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ECONOMIC VIABILITY AND COST BENEFIT ANALYSIS OF SMALL SCALE POLYCULTURE OF CARPS

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ABSTRACT

Economic viability and profitability ratio of small scale farming of Indian major carps, i.e., *Cattla cattla, Labeo rohita* and *Cirhinus mrigala* in polyculture system was evaluated. Carps were treated with twelve different formulated diets having four different sources of protein in re-circulatory concrete raceways. At the end of the trial, gross margin analysis and various profitability ratios were used to calculate the cost and returns of carp fish farming, while production utility was employed to find out the output of the farm. The result of the analysis revealed that the mean total cost per kilogram of fish was Pak Rs. 102.00 and the mean total revenue per kg was Pak Rs. 188.00. This gives a gross margin of Pak Rs. 121.00 per kilogram of fish produced. The mean benefit cost ratio (BCR) was obtained as 1.91:1, which confirms the capability and potential of carp′s aquaculture to contribute to sustainable livelihoods and to generate good income support even in concrete raceways as flow-through and re-circulating systems to raise production of fish, considerably in a small area in contrast with systems in earthen pond.

KEY WORDS: Cost benefit analysis, Carp′s Polyculture, Fish farming, Profitability ratios.

INTRODUCTION

Fish is a vital source of animal protein and supplies one fifth of the world′s total of animal origin protein (World Health Organization. 2009). In contrast to other animal protein, fish has higher feed conserving rate, protein retention and low cholesterol content (Anthonio and Akinwumi, 1991). F.A.O. recommended consumption of 35 grams of protein per day per person; out of which an average 7 grams should be of fish origin (F.A.O. 1991). To fulfill the increasing demand of highly nutritious fish protein in Pakistan, fish farming can be one of the solutions. Aquatic agricultural structure is a source of revenue for more than 700 million people around the world for their livelihoods (Akegbejo-Samsons and Adeoye, 2012).

Aquaculture is a management-intensive industry therefore investors from commercial aquaculture try to raise profits by decreasing the operational cost. Expansion of aquaculture industry has experienced many constraints which include lack of quality feed and high expenses of feed (Olagunju *et al.,* 2007). The majority of non-commercial farmers apply feed with insufficient level of protein or low quality manufactured feeds, which give futile result therefore; trend of using farm made feeds is growing gradually. To explore aquaculture and limit this menace, it is essential to look at expenditure and gain relationship of carp farming (Olasunkanmi, 2012). The cost-benefit analysis is an innovative and approximate way to evaluate economics (Robinson, 1993).

As compared to other allied framings' such as livestock or dairy; fish aquaculture requires small space, and low investment (Olagunju *et al.,* 2007). Moreover in terms of income, fish farming generates good profit and high revenue in almost all areas of country. It contributes to elevate the socio economic status of farmers.

The main objective of the present research is (1) to evaluate economic benefit of carp intensive fish farming in concrete raceways as re-circulatory water system; (2) to identify the most preferable type of protein in formulated diets, in a considerable inclusion level for boosting production for a profitable farming of carps and (3) to describe the primary technique used to estimate benefit cost and other profitability ratios.

MATERIALS AND METHODS

A private farm located at the vicinity of Thatta, Sindh, was selected on the basis of availability of inland water and prevalence of fish farming activities in the area. Three species from Indian major carps i.e. *Cattla cattla, Labeo rohita* and *Cirhinus mrigal* were selected as surface, column and bottom feeder respectively and cultured with the ratio of 33:33:34 (Wahab *et al*., 2002). These carps were treated with twelve different combinations of formulated diets in 36 re-circulatory concrete raceways with the dimension of 22′×50′ (W×L). Water quality parameters were maintained within the optimum range as10.0^{o}C to 30.5^{o}C temperature, 7.5 to 8.5 pH and 5.0-8.5 mg/l dissolved oxygen during the whole experimental period. Data was collected for rent of farm, management overheads, price of fingerlings, feed cost, harvesting expenditure and labour wages. The study was conducted for the duration of one year from Sep 2012 to Aug 2013. Gross margin analysis and benefit cost ratio were used to observe the cost and returns of carp fish farming, while production utility was employed to find out the output of the farm.

The economic outcome and effectiveness of the study was computed by following Olagunju *et al.* (2007) through various profitability ratios which include:

1. Gross ratio (GR) = TC/TR
2. Gross Margin (GM) = TR - TVC
3. Net Farm Income (NFI) = TR - TC
4. Rate of Return (ROR) = NR/TC
5. Expense Structure Ratio (ESR) = FC/TVC
6. Benefit Cost Ratio (BCR) = TR/TC

Where;
FC = Fixed cost
TVC = Total variable cost
TC = Total cost
TR = Total revenue

TVC consist of costs of fish seeds (fingerlings), feeds, hired labour, transportation, and miscellaneous. Profitability of the system was determined by simple profit/loss calculations.

RESULTS

From all formulated diets with different ingredients and varying levels of protein, high gross margin values were obtained (Table 1). Among all treatments, the minimum gross ratio was achieved by 25% corn gluten meal based diet as 0.35 with 1.83 Rate of returns. It implies that from every Pak Rs. 1.00 returns to the venture, Pak Rs. 0.35 was being spent. The expense structure ratio (ESR) was 0.57 which mean that about 57 % of the total cost of production contained fixed cost constituent. Due to the inexpensive price, 25%, 35% and 45% inclusion levels of corn gluten meal constituted the best benefit cost ratios (BCR) as 2.83:1, 2.37:1 and 2.26:1 respectively. The minimum total cost required to produce 1 kg of fish was Pak Rs. 72.00 acquired by 25% inclusion level of corn gluten meal, which showed a highest gross margin i.e., Pak Rs. 159.00 among all diets.

Table 1. Production economics/cost-benefit analysis of carp's hatchery supplied with different formulated diets.

		TVC (Rs./kg)	FC (Rs./kg)	TC (Rs./kg)	TR (Rs./kg)	GM (Rs./kg)	GR	NFI (Rs./kg)	ROR	ESR	BCR
Fish meal	25%	54	35	90	183	128	0.49	92	1.03	0.63	2.03:1
	35%	84	46	131	162	77	0.80	31	0.24	0.54	1.24:1
	45%	93	56	149	167	74	0.89	17	0.11	0.61	1.11:1
Poultry by products meal	25%	51	44	96	143	91	0.67	46	0.48	0.86	1.48:1
	35%	62	37	99	183	120	0.54	83	0.83	0.59	1.83:1
	45%	57	31	88	183.	125	0.48	94	1.05	0.53	2.05:1
Corn gluten meal	25%	46	26	72	206	159	0.35	133	1.83	0.57	2.83:1
	35%	58	27	86	206	147	0.42	119	1.37	0.47	2.37:1
	45%	77	23	101	230	152	0.44	128	1.26	0.30	2.26:1
Soy bean meal	25%	57	34	92	183	125	0.50	90	0.96	0.60	1.96:1
	35%	69	29	98	206	137	0.47	107	1.09	0.42	2.09:1
	45%	88	31	120	206	117	0.58	85	0.71	0.35	1.71:1
Mean		66	35	102	188	121	0.55	85	0.91	0.54	1.91:1

DISCUSSION

Profitability ratio is a division of monetary metrics that assists investors assess a business's capability to generate earning compared with its operating cost and other applicable costs, gain throughout a specific period. A higher ratio is a sign of a lucrative and worthwhile business (Okwn and Acheneje, 2011).

The cost benefit analysis shows that small scale carps farming with *Cattla cattla*, *Labeo rohita* and *Cirhinus mrigala* in concrete raceways is a highly beneficial business. The minimum total cost required to produce 1 kg of fish was Pak Rs, 72.00 acquired by 25% inclusion level of corn gluten meal, which showed a highest gross margin i.e. Pak Rs, 159.00 among all diets. This implies that they had least variable cost of production together with minimum fixed cost and thus provided the highest net farm income (NFI) per kilogram of fish production. The findings of Olukosi and Erhabor, (1988) coincide with the present results, who concluded that net farm income provides a general estimate of profitability of a venture by deducting the fixed and variable costs from the total revenue.

This result comes in conformation with the findings of Kamur and Saxena, (2005). They confirmed the significance of corn gluten meal as a substitute of fish meal and concluded that its inclusion at high level may slow down growth because of some deficiency in amino acid. Takagi *et al.*, (2000) stated that corn gluten meal in fish feed improves growth by fast rate of assimilation and thus give optimum result.

Soy bean meal based diets were proved the second best source of protein for the production of carps by producing net farm incomes as Pak Rs. 90.00, 107.00 and 85.00 with 1.96:1, 2.09:1 and 1.71:1 benefit-cost ratios for 25%, 35% and 45% levels respectively. Poultry by product meal with higher inclusions (35% and 45%) and fish meal at lower inclusion were also proved suitable diets for carp's production by generating 0.54, 0.48 and 0.49 gross margins correspondingly. It is therefore feasible to have higher value of BCR with the use of apt and cost-effective source of protein in feed. The maximum gross ratio was 0.89 by 45% fish meal based diet, which may be due to the high cost of feed in term of high inclusion level of fish meal, with 0.11 Rate of return, 0.61 ESR and 1.11:1 BCR.

Profitability of small scale aquaculture enterprises was also investigated by Akegbejo-Samsons and Adeoye, (2012). Olagunju *et al.* (2007) suggested farming of cat fish as a highly profitable business. Economic viability of carp's polyculture was also confirmed by Mazid *et al.* (1997). They prepared cost effective feeds from locally accessible ingredients and obtain high revenue.

In conclusion, aquaculture of carps is a highly lucrative business. It is therefore recommended that people should be encouraged to contribute for the extension and intensification of the industry and so as to increase their income.

REFERENCES

Akegbejo-Samsons, Y. and D. Adeoye. (2012). Measuring Profitability in Small Scale Aquaculture Enterprises in South West Nigeria. In: Visible Possibilities: The Economics of Sustainable Fisheries, Aquaculture and Seafood Trade: Proceedings of the Sixteenth Biennial Conference of the International Institute of Fisheries Economics and Trade, July 16-20, Dar es Salaam, Tanzania. *International Institute of Fisheries Economics and Trade* (IIFET), Corvallis. 1(2):187-210.

Anthonio, O.R. and J.A. Akinwumi. (1991). Supply and distribution of fish in Ibadan, Nigeria. *Geographical. Journal*., 14(2): 16.

F.A.O. (1991). *Fish for food and development: strategy and action programmes for fisheries*, Rome. pp. 48.

Kamur, V. I. and P. K. Saxena (2005). Incorporation of maize gluten in supplementary feed and its impact on growth and flesh quality of carps. *Aquaculture International*, 13: 555-573.

Mazid, M.A., M. Zaher, N.N. Begum, M.Z. Ali and F. Nahar. (1997). Formulation of cost effective feeds from locally available ingredients for carp polyculture system for increased production. *Aquaculture*, 151: 71-78.

Okwu, O.J. and S. Acheneje. (2011). Socio-economic analysis of fish farming in Makurdi Local Government area, Benue State, Nigeria. *Europ. J. of Social Sci.*, 23 (4): 508-519.

Olagunji, F.I., I.O. Adesiyan and A.A. Ezekiel. (2007). Economic viability of cat fish production in Oyo – State, Nigeria *J. of Human Ecol.*, 21(2): 121-124.

Olasunkanmi, J. B. (2012). Economic analysis of fish farming in Osun state, South-Western Nigeria. In: Visible Possibilities: The Economics of Sustainable Fisheries, Aquaculture and Seafood Trade: Proceedings of the Sixteenth Biennial Conference of the International Institute of Fisheries Economics and Trade, July 16-20, Dar es Salaam, Tanzania. *International Institute of Fisheries Economics and Trade* (IIFET), Corvallis. 1(2): 496- 505. http://hdl.handle.net/1957/35912

Olukosi, J.O. and P.O. Erhabor. (1988). *Introduction to Farm Management Economics: Principle and Application.* Agitab Publishers Ltd., Zaria.

Robinson, R. (1993). Economic evaluation and health care. What does it mean?. *British Med. J.*,, 307(6905): 670-673.

Takagi, S., H. Hosokawa, S. Shimenos and M. Ukawa. (2000). Utilization of corn gluten meal in a diet for red sea bream, *Pagrus major* (Japnese). *Nippon Suisan Gakkaishi.*, 66(3): 417-427.

Wahab, M.A., M.M. Rahman and A. Milstein. (2002). The effects of common carp, *Cyprinus carpio* (L.) and *Cirrhinus mrigala* (Hamilton) as bottom feeders in major Indian carp poly cultures. *Aquaculture Res.*, 33: 547-556.

World Health Organization. (2009). Global and regional food consumption patterns and trends. *WHO Technical Report Series*, (916), 1-17.

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