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## Evaluation of soil health card scheme on productivity and income generation in production of paddy

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### Abstract

An attempt has been made to analyze the impact of Soil Health Card Scheme (SHC) on productivity, fertilizer consumption and farmers' income in Jabalpur district of Madhya Pradesh. The data were gathered from 66 SHC holders and the impact of SHC was assessed based on the farmers' use of SHC. It was observed from the study that majority of farmers have a positive opinion regarding SHCs. They were found to have reduced the use of urea (28.08%), DAP (3.80%), MOP (51.77%) and Zinc sulphate (3.85%) and increased the SSP (36.84%), and organic manure (72.19%) in cultivation of paddy after adoption of the SHC recommendations. But still an average farmer not followed recommended doses of fertilizer and there was found a gap of 10.65%, 4.48%, 9.24%, 11.14%, 3.50% and 55.96% in Urea, DAP, MOP, Zinc sulphate, SSP and Organic manure as compared of recommended doses of fertilizer. Due to Soil Test Value (STV) based nutrient application net income increased by 23.96 percent after adoption of SHC. The benefit-cost ratio revealed that for an investment of ₹ 1.00, an average SHC holder received a return from ₹ 1.95 to 2.18 (11.86%) in paddy cultivation. The SHC Scheme is highly beneficial to the farmers in terms of increasing crop production and farmer's income. However, in order for the SHC recommendations to be adopted more widely, it is necessary to raise awareness among farmers of the advantages of this Scheme in terms of cost savings through STV-based nutrient application. Additionally, soil testing services and laboratories should be strengthened. This will help in balanced consumption of fertilizers in crop. Making the SHC accessible to farmers through information technology, including the internet and mobile, is urgently needed, in some way.

**Keywords:** Soil health card, paddy, productivity, income generation

### Introduction

Soil Health Card (SHC) Scheme was launched by the Government of India on February 19, 2015 from Suratgarh town of Sri Ganganagar district in Rajasthan by Department of Agriculture, Government of India for providing SHCs to farmers' once in three years for their land holdings.

SHC is a printed report that a farmer is handed over for each of his land holdings. SHC provides soil health data to get appropriate guidance to the farmers for the efficient use of fertilizer to cultivate crops based on soil health analysis. SHC is a field-specific detailed report of soil fertility status and other important soil parameters that affect crop productivity. It contains the status of his soil with respect to 12 parameters namely, nitrogen (N), phosphorus (P), potassium (K) as macronutrients; sulphur (S) as secondary nutrient; zinc (Zn), iron (Fe), copper (Cu), manganese (Mn), boron (B) as micronutrients; and physical parameters like potential of hydrogen (pH), electrical conductivity (EC) and organic carbon (OC) (SHC Guidelines, 2017). SHC advises farmers on the fertilizers and their quantities he should apply. The soil health card provides soil health data to convey appropriate guidance to the farmers for the efficient use of fertilizers to cultivate crops based on soil health analysis site, contains useful data on soil based on chemical analysis of the soil to describe soil health in terms of its nutrient availability and its physical and chemical properties (Mukati *et al.*, 2018) [4]. The major benefit of the SHC is creating awareness about missing nutrients and those which could be added for a balanced soil.

Generating nearly 16.39 million SHCs, Uttar Pradesh tops the list in terms of SHC distribution in the first phase of the Scheme, followed by Maharashtra (4 million) and Madhya Pradesh (3.88 million). Studies on impact of SHC in different parts of Madhya Pradesh conveyed an increased awareness among farmers about the importance of scientific application of manures and fertilizers for different crops (Niranjan *et al.*, 2018) [5]. Several SHC beneficiaries in Madhya Pradesh adopted SHC based nutrient management and benefitted in terms of yield and

income. In India, since the inception of the SHC scheme during Cycle-I (2015-17), 107.4 million SHCs were distributed to farmers and during Cycle-II (2017-19), 221.9 million SHCs were distributed. Following cycle I and II under the Scheme, in 2019-20, the pilot project "Development of Model Villages Programme (MVP)" was implemented under which the sampling and testing of cultivable soil was encouraged in partnership with the farmers. One village per block was adopted for land holding based soil testing and organization of larger numbers of demonstrations in the adopted villages.

In Madhya Pradesh, the SHC Scheme is being implemented in all the districts through 103 soil testing labs (30 under State Department, 26 under Madhya Pradesh State Agriculture Marketing Board and 47 under Agricultural Universities) running under the control of State Agriculture Department (Chauhan, 2017) [1]. Under this Scheme, free SHCs are being distributed to farmers once in every two years on the basis of 12 standards of test results of grid-based soil samples collected from the fields of farmers.

In the above context, the present study was undertaken to analyze the impact of SHC Scheme on paddy crop of Madhya Pradesh. Productivity of paddy in Madhya Pradesh is 22.83

q/ha (2021-22) which is expected to increase. (Agricultural Statistics at a Glance, 2021) [3].

**The study was conducted with following specific objectives**

- To analyze the opinion of farmers regarding SHCs.
- To determine the fertilizer consumption pattern and extent of adoption of SHC recommendations in paddy cultivation by farmers.
- To assess the impact of SHC on crop yield and income generation in paddy.

**Methodology**

The study is confined to Jabalpur district of Madhya Pradesh. Out of 7 blocks namely Kundam, Shahpura, Sihora, Majholi, Patan, Jabalpur and Panagar, 3 blocks were randomly selected for the study. In each selected block one model village i.e., Luhari (Patan), Parasia (Jabalpur) and Biharia (Panagar) were selected. A list of all the SHC holders was prepared and classified into 3 categories i.e., small (<2 Ha), medium (2-4 Ha) and large (>4 Ha) and 20 percent of respondents in each category were selected through probability proportionate random sampling method for the study (Table -1).

**Table 1:** Selected SHC holders of the study

S. No.	Category	Selected Model Villages			Total (N)	Selected Respondents (n)
		Parasia	Biharia	Luhari (Kanti)		
1.	Small	46	114	32	192	38
2.	Medium	32	29	22	83	17
3.	Large	15	17	25	57	11
Total		93	160	79	332	66

As such, 38, 17 and 11 SHC holders were selected from small, medium and large size categories respectively. Thus, Total sample size comprised 66 beneficiary households. However, there was no significant difference found in the results among these three categories. Hence, the analysis of findings is done on the basis of overall level. The response was taken out with the help of a well-developed pre-tested interview schedule and was collected through a survey method by personal contact with the respondents. The data were related to the year 2021- 2022. The data was analyzed by the use of analytical tools like frequency, percentage, mean, 5 – point Likert scale, absolute change, relative change and cost and profitability concepts were used to draw conclusions.

**Results and Discussion**

Farmers’ opinion before and after adopting SHC recommendations, extent of adoption of SHC recommendations and the impact of SHC Scheme on yield and income have been considered for the study.

**Farmers’ opinion to obtain Soil Health Cards**

Majority of farmers strongly agreed and agreed respectively with positive opinion on a five point continuum that SHC is better to assess soil health (4.25), helps in reducing input costs (3.98), it being a free service (3.77) and can determine the optimal usage of recommended doses in the field (3.70), able to obtain additional benefits from the department in the future (3.43), helps in risk mitigation while crop cultivation (3.37), helps in claiming crop insurance (2.89) were the main opinions to obtain SHCs (Table 2).

**Table 2:** Farmers’ opinion to obtain SHC (in percentage)

Particulars	Likert Scale	Farmers’ Reaction				
		SA	A	N	D	SD
For better soil health	4.25	43.06	20.36	18.63	13.67	4.55
Helps in reduce input costs	3.98	15.18	51.52	16.32	12.64	4.35
It is a free service	3.77	24.60	51.15	16.67	7.58	0.00
Determination of the optimal usage of RDF in the field	3.70	18.26	57.69	11.71	6.43	5.91
Obtain additional benefits from the department in the future	3.43	6.06	7.58	53.03	27.27	6.06
Helps in risk mitigation while crop cultivation	3.37	3.03	4.55	83.60	6.06	3.03
Helps in claiming Crop insurance	2.89	0.00	1.52	90.90	7.58	0.00
SA = Strongly Agree; A = Agree; N = Neither; D = Disagree; SD = Strongly Disagree						

**Extent of adoption of SHC recommendations**

Application of fertilizers as per the recommendation of SHCs reduction in fertilizers with respect to previous application of

fertilizers and adoption level of recommended dose of fertilizers (RDF) mentioned in SHCs.

**Table 3:** Extent of adoption of RDF as per SHC (in Kg)

Fertilizers	Before	After	RDF	Consumption over previous doses		Adoption over RDF	
				Absolute Change	Percent Change	Absolute Change	Percent Change
Urea	249.60	187.00	209.29	- 62.60	- 25.08	- 22.29	- 10.65
DAP	109.46	105.30	110.24	- 4.16	- 3.80	- 4.94	- 4.48
MOP	45.41	21.90	24.35	- 23.51	- 51.77	- 2.45	- 9.24
ZnSO <sub>4</sub>	30.65	26.80	30.16	- 3.85	- 12.56	- 3.36	- 11.14
SSP	169.25	231.60	240.00	62.35	36.84	- 8.40	- 3.50
Organic Manure	1510.00	2600.00	5904.00	1090.00	72.19	- 3304.00	- 55.96

The consumption of Urea, Di-ammonium Phosphate (DAP), Muriate of Potash (MOP) and Zinc sulphate decreased to an effect of 25.08, 3.80, 23.51 and 3.85 percent. While the use of Single Super Phosphate (SSP) and Organic Manure increased 36.84 and 72.19 percent in paddy cultivation. Although, there was still a gap of -10.65, -4.48, -9.24, -11.14, -3.50 and -55.96 percent in Urea, DAP, MOP, ZnSO<sub>4</sub>, SSP and organic manure as compared to RDF (Table 3).

**Impact of SHC Scheme on yield and income**

A remarkable change of 4.76 percent (2 q/ha) from 42 (before) to 44 q/ha (after) in the yield of paddy was observed after adoption of SHC recommendation by SHC holders in

cultivation of paddy. After adoption of SHC recommendations in cultivation of paddy an average farmer found to be decreased expenditure on manure – fertilizers and pesticides – herbicides, by 12.59 and 15.77 percent respectively, while the expenditure on labour (8.17%) and seed (1.05%) increased; with the result of this the total variable cost of cultivation decreased by 3.64 percent from ₹ 33147.00 to 31942.00 per ha and net return increased by 19.65 percent from ₹ 61030.00 to 73025.00 per ha. The return per rupee investment was also found to increase from ₹ 1.84 to 2.29 after adoption of SHC recommendations in cultivation of paddy by SHC holders (Table-4)

**Table 4:** Change in Cost and Return structure after adoption of RDF (in ₹/ ha)

Particulars	Before	After	Absolute Change	Relative Change
Human Labour	5676.00	6140.00	464.00	8.17
Machine Labour	5930.00	6979.00	1049.00	17.69
Total Labour Cost	11606.00	13119.00	1513.00	13.04
Seed	1613.00	1630.00	17.00	1.05
Manures and Fertilizers	12828.00	11213.00	-1615.00	-12.59
Pesticides and Herbicides	7100.00	5980.00	-1120.00	-15.77
Total Material cost	21541.00	18823.00	-2718.00	-12.62
Interest On Working Capital @ 7%	773.45	746.27	-27.18	-3.51
Depreciation on Machines @ 10%	14491.00	15508.00	1017.00	7.02
Total Variable Cost	33147.00	31942.00	-1205.00	-3.64
Total Yield (q/ha)	42.00	44.00	2.00	4.76
Price	1905.00	1945.00	40.00	2.10
By – Product (q/ha)	20.00	23.00	3.00	15.00
Price	740.00	883.00	143.00	19.32
Cost of production (₹/q)	1152.68	1096.30	-56.38	-4.89
Gross Return	94177.00	104967.00	10790.00	11.46
Net Return	61030.00	73025.00	11995.00	19.65
Return / Rupees of Investment	1.84	2.29	0.44	24.17

**Farmers’ opinion after adoption of SHC recommendations**

The majority of respondents agreed to the statement that Soil Test Value (STV) based nutrient application improves crop growth (4.09), helps in increasing quality of the produce (3.83), increase germination percentage (3.76), increase

productivity (3.67), reduce fertilizer application (3.63), overcome soil salinity problems (3.51), control soil borne diseases (3.43) and reduce incidence of pests (3.39) after adoption of SHC recommendations during production process of paddy (Table 5).

**Table 5:** Farmers’ opinion after adoption of SHC recommendations (in percentage)

Particulars	Likert Scale	Farmers’ Reactions				
		SA	A	N	D	SD
Improves crop growth	4.09	21.15	54.52	12.18	8.09	5.06
Increases quality of the produce	3.83	17.70	55.03	19.66	4.05	3.57
Increases germination percentage	3.76	22.73	45.61	17.21	9.09	5.36
Increases productivity	3.67	17.18	48.52	16.32	11.64	6.35
Reduce fertilizer application	3.63	15.15	49.06	18.18	10.22	7.39
Overcome soil salinity problems	3.51	10.61	54.58	24.16	7.08	3.58
Control soil borne diseases	3.43	9.09	13.02	57.09	18.18	2.62
Reduces incidence of pests	3.39	4.55	9.55	45.50	34.01	6.39

SA = Strongly Agree; A = Agree; N = Neither; D = Disagree; SD = Strongly Disagree

## Conclusions

The study has revealed that most of the farmers had positive attitudes before adopting and after adopting SHC recommendations. The majority of farmers were conscious that the Soil Health Card offers ways to enhance soil health and achieve greater crop yields while reducing unnecessary expenses, by providing information on the necessary nutrient levels in the soil. The consumption of Urea, DAP, MOP & Zinc sulphate reduced while, the usage of SSP & organic manure increased. Although there was still a gap of 10.65 (Urea), 4.48 (DAP), 9.24 (MOP), 11.14 (ZnSO<sub>4</sub>), 3.50 (SSP) and 55.96 (organic manure) percent in cultivation of paddy as compared to the RDF mentioned in the SHC. The variable cost of cultivation was decreased by 3.64 percent (₹33147 to 31942 per ha) while net return was increased by 19.65 (₹ 61030 to 73025 per ha), after adoption of SHC recommendations. The return per rupee investment also found to be increased from ₹ 1.84 to 2.29 after adoption of SHC recommendations in production of paddy.

Therefore, there is a need to generate awareness about the benefits of this Scheme among the farmers and strengthen soil testing services / laboratories on the other hand for a wider adoption of SHC recommendations.

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