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Integrated Farming System to Improve Agriculture System

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Abstract: Sustainable farming approach has been adopted by thousands of small and marginal family farmers in resource-poor areas in order to diversify farm production, raise cash revenue, boost the quality and quantity of food produced, and use underutilized resources. A well-integrated farm with market connections that will assure a family's nutrition and way of life often takes three to four years to create.

Introduction

A farming system is the result of complex interactions among a number of interdependent components, where an individual former allocates certain quantities and qualities of factors of procluction, namely land, labour, capital and management to which he access (Mahapatra, 1994).

The approach (IFS) aims at increasing income and employment for small holdings by integrating various farm enterprises and recycling crop residues and by-products within the farm itself. (Behera and Mohapatra, 1999; Singh et al; 2006).

The propose study on integrated farming system for optimum profitability and sustainability in Distt. Rewa (MP) - A case study of rice crop finds its significant place in the present review and views of the various scientists to plan a proper study with clear cut objectives to understand application of integrated farming concept in rice-crop to Sustain potentiality of production and scope for resource utilization with greater input use efficiency.
The Present study has been conducted in Rewa district of Madhya Pradesh.

Physiographic situation:

- **Location :**

The Rewa district lies in the central part of the state of Madhya Pradesh, covering an area of 6287.45 Sq Km. - (As per Statistical Book) It lies between North latitude 24°16'30" and 25°11'15" and east longitude 81°03'15" ;md 82°18'45", falling in Survey of India Topo sheet No. 63 G, H, & 63 L. It is located in the northeastern comer of the State, and bounded by Satna district in the West, Sidhi district in the South & the State of Uttar Pradesh in the North & East. Rewa town is the district head quarter for administrative purposes. The district is sub divided into seven Tehsils and nine blocks. The district and block headquarters are connected

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by a network of metallic roads apart from the state highways, The National Highway No. 7 (Varanasi Kannyakumari) & NH 75 (Gwalior - Ranchi joins to NH 33) passes through the Rewa and NH -27 (Mangawan - Allahabad) also passes through the district. Rail line pass through the district.

General vegetation

Agriculture is the backbone of the economy of the district. The chief agricultural products in the district are paddy, maize, millet, etc. The adoption of the new agricultural technologies amongst the famers of the district helps to increase the production of various agricultural items. In terms of mineral resources, the district is rich in it. The Rewa district has a belt of limestone and coal is also found in its nearby districts such as Shahdol. Umaria, Sidhi and Singrauli. Due to the availability of limestone some cement factories are set up in some of its nearby places. Every year a huge chunk of revenue comes from these factories helps in its economy to a great extent. In 2006, the Ministry of Panchayati Raj declared Rewa as one of the country's 250 most backward districts and currently receiving funds from the Backward Regions Grant Fund Programme (BRGF). In the year 2019-20 the gross domestic product in the district was Rs. 24,87,214 lakhs at current price and Rs. 14.55.021 lakhs at constant prices in the year 2011-2012. The net domestic product in the district during the period 2019-20 was Rs. 22.91.819 lakh at current price and Rs. 13.04.404 lakh at constant prices in the year 2011-2012 The Per Capita Income or NDDP, At Factor Cost during the period 2019-20 was Rs. 84,895 at current price and Rs. 48.319 at constant prices in the year 2011-2012.

Major Field Crops	: Rice Soybean, Sorghum, Pigeonpea, Blackgram, Wheat, Chickpea, Lentil, Linseed, Barley.
Horticulture crops – Fruits	: Mango, Guava, Orange, Water Chestnet.
Horticultural crops –Vegetables	: Tomato, Potato, Cauliflower, Chilli, Onion.
Medicinal and Aromatic Crops	: Ashwagandha, Turmeric.
Plantation crops	: Mango, Guava, Citrus , Aonla .
Fodder crops	: Berseem, MP chari.

METHODOLOGY

The present investigation entitled “Study of integrated farming system for optimum profitability and sustainability in Distt. Rewa (M.P.). A case study of Rice crop” involved field experiments conducted at agricultural research farm Kuthulia Rewa.

The samples for analysis have been collected from ICAR project on “Integrated Farming System” Kuthulia Farm Rewa District (M.P.).

- **Methodology for Soil analysis:**

The Samples from experimental fields were collected and composit samples were made and

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the following parameters were analysed using the standerad soil analysis method

Mechanical analysis:

Texture is one of the most important physical properties of soil. The soil texture is based upon division of the size of soil particles into three size fractions viz., Sand (2–0.05mm average particle diameter), Silt (0.05–0.002mm) and Clay (less then 0.002mm). If one of these fractions dominates the properties of a soil, the name of that fraction is included in the name of the texture.

- **Economics analysis:**

The economics of various treatments was worked out separately by taking into account the existing price of inputs and produce of current year. The investment on fertilizers, labour and power for performing different operations such as ploughing, weeding, irrigation, harvesting, threshing and winnowing were worked out (Rs. ha-1 as per rate prevalent at the Agricultural Research Farm, Institute of Agricultural Sciences Rewa (M.P.). The cost of cultivation was taken into account for calculating economics of treatments and expressed as net returns (Rs./ha-^{1}) and output: input ratio.

Observation

To understand sustainable resource management for climatic smart integrated forming system (IFS) and to identify the cropping system module for different forming system a proper study was undertaken and the experimentation was done for the year 2019-2020 and 2020-2021.

The main objectives covered during present investigation were:

- To identify most sustainable, productive and profitable system.
- To meet out the diverse feed and fodder requirements of house hold for lively hood security.
- And the nutrient dynamics was also studied.

The experimentation was done during the two consecutive year 2019-2020 and 2020-2021.

Observation for year 2019-2020:

The detailed experimentation plan is as follows:

- Year of start : 2019-2020
- Experimental design : Randomized Block Design
- Plot Size : Gross = 5m x 4.2m = 21 Sq meter
  Net plot = 4 x 3.0 Sq meter = 12 Sq meter
- Date of sowing : Kharif – 10.07.2019
  Rabi – 11.10.2019 to 26.11.2019

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Table :1 Chemical properties of soil in different cropping system (2019-20)

Treatment	**pH**	**Ec**	**O e g/kg**	**Available Nutrient kg/ha**		
				N	**P**	**K**
T_1 Rice (Danteshwari) – Wheat (HD02864)	7.30	2.21	3.90	112.60	10.20	312
T_2 Rice (Danteshwari) – Green manure – Barley (Geetanjali)	6.6	0.26	4.20	109.20	11.76	368
T_3 Rice (Danteshwari) – Gram (JG-322) + Mustard (Pusa bold)- GM	6.7	0.28	5.80	198.40	15.20	416
T_4 Rice (Danteshwari) – Pea (Arkel)- Green gram (PDM-139)	7.3	0.41	5.7	197.90	18.80	380
T_5 Rice (Danteshwari) – Potato (Kurfi Chandramukhi)	6.6	0.48	4.60	116.30	12.60	295
T_6 Rice (Danteshwari) – Pea (Arkel) + Mustard (Pusa bold) + Green Manure	6.40	0.33	4.80	119.40	14.30	332
T_7 Rice (PS-5) Berseem (JB-1)	6.20	0.41	6.20	193.60	16.20	410
T_8 Rice (Danteshwari) – Barley fodder (JB-58) Bajra fodder (WCC-75)	7.90	0.32	4.40	121.20	15.30	418
T_9 Rice (PS-5) – Garlic (G-1)	6.70	0.98	3.80	132.80	16.00	381
T_{10} Rice (Danteshwari) – Toria (T-9)	7.20	0.69	3.70	136.20	13.60	363

Nutrient dynamics under different cropping system:

The final results an nutrient dynamics have been computed and presented in table 6.2 for the year 2019-20.

Chemical properties of soil after harvest of summer crops has been given in for the year Table1 reveals that there was no major changes in soil pH and Ec. Organic carbon 6.2 g/kg was maximum in rice - berseem followed by 5.8 g/kg in rice- gram + mustard - green manure and rice- pea- green gram. The available nitrogen status were also higher in rice- berseem, rice- gram mustard green manure and rice- pea- green gram cropping system. The available potash status was higher in rice- gram+ mustard - green manure, rice berseem and rice- barley- bajra cropping system.

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Table :2 Grain yield, Economical yield, Net return and B:C ratio under different weed management practices under organic production system of rice-garlic. (2019-20)

Treatment	Yield q/ha		REY q/ha	Gross return Rs./ha	Net return Rs./ha	B:C Ration
	Rice	Garlic				
T_1 Two handed weeding 25 and 50 DAT	56.26	107.04	255.38	561850	358550	2.76
T_2 Cono weeder 25 DAT + one HW at 50 DAT	54.81	95.41	233.17	512982	334282	2.87
T_3 Inter cropping with Dhaincha in rice and mustard in garlic	49.75 R 133.10 GM	36.57 G 13.05 M	143.64	316010	161687	2.04
T_4 Stale seed bed + reduced spacing upto (25%) + mulching with wheat straw + one hand weeding	55.68	69.60	187.77	513096	233196	2.29
T_5 Locally available weed mulch + 1 hand pulling	47.12	41.47	127.83	281244	101624	1.56
T_6 Incorporation of mustard oil cake 15 days before sowing @ 5t/ha + 1HW	5051	122.67	279.72	615402	267276	1.76
T_7 ITK treatment on weed control practices of farmers as mulching with leaf on mango	43.73	53.65	146.00	321213	163100	1.94

Weed Management:

The final results for weed management practice have been computed and presented in table 6.3. For 2019-2020.The findings have been discussed here under.Weed intensity/m2 has been given in fable rice field were Jussia, suffrusticosa, Monochoria, vaginalis, & Fimbris-tylish reveals that major weeds in dichotoma and Echinoclova colonum in kharif. In rabi season major weeds found in garlic fields were Medicago hyspida, Phalaris minor, Anagalis arvensis and Heliotropium indiceum. Two hand weedings at 25 and 50 DAS in rice and 40 and 80 DAS in garlic gave good control of weeds as weed intensity and biomass were reduced in kharif and rabi followed by application of 5t/ha mustard oil cake along with one hand weeding. Mulching alone with mango leaf and intercropping were not found effective weed control practices as compared to 2 HW in rice and garlic.Grain yield of rice and economical yield of garlic have been given in Table 2 reveals that maximum rice yield 56.26 q/ha was noted under two hand weeding which was at par to stale seed bed + reduced spacing by 25%+ one HW and mulching by straw and T_2 in which one Hoeing + 1 Hand weeding was given as weed control practices. Mulching alone with mango leave was found interior among all the weed control practices.

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Garlic bulb yield 122.67 g/ha was maximum under the application of 5t/ha mustard oil cake + HW at 80 DAS followed by 107.04 q ha in 2 HW at 40 and 80 DAS as weed control treatments. One Hoeing at 40 DAS and 1 HW at 80 DAS was also better than mulching and reduced spacing.

The net profit Rs. 358550/ha and B.C ratio 2.76 was maximum under 2 HW followed by Rs. 334282 and B:C ratio 2.87 under one Hoeing and 1 HW as given in rice and garlic both. Application of mustard oil cake 5t/ha + 1 HW was uneconomical due to higher cost of mustard oil cake as it gave BC ratio 1.76 only.

The findings of present investigation is summarized as follows:

Year 2019-2020

•Among different cropping system, rice crop performed better under the residual effect of rice- barley- bajra, rice-green manure-barley and rice - pea + mustard - green manure cropping system. Rice -garlic cropping system gave maximum REY 380.89 q/ha, net profit Rs. 430176 and B:C ratio 2.68 followed by rice- potato - green gram cropping system. Rice-berseem (F+S) gave maximum B.C ratio 3.17 followed by BC ratio 3 in rice- Potato-green gram.

•The major dominating weeds in rice were Jussia suffruticosa, Monochoria, Fimbirstylish dichotoma and Echinoclova colonum. The garlic field was infested with Medicago hyspida. Phalaris minor. Heliotropium indicum, Chenopodium album and Anagalis arvensis.

•Rice equivalent yield 279.72 q/ha and gross return Rs. 615402/ha was maximum under application of 5t/ha oil cake + 1 HW in rice and garlic but it gave lower return Rs. 267276/ha which is lower than two hand weeding and I Hoeing + 1 HW given as weed control treatment in rice and garlic under organic production system. Net profit Rs. 358550/ha was maximum under 2 HW in (T1) followed by 1 Hoeing+ 1 HW in T_2 (Rs. 334282). These treatments gave higher B:C ratio 2.76 and 2.87 which was higher than application of mustard oil cake 5/ha+ 1 HW in rice and garlic and mulching with any material in other treatment as weed control.

A combination of Rice+Potato, Rice + Berseem, Rice+Barley+Bajra, Rice + Pea + Mustered and Rice + Garlic are suggested as major crop combinations if tried under the principle of integrated forming system can provide profitability and sustainability to formers of Rewa district.

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