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Evaluation of Soil Health Card Scheme on Productivity & Income Generation of Wheat in Kymore Plateau Region

R K Dubey ^{a++}, A A Raut ^{b#}, Veena Rathore ^{c†}, Venkteshwar Jallaraph ^{b‡} and Prashant Namdeo ^{d^*}

^a JNKVV, Jabalpur, India.

^b ICAR- ATARI, Zone-IX, JNKVV, Jabalpur, India.

^c Department of Agricultural Economics & F.M., JNKVV, Jabalpur, India.

^d Seed Technology Research Centre, JNKVV, Jabalpur, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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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

⁺⁺ Research Scholar;

[#] Scientist;

[†] Assistant Professor;

[‡] Senior Research Fellow;

[^] Young Professional-I;

*Corresponding author: E-mail: prashantnamdeo@jnkvv.org;

farmers' use of SHC. It was observed from the study that the majority of farmers have a positive opinion regarding SHCs. They were found to have reduced the use of urea, DAP and MOP and increased the SSP, and organic manure in cultivation of wheat after adoption of the SHC recommendations. Due to Soil Test Value (STV) based nutrient application net income increased by 9.38 per cent after adoption of SHC. The benefit-cost ratio revealed that for an investment of ₹ 1.00, an average SHC holder received a return of ₹ 1.98 in wheat cultivation. The SHC Scheme is highly beneficial to the farmers in terms of increasing crop production and farmer's income. However, there is a need to generate awareness about the benefits of this Scheme in terms of cost saving through STV based nutrient application among the farmers and strengthen soil testing services / laboratories for a wider adoption of SHC recommendations.

Keywords: *Soil health card; wheat; productivity; income generation; soil health; micronutrients; fertilizers.*

1. INTRODUCTION

The 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 [1].

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 [2]. 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) [3]. 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 [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 [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), 107.40 million SHCs were distributed to farmers and during Cycle-II (2017-19), 221.90 million SHCs were distributed. Following cycles, 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 [6].

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 [7]. 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 wheat for which is a prominent crop of Madhya Pradesh. Madhya Pradesh produces

19.61 million tons which is expected to increase. In terms of wheat production, Madhya Pradesh (17.62 million tons) is second only to Uttar Pradesh (35.50 million tons) in India [8]. 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 wheat cultivation by farmers.
- To assess the impact of SHC on crop yield and income generation in wheat.

2. METHODOLOGY

The study is confined to the 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 [9,10] (Fig.1).

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 conclusion.

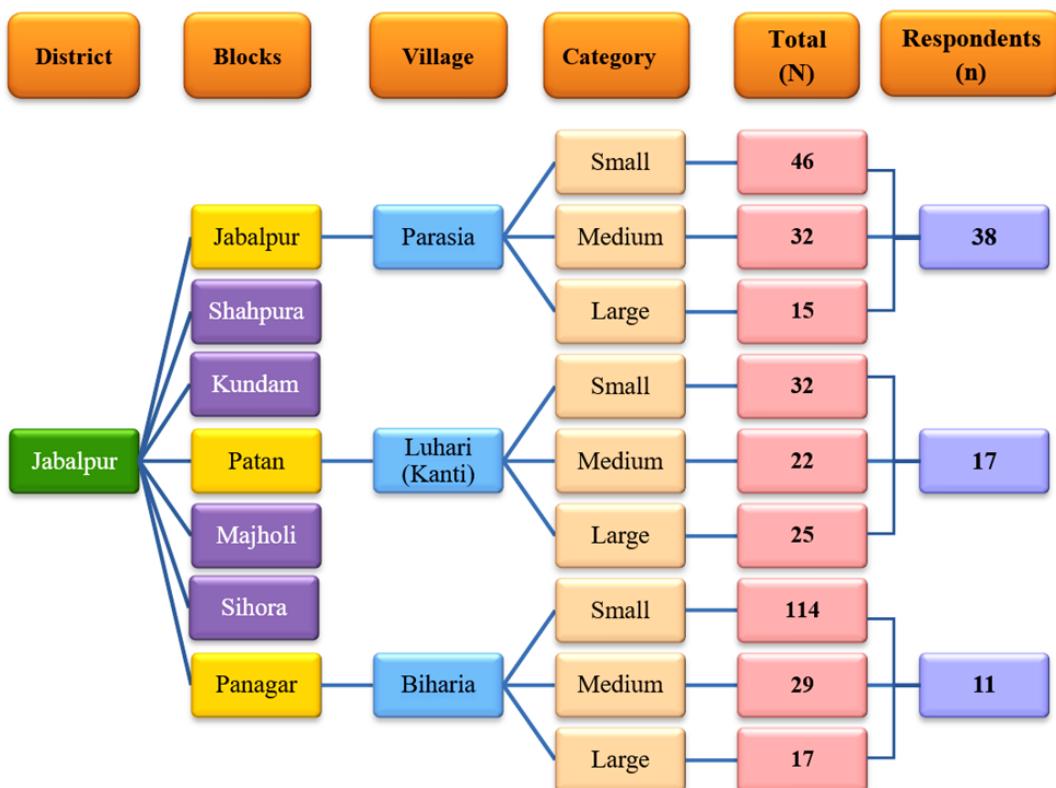


Fig. 1. Selected soil health card holders for the study

3. 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.

3.1 Farmers' Opinion to Obtain Soil Health Cards

The majority of farmers strongly agreed and agreed respectively with a 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 1).

3.2 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.

The consumption of Urea, Di-ammonium Phosphate (DAP) and Muriate of Potash (MOP) decreased to an effect of 20.94, 9.75 and 64.12 per cent. While the use of Single Super Phosphate (SSP) and Organic Manure increased 113.72 and 19.72 per cent in wheat cultivation. Although, there was still a gap of -5.89, -11.61, -10.25, -1.20 and -71.21 per cent in Urea, DAP,

MOP, SSP and organic manure as compared to RDF [10] (Table 2).

3.3 Impact of SHC Scheme on Yield and Income

A remarkable change of 9.38 per cent (3 q/ha) from 32 (before) to 35 q/ha (after) in the yield of wheat was observed after adoption of SHC recommendation by SHC holders in cultivation of wheat [11]. After adoption of SHC recommendations in cultivation of wheat an average farmer found to be decreased expenditure on manure – fertilizers and pesticides – herbicides, by 2.33 and 26.62 per cent respectively, while the expenditure on labour (8.21%) and seed (7.25%) increased; with the result of this the total variable cost of cultivation increased by 3.30 per cent from ₹ 40046.17 to 41367.06 per ha and net return increased by 38.19 per cent from ₹ 29363.83 to 40577.94 per ha. The return per rupee investment was also found to increase from ₹ 1.73 to 1.98 after adoption of SHC recommendations in cultivation of wheat by SHC holders (Table 3).

3.4 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 wheat (Table 4).

Table 1. 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

Table 2. Extent of adoption of RDF as per SHC (in Kg)

Fertilizers	Before	After	RDF	Consumption over previous doses		Adoption over RDF	
				Absolute Change	Percentage Change	Absolute Change	Percentage Change
Urea	249.41	197.18	209.52	- 52.23	- 20.94	- 12.34	- 5.89
DAP	108.12	97.58	110.40	- 10.54	- 9.75	- 12.82	- 11.61
MOP	61.03	21.90	24.40	- 39.13	- 64.12	- 2.50	- 10.25
SSP	169.05	361.30	365.67	192.25	113.72	- 4.37	- 1.20
Organic Manure	1420.00	1700.00	5904.00	280.00	19.72	- 4204.00	- 71.21

Table 3. Change in cost and return structure after adoption of RDF (in ₹/ ha)

Particulars	Before	After	Absolute Change	Relative Change
Human Labour	5361.00	5646.00	285.00	5.32
Machine Labour	5931.00	6573.00	642.00	10.82
Total Labour Cost	11292.00	12219.00	927.00	8.21
Seed	1104.00	1184.00	80.00	7.25
Seed Treatment	25.00	50.00	25.00	100.00
Manures and Fertilizers	9784.00	9556.00	-228.00	-2.33
Pesticides and Herbicides	2074.00	1522.00	-552.00	-26.62
Total Material cost	12987.00	12312.00	-675.00	-5.20
Interest On Working Capital @ 7%	1276.17	1328.06	51.89	4.07
Depreciation on Machines @ 10%	14491.00	15508.00	1017.00	7.02
Total Variable Cost	40046.17	41367.06	1320.89	3.30
Total Yield (q/ha)	32.00	35.00	3.00	9.38
Price	1955.00	2045.00	90.00	4.60
By – Product (q/ha)	13.00	15.00	2.00	15.38
Price	592.00	750.00	158.00	26.69
Cost of production (₹/q)	1251.44	1181.92	- 69.53	- 5.56
Gross Return	69410.00	81945.00	12535.00	18.06
Net Return	29363.83	40577.94	11214.11	38.19
Return / Rupees of Investment	1.73	1.98	0.25	14.29
Additional Cost			1320.89	
Additional Gross Return			12535.00	
Additional Net Return			11214.11	
Additional Gross Return / Additional Cost			1: 9.5	

Note: q represents quintals

Table 4. 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

4. CONCLUSION

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 [6]. The consumption of Urea, DAP & MOP reduced while, the usage of SSP & organic manure increased. Although there was still a gap of 5.89 (Urea), 11.61 (DAP), 10.25 (MOP), 1.20 (SSP)

and 71.21 (organic manure) per cent in cultivation of wheat as compared to the RDF mentioned in the SHC. The variable cost of cultivation and net return was increased by 3.30 (₹ 40046 to 41367 per ha), 38.19 per cent (₹ 29364 to 40578) respectively after adoption of SHC recommendations. The return per rupee investment also found to be increased from ₹ 1.73 to 1.98 after adoption of SHC recommendations in production of wheat.

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.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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