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Economic analysis of ifs (Integrated farming system) in Ranchi, district of Jharkhand

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Abstract
The study of "An Economic Analysis on Integrated Farming System Model of Burakocha village in Angara block of Ranchi District, Jharkhand" was conducted in 2022. For collecting the data different methods were adopted like quantitative (survey-personal interview) and qualitative (observation, case study). Through the survey, it was known that more than half of the villagers were literate but education standard was very poor. Farmers of this village practiced organic agriculture. They also reared livestock. In this village, Educational level. 24% of farmers have completed their primary education, 15% of farmers have completed their secondary education, 14% famers are graduates,2% famers are post graduate 45% of farmers are illiterate and major of the farmers (45%) illiterate. Hence, we can say that the majority of farmers had illiterate but level of education was mostly up to primary level. We analyzed that in survey area 17% farmers are marginal, 33% farmers are small, 38% farmers are semi medium, 4% farmers are medium and 0% farmers are large. Hence, we can say majority of farmers have 2-4 ha. Land. The cropping pattern of the study area in which cropping pattern was categorized into seven patterns. This also includes marginal farmers, small farmers. Semi-small farmers and medium framers in which 24 farmers followed integrated farming system (IFS) 1 pattern, 16 farmers followed integrated farming system (IFS) 2 pattern, 8 farmers followed integrated farming system (IFS) 3, 9 farmers followed integrated farming system (IFS) 4, 16 farmers followed integrated farming system (IFS) 5, 17 farmers followed integrated farming system (IFS) 6 and 10 farmers followed integrated farming system (IFS) 7. Majority of farmers followed integrated farming system (IFS) 1.We analyzed that in survey area Average income of kharif season are 1 crore, in Rabi season 80 lakhs, in zaid season 30 lakhs and by horticulture crops is 20 lakhs. Hence, the More earning season is kharif. The average expenditure of farmers in study area by agriculture. It includes machinery cost Rs. 543621, manure and fertilizers cost Rs. 2323120, seed cost Rs. 2227696, pesticides cost Rs. 507922, irrigation cost Rs. 56516 and labour cost is Rs. 146000. So, the total average annual expenditure of farmers is Rs. 5753975. Hence, he impact of Integrated Farming System on farmers' income. Average income earned by farmers before Integrated Farming System was Rs 1.5 to Rs. 2.0 lakhs but the average farmers income after Integrated Farming System are Rs. 4.5 lakhs to Rs. 5.0 lakhs. So, the difference is 171.42 percentage (approx) after adopting IFS (integrated farming system).

Keywords: Integrated farming system, cobb-douglas and different cropping pattern

1. Introduction
Integrated Farming systems (IFS), and ways of thinking about them, evolved in space and time. Rapid evolution took place in the last two decades when crop and livestock yields increased, together with concerns about their socio-economic and biophysical tradeoffs. The application of farming systems research (FSR) to agricultural development was a response to problems arising from a predominantly reductionist approach to research and a cornucopian view of external inputs. Modern technologies were either not welcomes or caused unexpected negative trade-offs. This paper reviews definitions and forms of FSR and the need for evolution in thinking about agricultural development. Application of thermodynamic theory (TDT) to the study of farming systems influences discussion between cornucopian and conservationists, and between reductionist and holistic approaches to research. There is a need to recognize context (suitability of technology), and to pay more attention to relations within systems (system dynamics) and to defining criteria for sustainability. The paper links biophysical and socio-economic processes, gives a physical background for the anthropomorphic concepts of waste, and reviews aspects of objectivism and constructivism. It is argued that FSR can only advance if the full portent of these issues is considered in thinking about development of IFS.

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The complexity of the reality should make scientists think more carefully about the appropriate strategy that will get people out of poverty. Research in Asia of replications of the famous Bangladesh Grameen Bank micro-credit programs show that there is an ideal progression for farm families in the sub-continent that even the poor aspire too. According to this experience poor women invest in small livestock and the household step by step gets out of poverty. There is a great and unmet challenge for research on local resources to cater to the needs of these people.

1.1 Indian Agriculture
Agriculture in India is noted for its multi-functionality in terms of employment, livelihood, food, nutrition, and environmental security. Cropping income alone on small farms is hardly enough to support a farmer's family, especially as farm sizes shrink due to population growth, moreover; periodic monsoon failures aggravate the situation. As a result, a smart mix of any one or more of these enterprises with agronomic crops should complement the farm income in order for the farmer to be assured of regular income for a satisfactory living (above the poverty line). The selection of enterprises must be based on the cardinal principle of minimizing the competition and maximizing the complementarities between the enterprises.

In India, the farmers maintain different enterprises for their complimentary and supplementary nature and for ensuring sustainable livelihood from time immemorial. After the advent of green revolution in late-1960s and economic liberalization in early-1990s, the farmers gradually started focusing on a few enterprises due to several imposing factors including shrinking farm sizes, fluctuating commodity prices, livelihood diversification and shortage of labour during peak agriculture season. It had a severe impact on food and nutritional security of millions of poor farm households. The anguish of farmers is often expressed in terms of their agitation in one or the other part of the country, unwillingness to continue farming and increasing demands of compensating their economic loss. Although suggestions are pouring in from experts and leaders of organisation for strengthening the income base of farmers, the government cannot implement them entirely due to compulsions from socio-economic and political considerations.

1.2 The Concept Integrated Farming System (Integrated Farming System (IFS)
Integrated farming system (IFS) cope with the changes farm level, in a manner that balances food production, profitability, safety, animal welfare, social responsibility and environmental care. The Integrated Farming System has been used for integrated resource management which may not include either livestock or fish components. Its focus is the integration of livestock, horticulture and fishery, goat farming, pig farming, poultry, often within a larger farming or livelihood system. Integrated farming system (IFS) is a farming system that combines a variety of crop and livestock, horticulture and the application of various techniques to create suitable conditions to protect the environment, maintain land productivity and increase farmer income. The rationale behind integrated farming is to minimise wastes from the various subsystems on the farm. Wastes or by-products from each subsystem are used as input to other subsystems to improve the productivity and lower the cost of production of the outputs of the various subsystems. This farming system

occurs between the input-output relationship of commodities, linkages between production activities with pre-production and post-production, as well as between agriculture and manufacturing activities and services. Integrated farming system (IFS) is part of the agro-eco technology system consisting of various interrelated components include non-farm business components, biophysical nature, and socio-economic, political and cultural. The Integrated farming system is a systematic approach to the use of low external input between crops with livestock and horticulture.

1.3 The Importance of Integrated Farming System Development
The advantages of integrated farming system (IFS) are productivity, profitability, sustainability, balanced food, environmental safety, recycling of waste, saving energy, adoption of new technology, money around the year, availability of fodder, fuel, and timber, employment round the year, agro industries, increases input efficiency, standard of living and avoid degradation 4 of forest. Integrated farming system (IFS) is very important to be develop because could become a solution to the problems in the regional development. This includes
a) Physical environment damage
b) Biotic environmental damage such as the decline of biological resources, illegal logging, damage to coastal ecosystems, rivers, and lakes
c) Damage to natural resources
d) Natural disasters
e) Lack of development of local potential

1.4 Agriculture in Jharkhand
Agriculture is the main stay for the 80% of rural population of the state. Agriculture is their employment and primary income generating activity. The agricultural economy of the Jharkhand state is characterized by dependence on nature, low investment, low productivity, mono-cropping with paddy as the dominant crop, in inadequate irrigation facilities and small and marginal holdings. The dependence of agriculture on the Vagaries of the rain-god can be gauged from the fact that as much as 92% of the total cultivated area is unirrigated.

2. Research methodology
This chapter deals with the description of the study area, the sampling procedure followed, the nature and sources of data and analytical tools and techniques employed. The methodology is presented under the following major headings. The multiple stage of stratified sampling process was adopted for sampling.

2.1 Selection of block
Out of 18 blocks in Ranchi district, Angara block was selected purposively for the study. The basis for selection of block was based on maximum no. Of farmers adopted integrated farming system (IFS).

2.2 Selection of villages
A complete list of villages was prepared. Out of 82 villages, 5% of villages were selected randomly for the study because of the large number of farmers adopted integrated farming system (IFS).

2.3 Selection of the respondent
A multistage sampling was adopted for the study. The top 4

villages were selected because of the large number of farmers adopted integrated farming system (IFS). 100 Respondents were selected on basis of their landholding and production (Marginal farmer, small, semi medium farmer, medium farmer, and large farmers).

Table 1: Detail about respondents

Category	Types of farmer	Land holding	No. of respondents
Size-1	Marginal farmer	<1 ha	17
Size-2	small farmer	1-2 ha	33
Size-3	semi medium farmer	2-4 ha	38
Size-4	medium farmer	4-10 ha	12
Size-5	large farmer	>10 ha	0
		Total =	100

2.4 Data collection
Required data was collected through simple survey method with the help of questionnaire from the farmers as per the objective of study. Primary and secondary data was collected from the following Sources
- **Primary data:** Primary data was collected from the farmers through personal interview with the help of schedule.
- **Secondary data:** Secondary data was collected from Internet, Magazines and Newspaper etc.
- **Method of Analysis:** The Collected information and data from the various sources was systematically tabulated and analyze with the help of simple average and percentage.

2.5 Analytical tool
2.5.1 Cobb-douglas production function
To study the resource productivity and allocative efficiency in identified different Farming Systems, a modified Cobb-Douglas type function was fitted separately. This was done with a view to quantify and to determine the extent to which the important resources, explain the variability in the gross returns of the Farming Systems and to determine whether the resources are optimally used in these Farming Systems.

The Cobb-Douglas Production Function is:

$$Q = A * K^{\alpha} * L^{\beta}$$

Q = output
K = capital
L = Labour
A, α, β =Possitive Constants.

2.5.2 Objective of the study
2.5.2.1 To assess economics of different cropping system

Table 2: Farmers adopted integrated farming system (IFS)

Years	No. of respondents
Below 1 years	19
1-3 years	23
3-5 years	21
5-10 years	20
Above 10 years	17

Above table 2 shows that from how many years farmers adopted integrated farming system (IFS) in which 19% of farmers adopted integrated farming system (IFS) below 1 years, 23% of farmers adopted integrated farming system (IFS) from 1-3 years, 21% of farmers adopted integrated farming system (IFS) from 3-5 years, 20% of farmers adopted integrated farming system (IFS) from 5-10 years and 17% of farmers adopted integrated farming system (IFS) above 10 years.

Table 3: Detail about Different Cropping Pattern

Cropping pattern	Marginal farmer (<1 ha)	Small farmer (1-2 ha)	Semi-medium (2-4ha)	Medium(4-10ha)	Large(>10ha)
Integrated Farming System (IFS) 1	5	8	9	2	0
Integrated Farming System (IFS) 2	3	5	6	2	0
Integrated Farming System (IFS)3	1	2	4	1	0
Integrated Farming System (IFS) 4	2	3	3	1	0
Integrated Farming System (IFS) 5	1	6	7	2	0
Integrated Farming System (IFS) 6	4	5	6	2	0
Integrated Farming System (IFS)7	1	4	3	2	0

a) Integrated Farming System (IFS) 1- Paddy + Vegetable + Poultry + Dairy + Other
b) Integrated Farming System (IFS) 2- Paddy + Vegetable + Pig Farming + Other
c) Integrated Farming System (IFS) 3- Paddy + Maize + Goat Farming + Other
d) Integrated Farming System (IFS) 4- Paddy + Mustard + Fishery + Other
e) Integrated Farming System (IFS) 5- Paddy + Horticulture + Dairy + Other
f) Integrated Farming System (IFS) 6- Paddy + Pulses + Vegetable + Other
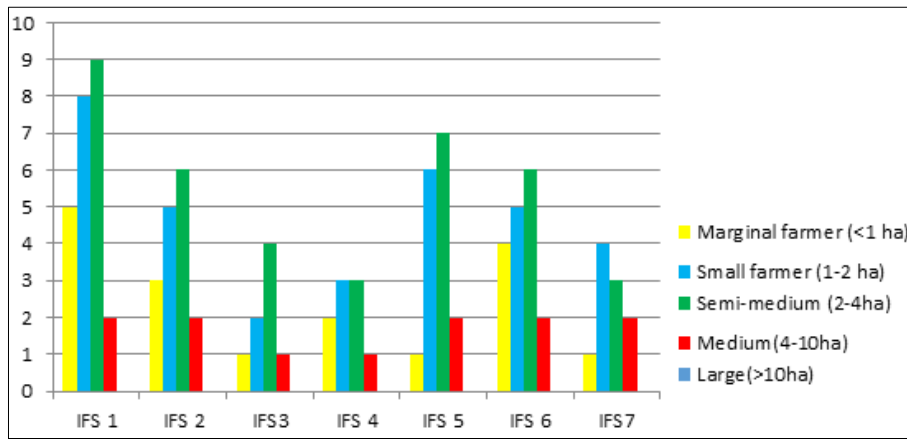g) Integrated Farming System (IFS) 7- Maize + Pulses +Pig Farming + Others

Fig 1: Graph Representing Different Cropping Pattern

Above graph 1 show the cropping pattern of the study area in which cropping pattern was categorized into seven patterns. This also includes marginal farmers, small farmers. Semi-small farmers and medium framers in which 24 farmers followed integrated farming system (IFS) 1 pattern, 16 farmers followed integrated farming system (IFS) 2 pattern, 8 farmers followed integrated farming system (IFS) 3, 9 farmers followed integrated farming system (IFS) 4, 16 farmers followed integrated farming system (IFS) 5, 17 farmers followed integrated farming system (IFS) 6 and 10 farmers followed integrated farming system (IFS) 7. Majority of farmers followed integrated farming system (IFS) 1.

2.5.2.2 Income of farmers in study area by integrated farming system (IFS)

Table 4: Crops grown in study area

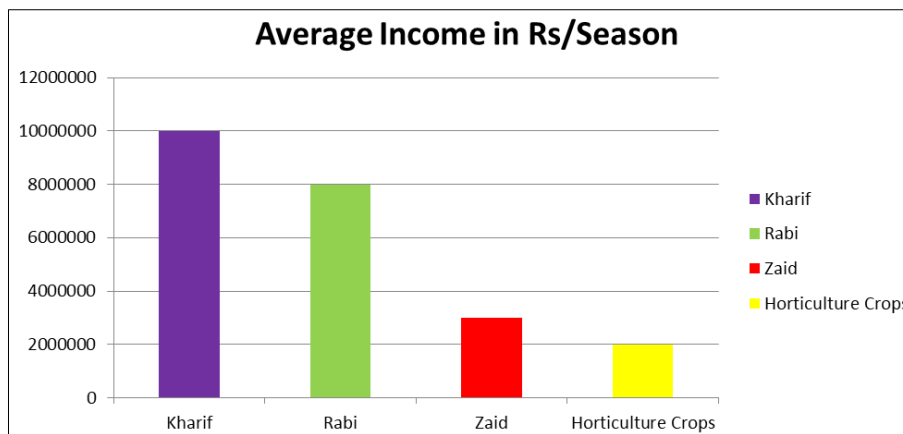| Season	Crop	Average Income In Rs/ Session
Kharif	Pulses, maize, oilseeds, paddy, potato, onion, tomato, cauliflower, cabbage, others	10000000
Rabi	Wheat, barley, peas, gram, other	8000000
Zaid	Cucumber, watermelon, bitter gourd, pumpkin, other	3000000
Horticulture Crops	Mango, jackfruit, guava, litchi, banana, other	2000000
Total		23000000

Fig 2: Graph representing average income in Rs/season

Average income of farmers in different season. In Kharif season the earning was highest followed by Rabi and Zaid season.

Table 5: Detail about Livestock (annual income)

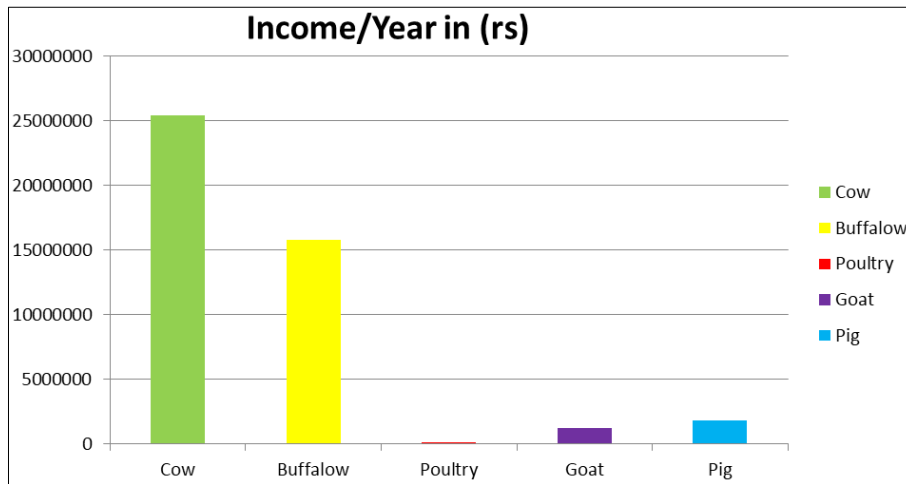| Animals	No. Of animals or sarea	Average production of milk/ meat in (lit/Kg)	Average Cost of 1 (kg/lit) milk/meat	Income/day In (Rs)	Income /year In (Rs)
Cow	232	2320	30/lit	69600	25404000
Buffalow	180	1440	30/lit	43200	15768000
Poultry	850	1700	100/kg	-	170000
Goat	162	2430	500/kg	-	1215000
Pig	180	9000	200/kg	-	1800000
Total					44357000

Fig 3: Graph Re-presenting average annual income (Rs.) from Livestock

From above chart 3 and table 5, we analyzed that in survey area Average income from cow is Rs. 25404000, Average income from buffalo is Rs. 15768000, Average income from poultry is Rs. 170000, Average income from goat is Rs. 1215000 and Average income from pig is Rs. 1800000.

According to above income the average incomes of farmers in study area through livestock's are :-

Average income = Total income in year/No. of farmers
= 44357000/100
= Rs. 443570

So, Rs. 443570 per annum is the average income of farmers in study area by livestock.

Average income earned by farmers through integrated farming system (IFS) = Average income earn by agriculture + Average income earn by livestock
= Rs. 230000 + Rs. 443570
= Rs. 673570

So, average annual income earn by farmers is Rs. 673570

3. Summary
The concept of a farming system is a collection of pieces or components that are interconnected and interact with one another. The farmer himself is at the centre of interaction, exercising control and choice over the nature and result of interaction. The analysis was based on survey data received from 100 farmers for the 2021-22 financial year four villages were chosen on purpose and 24 farmers from each village were chosen at random. Farmers from each community were divided into seven groups: integrated farming system (IFS) 1- paddy + vegetable + poultry + dairy + other integrated farming system (IFS) 2- paddy + vegetable + pig farming + other integrated farming system (IFS) 3- paddy + maize + goat farming + other integrated farming system (IFS) 4- paddy + mustard + fishery + other integrated farming system (IFS) 5- paddy + horticulture + dairy + other integrated farming system (IFS) 6- paddy + pulses + vegetable + other integrated farming system (IFS) 7- maize + pulses +pig farming + others.

4. Conclusion
It can be concluded that Integrated Farming System (IFS) had a positive effect on the economic return maintaining the environmental sustainability than the Non Integrated Farming System (NIFS).

Average income of kharif season are 1crore, in Rabi season 80 lakhs, in zaid season 30 lakhs and by horticulture crops is 20 lakhs. Hence, the more earning season is kharif.

Average income from cow is Rs. 25404000, Average income from buffalo is Rs. 15768000, Average income from poultry is Rs. 170000, Average income from goat is Rs. 1215000 and Average income from pig is Rs. 1800000.

The impact of Integrated Farming System on farmers' income. Average income earned by farmers before Integrated Farming System was Rs 1.5 to Rs. 2.0 lakhs but the average farmers income after Integrated Farming System are Rs. 4.5 lakhs to Rs. 5.0 lakhs.

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