

## Economical Performance of Sustainable and Modern Agriculture System under NRLM in Chhattisgarh - An Empirical Study

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### ABSTRACT

India has traditionally been a country of sustainable agriculture, but the growth of modern scientific, input intensive agriculture has pushed it to wall. But with the increasing awareness about the safety and quality of foods, long term sustainability of system and accumulating evidence if being equally productive. The sustainable agriculture is labour intensive, but its cost of cultivation is lower due to saving on chemical pesticides, fertilizers and seeds. The yield on sustainable agriculture is higher by adopting system of rice intensification and direct seeded rice by seed drum. The analyzed data showed that the average holding size of SA practicing respondents in Bastar Plateau had a little more than land holding size of the SA practicing respondents of Chhattisgarh Plains. The land holding size was double in Northern Hill region than the both region. FBI from sustainable agriculture in the production of paddy is much higher than that from modern agriculture, though there are differences in Cost  $A_1$ . In the case of paddy SAS practicing farmers were adopted NPM input methods which is reflecting in Cost  $A_1$  became cheaper than the chemical input method used by MAS farmers. Yield was higher than MAS cultivated farmers due to might be 39 percentage SAS farmers were cultivated paddy by system of rice intensification. FBI from Bastar plateau region under sustainable agriculture system is more than double than Modern agriculture system. The larger variation in the SAS farmers FBI could be observed in the Chhattisgarh plain region which is higher than the MAS farmers. NRLM's core objective is to increase at least 1 lakh additional income of the SHG members. Sustainable agriculture is the major activity in which we can reduce the cost of production and increase the production. This can also fulfill thought of respected prime minister "Doubling of farmer's Income by 2022."

**Key words:** Sustainable Agriculture, Economic Performance, Farm Business Income, Cost

### INTRODUCTION

NRLM Aajeevika - National Rural Livelihoods Mission (NRLM) was launched by the Ministry of Rural Development (MoRD), Government of India in June 2011. Aided in part through investment support by

the World Bank, the Mission aims at creating efficient and effective institutional platforms of the rural poor enabling them to increase household income through sustainable livelihood enhancements and improved access to financial services.

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NRLM has set out with an agenda to cover 7 Crore rural poor households, across 600 districts, 6000 blocks, 2.5 lakh Gram Panchayats and 6 lakh villages in the country through self-managed Self Help Groups (SHGs) and federated institutions and support them for livelihoods collectives in a period of 8-10 years.

In March 2014, the Chhattisgarh state rural livelihood mission 'BIHAN' (NRLM) launched a project to alleviation of poverty through sustainable agriculture for marginal and small women farmers through community resource persons called CMSA (community managed sustainable agriculture). In Chhattisgarh for poverty alleviation through sustainable agriculture community managed sustainable agriculture (CMSA) was launched in two districts *i.e.* Balrampur and Rajnandgaon as a pilot project. The project started in ten villages in two clusters in two blocks of the pilot district. In 2015 it was spreaded in 5 blocks of 5 district of different agro-climatic region of Chhattisgarh. Now CGSRLM is working with 28 blocks of 14 district during 2016-17 with 150,300 farmers.

During the past more than 20 years, farmers have shown steadily increasing interest in ecological farming or sustainable agriculture. Many farmers who adopted sustainable agriculture methods early in this period were motivated by reasons relating to the health and safety of their families consumers and livestock by idealistic convictions about soil and land stewardship. more recently, as costs of chemicals and credit have increased and commodity prices have stagnated, thousands of conventional farmers have begun to search for ways to decreased input costs. These economic pragmatists might deny identification with the sustainable agriculture movement, but they are moving in that direction.

The present investigation was carried out to study cost of cultivation of farmers regarding sustainable agriculture Versus Modern agriculture. What is the Cost benefit ratio after adopting sustainable agriculture? Many farmers are switching over to

sustainable agriculture. Are the aware about standard of sustainable agriculture? is there any suggestion to promote sustainable agriculture ? What are the components of belief regarding sustainable agriculture? to seek answers to some of these questions the present study was planned with the titled objectives

### **Review of literature**

Several studies directly compared returns on organic and conventional farms. Lockeretz *et al.* compared the economic performance of 14 organic crop/livestock farm in the Midwest with that of 14 conventional farms. the study farms were paired on the basis of physical characteristics and types of farm enterprises. The market value of crop produced per unit area was 11 percent less on the organic farm but since the cost of production was also less, the net income per unit area was comparable for both system. a study by Robert *et al.*<sup>1</sup> compared data from 15 organic farms in the western corn belt with USDA data on representative conventional farms in the same area in the most cases the net returns were greater on the organic farms. Dabbert and madden<sup>2</sup> in their study note that an established organic farm can be as profitable as a conventional farm under certain circumstances. however, organic farming system often require a transition period before they are fully established after a changeover from conventional farming yields may decreased and recover only slowly during those transition period and less profitable crop rotation may be required to establish an organic system. karemane and balachandra<sup>3</sup> observed that a comparison of the costs and returns of the different farming systems reveal that the two modern farming system, *i.e.*, semi- intensive prawn farming and mixed farming had the highest net returns. however the benefit cost ratio ,which explains the returns per rupee invested, indicated that paddy/prawn rotation system was the most profitable enterprises. Siddaraju, V.G. and M. Indira <sup>6</sup>have done analysis the economic performance of organic agriculture and modern agriculture system and compare them.

the study revealed that farm business income from organic agriculture is greater than that from modern agriculture in the case of coconut, arecanut, paddy and sugarcane.

### MATERIAL AND METHODS

The present study is based on primary data collected from the growers practicing sustainable agriculture and modern agriculture for the crop paddy. The present study was conducted in 1 district of Bastar Plateau, 3 district of Chhattisgarh plains and 1 district of northern hills of Chhattisgarh regions. In view of the assumption that in first 5 district (Bastar, Kanker, Gariyaband, Rajnandgaon and Balrampur) in which 5 blocks (Bastar, Narharpur, Chhura, Rajnandgaon and Balrampur) were selected through purposive random sampling. Selected district and blocks are oldest selected area under sustainable agriculture of CGSRLM. From each Block, ten villages and 100 farmers were selected for 1<sup>st</sup> phase of CGSRLM sustainable agriculture intervention. Therefore from each block one village was purposively selected and from each village 10 farmers were selected. The study covered 50 farmers practicing sustainable agriculture. In order to make a comparative study a control group of 50 farmers (10 farmers each village) practicing modern agriculture were selected from the same villages. The criteria for the selection of these farmers are that they represent the member of Self help group of CGSRLM (Bihar). Economic performance of any system could be analyzed by analyzing the costs and returns. In this context, the present study, relative economic performance of sustainable and modern agriculture is analyzed in term of Farm business Income with Paddy crop. Secondary data obtained from Office of the Development Commissioner, SRLM, Indirawati Bhawan, Naya Raipur, Chhattisgarh.

### Technologies Promoted Under Sustainable Agriculture

Sustainable agriculture has basically 4 main objectives i.e. 1. To increase production. 2. To decrease cost. 3. To increase no. of

employment days and 4. To decrease Risk of the livelihood. To achieve above mentioned objectives the farmers are adopting Technologies promoted under Sustainable Agriculture are blend of scientifically proven technology, local wisdom, and, farmers' innovations. Over a period of time these technologies are building good ecology where there is a balance between friendly insects and crop pests, and this is leading to reducing the costs on pest management to 'zero'. Following interventions were promoted under Sustainable Agriculture:

#### (a) Non Pesticide Management (NPM)

The main principle underlying NPM is that pests can be managed by understanding their behavior, lifecycle and finally it reduces the cost of cultivation behalf of chemical inputs. The emphasis is on prevention rather than control. A comprehensive strategy is evolved for pest management. These include: deep summer ploughing, community bonfires, seed treatment, bird perches, border crops, trap crops, yellow and white plates, intercrops, light traps, pheromone traps, delta traps in groundnut, alleys in paddy and cutting of the tips in paddy at the time of transplantation. The above practices are called as 'non-negotiables' and are mandatory for all NPM farmers. The application of botanical extracts is only as a last resort. Another key part is the Comprehensive Soil Fertility Management. As part of this the focus is on building soil microbial activity. Every crop removes substantial amount of nutrients from soil. However the share of grains would be in the range of 15%. The core principle of natural soil fertility enhancement is to return the crop residues to the soil, either directly or through animal feed route during the crop period. To sustain the productivity level, the nutrients removed by the crop have to be replenish soil nutrients particularly soil carbon. Mulching, incorporation of straw and other crop residues into soil will replenish the soil. Role of earthworms is critical in soil fertility management. Soil is treated as living organism and the focus is on enriching soil health.

**(b) Poorest of the Poor (POP) Strategy**

POP Strategy in Sustainable agriculture (SA) is to facilitate the land lease to the landless laborers and promote SA in these lands. 0.5 acre land will be leased in to PoP households, and they undertake SRI paddy cultivation in 0.25 acre and vegetable cultivation in the remaining 0.25 acres. It is designed to achieve two objectives. The first objective is that the PoP family should earn a net income of Rs. 50, 000 in a year and second is that by growing paddy and vegetables the PoP family shall have food security. Apart from selling the produce, they can save something for their own consumption.

**(c) Rain Fed Sustainable Agriculture (RFSA)**

Soil and moisture conservation works which include conservation furrows at every 4mts, trench around farm, farm pond and compost pit. Main objective of this intervention is to harvest rainwater and to increase cropping intensity.

**(d) System of Rice Intensification (SRI)**

System of Rice Intensification (SRI) is a cost effective and resource efficient method of cultivation of paddy. SRI is promoted to reduce ground water exploitation and to increase yields. Weeding by weeder increases no. of effective tiller and reduces the labour cost.

**(e) Direct Seeded Rice (DSR)**

Rice can be directly seeded either through dry or wet (pregerminated) seeding. dry seeding of rice can be done by drilling the seeds into a depth of 2-3 centimeters. wet seeding requires leveled field to be harrowed and then flooded (puddling). the field is left for 12-24 hours after puddling, then germinated seeds (48-72 hours) are sown using a drum seeder. it also makes space for mechanical weeding it further helps to promote new effective tillers and reduces labour cost.

**RESULT AND DISCUSSION**

Farm business income (FBI) is one of the indicator to measure the economic profitability of an agriculture farm. It has been chosen to understand the relative economic profitability

of sustainable agriculture and modern agriculture system in the production of selected Crop. FBI is the difference between the gross return and Cost  $A_1$

**Farm Business Income = Gross income – Cost  $A_1$**

Where,

Gross Income = total profit (includes return from main product and by-product value at market price), Cost  $A_1$  = actual paid out costs for owner cultivator. This cost approximates the actual expenditure incurred in cash and kind includes the following items

- a. hired human labour,
- b. owned and hired bullock labour,
- c. seeds,
- d. manures and fertilizers,
- e. plant protection chemicals,
- f. implements charges,
- g. land revenue and other taxes,
- h. irrigation charges,
- i. Other miscellaneous charges.

Cost of cultivation per acre during 2015-16 kharif seasons was calculated for paddy crop. it is taken from sustainable agriculture and modern agriculture system adopted farmers.

The respondents reported on their land holding size, and adopted method of paddy cultivation are presented in table 1. the analyzed data showed that the average holding size of SA practicing respondents in Bastar Plateau (0.73 Acre) was a little more than land holding size of the SA practicing respondents in Chhattisgarh Plains (0.55 Acre). The land holding size was more than one time in Northern Hill region (1.26 Acres) than the both region. Majority of the respondents had more land holding size but due to lack of some belief and awareness factor they have adopted in small land size. Chhattisgarh plain region respondent adopted in less land holding size for SA it may be bad consequences of organic farming and their awareness level than another region of Chhattisgarh. If we will see modern agriculture system adopted respondents then it is found only in Chhattisgarh plain region has good mean holding size than Bastar plateau and northern hills region. out of 100 Farmers 39 percent farmers were adopted the System of

rice intensification method under Sustainable agriculture in the other hand 29 percent farmers were adopted broadcasting method by modern agriculture system. directed seeded

rice is only adopted by Narharpur block of Kanker district. Transplanting method is also adopted by farmers of modern agriculture system with 20 percentages.

**Table 1: Distribution of Farmers by their land holding size and Adopted method of Paddy cultivation**

District	Variables	No. of farmers	Total acres	Average acres	Adopted Method of Paddy Cultivation			
					SRI	DSR	Trans-planting	Broad-casting
Bastar	SAS	10	7.3	0.73	8		2	
	MAS	10	12.1	1.21			3	7
kanker	SAS	10	5.7	0.57	6	3	1	
	MAS	10	15.6	1.56			2	8
Gariyaband	SAS	10	4.3	0.43	9		1	
	MAS	10	18.6	1.86			7	3
Rajnandgaon	SAS	10	6.5	0.65	10			
	MAS	10	13.5	1.35	1		6	3
Balrampur	SAS	10	12.6	1.26	6		4	
	MAS	10	22.1	2.21			2	8
Total		100	118.3	11.83	40	3	28	29

Source: Survey Data

Farm business Income under Sustainable agriculture system (SAS) and Modern Agriculture System (MAS) in the production of paddy crop are presented in table 2.

**Table 2. Farm Business income of paddy under Sustainable and Modern Agriculture system.**

District	Variables	Input Type	Cost A <sub>1</sub> /Acre in Rupees	Yield /Acre in Q	Gross Return/acre in Rupees @ MSP	FBI
Bastar	SAS	NPM	9250	22	33220	23970
	MAS	chemical	12890	16	24160	11270
Kanker	SAS	NPM	12610	25.5	38505	25895
	MAS	chemical	15300	17.5	26425	11125
Gariyaband	SAS	NPM	11075	25	37750	26675
	MAS	chemical	13985	20	30200	16215
Rajnandgaon	SAS	NPM	13560	25	37750	24190
	MAS	chemical	17985	20	30200	12215
Balrampur	SAS	NPM	11920	21.5	32465	20545
	MAS	chemical	15750	17	25670	9920
Total			14032.5	22.2	33522	19489.5

Source: Survey Data

The table 2 indicates that FBI from sustainable agriculture in the production of paddy are much higher than that from modern agriculture, through there are differences in Cost A<sub>1</sub>.

In the case of paddy SAS practicing farmers were adopted NPM input methods which is reflecting in Cost A<sub>1</sub> became on an average Rs.3,499 cheaper than the chemical

input method used by MAS farmers. Yield is 23.8 quintal per acre were higher than MAS cultivated farmers (18.1 quintal per acre) due to might be 39 percentage SAS farmers were cultivated paddy by system of rice intensification. Total and average Gross Return from SAS is Rs. 179,690 and Rs. 35,938 respectively whereas under MAS total and average gross return is Rs.136655 and Rs.

27,331 respectively. Gross return from SAS is higher due higher yield and higher price received which is Rs. 8,607 per acre.

FBI from Bastar plateau region under sustainable agriculture system is more than double than Modern agriculture system. The larger variation in the SAS farmers FBI could be observed in the Chhattisgarh plain region which is Rs. 12,401.6 higher than the MAS farmers. FBI from Northern hill's SAS farmers is Rs.20,545 which is Rs.10,625 higher than the MAS farmers.

The data clearly shows that Sustainable agriculture is economically profitable. It has double advantage to the grower; it provides greater savings in the Costs and best returns to the growers at present and ensures the sustainability of these returns in future by protecting the fertility of soil and environment.

#### SUMMARY AND CONCLUSION

Sustainable agriculture is economically profitable compare to modern agriculture. The study revealed that farm business income from sustainable agriculture is greater than that from modern agriculture in the case of all region of Chhattisgarh. It is observed that in case of all regions of Chhattisgarh Cost of cultivation under sustainable agriculture is more efficient and cheaper as compare to modern cultivation due to non pesticide management. Net return from Sustainable agriculture is also more because yield per acre and price per unit of produce is higher. It has been observed that cost of cultivation under sustainable agriculture is less in the present context through the farm business income from sustainable agriculture less due to lost cost of input. It is mainly due to the locally available materials, Low cost pest and disease control methods i.e. trap crop, pheromone traps and Botanicals for low cost soil fertility methods i.e. cow urine and dung, Nadep, ghanajiwamrit, drawjiwamrit, green manures, azolla etc. efforts should be made to encourage farmers to keep livestock to produce on farm organic inputs in order to reduce the cost of

organic manure and bio-pesticide due to most of sustainable agriculture practices cow urine and dung are using. NRLM's core objective is to increase atleast 1 lakh additional income of SHG members. sustainable agriculture is the major activity in which we can reduce the cost of production and increase the production. This can also fulfill thought of respected prime minister "Doubling of farmer's Income by 2022."

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