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Production economics of striped catfish (*Pangasianodon hypophthalmus*, Sauvage, 1878) farming under polyculture system in Bangladesh

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ABSTRACT

The present study assesses the production costs, profitability and the importance of inputs (seed, feed, fertilizer and labor) in striped catfish (*Pangasianodon hypophthalmus*) production under polyculture system in Bangladesh. A survey was conducted by structured questionnaire during November 2011–June 2012 that included 201 pangasius farmers of four locations, namely Bogra, Jessore, Mymensingh and Narshingdi districts. Based on the aquaculture operation area and management characteristics, these farms were categorized into small, medium and large scale farms. The average annual production costs, gross income, net income and benefit cost ratios were higher ($P \geq 0.05$) in medium farms, followed by small and large farms and these parameters varied significantly ($P \leq 0.05$) between farm locations. The Cobb-Douglas production function model was applied to evaluate several independent variables (inputs) related with fish production. The results showed that feeding and stocking density were the most significant factors influencing fish production. The analysis also showed an increasing return to scale, implying an increase in inputs will more than proportionately increase production. The estimated marginal physical productivity of the inputs suggests that stocking density, feeding and labor should be increased in order to increase farm profitability. However, some inputs were inefficiently used by different farm categories. Based on the findings of this study, it is recommended that farmers should consider more attention on the use of these inputs more efficiently in order to facilitate a sustainable increase in fish production.

1. Introduction

Striped catfish (*Pangasianodon hypophthalmus*) also known as *pangasius* or locally as *pangas* or *Thai pangas*, is an important fast-growing aquaculture commodity in the Asian region, particularly Vietnam, Thailand, India, Myanmar, Indonesia and Bangladesh (Phan et al., 2009; Ali et al., 2013). Pangasius farming is a significant component of aquaculture production in Bangladesh with a total production of 494,357 t in the fiscal year 2015–2016, accounting for 29% of the total farmed fish supply in the country (DoF, 2017a). Commercial pangasius production was first started in 1993 (Ali and Haque, 2011) and it has rapidly developed into an economically significant activity (Ali et al., 2013). The species possesses several characteristics that have helped drive this growth: good survival rates, fast growth, large size and a high market demand (Sarker, 2000). Additionally, it can be stocked at a much higher density in ponds compared with other aquaculture species (Alam, 2011). As a result, pangasius farming has rapidly established itself as an important aquaculture industry in Bangladesh.

The high capital requirements for commercial production have usually been thought to limit the potential for direct involvement by the resource-poor (Belton et al., 2014a). However, the development of intensive pangasius farming has benefited landless laborers by creating employment opportunities, particularly involving the provision of supporting goods and services in associated value chains (Ali, 2009; Belton and Azad, 2012; Ali et al., 2013). Pangasius farming generated a higher intensity of on-farm wage employment, resulting in higher wages and shorter working hours compared to agricultural labor (Belton et al., 2017). It has also created off-farm employment opportunities in areas such as feed mills, inputs trading (e.g. feed and chemicals), fish harvesting, transportation and marketing (Ali, 2009; Belton et al., 2017). This industry provides many livelihood opportunities with long backward and forward linkages for a wide range of value chain actors (Ali, 2009; Belton and Azad, 2012).

Fish is the main animal-source food consumed, accounting for 60% of animal protein intake (DoF, 2017b) and is the most frequently consumed nutrient rich food (Toufique and Belton, 2014) in Bangladesh.

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Legend


 Study Area

Fig. 1. Map showing the geographical distribution of the surveyed farms.



Pangasius is now the most consumed fish in rural areas of Bangladesh (Hernandez et al., 2017). It has a significant local market demand and almost all of the production is consumed domestically, providing a year round supply of animal protein to consumers in both rural and urban areas (Ali et al., 2013; Belton et al., 2014b; Hernandez et al., 2017). Pangasius aquaculture has improved access to fish among poor consumers in Bangladesh by increasing supply and reducing relative prices (Toufique and Belton, 2014; Belton et al., 2014a). Moreover, it has proven particularly popular among poor consumers in urban areas due to its low market value, arguably making it one of the most important cultured species for food security in Bangladesh (Belton et al., 2011).

There appears to be good potential for further development of this industry in Bangladesh. Considering the potential of pangasius as its vital role in food security for poorer consumers, its production needs to be increased through the targeted application of inputs that are readily available to farmers. Whilst several studies have been conducted in Bangladesh related to pangasius productivity (Ali et al., 2013; Jahan et al., 2015) only one study to date has focused on an economic analysis of different pangasius production systems (Ahmed et al., 2010).

Furthermore, the data on which the study of Ahmed et al. (2010) is based was collected in only one sub-district in 2006, since which production systems in Bangladesh have intensified further (Ali et al., 2013). It is therefore vital that the economics of pangasius production are reassessed in order to facilitate informed farmer decision making. The objectives of this study were to assess production costs, profitability and the role of inputs in pangasius production.

2. Materials and methods

2.1. Study area

This study was performed as part of the Cereal Systems Initiative for South Asia (CSISA) project funded by the United States Agency for International Development (USAID). The survey was conducted in Bogra, Jessore, Mymensingh and Narshingdi districts, which constitute the major pangasius production areas of Bangladesh (Fig. 1). The geographical distribution of Pangasius farms approximately corresponds with the major locations of pangasius hatcheries listed by Ali et al. (2013).

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