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Integrated Fish cum Poultry Farming for Self Employment and Household Nutritional Security in Arunachal Pradesh

V K Misra, C P Singh, N D Singh, T S Mishra, N K Mishra[1], A N Tripathi[2] and Shashank Singh[3]

Krishi Vigyan Kendra, West Kameng 790 101 (Arunachal Pradesh)

ABSTRACT

The present study was aimed to assess the utility of integrated fish and poultry farming for self employment and nutritional security purpose. The study was conducted in the five villages *i.e.* Salari, Chug, Changpa, Pangsa and Sangti from Dirang circle of West Kameng district. The fish ponds and poultry sheds were prepared by using standard methods and yield of fish, eggs and poultry meat was evaluated and compared with farmer's practice to analyze the cost-benefit ratio of integrated fish and poultry farming system. The results revealed that there was high cost-benefit ratio observed in this system as compared to traditional farmer's practice. The study suggests that integrated fish and poultry farming system is a viable option to increase the income of small and marginal farmers.

Key Words: Birds, Economics, Fish farming Integration, Nutritional security, Poultry.

INTRODUCTION

The Dirang circle of West Kameng district of Arunachal Pradesh is blessed with complex climatic environmental conditions having foothill as well as complex hill eco-system with the varying elevation ranging about from 300-4200 m. The West Kameng district of Arunachal Pradesh is lying approximately between 91° 30' to 92°40' East longitudes and 26° 54' to 28° 01' North latitudes and covers about 7422 Sq.KM of geographical region accounting for 8.86 per cent of the total area of the state. On the agricultural front, it is still at the stage of subsistence level of farming. In this context, Integrated Fish Farming may become a one of the best examples of mixed farming for sustainable development of the rural farming community.

Integrated fish farming also refers to the simultaneous culture of fish or shell fish along with other culture systems. It may also be defined as the sequential linkage between two or more culture practices. Fish culture can be integrated with several systems for efficient resource utilisation. Among various integrated fish farming technologies a simple and economically viable system of fish-cum-poultry farming has been developed. Under this system the nutrients from the poultry are recycled in the pond and this allows for escalation of production and income while reducing the affluent along with the dumping of the wastes would have had on the environment (Singh *et al,* 2014; Misra *et al,* 2016). Direct use of livestock wastes is one of the most widespread and conventionally accepted forms of integrated fish farming and the practice increases the efficiency of both chicken farming and fish culture through the profitable utilization of animal and feed waste products (Nnaji *et al,* 2009). The cost of formulated fish feed is usually about 70per cent of production costs and the use of animal manure considerably reduces operational costs and makes it possible for low income fish farmers to profitably engage in the enterprise. Banerjee *et al* (2014) reported that the use of cow dung and duck manure for practicing aquaculture is a viable option for natural biodiversity.

Corresponding Author's Email: vipin_misra_81@yahoo.com

[1]FETC Colonelganj, Gonda (U.P)

[2]K.V.K Lower Subansiri, Arunachal Pradesh

[3]College of Fisheries, R.P.C.A.U Dholi, Bihar.

Bhuiyal *et al* (2014) documented that the integrated farming system improve the efficiency of marginal and small farms that appeared to be the most efficient performers in the integration and arrangement of farming enterprises. Hence, the present study was aimed to assess the utility of integrated fish and poultry farming for self employment and nutritional security.

MATERIALS AND METHODS

Location of study

The present study was conducted at farmer's fields at 5 locations of district West Kameng Arunachal Pradesh Namely Salari, Chug, Changpa, Pangsa and Sangti from Dirang circle using about 0.45 ha pond area.

Preparation of fish pond

The fish ponds were prepared by the application of cow dung @ 10 t/ ha before one month of stocking of fingerlings followed by application of lime @ 500 kg/ ha after 15 days interval. A total number of 5000 fingerlings of Indian major carps and exotic carps in all the ponds in the proportion *i.e.* 20% Catla, 20% Rohu and 15% Mrigala from Indian Major carps and 20% Silver carp, 10% grass Carp and 15% common carp from exotic carp were stocked @ of stocking density 10,000/ ha considering the 10per cent mortality also. The fingerlings of all fish species were collected from hatchery and stocked at a time in each pond as per their capacity. Fish were fed with a mixture of rice bran and oilcake in 1:1 ratio daily @ 4per cent of body weight as farmer's practice. In case of experimental ponds, no supplemented feed was provided to the fish except grass carp which were fed with green grass/ leafs of cabbage/green maize as per their availability @ 5per cent of biomass.

Preparation of poultry sheds

Poultry sheds prepared by using locally available woods and bamboo was installed on the dyke of the fish ponds. The floor of each house was made of slated bamboo and the space between slats was just enough to facilitate the wasted food and chicken dropping to fall directly into the pond water. Prior to shifting, proper disinfection procedure of poultry house and equipments was also ensured. All the poultry birds were also vaccinated (Table 1.) against diseases. A total number of 250 chicks (20 d old) for all the 5 locations of local breeds which were well acclimated as per local environmental conditions were introduced in poultry shed.

Feeding of poultry birds

Grower mash was provided to the birds during the age of 9-20 wk @ 50-70 g/bird/ day, whereas a layer mash was provided to the birds above 20 wk @ 80-120 g/bird/day. The feed was given to the birds in feed hoppers to avoid wastage and an ample supply of water was made available to all the birds at all the time. The feed were administered two times in a day by filling 3/4 of the feeders.

Evaluation of Integrated fish and poultry farming system

Egg laying started when the birds becomes 20 wk old. Eggs were counted and removed from the shed daily. Fish culture practice without any integration as farmer's practice was compared to fish-cum-poultry integration as experimental trials. Yield of fish, eggs and poultry meat was evaluated and compared with farmer's practice.

Table 1. Vaccination schedule against some important disease.

Name of vaccine	Age	Dose	Method
Lasota	21 days	2 drop	1drop in eye & 1 drop in nose
IBD 2nd	28 days	2 drop	-do-
Fowl pox	42 days	1 drop	Wing web
R2B	8-10 weeks	0.5ml	Subcutaneous

RESULTS AND DISCUSSION

The findings of present study on the various aspects of the production from both the sites i.e. farmers practice and experimental practice are summarized in Table 2-4. The data (Table 2) depict about the physiochemical parameter of water i.e. Temperature, pH, Dissolved oxygen and Conductivity. The pond water temperature was in the range of 24.6 to 20.1 ^{0}C during the month of August to October for both the treatments that was observed good for growth of carps. After that it goes down from November to March in the range of 11.8 to 17.8^{0}C while again the increment in temperature were recorded for both the treatments in the month of April to June i.e. 20.9 to 23.4^{0}c which were suitable for the growth of fishes. The pH was observed in the range of 6.4 to 8.3 for both the treatments during the whole culture period having some fluctuations as per seasonal changes which might be due to the change in water temperature. The dissolved oxygen in the pond water was found in the range of 6.91 to 8.42 mg/l, lowest in the month of August and highest in the month of January. The change in oxygen concentration could be due to the change in the environmental conditions and feeding demand of fishes according to seasonal changes. The conductivity of pond water for all the sites were found in the range of 158.6 to 182.4 which was lowest in the month of August in both while maximum values pattern vary for the highest in the months of May and January, respectively.

Growth Performance

The significant increases in final weight of fingerlings were recorded as mentioned in Table 3. In reference to Catla the maximum weight at the time of harvest was recorded 620±30g in experimental units against 530±20 in the farmers practice unites having the weight of 3.5±0.5g at the time of stocking. In case of Rohu the maximum weight was found 510±20 g in experimental ponds in comparison to 450±30g in the pond of practicing farmers. The initial weight of fingerlings of Rohu was 2.8±0.3g at the time of stocking. While In reference to Mrigala it was found 570±40g in experimental ponds in comparison to the farmers practice ponds which were recorded 430±15g. In case of exotic carp, significant growth was also observed. In Silver carp the maximum weight was 630±25g in experimental ponds in comparison to 580±30g in the practicing farmer's pond fishes. With reference to Grass carp it was recorded 920±18g in the experimental pond in comparison to 750±23g recorded in practicing farmer's pond. The highest weight gain was recorded in the common carp of experimental ponds i.e. 550±25g in comparison to 520±50g recorded in the fishes obtained from practicing farmer's pond. The Significant increase

Table 2. Water quality parameters.

Parameter	Month	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June
D.O Mg/l	F.P	6.91	7.20	6.83	7.65	7.86	8.42	7.73	7.61	7.64	6.92	7.43
	Exp.	7.05	6.93	7.21	7.21	7.16	7.38	7.38	7.41	6.92	7.36	6.98
pH	F.P	7.3	6.4	6.9	6.4	6.5	6.9	6.8	7.8	7.3	6.9	6.3
	Exp.	6.7	7.4	6.7	6.8	7.8	7.6	7.8	6.4	6.4	6.8	8.3
Temp ^{0}C	F.P	22.8	20.1	16.2	14.4	13.6	14.8	15.7	17.6	20.9	22.3	23.4
	Exp.	24.6	20.6	13.6	11.8	12.9	15.3	16.2	17.8	21.4	23.2	22.8
Conductivity Micro-Siemens/cm	F.P	158.6	170.3	169.2	175.0	173.4	178.6	169.7	160.2	168.2	180.2	176.1
	Exp.	164.2	172.4	172.1	176.2	170.8	182.6	180.2	168.4	173.4	169.6	172.4

(Values or mean of two year trial); F.P = Farmers Practice and Exp = Experimental growth performance unit

in survival rate of fingerlings was also observed in the fishes of experimental ponds in comparison to the fishes of practicing farmer's pond during the experimental trials. It was found 62 per cent for Catla in experimental ponds in comparison to 60 per cent in the pond of practicing farmers, 64.5 per cent for Rohu in experimental ponds against 62 per cent in the pond of practicing farmers, 62.3 per cent in Mrigala in Experimental ponds in comparison to 58.0 per cent in practicing farmer's pond. The same trend were also found in the case of exotic carp fingerlings i.e. 70.8 per cent in Silver carps in experimental ponds in comparison to 69.0 per cent in practicing farmers pond while it was recorded 75.0 per cent in experimental ponds against 73.0 per cent in the pond of practicing farmers in case of grass carp and 73.4 per cent in common carp fingerlings in experimental ponds in comparison to 71.0 per cent in practicing farmer ponds.

Economic calculation

The data on economic aspect recorded from all the experimental trials showed that the cost of cultivation in farmer's practice (Table 4.) was observed as Rs. 31,000/-for an average of 300m^2 (15x20m) pond including whole expenditure incurred during the experimentation in compared to the average outcome/return i.e. Rs. 75000/- from all the locations after selling of the system produce like fish, egg and poultry meat which shows about 2.4 fold increment in farms income of the region. The main reason observed for increased income was very less expense incurred in feeding of fish stock due to the availability of direct chicken dropping along with unused and undigested feed items which was directly used by the fish stock and in other way it acts as a fertilizer to increase the fish pond productivity Misra *et al* (2016). About 80 per cent of the chicken dropping represents undigested food stuffs due to very short digestive tract of chicken Sharma *et al* (2016).

CONCLUSION

Under reduction of cost of supplemental feed and fertilizers for fish farming strengthening integration of poultry cum fish farming which makes this system viable in state environment for employment generation and concerned aspects. As the poultry-fish farms are ageing the farmers become fully experienced and the profit margin would increase. If increased fish production is encouraged, the farmer's income will increase and his poverty level will be reduced while concomitantly there will be more protein available for the farmer's family, his associates and the community at large especially in the urban areas. On replication of this system at farmers 'level research would be nearer to the goal. On the other hands land is a limited resource and if more land is used in the farming, the forest will be depleted to a degree that will be harmful to the environment, correspondingly, the cost of

Table 3. Growth Performance and Survival of fingerlings after stocking.

Sr. No	Species	Initial weight during stocking (g)	Weight of fishes during harvest (g)		Survival (%)	
			F.P	E.P	F.P	E.P
1	Catla	3.2	530 ±20	620 ± 30	60.00	62.00
2	Rohu	2.8	450 ± 30	510 ± 20	62.00	64.50
3	Mrigala	3.9	430 ± 50	570 ±45	58.00	62.30
4	Silver Carp	5.3	580 ± 40	630 ±25	69.00	70.80
5	Grass Carp	4.7	750 ±50	920 ± 40	73.00	75.20
6	Common Carp	4.3	520 ± 50	550 ±40	71.00	73.40

(The values for weight at the time of stocking are mean of 20 specimens in both years for each species)

Table 4. Economics of Integrated Fish cum Poultry Farming System.

Expenditure Statement		
Sr. No.	**Commodity / Item (Quantity/ No.)**	**Cost Involved (Rs.)**
1	Fingerlings (n=500)	5,000.00
2	Poultry Housing	2,000.00
3	Poultry Feed	9,000.00
4	Labour cost	10,000.00
5	Miscellaneous	5,000.00
Total cost involved		**31,000.00**
Outcome statement		
S. No.	**Commodity (Quantity)**	**Earning (Rs.)**
1.	Fish (180.0 Kg)	63,000.00
2.	Egg (n=200)	10,000.00
3.	Chicken (50.0Kg)	2,000.00
Total outcome		**75,000.00**

production of food will rise. Therefore, a method needed to produce more food from existing farming land in this context is integrated farming offers a possible solution.

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