the variable is negative, implying that increasing feed cost exerts downward pressure on expected farm returns in the study area. Existing data suggests that access to balanced feed is still a major challenge in the region and as indicated in the survey, most farmers are still using maize bran, which is said to be of poor quality. The inverse relationship

Table 4. Factor affecting the arofitability of fish production in central Uganda.

Dependent variable = Gross Profit (US$)				
Variable	**Coefficient**	**Std. Error**	**t-value**	**p-value**
Constant	-6.899	4.325	-1.595	0.112
Pond size	0.291***	0.109	2.656	0.009
Number of fingerlings stocked	-0.665	0.376	-1.768	0.079
Hired pond manager	0.003	0.504	0.005	0.996
Predators	-1.170**	0.532	-2.200	0.029
Cost of feeds	-0.422**	0.179	-2.359	0.019
Membership to a farmers' group	-0.441	0.388	-1.136	0.258
Access to extension services	0.008	0.008	0.984	0.326
Record keeping	0.042***	0.015	2.811	0.005
Fish farming experience	0.987**	0.427	2.311	0.022
Price of a unit of fish	1.220**	0.536	2.276	0.024
Volume of fish harvested	0.177***	0.036	4.962	0.000
Production cycle	-0.120	4.299	-0.028	0.978
Adjusted R^2 = 0.66				
Sample size = 200				
Model test: F[12, 188] = 7.13, Prob. value = 0.00000				

*** and ** are significant levels at 1 and 5%, respectively.

between feed cost and farm returns foundin the study may be attributed to this situation. Similarly, the estimated coefficient for the variable measuring fish predators in the study region has the hypothesized negative sign, implying that the presence of predators exerts downward pressure on profitability. This finding is supported by previous studies (Be'er, 1995; Shy and Frankenberg, 1995), which have noted that predators can kill or wound fish, damage equipment; resulting in losses through escapes, stress fish, resulting in reductions in appetite, which in turn causes poor growth and reduced resistance to diseases. These, in turn, cause poor production and profitability (Be'er, 1995; Shy and Frankenberg, 1995).

Any analysis of the aquaculture business, whether financial or biological, is dependent upon sound information (Killan et al., 1998; Pomeroy, 2003; Mwangi, 2008; Auburn University, 2010). The effect of this variable is measured through a dummy variable measuring record keeping, and the estimated coefficient has the hypothesized positive effect, thus supporting the views expressed by Pomeroy (2003) that, accurate, detailed and complete records can help the aquaculturists to provide control over the business and improve the management and efficiency of the farm, provide a basis for farm credit and financing, determine the relative profitability of various production techniques or systems, and provide information for government programs (Pomeroy, 2003).The estimated coefficient for the experience variable implies that years of fish farming are positively correlated with profitability. This result is in line with other studies (Ugwumba and Chukwuji, 2010).

Similarly, the result for the volume of fish harvested implies that the higher the volume harvested, the higher the revenue. Ugwumba and Chukwuji (2010) and Ugwamba (2010) registered similar results in Nigeria. Other variables including hiring a pond manager, membership to a farmers' group, access to extension services, number of fingerlings stocked and length of production cyclewere shown to have no significant influence on profitability in central Uganda. It is paramount to note though, that lack of statistical significance does not necessarily mean lack of importance, especially for an infant sub-sector such as the one studied here with the various constraints as highlighted below.

Constraints to fish farming in Central Uganda

A summary of the reported constraints is presented in Table 5. Fish predators (that ranged from birds, to snakes and other wild animals) were identified to be the most serious constraint to fish production, as reported by 51 percent of the respondents. Scarcity of feeds came second in being another serious constraint leading to high production cost. This finding is in agreement with the findings of Ocmer (2006) and Ugwumba and Chukwuji (2010), who reported high cost of feeds as a very serious constraint to fish production.

Another constraint was lack of capital. Fish farming is a capital intensive enterprise thus requiring big capital investment for reasonable profit to be made (Ugwumba and Chukwuji, 2010). Poor quality fingerling was another

Table 5. Constraints facing fish farmers in the study districts (n=197).

Variable	Percentages*
Lack of water	6.1
Expensive feeds	41.6
Scarce feeds	6.6
Lack of market	19.3
Predators of fish	50.8
Poor quality fingerlings	22.3
Lack of extension services	14.2
Poor weather	3.0
Thieves	17.8
Expensive labor	3.6
Lack of capital	39.1
Poison	1.0
Pond flooding	7.1
Lack of harvesting net	6.1
Insufficient equipment	5.6
Leaking ponds	1.0
Overstocked ponds	1.0
Poor transport	2.0
High maintenance cost	6.6

*Percentages do not add to 100 due to multiple responses.

serious problem as reported by 22% of the farmers. Many farmers complained of poor fingerlings, which in some cases did not grow to the farmers expectations. This result supports earlier conclusions indicating that access to fingerlings is a serious constraint (Isyagi, 2007).

Conclusion

The objectives of the study were to assess the profitability of small scale aquaculture enterprises, determine factors affecting the profitability of such enterprises, and assess the constraints faced by small-scale fish farmers in the study region. To address these objectives, both descriptive and econometric analyses were conducted using data collected through field survey administered in 2010. The descriptive results showed that many farmers had spent close to eight years in the fish business and owned 1 to 2 ponds measuring 500 m^2 on average. The major constraints included: predators, expensive fish, and lack of capital in that order. In terms of fish enterprises fish farming was found to be a profitable business as evidenced by the average gross margin value of US$104 per cycle and net farm income of US$41. Net returns of investment of 0.05 implied that for every US$1.0 invested in the fish farming business, US$ 0.05 was generated in return. The data also revealed that farmers incurred higher variable costs (92.8%) than fixed costs (7.3%) with the majority of the variable costs attributed to feeds and fingerings. It is imperative that government institutes policies that encourage private individuals and commercial farms with capital to venture into production of good quality feeds and fingerings to reduce the observed high variable costs. This will in-turn go increase fish yield which was found to be relevant in increasing profits. Along with improving available feeds and fingerlings, improvement in provision of extension services, which can substitute experience is very vital for transforming Uganda's aquaculture subsector from substance to commercial venture.

In closing, while the findings of this study highlight some significant variables in determining the profitability of small-scale fish farming, some limitations must be considered. First, we have examined an industry that is prevalent with market imperfections at the production, harvesting, and marketing levels. Second, the common-property characteristic of the basic resource is well known. Finally, the small sample size of our dataset warrant some caution when drawing broader conclusions from the results. Amidst these limitations, aquaculture has gradually gained recognition and is currently being promoted as a sector to provide, employment, food security and eradication of poverty. Because of this recognition, it has become imperative to provide empirical data to guide policymakers in making informed decisions. Thus the importance of this study cannot be overemphasized.

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