Research Application Summary

The effect of fish farming systems on water quality and community livelihoods in Mbale: A socio economic and biophysical assessment

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Abstract

Fish farming contributes to people's livelihoods, nutrition security, and foreign exchange. However, these potential may be achieved at the expense of the environment. This study determined the effect of fish farming on water quality and livelihoods of the communities in Mbale Sub region, eastern Uganda . The study was conducted between November 2010 and June 2011. Quality parameters were conducted at Best Buy Fish Farm located at 36N0630269, UTM0120510 in Mbale town. The results revealed that the water quality did not affect livelihoods for those practicing on small scale. Fish farming was beneficial: farmers educated their children (24.2%), bought assets (12.5%) and improved food consumption (9.2%). Challenges included: poor quality fish seed and shortage of feeds. Therefore, fish farming should be promoted by implementing policies that encourage Government/Partenership to invest in hatcheries in order to increase quality fries supply, and encourage research in quality feeds to improve farmers profit margins.

Key words: Aquaculture, food security, community livelihoods, Uganda, water quality

Résumé

L'élevage de poisson contribue aux moyens d'existence des populations, à la sécurité, à la nutrition et à l'obtention des devises étrangères. Toutefois, ces possibilités peuvent être réalisées au détriment de l'environnement. Cette étude détermine l'effet de la pisciculture sur la qualité de l'eau et des moyens d'existence des communautés de la sous région de Mbale, à l'Est de l'Ouganda. L'étude a été réalisée entre Novembre 2010 et Juin 2011. Les paramètres de qualité ont été menés à la ferme appelée «Best Buy Fish » situé à 36N0630269, UTM0120510 dans la ville de Mbale. Les résultats ont révélé que la qualité de l'eau n'a pas d'incidence sur les moyens de subsistance pour ceux qui pratiquent l'élevage de poisson à petite échelle. La pisciculture a été bénéfique: les

agriculteurs qui ont instruit leurs enfants (24,2%), ceux-là qui ont acheté les biens (12,5%) et ceux-là qui ont utilisé le revenu pour la consommation alimentaire améliorée (9,2%). Parmi les défis on peut citer: la mauvaise qualité des alevins et la pénurie d'aliments. Par conséquent, la pisciculture devrait être encouragée par la mise en œuvre des politiques qui encouragent le gouvernement / le partenaire à investir dans des écloseries afin d'augmenter la qualité des approvisionnements, et encourager la recherche de la qualité de nourriture pour améliorer les marges de profit des agriculteurs.

Mots clés: aquaculture, la sécurité alimentaire, les moyens de subsistance de la communauté, l'Ouganda, la qualité de l'eau

Background

Globally, fish farming is a source of income and livelihood for millions of people and is one of the activities for wise use of water resources as well as being a major contributor to food security in low income countries (Edwards, 2002; USAID, 2005; Khonder *et al.*, 2009; Waidbacher, 2009; FAO, 2010b). Fish farming provides a reliable and a non-seasonal supply of protein and supplements household income (Nwachukwa and Onuegbu, 2008; FAO, 2010). Small scale extensive culture systems have many non-quantified social values such as reducing poverty and driving development (Carballo *et al.*, 2008; Nwachukwa and Onuegbu, 2008; Kawarazuka, 2010; FAO, 2011). This community development in many cases is attained at the expense of the environment. There are limited studies which have attempted to document this phenomenon. This study attempted to determine the potential of fish farming in changing water the quality and its effect on livelihoods of the communities in Mbale, eastern Uganda.

Literature Summary

Fish farming impacts on the ecology of water bodies in different ways: pollution of water resources and soil, and depletion of underground aquifers (Sinh, 2009; Wattage, 2009). Many aquaculture practices affect the aquatic ecosystem by enriching recipient waters with nutrients and organic matter (FAO, 2006). This results in a build-up of anoxic sediments, changes in benthic communities, disruption, and restructuring of biological and/or social environments, competition for, and in some cases, depletion of resources. The aquaculture activity may easily be integrated into other farm and livelihood activities (USAID, 2005) and has potential to contribute to household incomes through integration with agriculture where waste water nutrients derived from fish ponds are used to fertilise crops and can also

be source of water for irrigation during the dry season (Kawarazuka, 2010).

Study Description

This study was conducted in the eastern part of Uganda, specifically in the three districts of Mbale, Sironko and Manafwa between November 2010 and June 2011. The water quality studies were done at Best Buy Fish Farm located at 36N0630269, UTM0120510 north of Mbale town where a semi-intensive production system is practiced. The experimental set up consisted of a water reservoir, three ponds selected randomly from total of seven with an average area of 6.3 m^2. Some water quality parameters and nutrient concentrations such as water temperature, Dissolved Oxygen (DO), Dissolved Solids (DS), pH, phosphates, nitrates, nitrites, ammonia and conductivity were measured monthly for the first half of the year 2011. For the second objective, a sample of 120 respondents was selected for livelihood analysis and data were collected using a structured questionnaire. Analysis of data was done using SPSS (social science) computer package to derive descriptive statistics.

Research Application

The analysis of variance (ANOVA) and Turkey test showed that there was no statistically significant difference ($p>0.05$) in water temperature, DO ($p=0.19$), DS ($p=0.54$), pH ($p=0.51$), conductivity ($p=0.48$), and ammonia ($p=0.24$) among the study sites and seasons. However, Secchi depth in the dry season was significantly different ($p=0.0008$). A Kruskal Wallis analysis of nutrients (nitrates ($p=0.74$), nitrites ($p=0.57$) and phosphate ($p=0.19$) revealed a statistically non significant difference among the study sites. Fourteen families of benthic fauna were recorded; the overall benthic population was estimated to be 32,350 numbers per square metre. The most abundant group was the Oligochaetes which made up 76% of the total number of invertebrates, followed by diptera which accounted for 23%. Multiple regression analysis showed no relationship between macro invertebrate density and environmental variables. Analysis of abundance using Simpson's index of diversity and Shannon Wiener's index (H), showed a variation in abundance: water source (0.63), reservoir (0.53), pond1 (0.68), pond 2 (0.35), pond 3 (0.51), outlet (0.32); and diversity: water source (0.59), reservoir (0.92), pond 1 (0.53), pond 2 (1.6), pond 3 (0.84), outlet (1.22). Benthic assemblage disturbance due to fish farming was minimal. The study results revealed therefore that the water quality did not affect livelihoods but caution need to be taken especially when fish farming is adopted on large scale. Results on objective three showed that majority of the

farmers (60%) benefited from fish farming in the study area (Fig.1).

There was increased food consumption (9.2%), social status (16.1%), 12.5% bought assets, and others educated their children (24.2%). Most households agreed that as a result of fish farming their food and fish consumption had increased (Fig. 1). The farmers expected to increase fish production through expanding the enterprise (64.2%) (Fig. 2), others hoped to increase fish

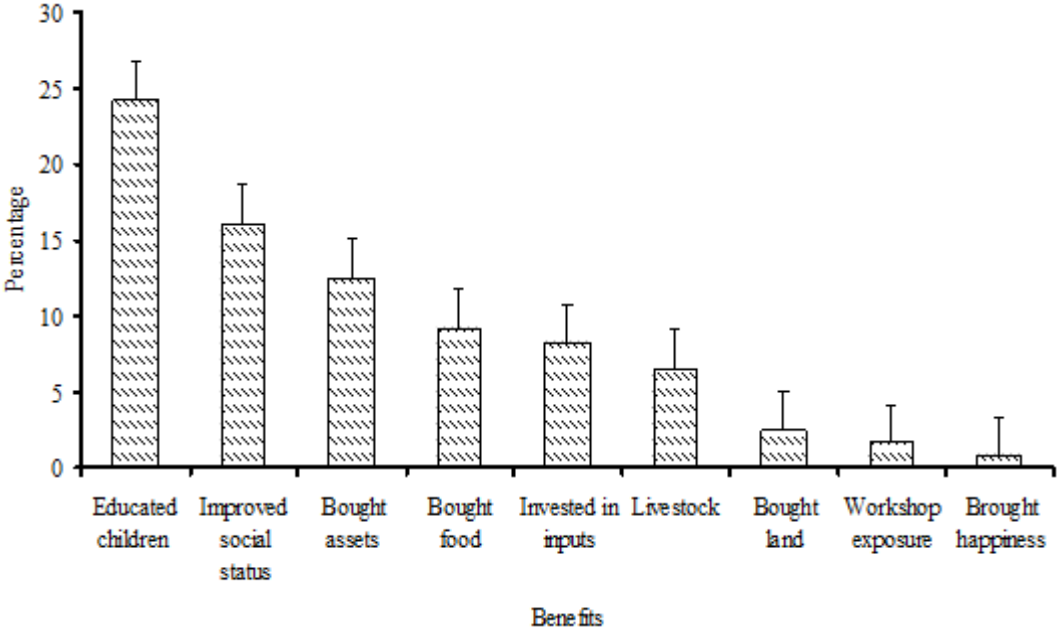

Figure 1. Benefits from fish farming.

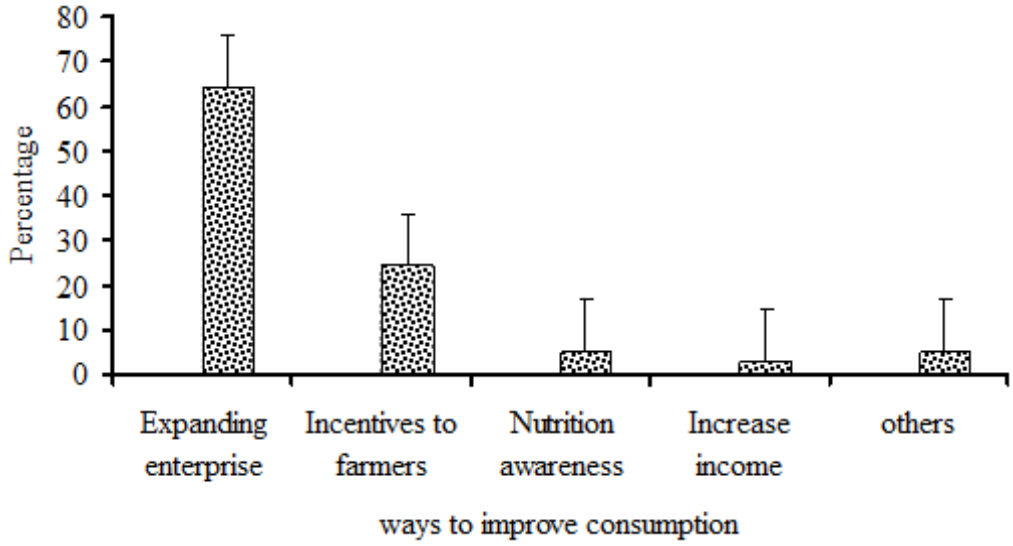

Figure 2. Ways to improve fish consumption.

production if they received incentives from the government (24.2%), and also through nutrition awareness.

In spite of the benefits, fish farmers in this region faced a number of challenges and these included: poor quality and shortage of feeds, high price of inputs, predators, and limited credit. The entire region lacked a feed mill and thus had to source them from Kampala (227 km) or produced own home made feed which appeared to have low nutritive quality.

Recommendations

Fish farming is a viable enterprise capable of contributing to food security, income and asset base. Therefore it is recommended that fish farming be promoted by supporting policies to strengthen input services by encouraging public private partnerships to invest in hatcheries in order to increase quality fries supply, encourage research in developing a low cost quality feed to improve farmers profit margins and encouraging targeted extension services.

Acknowledgement

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