

Techno-Economic Feasibility of Cow-Manure Recycling in Fish Pond

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ABSTRACT

In view of the recent trend of optimising aquaculture in an eco-friendly way by recycling animal waste, a study was conducted on the feasibility of fish farming with application of fresh cowdung without supplemental feed and inorganic fertilizer. The efficacy of the system in terms of its production, net return and input cost was compared with a control set of ponds, run as per package of practices for composite carp culture technology. Average calculated fish production was 3390 kg/ha in the experimental and 3814 kg/ha in the control. Findings revealed that although fish production was 12.5% lower in the experimental units, net return was 44.5% higher than the control units. Input cost was 29.5% lower in the experimental unit, which supports efficacy of the system. The system was found to be specifically suitable for fish farming in homestead ponds of rural areas of the N.E. India.

Recycling of livestock waste in fish pond holds vast potentialities for enhancing productivity with low input cost, (Sharma and Olah 1986, Sharma and Das 1988, Chetia Borah et al, 1998). It is regarded as one of the logistic approaches for eco-friendly management and rational utilization of available resources for sustainable production.

In India, cattle farming is often the key component in mixed farming system and it occupies an important place in the economy of the country. Use of cowdung for soil nutrient management in agriculture and aquaculture is an age-old practice in most south and south east Asian countries. Scientific pond management practices include application of cow manure alongwith inorganic fertilizers and supplementary feeding for enhancing fish production upto 4000 kg/ha (Anon 1993, Jhingran 1982, Sharma et al. 1983). Fish farming with application of cow manure only at a dose of 10 ton/ha/year at equal weekly installments reported to yield a production of 3013.8 kg/ha without any supplementary feeding and inorganic fertilization (Dutta and Goswami, 1988). The present communication deals with the techno-economic feasibility of fish farming with recycling of fresh cowdung daily at a definite dose without other inputs like supplementary feed and inorganic fertilizer.

MATERIALS AND METHOD

The experiments were conducted at Fisheries Research Centre, Assam Agricultural University, Jorhat, Assam, during 1994-97. Three regular dug out ponds (0.05 ha area and 2.5 m depth)

constructed at clay-loam soils were used for the experiment. The ponds were limed as per lime requirement test. Dose of cowdung application was determined by a set of preliminary trials. An initial dose of cowdung @ 2000 Kg/ha was applied 20 days prior to stocking. After second day of stocking, fresh cowdung was applied daily at a rate of 70 kg/ha. Ponds were stocked with carry over seeds (average weight 41.6 gm) of Silver carp, Catla, Rohu, Grass carp, Mrigal and Common carp at a density of 7000 nos./ha. Water samples were collected at regular intervals and analysed for important physicochemical parameters (pH, DO, free CO₂, BOD, alkalinity and plankton population) following standard methods (APHA, 1985). No supplementary feeding was done to the fishes except occasional feeding of grass carp with aquatic and terrestrial vegetation. Survival, growth increment and total production of fish were recorded. Harvesting was done after 11 months of rearing. A control set of ponds were run following package of practices for composite culture of carps (Anon, 1993). Comparative economic analysis of both sets of ponds were carried out and results were subjected to student's 't' test to find out the significance at 10 degree of freedom.

RESULTS AND DISCUSSION

During the period of one experimental year, a total of 25,100 kg/ha cowdung containing 0.5% N, 0.1%P and 0.5%K was recycled in pond. Analysis of important parameters (Fig. 1) of water revealed that the range of water pH remained nearly neutral to slightly alkaline during the period of experiment in both sets of ponds. The range of variation in dissolved oxygen content was markedly higher in the experimental than in the control exhibiting a declining trend towards the termination of experiment. The CO₂ concentration ranged from 0.0-7.0 mg/l in the experimental and 2.0-6.0 mg/l in the control pond showing marked monthly variation in both the sets of ponds. Increasing trend of plankton population (Fig. 2) in the experimental pond (0.55 ml to 3.9 ml/50 lit water) indicated enhancement in primary productivity, attributed primarily to the cow manure recycling. All these important parameters were observed to be within favourable range in both sets of ponds (Jhingran, 1982).

Details on survival, growth and production of fish are depicted in Table 1. Rate of survival was found to be excellent in both sets of ponds ranging from 71.4% to 82.8% in the experimental and 68% - 85.7% in the control ponds. Species wise growth record revealed that maximum growth was exhibited by the silver carp followed by grass carp, catla, rohu and mrigal in the experimental ponds, whereas in the control pond, maximum growth attained by grass carp followed by silver carp, mrigal, catla, rohu and common carp. The surface feeders (Silver-carp and Catla) contributed highest share (51.8%) to the total production in the case of experimental pond, which compares favourably to the results obtained by Dutta and Goswami (1988) in cow manured pond and by Sharma et al. (1988) in swine dung manured ponds. Abundance of planktons, green and blue green algae may be the prime reason for enhanced growth of these planktophagous fishes (Sharma et al., 1988; Dutta and Goswami, 1988).

On the other hand, in control ponds surface feeders contributed 40.3% of the total production followed by column and bottom feeder respectively. Net production was 12.5% lower in the experimental pond than the control ponds. Although there was significant difference in the

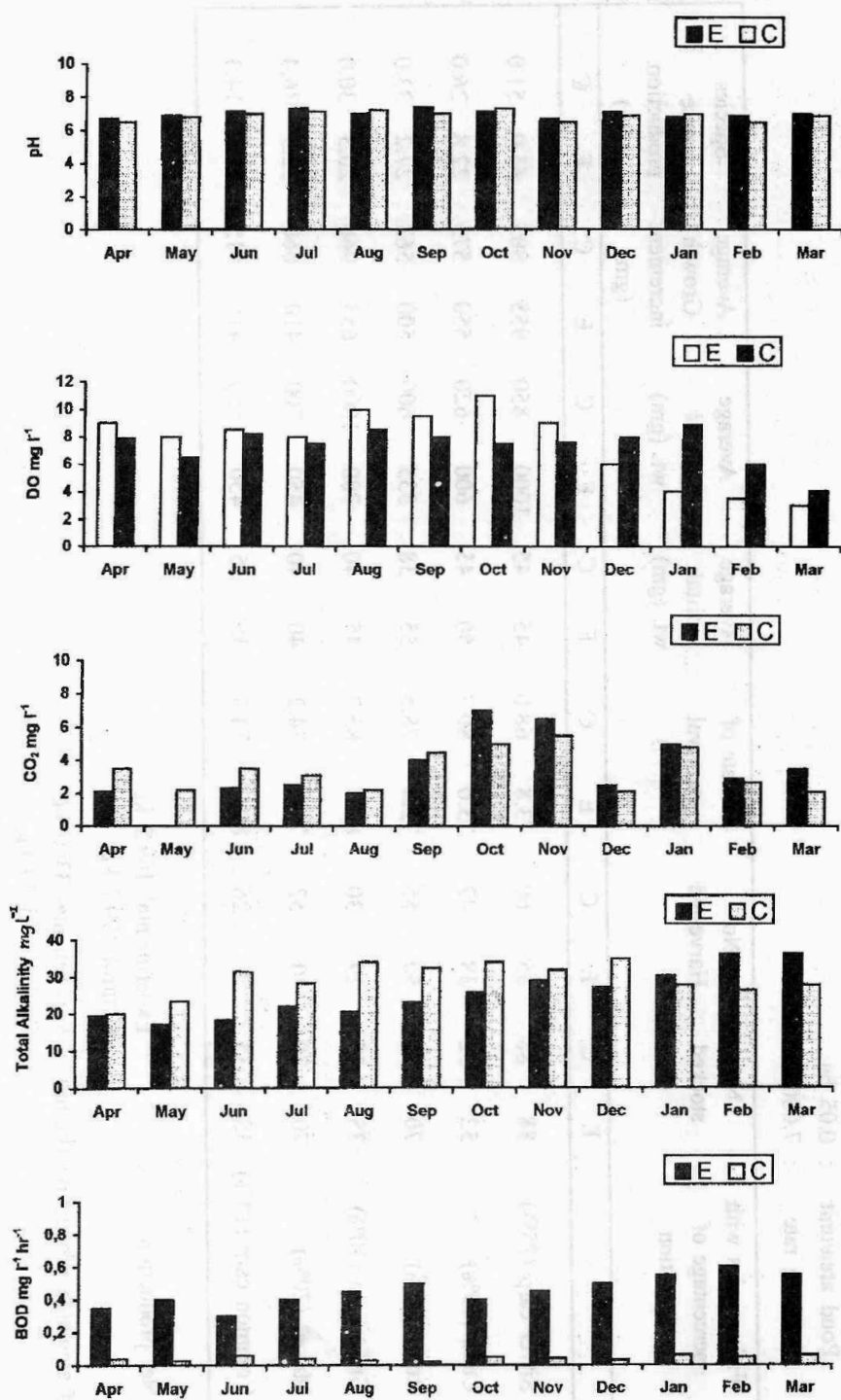


Fig. 1 Monthly variation in water quality parameters. E : Experimental, C : Control

Table 1. Survival, growth and production of fish in experimental (E) and control (C) pond

Period of rearing : 11 months
 Pond area/unit : 0.05 ha
 Stocking rate : 7,000/ha

Fish species with percentage of composition	No. stocked		No. Harvested		Rate of survival (%)		Average initial wt. (gm)		Average Final wt. (gm)		Average Growth increment (gm)		Species wise production (kg)	
	E	C	E	C	E	C	E	C	E	C	E	C	E	C
Silver carp (25%)	88	88	65	60	73.8	68.0	45	45	1000	850	955	805	65.0	51.0
Catla (15%)	52	52	38	42	73.0	80.7	50	45	600	620	550	575	22.8	26.0
Rohu (20%)	70	70	50	55	72.8	78.5	35	38	535	600	500	562	27.2	33.0
Grass carp (10%)	35	35	29	30	82.8	85.7	45	40	700	1000	655	960	20.3	30.0
Mrigal (20%)	70	70	50	52	71.4	74.2	40	40	450	700	410	660	22.5	36.4
Common carp (10%)	35	35	28	26	80.0	74.3	35	35	450	550	415	515	11.7	14.3

Net production : Experimental 169.5 kg
 Control 190.7 kg

Calculated production (kg/ha) : Experimental 3390 kg
 Control 3814 kg

Table 2 Production Economics of experimental and control units

Experimental : Cow manure recycled

Control : As per POP on composite carp culture

Item	Unit	Experimental			Control		
		Qty.	Rate (Rs.)	Cost (Rs.)	Qty.	Rate (Rs.)	Cost (Rs.)
1. Pond dewatering and desilting (area 0.05 ha)	—	—	LS	1,000.00	—	—	1,000.00
2. Lime	Kg	108	3/kg	324.00	108	3/kg	324.00
3. Carried over seed (7000/ha)	No	350	1/seed	350.00	350	1/seed	350.00
4. Fertilizer							
Cowdung	Kg	1255	0.3/kg	376.50	600	0.3/kg	180.00
Urea	Kg	—	—	—	13.75	4/kg	55.00
SSP	Kg	—	—	—	11.80	5.5/kg	65.00
5. Feed Ricebran	Kg	—	—	—	160	2.5/kg	400.00
MOC	Kg	—	—	—	160	4/kg	640.00
Vegetation for grass carp	—	—	LS	50.00	—	LS	50.00
6. Harvesting	—	—	LS	200.00	—	LS	200.00
7. Miscellaneous	—	—	LS	100.00	—	—	100.00
Total operational cost*		Rs.		2400.50			3364.00
Production & Return							
Fish production	Kg			169.50			190.70
Sale price rate	Rs.			30/kg			30/kg
Total return	Rs.			5085.00			5721.00
Net return**	Rs.			2684.50			2357.00
P.C. profit to variable cost	%			114.50**			70.00
Cost of production of fish	Rs/Kg			14.10			17.64

* Labour charge not included; ** Highly significant at 0.05 level; LS : Lumpsum

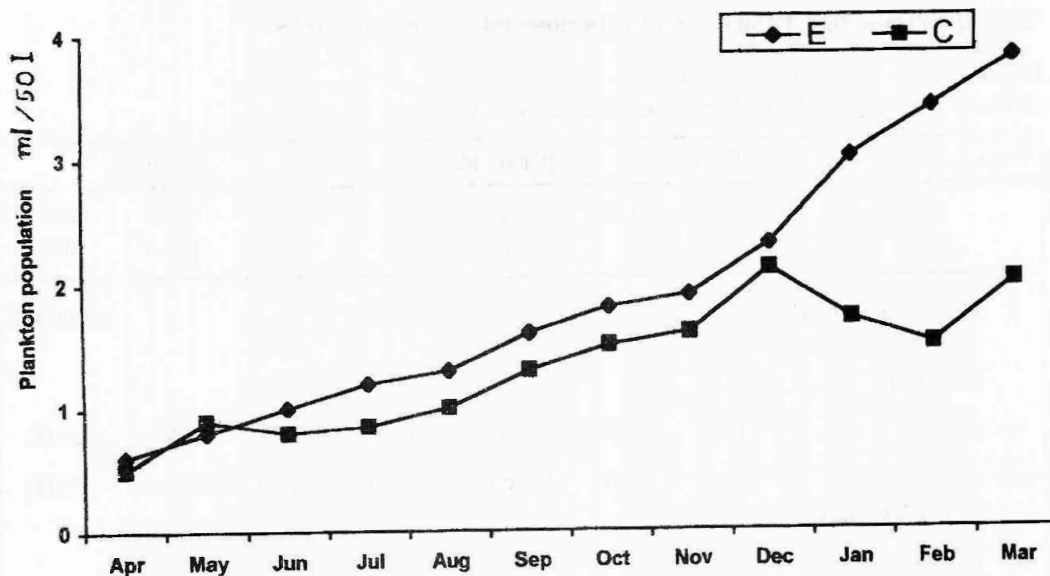


Fig. 2 Monthly variation of plankton population of Experimental (E) and control pond (C)

production trend (on subjecting to student's 't' test at 0.05 level), on economic analysis (Table II) the experimental unit proved to be more profit oriented due to low input cost involvement (as evident from 29.5% lower operational cost) which is attributable to deletion of supplementary feeding and inorganic fertilization. Net return to variable cost was 44.5% higher in the experimental unit and was found to be highly significant on subjecting to Student's 't' test at 0.05 level. Cost of production per kilogram of fish was 26% higher in the control ponds in comparison to the experimental units.

In India, most of the rural fish farmers practise fish farming in traditional way. Very few people follow the technical suggestions regarding use of fertilizers and supplementary feed (Misra, 1996). High cost involvement and nonavailability of input are two major reasons of non-adoption of scientific fish farming technology (Bhagowati, 1990; Bhaumik et al., 1992; Misra, 1996). The present technology will be definitely suitable for fish farming in homestead ponds of rural areas particularly in the N.E. India as cattle farming is very common among the farmers of this region and judicious utilization of cattle manure in aquaculture will definitely lead to assured protein production with minimum cost.

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