

# Present Status of Pond-Based Integrated Farming on Selected Blocks of South 24 Parganas, India

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**Abstract:** *The main objectives of this study were found out the integrated farming system (IFS) situation and adaptation for the cultivation. The farmers were converted their occupation crop production to IFS. The result depicted that the overall education level (39.39%) of the respondents was quite medium. Most of the respondents belonged to 40 to 60 years old. 42.42% per cent of the respondents had power of hard working own self. Due to having power of hard working respondents own self, there was a huge potential work force which may be used for Integrated Farming System which is considered as a labour intensive practice. Most of the respondents (39.39%) fell in the medium income category i. e. annual income Rs.1 lakh to 5 Lakh. This research may help out the local administrators, policy maker and others stakeholder for sustainable development of farmers of South 24 Parganas district.*

**Keywords:** Integrated farming system (IFS); Farmers situation; Socio-economic condition; Income efficiency; South 24 Parganas.

## 1. Introduction

Indian Sundarban is predominated by a typical CDR Agro-ecosystem plagued by a host of biotic and abiotic stresses. The effective area of agricultural land in Sundarban is 3, 15, 000 ha. Soils are deep fine-textured, heavily structured & slow draining. Nearly 62 % of total cultivable land is low lying and suffers from increased salinity during the dry season. Soil drainage is generally inadequate and deep water stagnation is common in monsoon months. Approx. 20 % of the agricultural land in this region is a multi-cropped pattern. Farmers are mostly small (9%) and Marginal (35%) in nature. Except for these farmers, the concentration of Bargaders, landless agricultural laborers is most high. In 2001, per capita land was 0.084 ha. The farming community consisting of small and marginal farmers and Bargaders are focused on subsistence production (source: official website of Sundarban Development Board). IFS employs a resource management strategy that helps to achieve economic benefit and sustained agricultural production that meets the diverse requirement of the farm household without undermining the resource base and maintaining high environmental quality. Multiple benefits like increased food production, increased net farm income, improved nutritional status, promotion of sustainable natural resource management of land, water. At present, the farmers focus on crop production which is subjected to a high degree of uncertainty in income and employment to farmers. In this matter, it is imperative to evolve a suitable strategy for increasing the income of a farm throughout the year. Integration of various agricultural enterprises that are cropping, animal husbandry, fishery, etc., in the farming system, has great potentialities in the agricultural economy. These enterprises not only supplement the income of the farmers but also help in increasing the family labor employment throughout the year (Singh et al.1997; Jayanthi et. al.2000; Singh et. al.2006). Integration of livestock with crop components has been found beneficial as it improves soil physical and chemical properties in terms of N, P, K, and other mineral nutrients (Kumar et al.2016).

Manure and urine raise the pH level and accelerate the decomposition of organic matter and microbial activity (Brouwer and Powell 1995, 1998). It helps to improve and conserve the productive capacities of soils, with physical, chemical, and biological soil recuperation. The main objective of this study was (1) to study the present agricultural status including present cropping pattern, area under major crops and agricultural production in the study area; (2) to record the status of present integrated farming practice as a means of sustainable agricultural system and making an analysis on the profitable aspect of integrated farming based on collected data through GIS Mapping; (3) to identify the profitable aspects of sustainable integrated farming system by comparing with the traditional agricultural system in term of income, expenditure, net profit and benefit-cost ratio.

### Study area

The South 24-Parganas district is located between 22° 30' 45" to 20° 29' North latitude and between 89° 4' 56" and 88° 3' 45" East longitudes bounded by the river Hooghly in the West. The district of South 24 Parganas came into existence on March 1, 1986. Bay of Bengal in the South, Kolkata city and North 24 Parganas in the North & Eastern boundary is demarcated by Bangladesh and Bidyadhari & Matla River.

## 2. Materials and method

### Data used and survey report

A structured socio-economic and technical survey was conducted during 14<sup>th</sup> April through 16<sup>th</sup> May 2021 in different blocks of South-24 Parganas (Table 1). The researchers were visited to 10 villages involved where the different interventions were in operation. Within each village (Aandhar manik, Kalmikhali, Dodaliya, Nandakumar, Narayanpur fishery gheri, Madhabnagar, Dakhinlakhinarayanpur, Banoshyanagar, Uttar surendrananj, Dakhinsurendrananj), many different social

groupings, ethnic groups, income groups, gender grouping, cultural groups related with sustainable pond based integrated farmers.

### Data Collection method

The data collection method generally depends on the nature of investigation to be made. Normally, case studies involve a mixture of methods (Yin, 1984; Denscombe, 1998; Robson, 2002, Ghosh et al., 2017). A combination of methods such as small-scale survey could yield cost effective data on the determinants of rural livelihoods (Ellis, 1998). One, major strength of case study research is the use of multiple sources of evidence to maximize the findings (Yin, 1984; Anderson et al.1998; Denscombe, 1998; Bassey, 1999). Anderson et al. (1998) further cited that findings based on conclusions suggested by different data sources are far stronger than those suggested by one alone". Therefore, a large variety of tools were used for data collection in this investigation as follows:

### Questionnaire Survey

Questionnaire is essentially a structured technique for collecting primary data (Bell and Lederman 2003). Questionnaire is an extremely rapid and reliable method of data collection (Youngman 1982). Questionnaire surveys helps in getting data on livelihood strategies and strengthened that yield authentic data on the above issues. On the basis of wealth categories, data was collected. It was possible to assimilate across the cases and across wealth groups. Questionnaires provided very effective information, in particular perception and opinions of villagers (Ellis 1998; Cohen et al.2012).

### Semi-structured interviewing

Interviewing is a basic research tool for data collection in qualitative research has been broadly used. Gillham (2000) suggested that semi structured interviews as an important tool and proposed that 'this is the most important form of interviewing in case study research'. Ritchie et al (2013) appointed that semi structured interviewing could be used 'to achieve depth and boldness of understanding of social explanations rather than the broad understanding of surface patterns, preferences and opinions". Moreover, she added several advantages, as follows:

- 1) Gather real information about people's circumstances;
- 2) Collect assertion of their partiality and view;
- 3) Analyse in some thickness their experiences, inspiration and argument semi-structured interviews can be used to collect in complex information. It is also used to follow up ideas and to pierce responses (Ball and Lederman 2003).

### Piloting instruments

Piloting is an important step to be accessory in the development of data collection methods. This helps the researcher to confirm about the instructions, wording; questions; and the overall techniques that are being used for collecting information (Bell and Lederman 2003; Anderson et al.1990). Before original data collection started, all the tools used to collect information were tested. Piloting for the household socio-economic survey questionnaire was done at villages under the selected blocks.

### The Fieldwork

According to the research design, the fieldwork was performed in two phases. In Phase1, the fieldwork started in 14<sup>th</sup> April, 2021 and continued until 22<sup>th</sup> April, 2021 and this was followed by Phase 2 fieldwork, which finished in 28<sup>th</sup> May, 2021. The researcher spent about two months for data collection in the study area.

## 3. Result

This results deals with the representation and interpretation of collected data during the field study. Data were collected through Personal Interview with structured interview schedule. The result was organized in the following manner.

### Education

Table 2 reveals that 9.9 % per cent of the respondents were illiterate, 39.39 % per cent studied up to eight level, 33.33% per cent were educated up to secondary level, 15.15% per cent studied up to higher secondary level and only 3.03 % per cent were graduate and above.

### Integrated farm pond area holdings of the Respondents

Table.3. shows that 27.27 % per cent of the respondents had small size (<1 Bigha) of integrated farm pond area holding, whereas 63.63 % per cent of the respondents had medium size (1-5 Bigha) and only 9.09 % per cent of the respondents had large size (> 5 Bigha) of integrated farm Pond area holding.

### Combination of farm enterprises of the respondents

Table 4. Depicts that most of the respondents (42.42%) who practiced Integrated Farming System were having Poultry + Fish combination.

### Age distribution

Table.5shows that majority (57.57%) of the farmers belonged to middle age group (40 to 60 yrs) followed by the category of old (above 60 yrs) and young (up to 40 yrs) which accounted for 15.15 % per cent and 27.27% per cent of total respondents, respectively.

### Occupational Variations of the Respondents

From Table.6, most of IFS farmers (72.72 % ) was depended on Agriculture. It was also found that some of farmers (27.27 %) were belong to multiple occupation that is Mason, working in bakery factories, hawkery business.

### Starting years of pond based integrated farming system of Respondents

From Table.7, most of Integrated farmers (39.39%) started their farms after 2010. some of the farmers (33.33%) started their farms from before 2000 in Baruipur and Patharpratima block.

### Helping hand for making integrated farming system of Respondents

Table.8. Indicates that majority 42.42% per cent of the respondents were made farms by power of their hard working byown self + Labours andonly (21.21%) were made their farms by family members only (21.21%) respondents were made their farms by only labours.

**Total Expenditure for making integrated farms of Respondents:**

From Table.9, total expenditure for making integrated farms (45.45%) were between 1 Lakh to 1.5 Lakh in Baruipur and Patharpratima blocks. In Mograhat – II and Mathurapur – I block, it was found that the total expenditure for making integrated farms (18.18%) were less than 1 Lakh.

**Livestock Production per year from integrated Farms**

On the basis of Table.10, the farmers ( 24.24%) got production from livestock that is > 1000 pieces poultry per year. It was also found that the production from livestock sections most of the farmers got production that is 100 – 1000 pieces from ( 30.3%) per year in Baruipur, Mathurapur –I and Patharpratima blocks of South – 24 parganas district.

**Profit for selling livestock per year of Respondents**

Table.11. indicates that, most of the Respondents (24.24%) got profit more than 1 lakh per year due to proper marketing channel. Only Mathurapur – I, the Respondents (6.06%) got money for selling livestock less than 10000 per year.

**Fish Production per year from integrated Farm Pond**

From Table.12, the fish production from most of farm ponds (51.51%) was 1 – 10 quintal per year in Patharpratima (18.18%) and Baruipur blocks (24.24%) of South – 24 Parganas district due to proper cleaning management and regular check of farm ponds.

**Earning Money for selling fish per year of Respondents**

Table.13. is showing that Net profit for selling fish per year from most of the farm ponds (39.39%) was 1 – 5 Lakh. Some of farm pond's (9.09%) income for selling fish was more than 5 Lakh in Patharpratima than Baruipur (3.03%), Mograhat – II (3.03%) blocks of South-24 Parganas district due to good marketing linkages between farmers and market man, demand of various fishes in market of Coastal areas.

**4. Discussion**

The crop and cropping system-based perspective of research needs to make way for farming systems-based research conducted in a holistic manner for the sound management of available resources by small farmers (Kumar et al.2020). Under the gradual shrinking of landholding, it is necessary to integrate land-based enterprises like fishery, poultry, duckery, apiary, field, and horticultural crops, etc. within the biophysical and socio-economic environment of the farmers to make farming more profitable and dependable (Behera et al., 2014). No single farm enterprise is likely to be able to sustain the small and marginal farmers without resorting to integrated farming systems (IFS) for the generation of adequate income and gainful employment year-round (Mahapatra and Bapat 1992; Mahapatra 1994). The farming systems approach, therefore, is a valuable approach to addressing the problems of sustainable economic growth for farming communities in India.

To solve the problems of small resource-poor farmers, a diverse and risk-prone environment has led to the development of a more holistic, resource-based, client-oriented, and interacting approach, popularly known as the Integrated Farming System. Biswas (2003) defined

integrated farming as the integration of two or more sustainability of soil that has proven advantages over the mono-cropped situation (Manjunath et al.2018). IFS is an attempt to reconcile agricultural methods with the principles of sustainable development by balancing, in the words of 'FARRE', food production, profitability, safety, animal welfare, social responsibility, and environmental care (Singh and Rai 2006). Overall an integrated farming system fulfil the multiple objectives of making farmers self-sufficient by ensuring the family members a balanced diet, improving the standard of living through maximizing the total net returns and provide more employment, minimizing the risk and uncertainties, and keeping harmony with the environment (Mali et al.2014). Simultaneous production of fish in ponds, with pigs, duck, or chicken rearing in pens, beside or over the ponds constitutes continuous organic fertilization of the pond by the livestock. This practice increases the efficiency and rent ability of both livestock farming and fish culture through the profitable utilization of animal and feed wastes (Vincke 1988, Gill et al.2009).

**5. Conclusion**

Pond based Integrated Farming System is a type of farming which adopt and integrate the component of Vegetables, Livestock, Horticulture, Aquaculture with the objectives of continuous and stable income generation, employment generation and environmental sustainability. Generally, organic inputs are used in Pond based Integrated Farming System. The organic output of one enterprise is used as the input of another enterprise. Pond-based IFS shows efficient use of inputs which is very much needed as the price of every input in agriculture is increasing day by day. Govt. of India has also promoted Integrated Farming System under National Agricultural Development Programme which got good response in many areas. The integration of farm enterprises often suggested as the means for rapid economic development in India. In view of the growing pressure of population and limited scope of increasing additional income through crop production, diversification of farming practice is considered essential not only for the captivity of the rural masses from the squalid of poverty but also for meeting the demands of Horticulture fruits, meat, fish, eggs, etc. which generally show rising trends with increasing levels of per capita income in the country.

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**Table 1:** Total number of respondents of different blocks of South 24 Parganas

S. No.	Name of the Selected Blocks	No. of Respondent
1	Baruipur	12
2	Magrahat-II	1
3	Mathurapur-I	3
4	Patharpratima`	17

**Table 2:** Educational distribution of different farmers

S. No.	Block Name	Educational Distribution-Frequency (%) N = 33				
		Illiterate	Eight	Madhyamik	Higher Secondary	>Graduate
1	Baruipur	1 (3.03%)	5 (15.15%)	4 (12.12%)	2 (6.06%)	0 (0%)
2	Mograhat II	1 (3.03%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
3	Mathurapur I	1 (3.03%)	1 (3.03%)	1 (3.03%)	0 (0%)	0 (0%)
4	Patharpratima	0 (0%)	7 (21.21%)	6 (18.18%)	3 (9.09%)	1 (3.03%)

**Table 3:** Pond area used by the selected farmers in different study blocks

Pond area used by the selected farmers-Frequency (%) N = 33				
S. No.	Block Name	Area		
		< 1 Bigha	1-5 Bigha	>5 Bigha
1	Baruipur	2 (6.06%)	10 (30.30%)	0 (0%)
2	Mograhat II	0 (0%)	1 (3.03%)	0 (0%)
3	Mathurapur I	2 (6.06%)	1 (3.03%)	0 (0%)
4	Patharpratima	5 (15.15%)	9 (27.27%)	3 (9.09%)

**Table 4:** Various components of integrated farming system

Various Components of IFS-Frequency (%) N = 33							
SI No.	Block Name	Distribution					
		FV	FVP	FH	FVH	FPH	FP
1	Baruipur	2 (6.06%)	4 (12.12%)	2 (6.06%)	4 (12.12%)	0 (0%)	0 (0%)
2	Mograhat II	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (3.03%)	0 (0%)
3	Mathurapur I	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (3.03%)	2 (6.06%)
4	Patharpratima	4 (12.12%)	0 (0%)	0 (0%)	1 (3.03%)	0 (0%)	12 (36.36%)

**Table 5:** Age wise distribution of different farmers

SI No.	Block Name	Age Distribution (Years)-Frequency (%) N = 33		
		< 40	40-60	>60
1	Baruipur	3 (9.09%)	8 (24.24%)	1 (3.03%)
2	Mograhat II	0 (0%)	1 (3.03%)	0 (0%)
3	Mathurapur I	1 (3.03%)	2 (6.06%)	0 (0%)
4	Patharpratima	5 (15.15%)	8 (24.24%)	4 (12.12%)

**Table 6:** Occupational situation of farmers

SI No.	Block Name	Distribution	
		Single Occupation	Multi Occupation
1	Baruipur	9 (27.27%)	3 (9.09%)
2	Mograhat II	1 (3.03%)	0 (0%)
3	Mathurapur I	0 (0%)	3 (9.09%)
4	Patharpratima	14 (42.42%)	3 (9.09%)

**Table 7:** Starting years of IFS in different blocks of South 24 Parganas

SI No.	Block Name	Year Distribution		
		<2000	2000-2010	>2010
1	Baruipur	7 (21.21%)	5 (15.15%)	0 (0%)
2	Mograhat II	0 (0%)	1 (3.03%)	0 (0%)
3	Mathurapur I	0 (0%)	1 (3.03%)	2 (6.06%)
4	Patharpratima	4 (12.12%)	2 (6.06%)	11 (33.33%)

**Table 8:** Helping hand for IFS

Helping hand for making IFS-Frequency (%) N = 33						
SI No.	Block Name	Distribution				
		Labours	Neighbors	Family Members	Labours + Own self	Own self + Family Members
1	Baruipur	2 (6.06%)	0 (0%)	4 (12.12%)	6 (18.18%)	0 (0%)
2	Mograhat II	0 (0%)	0 (0%)	0 (0%)	1 (3.03%)	0 (0%)
3	Mathurapur I	1 (3.03%)	0 (0%)	2 (6.06%)	0 (0%)	0 (0%)
4	Patharpratima	4 (12.12%)	2 (6.06%)	1 (3.03%)	7 (21.21%)	3 (9.09%)

**Table 9:** Total expenditure for making farms

SI No.	Block Name	Distribution				
		<1Lakh	1-1.5 Lakh	1.51-2 Lakh	2.01-2.5 Lakh	> 2.5 Lakh
1	Baruipur	2 (6.06%)	8 (24.24%)	0 (0%)	1 (3.03%)	1 (3.03%)
2	Mograhat II	1 (3.03%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
3	Mathurapur I	2 (6.06%)	0 (0%)	0 (0%)	0 (0%)	1 (3.03%)
4	Patharpratima	1 (3.03%)	7 (21.21%)	7 (21.21%)	0 (0%)	2 (6.06%)

**Table 10:** Livestock production per year

SI No.	Block Name	Distribution (Year)			
		<100	100-1000	>1000	Not Applicable
1	Baruipur	0 (0 %)	4 (12.12%)	0 (0 %)	8 (24.24%)
2	Mograhath II	0 (0 %)	0 (0 %)	1 (3.03%)	0 (0 %)
3	Mathurapur I	2 (6.06%)	1 (3.03%)	0 (0 %)	0 (0 %)
4	Patharpratima	2 (6.06%)	5 (15.15%)	7 (21.21%)	5 (15.15%)

**Table 11:** Profit for selling livestock production.

SI No.	Block Name	Profit (/Year)			
		< 10000	10000-1 Lakh	> 1 Lakh	Not Applicable
1	Baruipur	0 (0%)	0.1212	0 (0%)	8 (24.24%)
2	Mograhath II	0 (0%)	1 (3.03%)	0 (0%)	0 (0%)
3	Mathurapur I	2 (6.06%)	0 (0%)	1 (3.03%)	0 (0%)
4	Patharpratima	0 (0%)	5 (15.15%)	7 (21.21%)	5 (15.15%)

**Table 12:** Fish production of different study blocks.

SI No.	Block Name	Distribution (/Year)		
		< 1 Quintal	1-10 Quintal	>10 Quintal
1	Baruipur	2 (6.06%)	8 (24.24%)	2 (6.06%)
2	Mograhath II	0 (0%)	1 (3.03%)	0 (0%)
3	Mathurapur I	1 (3.03%)	2 (6.06%)	0 (0%)
4	Patharpratima	3 (9.09%)	6 (18.18%)	8 (24.24%)

**Table 13:** Profit for selling fish in different blocks of South 24 Parganas.

SI No.	Block Name	Distribution (/Year)		
		< 1 Lakh	1-5 Lakh	> 5 Lakh
1	Baruipur	5 (15.15%)	6 (18.18%)	1 (3.03%)
2	Mograhath II	0 (0%)	0 (0%)	1 (3.03%)
3	Mathurapur I	2 (6.06%)	1 (3.03%)	0 (0%)
4	Patharpratima	8 (24.24%)	6 (18.18%)	3 (9.09%)