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Improvement of farmer's livelihood through rice-fish-duck integration at Namsai District of Arunachal Pradesh

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Abstract

Namsai district is the only plain district of Arunachal Pradesh have abundant scope for agriculture and allied sector. Due to lack of scientific knowledge and awareness, traditional monoculture system of rice, fish and duck farming is prevalent in the district yet. To improve the productivity as well as generate more income of farmers from various crops practiced in a specific area for a certain time, the integrated approach of rice cum fish and duck (IRFD) culture was carried out in farmers field. A total of 10 farmers were involved in the trial who were well experienced on traditional farming practices. Farmers having low-lying rice field with adjoining fish pond (n=10) were selected for frontline demonstration on Rice cum fish and duck culture. Rice variety Ranjit was planted using integrated nutrient and pest management practices, introducing catla (*Catla catla*), rohu (*Labeo rohita*), mrigal (*Cirrhinus mrigala*), silver carp (*Hypophthalmichthys molitrix*), grass carp (*Ctenopharyngodon idella*) and common carp (*Cyprinus carpio*) fish as composite fish culture in the pond and dual purpose khaki Campbell duck were reared in the dyke of the pond.

In the present study, the production performance of rice under trial increased by 57.8 percent compared to traditional practices. Similarly, average body weight and total yield of fish increased by 42.8 and 42.08 percent respectively. Khaki Campbell duck performed well in integrated system of rearing and laid egg more by 117.64 percent compare to the local duck (Pati duck). The gross total income under IRFD system were significantly higher in comparison of traditional monoculture practices.

Keywords: Integrated, rice, fish, duck

Introduction

India is a country transformed from being as begging bowl to sufficient food grains producer earlier during 1965. The increasing population and economic status, often demand more and more quality, balance and nutritious foods. Though India is self-dependent on their food requirement but the productivity of agricultural farms are generally low and much lower in North-East states. Low productivity and less return from crops are major hindrance to attract young youth to agriculture and allied sector. Low income generation of agricultural sector as well as un-employment state among the young generation is more in NE region of India. To increase the productivity of agriculture sector and bringing economic prosperity to eastern India that largely remain un-touched, the government are also giving impetus and initiative namely bring Green Revolution in Eastern India (BGREI) for second green revolution in the country. North-East region have comparatively larger farm size though least use of innovative agricultural practices. Integrated farming is considered to have taken its origin over 2,400 years from China (Hu and Zhou) [2], and it involves a dynamic system of fish poly-culture (a systematic way of rearing fish), production of poultry, livestock and crops, and the "integrated" (combined) use of manure, grass and other crops as feeds and fertilizers (NACA) [3]. Integrated fish farming refers to the coordinated growing of crops as well as rearing of fish in the same plot. This could also involve the rearing of animals and fish. The most commonly known integrated systems of farming are expressed in terms of "Fish-Cum"; meaning "Fish and" others as the case may be (Prein and Singh *et al.*) [4, 5]. Therefore keeping view in mind the present condition and suitability of technology, KVK, Namsai District Arunachal Pradesh initiated intervention through sustainable agricultural technology 'Rice-cum fish and duck' culture purposely to improve the income generation by the use of local resources and encourage the farmers to adopt the improve farming practices in rural area of Namsai District, Arunachal Pradesh.

Materials and Methods

Study was conducted on 10 No. of farmers. The programme was sponsored by Director, ICAR-NRC on Yak, Dirang, West Kameng District, Arunachal Pradesh. Topographical and methodological as well as social cultural condition of Namsai district is most suitable for integrate farming system. Agriculture- fish and livestock integration generate more income on small area as well produce varieties of product (grain, vegetable, fish and meat) which generate income as well as fulfil the social and nutrition requirement of tribal people. Rice is main crop of Rainy season. Rainfall started from March and end to September. Intermittent rainfall during winter and summer season is not a uncommon phenomena. Long duration rainfall assure water holding in pond provide long time to attain heavier body weight for fish. Rice crop is most suitable for submerge land. Fish pond is also connected with submerge rice cultivated area. Duck are water loving bird and needs minimum housing management and able to fulfil nutritional requirement from marshy land, submerge field of rice and ponds. Traditional rice, fish and duck farming is prevalent in Namsai district but due to lack of awareness and scientific knowledge traditional practice and monoculture are dominant. Farmers having low-lying rice field with adjoining fish pond (n=10) were selected for frontline demonstration on Rice cum fish and duck culture. Farmers were trained for five days on various aspects of crop fish-livestock farming system necessary inputs and on-site technical advises were given during preparation of field. Duck house was built near by the field or on dyke of pond. Rice variety Ranjit was used for rice crop. Ranjit is a long duration rice crop, logging resistant and potential of good productivity. Khaki Campbell duck improve breed of duck with high egg laying capacity were used as livestock unit. Fingerling of catla (*Catla catla*), rohu (*Labeo rohita*), mrigal (*Cirrhinus mrigala*), silver carp (*Hypophthalmichthys molitrix*), grass carp (*Ctenopharyngodon idella*), and common carp (*Cyprinus carpio*) were used in the ratio of 15, 15, 20, 15, 15, and 20 percent. The rice crop was transplanted in July-Aug under integrated nutrient and pest management. Rice crop was transplanted 20x20 cm row and plant spacing and applied NPK @ 40-20-20 kg/ha along with Azatobacter and PSB culture @ of 5kg/acre before transplanting. The basic design of the technology was digging of canals (2-3 feet wide and 1.5-2 feet depth) making dyke enough to prevent over flow in two sides of rice field (Fig 1).



Fig 1: Basic design of the technology

However, it was slightly modified depending on the conditions and situation of field. The yield of rice was calculated by weighing of whole rice grain after cleaning and

thrashing. Cost of cultivation was based on local wedge prevalent in the area. Average body weight of different variety fish at 150 days were recorded by weighing of individual (20 No.). Total fish production was estimated by weighing to fish at the time of final harvesting of the pond. Average body weight of khaki Campbell duck was recorded by weighing body weight at 30, 60, 90 and 120 days of age. Average egg production ability was observed by adding all egg produced during year divided by actual number of duck laying egg. Family labours were engaged for duck management, therefore, actual time spent was converted into actual man days and wage calculated based on prevalent labour charge. Depreciation on duck housing and pond dyke were included for cost and benefit analysis.

Results and Discussion

Rice production: In the present study rice yield was found 5793kg which was higher by 58.7 percent in comparison to Local practices and variety (Fig 2). Higher yield might be contributed by adoption of improved variety and cultivation practices. Use of duck in rice field have also been reported beneficial to rice crop (Tiwari *et al.*) [7]. The present results showed that the use of fertilizer and integrated nutrient and pest management are helpful to improve the production of rice crop in Namsai district of Arunachal Pradesh.

Performance of Khaki Campbell duck

Total 1000 number of day-old duckling was distributed to ten numbers of farmers under rice cum fish and duck culture demonstration. Performances of duck have been mentioned in table (1). The performance of Khaki Campbell duck was found to be better than the local breed (Pati duck). Adoption of improved breed, better management practices housing and availability of large foraging area under IRFD system might be helpful to improve the duck performance. Local duck which are reared traditionally was matured late, grow at slower rate and laid less egg in comparison of Khaki Campbell ducks. Number of eggs produced by Khaki Campbell ducks was more by 117.64 percent and body weight of duck at 120 days of age was higher by 34.38 percent. Average egg weight of Khaki Campbell and Local duck was 61.10 and 58.4g respectively. Mortality of Khaki Campbell duck after one month of age was major concern for farmers. Mortality during the brooding period was 5.2 percent and it increased as age advance. Overall mortality of Khaki Campbell duck was 25 percent. High mortality rate was contributed by poor management practices followed by the farmers. In contrary to Khaki Campbell duck mortality during brooding period was higher in local duck and it was reduced as age advance.

Performance of Fish

Average area of farmer's pond was 0.13 ha per farmer. However, after integration with rice field actual ponds area was 0.63 ha. Thus, bigger feeding space and duck excreta as feed material was available for fish, that might be contributed to higher body weight gain under IRFD culture as reported under present study. The average body weight of fish at 150 days of age was 506.6g and 355.84 g under IRFD and traditional pond respectively. The fish under IRFD culture attained 42.38 percent higher body weight in comparison of traditional practice. Total yield of fish in IRFD and traditional pond was 1471.5 and 1035.75 kg. The fish yield increase by 42.08 percent. The details of body weight gain and yield have been articulated in table (1 & 2).

Table 1: Performance of IRFD culture

SI No.	Name of the Parameters	Performance			
		IRFD		Traditional	
1	Rice Production				
	Total Grain yield (kg/ha)	5793		3650	
2	Fish Performance (g)				
	Av. Body weight at 150 days (g)	506.6		355.84	
	Catla	560		420	
	Rohu	140		85	
	Mrigal	120		70	
	Silver carp	800		560	
	Grass Carp	850		570	
	Common carp	570		430	
3	Duck Performance				
	Body weight at different age	M	F	M	F
	30	809	759	655	436
	60	1230	1012	870	530
	90	1985	1560	1470	890
	120	2392	1855	1780	1221
	Age at first egg laid (days)		145		172
	Total No. Of egg laid (No.)		185		85
	Egg weight (g)		62.1		58.4

Table 2: Cost-benefit Analysis:

Sl. No.	Particulars	IRFD (Rs.)	Traditional (Rs.)
Cost analysis			
1	Total cost of cultivation of Rice crop (0.5 ha)	10220	9270
2	Cost of Duck Farming		
	Duckling	6000	4000
	Cost of Concentrate and medicine expenditure	9900	2000
	Depreciation on Housing	1800	500
	Labour charge (one year)	12000	12000
	Total expenditure on Duckary unit	29700	18500
3	Cost of Fish Farming		
	Total cost of fish fingerling and dyke preparation around the rice field	13200	4200
	Total expenditure under IRFD (1+2+3)	53120	-
Return analysis			
Rice crop			
	Gross return	36198	22820
	Net Return	25978	13550
Duckery Unit (40 No. of layer)			
	Gross Return from eggs	74000	34000
	Net Return	44300	15500
Fish Units			
	Gross return	220725	155362
	Net Return	207525	151162
	Total net return under IRFD	237933	180212

In the present study higher productivity and return were observed (Table 1 & 2), similar results were also reported by previous study in different part of the country under

integrated farming system (Ganesan *et al.* Singh *et al.* and Tiwari *et al.*)^[1, 6, 7].

**Fig 2:** Rice cum fish cum duck

Conclusion

Based on the results of present study, therefore, concluded as integration of fish and duck with rice farming increased the productivity, profitability with least investment. Therefore, it is advice to the farmers to adopt integrated rice cum fish and duck culture to improve production of farm and their income.

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