Case Study

Freshwater fish farming towards nutrition and livelihood security of small and marginal farmers

The Challenge

Koraput district in the state of Odisha, India is characterized by subsistence farming. A majority of the farmers (>70%) are small and marginal landholders with an average per capita land holding of 0.79 ha. The levels of poverty and malnutrition are also high. In order to provide the necessary nutrients for a healthy life, a balanced diet should include recommended amounts of different food groups including fish which provides protein and minerals required by the body. As poverty limits the availability of household (HH) access to quality food from the market, fishery can be a source of both food and additional income for small farmers and landless rural households with access to water bodies.

Introduction

The Farming System for Nutrition (FSN) study in India under the research programme on Leveraging Agriculture for Nutrition in South Asia (LANSA) has focused on mainstreaming the nutrition dimension in the design of the farming system encompassing crop-livestock-nutrition garden-fisheries along with nutrition awareness activities (Bhaskar et al., 2017).

This case study examines the promotion of fish farming as a part of FSN intervention in six villages *viz.,* Atalguda, Banuaguda, Bhejaguda, Chikima, Kurkuti and Maliguda in Boipariguda. The population of the study villages is predominantly dependent on agriculture with 73% of the village households having either cultivation or agricultural labour as the primary occupation. A majority of the households were marginal farmers with less than a hectare of land. Paddy occupies bulk portion of land acreage followed by finger millet in some portion of upland areas. The diet was found to be largely cereal dominated with consumption of all other food groups being less than the recommended levels. The consumption of fish was once a week and consumed in very low quantities (7.6g/CU/day) and largely sourced from market. This was reflected in the high prevalence of under nutrition and anaemia in the community (Pradhan et al., 2017). Freshwater fish farming was introduced wherever waterbodies were available as an intervention under the FSN study, to improve the availability and access to fish as an animal protein food.

Intervention and outcome

Ponds in the study villages were mainly rain fed and used for multiple purposes: social and domestic use, livestock, crisis irrigation and fisheries in order of priority. Following a participatory discussion with the community members in 2013, fresh water fish farming was piloted in 3 community ponds in 3 villages involving 36 households. Composite fish farming of four major species; Catla (*Catla catla*) as surface feeder, Rohu (*Lebeo rohita*), as column feeder and Mrigal (*Cirhinus mrigala*) as bottom feeder were selected in the ratio of 4:3:3. Nutritive value of the selected fish species is given in Table 1.

Table 1: Nutritive value of freshwater fish (catla, mrigal & rohu)

Type	Moisture (g)	Protein (g)	Fat (g)	Energy (KJ)	Calcium (mg)	Iron (mg)	Phosphorus (gm)	Magnesium (gm)	Sodium (gm)	Retinol (Vitamin-A) (µg)
Catla & mrigal	78.43	17.94	2.15	394	43.53	1.14	182	25.58	36.56	4.32
Rohu	76.34	19.71	2.39	428	39.37	1.04	200	26.53	35.56	3.87

(All values are expressed per 100 gm of edible portion)
Source: *Indian Food Composition Tables, 2017, NIN, Hyderabad*

Regular training on package of practices, feeding practices and importance of fish consumption were given to the community with technical help from the District Fishery Department. Renovation of ponds was done for greater water retention. The results of the demonstration in 2013 motivated more farmers to engage in fish farming in subsequent years (2014-15: 23 ponds in 4 villages involving 145 farmers; 2015-16: 31 ponds in 4 villages involving 81 farmers; 2016-17: 64 ponds in 16 villages involving 131 farmers). Data on harvest and utilization of the produce was collected each year for four years (Table 2). Economics of the intervention (inputs costs and return) was calculated by converting the size of the pond into 1000 m2 (Table 3). Size of the pond ranged from 580 to 2000 m2.

Table 2: Year wise details of fresh water pisciculture (2013-2017)

Year	*Details of intervention & project support*	*No of HHs*	*No. of villages*	*No. of fish ponds*	*Total quantity harvested (kg)*	*Quantity consumed (%)*	*±Quantity distributed (%)*	*Quantity sold (%)*
2013-14	**Demonstration-** 100% input support (fingerlings, feed)	36	3	3 community ponds	142	68	25	7
2014-15	**Entry point activity -** 100% input support (fingerlings & feed); training on management practices	[a]145	4	23 community ponds	552	49	7	44
2015-16	**Intervention year 1**: 100% input and technical support	81	4	31 (27 individual, 1 group and 3 community ponds)	741*	28	18	54
2016-17	**Intervention year 2:** technical & 50% input support from project; rest 50% cost by participating farmers	131	16	64 (56 individual, 6 groups, and 2 community ponds)	1829**	32	9	59

**harvest data of 28 ponds & **harvest data of 58 ponds (as some HHs did not wish to harvest from their individual ponds)*

± indicates the quantity distributed to neighbours, relatives and in lieu of payment to those engaged for harvesting.

a In 2014-15,difficulty in management of groups made farmers shifting to individual fish farming from 2015-16 onwards.

Table 3: Economics of fresh water fish farming for a pond size of 1000 m2 (July, 2016-March, 2017)

Head wise Expenditure	**Particulars**	**Quantity**	**Amount (INR)**	**Average fish harvest (kg per pond size of 1000 m^2)**	**Unit price (INR kg^{-1})**	**[a]Total return (INR) 'B'**	**[b]Net return (INR) 'B-A'**
Pond preparation and liming	Lime	25 kg	350.00	37	140.00	5180.00	2700.00
	Cow dung	200 kg	200.00				
	Urea	10 kg	80.00				
Fingerlings	Mixed fingerlings	1000 nos.	200.00				
Feeding	Rice bran and waste maize grain	-	1050.00				
Labour cost for management	Labour for feeding, fishing etc.	-	600.00				
Total expenditure (INR) 'A'			**2480.00**				

[a]Total return was calculated taking the total harvest of fish per pond size of 1000 m2.

[b]Net return was calculated by subtracting total expenditure (A) from total return (B).

Conclusion & Future Strategy

This intervention helped bring many un-utilized and under-utilized water bodies in the villages under fish farming. An endline survey of 190 HHs on food consumption pattern in 2017 indicated that Fish consumption by no. of HHs was increased by 37 percent as compared to baseline in 2014 (126 HHs). The per capita consumption of fish (g per person per day) also increased from 9.43 to 25.14. Frequency of fish consumption by households was increased to 10% (daily), 12% (twice/thrice a week) and 23% (once a week) as against 0, 7 and 17% in baseline. Besides increasing availability for household consumption, the earning from fish farming supplemented household incomes. Farmers are happy with the production from this low input system (Box1). In 2017-18, 196 farmers were practicing pisciculture covering 73 ponds across 16 villages with only technical support from the project. They have been linked with the District Fishery Department for getting quality fingerlings. Measures for rejuvenation of water bodies, timely availability of quality fingerlings, knowledge and information about the nutritional value of small indigenous fish, and how best to include them in diets and related nutrition awareness messages by the fisheries department, health officials as well as local administration can help make fishery an important source of food and income for poor rural households.

Box 1:

"I am a marginal farmer with 2.5 acres land and six members in my household. I generally grow paddy, finger millet and green gram. I also have a pond of size (60 ft x 60 ft) where I occasionally go for pisciculture. In 2014, I attended a two day training programme on pond management, importance of quality fingerlings, and feed management for fresh water fish farming, organized by the M S Swaminathan Research Foundation. They also provided me with quality fingerlings and regularly monitored fish health and their growth through periodic visits. I got around 100 kg of fish for my family consumption through several harvests during March-May, 2015. I am continuing the practice now for last three years as it not only provides fish for household consumption but also gives me additional income through sale within the village. In 2016, I suffered crop loss due to insect pest attack in paddy and green gram; the income from the sale of fish helped in managing my family's expenses."

➢ **Nabin Batri, Kurkuti Village, Koraput**

References

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