UNDERSTANDING THE FISH FARMING CONSTRAINTS: EXPERIENCES FROM THE FISH FARMERS OF SAMDRUPCHOLING SUB-DISTRICT

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ABSTRACT: This case study was conducted to understand constraints to fish farming in Samdrupcholing Dungkhag. The technical staff of the Regional Centre for Aquaculture (RCA), Department of Livestock (DoL), Phuntshothang were used to collect data from all known fish farmers under Samdrupcholing Dungkhag. The study revealed that majority of the farmers (88.89%) were male, with larger proportion of age group (29.63%) are between 41-50 and 61-70 years of age. Majority (55.56%) of the fish farmers are illiterate while 51.85% of them have more than 11 years fish farming experience. Almost all (92.59%) the respondents are Hindu religion followers and farming (85.19) as primary occupation. Analysis of constraints in fish farming showed that unavailability of fish feed and pest/predators are the major constraints while water availability, technical knowledge of the farmers and inadequate capital were ranked as minor constraints deterring the fish farming in the region. Of the listed constraints, unavailability of fish feed, pest/predators, inadequate capital and water availability are more important because these constraints exist at severe to very severe level while technical knowledge and inadequate capital in constraints to severe level.

Keywords: Constraints; fish farming; fish farmers;

1. INTRODUCTION

Fish farming has seen appreciable growth in the recent years in the Southern Dzongkhags (district) of Bhutan. According to data from the National Research and Development Centre for Aquaculture (NRDCA), Gelephu, as of 2020, there were 506 fish farmers operating 667 functional fish ponds, with an overall fish production of 181.65 MT as reported in Thinley et al. (2022).

In particular, Samdrupcholing Dungkhag, a sub-district in Samdrup Jongkhar Dzongkhag (district) has a long-standing history of fish farming, dating back to 1980s. Currently, there are around 47 fish ponds in Samdrupcholing Dungkhag. However, the final turnover in terms of fish produced are not congruent to the production potential. Despite the concern over the low productivity of fish as compared to the inputs supplied, limited efforts have been made to investigate and understand the challenges that impede fishery sector development in the dungkhag. In light of this, the current study was carried out to assess and identify key challenges faced by the small-scale fish farmers of Samdrupcholing Dungkhag. The findings from this study will provide valuable insights and support the development of effective strategies to address the identified challenges and promote sustainable growth in the fish farming sector.

2. MATERIALS AND METHOD

2.1 Study area

Due to movement restrictions amid COVID-19 pandemic, the study was confined to areas

under Samdrupcholing Dungkhag. The Dungkhag consist of four Gewogs viz: Martshalla, Pemathang, Phuntshothang and Samrang. Fish farming is feasible in all Gewogs except Martshalla, due to unsuitable climate and topography. In 2021, RCA, Phuntshothang recorded 47 functional fish ponds across three Gewogs: 25 in Phuntshothang, 16 in Pemathang and 6 in Samrang Gewog. Phuntshothang Gewog is located in subtropical area and receives 2,500 mm to 4,000 mm rainfall over a year with an average annual temperature recorded of 25^0C (RNR Centre, Phuntshothang). The altitude of the study area is 250 meter above sea level (masl). The wet season extends from May to August with the peak rainfall in June and July and the area experiences dry season from November to January.

2.2 Data collection and analysis

Due to limited resources and the COVID-19 pandemic, which prevented randomized sampling, the respondents for this study were purposively selected using the farmers' list maintained with the farm. Technical staffs of the Centre carried out the assessment and data collection. Data was collected on two key aspects: the socio-economic characteristics; and constraints to fish farming practices in the area. In total 27 respondents were selected for the assessment.

The data on fish farming constraints was collected using a four-point scale adopted by Dauda et al. (2015) which included; not a constraint, not severe, severe and very severe. All data collected were analyzed using descriptive statistics, however, to elicit important constraints, four points Likert scale was used as described by Tsado et al. (2012) and Umunna et al. (2020), 4 = Very severe, 3 = Severe, 2 = not severe, and 1 = not a constraint. The mid points were summed up (1+2+3+4) to 10 and divided by 4 to obtain a mean of 2.5. Any constraints with a cut-off of 2.5 and above is regarded as major constraint, those between 1.5 and 2.4 is regarded as a minor constraint while those below 1.5 is classified as not a constraint.

3. RESULTS AND DISCUSSION

3.1 Socio-economic characteristics of fish farmers

The results of the socio-economic characteristics (Table 1), revealed a significant majority of male respondents (88.89 %), while female accounted for only 11.11 % of the sample. The finding is consistent with the findings by Dauda and Yakubu (2013) and Umunna et al. (2020), which also reported a male-dominated participation in fish farming. The observation aligns with the traditional gender roles in the local community, where males assume leadership positions and a primarily responsible for agricultural activities, including fish farming. Further, Umunna et al. (2020) justified that the male dominance implies the laborious nature of fish farming operations which may be very tedious for females to handle as well as the involvement of the female in the domestic affairs of the household.

Respondent ages ranged between 20 and 70 years. Notably, the two age groups that exhibited the highest level of activity in fish farming were the 41-50 and 61-70 age groups, both accounting for 29.63% of the respondents. This finding highlights the significance of these age groups as major contributors to fish production. Similar result was observed by Fagun et al. (2020) in a study conducted in Habiganj Sadar Upazila under the district of Habiganj, Bangladesh, wherein 30% of the respondents recorded were between age group of 41-50 years. This patterns suggests that individuals in these age group typically play a crucial role in fish farming.

The respondents between the age of 20 and 30 accounted for 11.11% while double of it fell within the 31and 40 years age range (22.22%).

The least (7.41%) age group recorded was between 51 and 60 years. Four educational categories were used to determine the level of education. Out of 27 fish farmers, 55.56% of the respondents were illiterate, 40.74% had primary level education and 3.70% had attained a secondary level education. No respondents reported having attended the Non-Formal Education (NFE). It was observed that illiterate farmers dominated the fish farming in Samdrupcholing Dungkhag contrary to the findings of Fagun et al. (2020) who reported that that 86.67% respondents to be educated fish farmers. It was also evident that the emerging groups supporting the growth of fish farming are those with primary school (40.74%) and secondary school (3.70%) qualification.

Table 1: Socio-economic characteristics of the fish farmers

Characteristics	Frequency	%
Sex		
Male	24	88.89
Female	3	11.11
Total	27	100.00
Age		
20-30	3	11.11
31-40	6	22.22
41-50	8	29.63
51-60	2	7.41
61-70	8	29.63
Total	27	100.00
Educational Level		
Illiterate	15	55.56
NFE	0	0.00
Primary school	11	40.74
Secondary School	1	3.70
Total	27	100.00
Fish farming experience		
1-5 years	6	22.22
6-10 years	7	25.93
> 11 years	14	51.85
Total	27	100.00
Religion		
Hindu	25	92.59
Buddhism	2	7.41
Others	0	0.00
Total	27	100.00
Primary occupation		
Farmer	23	85.19
Civil servant	0	0.00
Corporate employee	1	3.70
Private Business	3	11.11
Total	27	100.00

These educational backgrounds are important as they enable fish farmers to learn new skills and enhance their knowledge of fish farming, contributing to the development of aquaculture (Dauda et al., 2015). Interestingly, none of the respondents in the study area had NFE or a higher qualification than secondary level. Adelodun (2015) reported that the lesser participation of qualified younger generation in fish farming is due to preference of the "neat" white collar job with the attractive working environment.

Majority of the farms (51.85%) in the study area have been in operation for more than 11 years. Farms with 6-10 years of operation accounted for 25.93% followed closely by those with 1-5 years of operation (22.22%). Fagun et al. (2020) found a significant positive relationship between the farming experience and production, indicating higher production among farmers with more farming experience. In terms of religion, Hindu farmers dominated the fish farming activity (92.59%) while Buddhist farmers constituted only 3.70% of the respondents. The findings support the report by Dorji (2017) who stated that fish farming is primarily concentrated in the southern part of the country and predominantly undertaken by Hindu farmers. Interestingly, none of the respondents in the study area stated fish farming as their primary occupation. Majority (85%) reported agriculture as their primary occupation which aligns with the findings of Ali et al. (2010). However, a small percentage of private businessmen (11.11%) engaged in backyard fish farming as a secondary business, which is similar with the findings of Ali et al. (2008).

3.2 Fish farming constraints

Constraints were categorized into four groups viz: Resources, socio-cultural, technical knowledge and services, and market constraints.

3.2.1 Resource constraints

In general, capital investment is a common challenge for fish farmers, especially for those from marginally subsistence background who rely mainly on agriculture. This is often due to lack of access to agricultural loan (Dauda et al. 2015). The analysis in Table 2 shows more than half of the respondents (55.6 %) did not consider capital investment as a constraint, while 44.6% classified it as a constraint, with some facing severe difficulties. In terms of access to fish seed, the majority of respondents (88.9 %) reported it not being a constraint, while 11.1% considered it a constraint. As per the Regional Centre for Aquaculture (RCA), the issue may be related to the quality of fingerlings supplied in terms of age and sizes. Ensuring the availability of superior quality fingerlings is of paramount importance to enhance productivity and sustainability of fish farming operations. Adedeji and Okocha (2011) recommended the supply of uniform sized fingerlings of the same age to minimize post-stocking mortalities.

Land is considered the most crucial production input in aquaculture (Adedeji & Okocha 2011). In Samdrupcholing, the majority fish farmers (63%) expressed that land was not a significant constraint for fish farming. Very few respondents reported limited land as a severe constraint, while 29.6% considered it a constraint. With regards to support from the government, 44.4 % of the respondents still regarded it as inadequate. Pandey and Dewan (2006) emphasized that incentives, particularly subsidies, play a vital role in encouraging and motivating potential farmers to take up fish farming activities. Lack of adequate fish feed was reported as a constraint across all the study area with majority (70.4%) of the respondents identifying it as a severe constraint, and 18.5% and 11.1% of the respondents reporting it as constraint and very severe constraint respectively. The Likert scale ranking revealed that the unavailability of fish feed was a major constraint within the resource constraint category. This finding aligns with the suggestions of Malla and Behera (2019) who recommended formulation of low-cost feed using appropriate combination of locally available cheap feed ingredients.

3.2.2 Socio-cultural constraints

Table 3 presents an overview of the socio-cultural constraints faced by the fish farmers in the study area. Analysis of these constraints revealed that pest and predators pose a significant a constraint to fish farming in the study area. This finding aligns with the observations made by Akpabio and Inyang (2007), who emphasized the detrimental impact of predators on fish farmers, resulting in substaintial economic losses.

Among the various predators identified by the respondents, the otter was reported as the most common threat. Interestingly, theft and poaching were not identified as a constraint in study area, which could be attributed to the proximity of fish ponds to the farmers' residences, enabling easy monitoring and protection by the family members. However, it is worth noting that 11.1% of the respondents did report theft and poaching as a constraint affecting their household income. This finding aligns with the report by Pandey and Dewan (2006), highlighting the prevelance of theft and poaching as major inhibiting factors in fish farming in certain regions, particularly due to rivalry, enmity or jealousy. Support from family members is crucial in fish farming. The study revealed that, majority (92.6 %) of the fish farmers receive full support from the family members, which is instrumental in their operation.

Table 2: Resource constraints faced by the fish farmers

Variables	Not a constraint (%)	Constraint (%)	Severe (%)	Very severe (%)	Sum	Mean	Overall Rating
Inadequate capital	15 (55.6)	7 (25.9)	4 (14.8)	1 (3.7)	45	1.6	Minor constraint
Fingerlings supply	24 (88.9)	3 (11.1)	0 (0.0)	0 (0.0)	30	1.1	Not a constraint
Inadequate land	17 (63.0)	8 (29.6)	2 (7.4)	0 (0.0)	39	1.4	Not a constraint
Inadequate subsidy support	15 (55.6)	12 (44.4)	0 (0.0)	0 (0.0)	39	1.4	Not a constraint
Unavailability of fish feeds	0 (0.0)	5 (18.5)	19 (70.4)	3 (11.1)	79	2.9	Major constraint

Table 3: Sociocultural constraints faced by the fish farmers

Variables	Not a constraint (%)	Constrai nt (%)	Severe (%)	Very severe (%)	Sum	Mean	Overall Rating
Pest/Predators	1 (3.7)	6 (22.2)	11 (40.7)	9 (33.3)	82	3.2	Major constraint
Theft/poaching activities	24 (88.9)	3 (11.1)	0 (0.0)	0 (0.0)	30	1.1	Not a constraint
Family support	25 (92.6)	2 (7.4)	0 (0.0)	0 (0.0)	29	1.1	Not a constraint

Table 4: Technical knowledge and services constraints

Variables	Not a constraint (%)	Constraint (%)	Severe (%)	Very severe (%)	Sum	Mean	Overall Rating
Technical knowledge of farmers	12 (44.5)	9 (33.3)	6 (22.2)	0 (0.0)	48	1.8	Minor Constraint
Technical expertise from extension agents	18 (66.7)	7 (25.9)	2 (7.4)	0 (0.0)	38	1.4	Not a constraint
Disease infestation	23 (85.2)	3 (11.1)	1 (3.7)	0 (0.0)	32	1.2	Not a constraint
Water availability	14 (51.9)	6 (22.2)	1 (3.7)	6 (22.2)	53	2.0	Minor Constraint

However, a small percentage (7.4%) of respondents reported lack of support as a constraint. It is important to consider the age factor of the farmers and the social stigma associated with fish farming within the community.

3.2.3 Technical knowledge and expertise service constraints

Technical knowledge of farmers refers to awareness on best practices and effective management of fish ponds such as fish stocking, feeding, pond management, manuring and harvesting of fishes.

The findings presented in Table 4 revealed that the majority (44.5%) of the respondents possess good technical knowledge of fish farming, while 33.3% and 22.2% responded

as a constraint and severe constraint respectively. These findings are consistent with the study conducted by Goswami and Samajdar (2011) who also observed that majority of fish farmers had a medium level of knowledge regarding fish culture practices. It is worth noting that those respondents who reported technical knowledge as a constraint were typically fish farmers who had recently taken up fish farming with limited farming experience.

In terms of the technical expertise rendered by the extension agents, 66.7% of the respondents rated it as satisfactory, while 33.3% expressed dissatisfaction with the extension services. This finding contradicts with the observations of Malla and Behera (2019), Dauda and Yakubu (2013) and Adedeji and Okocha (2011) who all identified low level of technology adoption of fishery and low fish production is due to lack of extension service. The study revealed that disease infestation is not a constraint to majority of fish farmers in the study area (85.2%). This could be attributed to the subsistence nature of fish farming practiced by most marginal fish farmers in the area.

Majority (51.9%) of the respondents reported water availability is not a constraint, which is consistent with the findings of Dauda and Yakubu (2013). However, 22.2% of the respondents reported it as a constraint, with 3.7% considering it as a severe constraint and 22.2% perceiving it as a very severe constraint. These findings align with the statement by Adewumi (2015) that without assured, adequate and good quality water supply, fish production would be impossible. Water availability, along with quality feed and proper feeding practices is one of the most critical factors in fish production.

The Likert scale ranking concluded that of the selected variables, technical knowledge and water availability are minor constraints to fish farming in the area.

3.2.4 Market constraint

The findings of the study strongly indicate that Samdrupcholing offers a promising and guaranteed future market opportunity for fish, as all the respondents (100%) reported that market is not a constraint in the area. According to Adedeji and Okocha (2011), marketing is defined as all processes involved from the production of a commodity till it reaches the final consumer. In the context of fish farming, factors such as population size and the availability of basic facilities such as well-connected roads and proper preservation facilities play a crucial role in marketing chain.

4 CONCLUSION & RECOMMENDATIONS

Fish farming in Samdrupcholing Dungkhag faces various constraints that hinder its growth and production. These constraints ranging from moderate to severe to very severe, need to be addressed in order to ensure success of fish farming in the area. The results of the Likert scale ranking revealed that the unavailability of fish feeds and pests and predators as the major constraints affecting fish production and income generation. Other notable but minor constraints included the lack of technical knowledge among farmers, water availability and inadequate capital. However, it is worth noting that, market constraints were not reported by any of the respondents, indicating a positive market outlook for fish farming in the area. To address these constraints, the following interventions are recommended.

- ✓ Attempts should be made to encourage private sector involvement in fish feed production, through low-interest loans to solve the major constraint of fish feed constraint.
- ✓ Implementing practical measure to control predator-related issues, especially otter predation. Installing fences around fish farm has proven to be an effective measure in minimizing otter predation.
- ✓ Providing training and awareness programs to fish farmers to enhance their technical knowledge and equip them with

best practices and effective fish pond management techniques. Extension agents can play a vital role in delivering these training programs.

- ✓ Establishing improved access to capital for fish farming through collaborations with financial service providers. This will enable farmers to scale up their operation from small-scale to commercial level.
- ✓ A mandatory record keeping to be instituted throughout the whole fish production cycle to assess the profitability and future planning.
- ✓ Continuing government support in the form of subsidies to sustain fish farming activities and boos production in the area.

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