AERC, Jabalpur - Research Study No. 120

Impact of Soil Health Card Scheme on Production, Productivity and Soil Health in Madhya Pradesh

Study Sponsored by
Ministry of Agriculture and Farmers Welfare
(Govt. of India)

Agro Economic Research Centre
Jawaharlal Nehru Krishi Vishwa Vidyalaya
Jabalpur (M.P.) 482 004

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AGRO- ECONOMIC RESEARCH CENTRE FOR MADHYA PRADESH AND CHHATTISGARH
Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.)

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PREFACE

The present study entitled "Impact of Soil Health Card Scheme on Production, Productivity and Soil Health in Madhya Pradesh" has been assigned by the Directorate of Economics and Statistics, Ministry of Agriculture and Farmers' Welfare, Government of India to this centre in the year 2016-17 under the close coordination of Agricultural Development and Rural Transformation Centre , Institute for Social and Economic Change , Bangalore.

The study comprises 30 soil tested farmers and 30 control farmers of Jabalpur & Sehore districts of Madhya Pradesh. The study revealed that the 63.30 per cent HHs were found to be aware of SHC scheme and 25 per cent have knowledge of INM due to wider campaign put in place by the Govt. of Madhya Pradesh. Only 15 per cent of HHs experienced that use of INM curtailed fertilizer consumption. Only 3 (control) – 4 (soil tested) per cent of HHs were found to be aware about grid system under the scheme. The positive impact of Soil Health Card Scheme was also observed was also observed on production, productivity and probability of crops.

The present study was conducted by Dr. Deepak Rathi and Dr. H.O. Sharma of this Centre. They have done field investigation, tabulation, analysis, interpretation and drafting of the report. I wish to express my deep sense of gratitude to team members namely; Mr. S.K. Upadhye, Mr. C.K. Mishra, Mr. S.C. Meena, Mr. H. K. Niranjan, S.S. Thakur, Mr. R.S. Bareliya and Mr. R.S. Chouhan for their untiring efforts in bringing this innovative study to its perfect shape.

I extend heartfelt thanks to Dr. Ramappa. K.B., Associate Professor, and Coordinator of this study Agricultural Development and Rural Transformation Centre, Institute for Social and Economic Change, Bangalore for providing valuable guidelines and time to time suggestions for conducting the study successfully.

On behalf of the Centre, I express deep sense of gratitude to Dr. V.S. Tomar, Hon'ble Vice-Chancellor and Chairman Advisory Body of AERC, Jabalpur, Shri. P.C. Bodh, Adviser, AER Division, Ministry of Agriculture and Farmers' Welfare, Govt. of India, New Delhi. Dr. S.K. Rao, Director Research Services, Dr. P.K. Mishra, Dean, Faculty of Agriculture, and Dr. D. Khare, Director Instruction, Dr. P. K. Bisen, Director Extension Services, Dr. N.K. Raghuwanshi, Prof. & Head (Agril. Econ.&F.M.), Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur for providing the valuable guidance and all facilities during various stages in successful completion of this study of high importance.

I express sincere thanks to Shri A. M. Sharma, Deputy Director of Agriculture, Jabalpur and Shri R. D. Mandloi, Assistant Soil testing Officer, Sehore and their field staff for providing not only secondary data but also extending great assistance in collection of field data from the selected respondents .

I hope the findings and suggestions made in the study would be useful to policy makers of the State and Govt. of India

Date : 31.03.2017
Place: Jabalpur

(Hari Om Sharma)
Prof. & Director

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CHAPTER-I

INTRODUCTION

1.1 Background

The soil health card (SHC) is a complete evaluation of the quality of soil right from its functional characteristics to water and nutrients content and other biological properties. It contains corrective measures that a farmer should adopt to obtain a better yield. SHC help the farmers as with the issue of the card, the farmers get a well-monitored report of the soil. It is useful for cultivation of crops as farmers were guided by the experts along with solutions to improve the quality of the soil. It also helps the farmers to get a long-term soil health record and accordingly can study and evaluate the results of different soil management practices. The SHC can become most helpful and effective when filled out regularly by the same person over a period of time. The idea is not to compare the varied soil types but to find out methods to improve soil fertility to access the different types of soil and their ability to support crop production in spite of their limitations and as per their abilities. The SHC help the farmers to get an idea on the crop-wise recommendations of nutrients and fertilizers required in each type of soil. This can help in increasing the crop yield.

The various soil testing laboratories in the State carry out the testing of the soil samples, the results of which are analysed by the experts. The results are related to the strength and weaknesses of the soil. The experts also suggest methods to improve the soil quality. These results with suggestions are displayed in the SHCs.

The SHC scheme was launched in February 2015. This is a flagship programme for the agricultural sector of the country. Among all the states in India, it is Andhra Pradesh which has taken the lead in distribution of the Soil Health Cards to farmers. Two other states, Tamil Nadu and Punjab have collected the maximum amount of soil samples for testing during the kharif season. Other States which are taking the lead are Uttar Pradesh, Punjab, Chhattisgarh, Telangana, Odisha and Madhya Pradesh. Farmers in states like Haryana, Kerala, Mizoram, Arunachal Pradesh, Sikkim, Tamil Nadu, Goa, Gujarat, Uttarakhand and West Bengal have not issued a single card as against the targets set for them for 2015-16. (www.soilhealthcard.dac.gov.in)

Box. 1: Key Features of the Soil Health Card Scheme

1. The government is planning to cover as many as 14 crore farmers under the scheme.
2. The scheme covers all parts of the country.
3. In the form of soil card, the farmers get a report. And this report contains all the details about the soil of their particular farm.
4. The soil health card is prepared once in every 3 years.

In order to make the SHC scheme more successful, the government of India, along with the Department of Agriculture and Farmers' Welfare of India has launched a SHC agriculture portal. In fact two other agri-portals have been recently launched viz. Fertiliser Quality Control System and Participatory Guarantee System portal. The farmers need to register at the web portal www.soilhealth.dac.gov.in along with the details of the soil samples and test lab reports.

Once registered, the farmer can keep a track of the test results by soil testing labs, fertilizer and nutrients recommendations, SHC generation and Management Information System (MIS) module for monitoring progress. The basic objective behind the launch of the web portal is to create a single national database on soil health which can be used in the future for research and planning both by farmers and soil experts. Right now the portal is in English. Very soon, its content will be available in regional languages too.

The SHC Scheme is an initiative by Prime Minister for the welfare of farmers. Under the scheme, SHC is useful to farmer which contain details about what kind of soil is there in the farmers' land along with crops they can grow in their land to get maximum profits and corrective measures the farmers can take to improve the yield.

This scheme is being implemented in all the districts of the Madhya Pradesh 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. (Fig. 1.1)

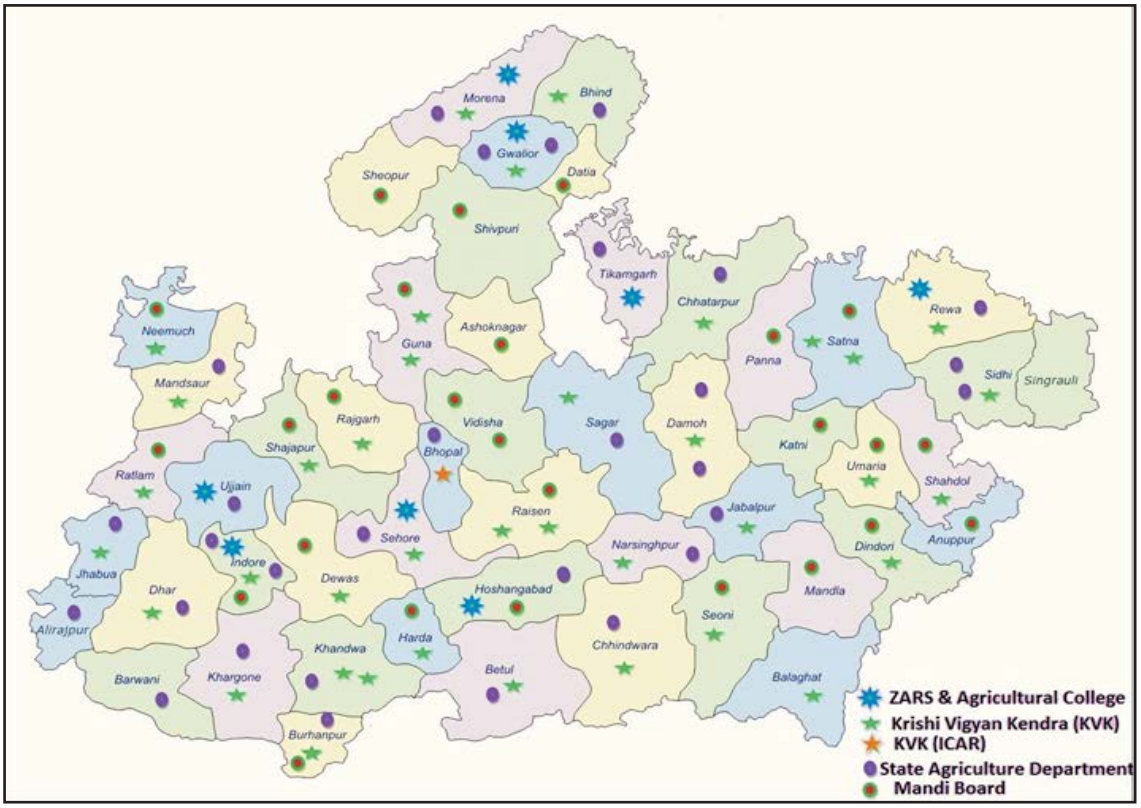

Fig. 1.1: Concentration of Soil Testing Laboratories in Madhya Pradesh

Soil testing laboratories infrastructure found to be weak in the State. An average soil testing laboratory was found to cover 171816 hectares of net area sown and 85215 numbers of farmers. The net sown area and number of farmers covered by 103 soil testing laboratories were found to be covered 15422057 ha and 7431391 farmers respectively in the State. Amongst different districts the maximum laboratories were found in Khandwa (including Bhurhanpur) (6) followed by Indore (5), Guna (including Ashoknagar) (4), Gwalior (4), Morena (3), Damoh (3), Hosangabad (3), Jhabua including Alirajpur (3), Raisen (3), Rewa (3), Satna (3), Sehore (3), Shahdol (including Anuppur) (3) and Sidhi (3).

Table 1.1: Concentration of soil testing labs in different district of Madhya Pradesh

S.No.	District	No. of Soil Testing Labs	Coverage per Soil Testing Lab	
			Net Area Sown (ha)	Farmers (Numbers)
1	Balaghat	1	279017	254334
2	Barwani	1	229648	90461
3	Betul	2	220288	89014
4	Bhind	2	170666	89020
5	Bhopal	2	77696	29706
6	Chhatarpur	2	233313	117619
7	Chhindwara	2	255748	126436
8	Damoh	3	105990	53006
9	Datia	1	211563	102614
10	Dewas	2	199688	72810
11	Dhar	2	250949	93587
12	Dindori	2	101565	56286
13	Guna+Ashoknagar	4	162532	60518
14	Gwalior	4	52840	27458
15	Harda	2	91199	53500
16	Hoshangabad	3	104665	37475
17	Indore	5	50271	21543
18	Jabalpur	2	139354	91194
19	Jhabua+Alirajpur	3	120173	62028
20	Katni	1	216784	179026
21	Khandwa+Burhanpur	6	67975	28079
22	Khargone	2	201152	80635
23	Mandla	1	227160	162592
24	Mandsaur	2	178591	80757
25	Morena	3	90561	58904
26	Narshingpur	2	154655	67181
27	Neemuch	2	91624	47360
28	Panna	1	271957	157045
29	Raisen	3	144697	49550
30	Rajgarh	2	219551	98982
31	Ratlam	2	168757	76530
32	Rewa	3	121021	82066
33	Sagar	2	274370	127549
34	Satna	3	117591	80054
35	Sehore	3	132956	44459
36	Seoni	2	198438	95978
37	Shahdol+Anuppur	3	119047	76132
38	Shajapur+Agar	2	229667	93798
39	Sheopur	1	169541	82483
40	Shivpuri	1	458027	182944
41	SIDHI+Singrauli	3	112173	76998
42	Tikamgarh	2	139190	86580
43	Ujjain	2	249831	80188
44	Umaria	2	52433	40014
45	Vidisha	2	266806	70176
	MP State Total (Average)	103	15422057 (171816)	7431391 (85215)

A Soil testing lab was found to be cover 50271 (Indore) to 458027 (Shivpuri) hectares of net area sown and 21543 (Indore) to 254334 (Balaghat) farmers in Madhya Pradesh. (Table 1.1)

It is observed that Govt. of Madhya Pradesh fixed the target of 805000 soil samples, from which 70.29 per cent soil samples were collected from the farmers' fields till December 2014. The total soil samples received in soil testing labs were recorded to be 494938, out of which 78.94 per cent were analyzed.

As for as the progress of distribution of SHCs is concerned, 40.25 per cent (1207353) SHCs of the target 3000000 have been found to be distributed among farmers.

Table 1.2: Performance of soil testing and SHC scheme in Madhya Pradesh. (2015-16)

S. No.	Particulars	Numbers
1	Physical target	805000
2	Collection of soil sample	565843
3	Percentage of sample collected to target	70.29
4	Sample received by soil testing labs	494938
5	Total sample analyzed	390682
6	Percentage of sample analyzed to sample received by soil testing labs	78.94
7	Target of distribution of SHC	3000000
8	Achievement of distribution of SHC	1207353
9	Percentage achievement to target of SHC	40.25

Source: Department of Farmers welfare and Agriculture Development, Madhya Pradesh

How far, SHC scheme is beneficial scheme for farmers? As there are so many illiterate farmers in the State and they do not know which types of crops they should grow to get maximum yield. Basically, they do not know the quality and the type of their soil. They might know by experience which crops can be grow and which crops fail. But they don't know what they can do to improve the condition of their soil.

Considering all these facts in mind the present study has been formulated with following specific objective:

1.2 Objectives

1. To identify socio economics characteristics of soil tested and control farmers.
2. To study the awareness of SHC scheme among the farmers
3. To determine the adoption of RDF as per SHC scheme by the farmers.
4. To analyse the impact of soil test technology on crop production, productivity and income of the farmers.

1.3 Review of Literature

Resuming of research study is very essential for any research. The main objective of the resuming of literature is to determine what work {both theoretically and practically}had been done in the past, which could assist in delineation of problematic areas, provide a basis

for conceptual frame work method and procedure used and suggest operational definitions for major concept to help in interpretation of finding. The resume of research study provides guidelines to an investigator, making his work more precise through the use of review of literature. A very little work has been done so far related to the study. However, some of the important available literatures are reviewed as under.

Shah and Shah (1992) observed that farmers have not responded soil testing services in Gujarat which are essential for improving fertilizer use efficiency. They suggested involving 36 qualified staff in the dissemination process to overcome the inefficient and excess use of fertilizer.

Desai et al. (1993) revealed that raising the level of fertilizer consumption is the key to secure future agricultural growth. A balance use of nutrient is also crucial, for which investment in soil testing is essential.

Trivedi and Patel (1994) concluded that fertilizer use efficiency (FUE) was low in India. Soil testing is a basic tool to improve FUE and to reduce adverse effect of fertilizer consumption.

Dhyan Singh (1996) revealed that soil testing is important in evaluating the fertilizer status of the soil and helps to recommend adequate and balanced plant nutrient needed for optimum crop production. He defined problematic soils and better nutrient management for higher crop productivity.

Anonymous (2000) discussed the current use of soil tests to predict the probability of crop response to application of fertilizers, and considered their possible use to determine if application of fertilizers and/or waste material will result in the pollution of surface and groundwater.

Biswas (2002) observed that the soil testing is proven scientific tools to evaluate soil fertility for recommending balanced nutrition to crops. However, the soil testing programme in India has failed to create the desirable impact on the farming community due to extremely poor coverage and delay in timely dissemination of fertilizers recommendation to farmers. While creation of required infrastructural facilities involves huge burden on Government exchequer, application of space age technology has given ample scope to improve the analyzing capacity as well as dissemination ability of the soil testing laboratories. This, coupled with professional management through proper linkages can bring radical changes in the soil testing service in the country to the extent of farmers satisfaction.

Prasad and Rao (2002) revealed that awareness should be created among the farmers regarding the importance of soil test based fertilizer recommendations. They also concluded that there was a dire need to promote Integrated Nutrient Management concept among the farming community and thereby making savings in input cost. They observed yield improvement by 5 to 6 per cent and 20 to 30 per cent input saving as a result of improvement in soil health by extension activities done in Andhra Pradesh.

Sharma, et. al (2005) reported that only 13 per cent of soybean growers were tested their soil for application of balance dose of fertilizer. Majority of them were not tested their soil due to lack of knowledge (70.20%), soil testing was incredible (27.34%), soil testing laboratories situated far away (12.24%), non availability of soil testing report (11.02%) and complicated method of taking soil samples(8.97%).

Chanda (2005) revealed that there was negative balance of nutrients in the soil in India as a result of mining of more nutrients than replenishing through fertilizer and other sources. The fertilizer crop response ratio has been declining due to lower use of fertilizer than the required amount.

Reid (2006) observed that soil testing plays an important role in crop production and nutrient management. On farms that use commercial fertilizer as the main nutrient source, it is the best way to plan for profitable fertilizer applications. Soil testing is really a three-step process, the collection of a representative sample from each field or section, proper analysis of that sample to determine the levels of available nutrients and use of the results to determine optimum fertilizer rates. Keeping records is an integral part of the soil-testing process; they will help to determine if soil test levels are increasing, decreasing or being maintained over time.

Anonymous (2008a) in their study of five states viz. Haryana, Tamil Nadu, Assam, Punjab and West Bengal found that 37 in almost all the states, the farmers do not apply fertilizers after getting their soils tested. It ranged from 2.7 per cent in West Bengal to 41.13 per cent in Assam.

Anonymous (2008b) concluded that out of the sample farmers who got their soil tested, only 50 per cent actually followed the recommended dosage of fertilizers. The foregoing literatures imply that there are limited in depth studies on economic analysis of fertilizer consumption, particularly in Gujarat State.

Sahrawat, et. al (2011) confirmed that efficacy of the soil test-based balanced nutrient management in enhancing productivity of a range of crops in on-farm farmer participatory trials under rainfed conditions. Soil testing is indeed an effective tool for on-farm fertility management, a prerequisite for sustainably enhancing the productivity in rainfed areas in the Semi Arid Tropic regions of India. He also emphasized the need to strengthen the soil-testing infrastructure in the country.

Chouhan et. al (2012) studied the impact of soil testing service being provided to the farmers in the Bhopal district of Madhya Pradesh and observed that about 43 per cent farmers adopted the recommendations of the Laboratory on seed, fertilizer and plant protection chemicals. They also observed and found that on adoption of recommendations, the cost of production of different crops decreased, while net income increased. The constraints reported by the farmers in adoption of recommendations included high cost, difficulty in adoption, low credibility of soil testing report and long distance to laboratory.

Sahrawat, et. al (2012) observed that the use of internal soil standards in an analytical service laboratory is a simple, inexpensive, and effective tool for providing feedback on the quality of soil-testing service.

Sharma et. al (2015) studied the constraints of soil testing analysis in Madhya Pradesh and found that there is an ample scope to improve the analyzing capacity as well as dissemination ability of soil testing laboratories. If this, couple with professional management through proper linkages, can bring radical changes in soil testing services in the state to the extent of farmers' satisfaction. The results of the research undertaken made it clear that adoption of recommendation of soil testing reduced the cost of production and increased returns over cost of cultivation of crops. This fact may be popularized amongst the farmers so that they can take benefit of soil testing analysis. Sufficient

field staff with trained personal should be kept at village level and method as well as result demonstrations of these recommendations may be taken up in farmers' field for its wide adoption.

Hence, it is clear from above reviews that very little work has been done so far in this particular aspect. However, these laboratories were found to work from a long period of time. Soil testing is a proven scientific tool to evaluate soil fertility and plays an important role in crop production and nutrient management. (Reid, 2006). The soil testing programme in India has failed to create the desirable impact on the farming community due to extremely poor coverage and delay in timely dissemination of fertilizers recommendation to farmers (Biswas, 2002) and very few farmers were found to be tested their soil for adoption of recommended dose of fertilizer in their farms. (Sharma et.al 2005)

1.4 Research Methodology

The study confined to two districts (Jabalpur & Sehore) of Madhya Pradesh in which the SHC Scheme was implemented since its inception year 2015-16 and running successfully in the State. (Fig. 1.2) A block in each selected district was further selected purposively for the study from where maximum number of soil samples have been collected by soil testing laboratories. A village in each block was selected on the basis of same criteria and 15 soil tested farmers from each selected village were selected randomly for detailed study. An equal number of control farmers were selected from the same selected villages from where SHC beneficiaries were interviewed. Thus, the study comprise of 30 soil tested farmers/beneficiaries and 30 control farmers of 4 villages, 2 blocks and 2 districts of Madhya Pradesh. (Table 1.3)

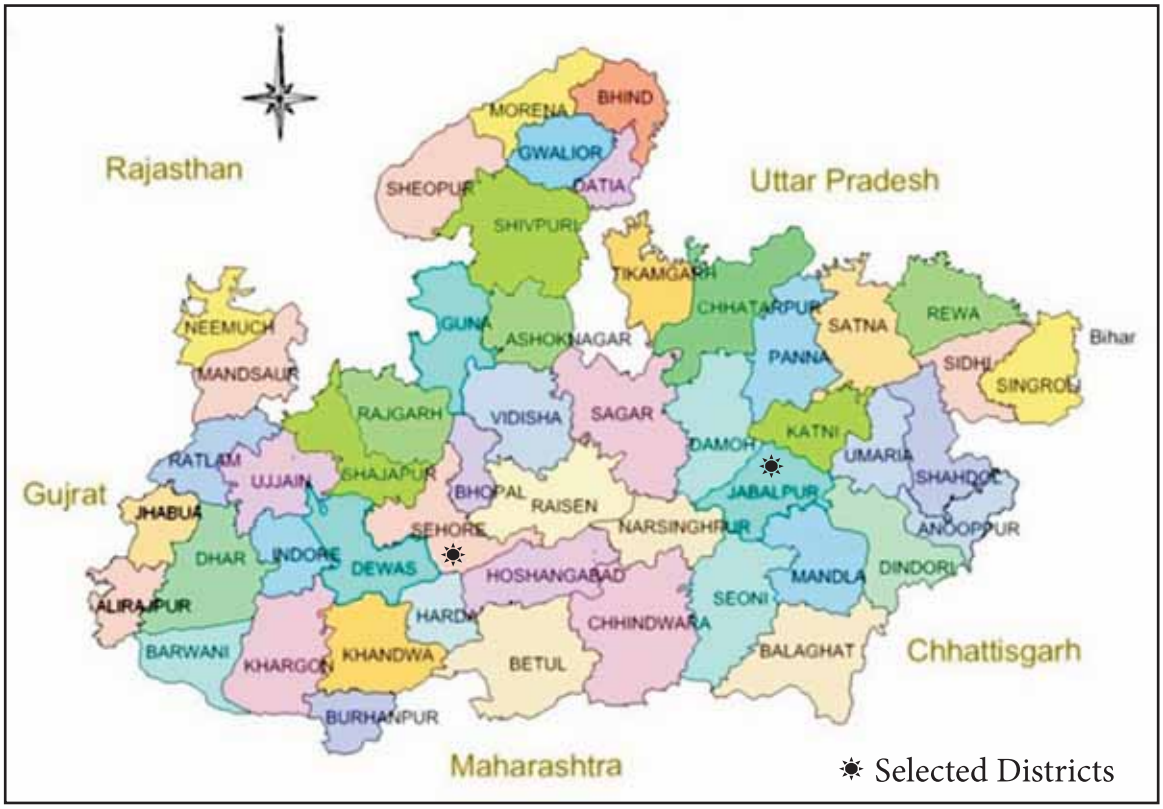

Fig 1.2: Selected districts for the study in Madhya Pradesh

The sample farmers were interviewed through interview schedule provided by the Coordinator (Agriculture Development and Rural Transformation Centre, Institute of Social Change, Bangalore) and tested in local condition of the Madhya Pradesh. Collected data were classified, tabulated and analysed in the light of stated objectives of the study.

Table 1.3: Numbers of respondents selected for the study

S. No.	Name of The Districts & Block	Name of Villages	Number of Respondents	
			Soil Tested Farmers	Control Farmers
1	Jabalpur, Panagar	Panagar, Chattarpur	15	15
2	Sehore, Sehore	Chanderi, Bijlon	15	15
Total	2	4	30	30

The 3 major kharif crops i.e. Paddy, Soybean and Maize grown by the farmers were taken into consideration to analyze the impact of soil test technology on crop production, productivity and income of the farmers. Suitable statistical tools viz. mean, percentage etc. have been used to draw conclusions from the data.

1.5 Limitations of the Study

The study does not claim its completeness in all aspects and certainly had some limitations. The secondary data as regards to number of farmers in different districts of Madhya Pradesh were taken from Census 2011. At that time Madhya Pradesh was having 45 districts hence, concentration of soil testing labs was worked out accordingly. The primary data relating to the objectives of the study were collected from the selected respondents. The information provided by them is based on the face to face interview and they do not keep any record of their farming practices. Therefore, the information provided by them is entirely based on their memory thus, there is possibility of certain biasness may enter in the present study.

1.6 Organization of the Report

The study is organized into 6 chapters. Chapter 1 covers the introductory part of the study followed by general characteristics of the sample household (Chapter II). Chapter 3 deals with the awareness of SHC scheme. Adoption of RDF as per SHC scheme have been discussed in Chapter 4, while impact of SHC scheme on crop production and soil health was covered in Chapter 5 and Chapter 6 covers Conclusion & Policy implication.

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CHAPTER-II

GENERAL CHARACTERISTICS OF SAMPLE HOUSEHOLDS

This chapter deals with the general characteristics of the households (HHs) their sources of irrigation, operational holdings, cropping pattern and gross income realized through agricultural production.

2.1 General Characteristics

In general characteristics of the age, education, occupation, gender, average family size, experience in farming and their caste have been considered for control as well as soil tested farmers and depicted in table 2.1.

Table 2.1: General characteristics of sample HHs

Particulars	Control Farmers	Soil Tested Farmers	Total
Average age of respondents (Years)	48	47	48
Average years of respondent education	4	7	6
Agriculture as main occupation (%)	93	97	95
Gender (% of respondents)			
Male	100	100	100
Female	0	0	0
Average family size	7	7	7
Average number of people engaged in farming	4	3	4
Average years of experience in farming	26	28	27
Caste (% of respondents)			
SC	3	0	2
ST	0	0	0
OBC	70	80	75
General	27	20	23

It is observed from the data that at overall level, an average household was of 48 years of age in which he spends only 6 years in schooling and have 7 members in his family out of which 4 members were found to be engaged in farming. The 95 per cent of HHs engaged themselves in agriculture as a main occupation. All the respondents were found to be male and have 27 years of experience in farming. The farming was found to be dominated by male. The composition of caste was found to be dominated by OBC (75%) followed by General (23%) and SC (2%) categories. The similar findings were observed in control as well as soil tested farmers with almost negligible variation, except in case of average years in schooling, which was found to be 7 in case of soil test farmers and 4 in case of control farmers.

2.2 Operational Holdings

The average land owned, leased in, leased out, uncultivated land, irrigated, un irrigated

land along with rental value of leased in & leased out land, net operated land, area sown more than once, gross cropped area and cropping intensity of control and soil tested farmers and their overall picture is depicted in table 2.2.

Table 2.2: Operational land holdings of sample Hhs (Acre)

Particulars	Control Farmers	Soil Tested Farmers	Overall
Owned land	4.72 (53.64)	5.68 (55.41)	5.20 (54.53)
Leased-in	0.83 (9.43)	0.35 (3.41)	0.59 (6.42)
Leased -out	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Uncultivated land	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Rental value of leased in land (Rs/acre)	10333	9375	9854
Rental value of leased out land (Rs/acre)	0.00	0.00	0.00
Total irrigated land	5.09 (57.84)	5.56 (56.24)	5.33 (56.04)
Total un-irrigated land	0.46 (5.23)	0.47 (4.59)	0.47 (4.91)
Net operated land	5.35 (63.07)	6.03 (58.83)	5.79 (60.95)
Area sown more than once	3.25 (36.93)	4.22 (41.17)	3.74 (39.05)
Gross Cropped Area	8.80 (100.00)	10.25 (100.00)	9.53 (100.00)
Cropping Intensity (%)	158.56	169.98	164.27

Figure in the parenthesis shows percentage to gross cropped area

It is observed from the data that the land owned by an average sample respondent on overall basis was found to be 5.20 acres along with 0.59 acres of leased in land constituting net operated area of 5.79 acres. The practice of leasing out land was not observed among the sample HHs in the area under study. More than 55 per cent of gross cropped area was found to be irrigated. The rental value of Rs.9854 per acre for leased in land was reported by the sample HH at overall level, which was found to be Rs. 10333 and 9375 per acres in case of control and soil tested farmers respectively. On overall basis an average sample respondents devoted his 3.74 acres of net area sown under double cropped area constituted gross cropped area of 9.53 acres with cropping intensity of 164.27 per cent.

The remarkable difference between different parameter of operational holdings as regards to control and soil tested farmers was not found in the area under study. However, an average soil tested farmer (6.03 acres) was found to cultivate more operated land as compared to an average control farmer (5.55 acres). The gross cropped area was also found more in case of average soil tested farmer (10.25 acres) than an average control farmer (8.80 acres) resulting into 169.98 and 158.50 per cent cropping intensity respectively.

2.3 Sources of Irrigation

The different sources of irrigation viz. dug well, bore well, canal and tanks across control and soil tested farmers at overall level are shown in table 2.3.

Table 2.3: Sources of irrigation of sample HHs (Percentage)

Particulars	Control Farmers	Soil Tested Farmers	Overall
Dug well	2.80	0.83	1.82
	(70.00)	(20.00)	(45.00)
Bore well	1.27	2.89	2.08
	(23.30)	(60.00)	(41.65)
Canal	1.02	1.11	1.07
	(6.70)	(13.33)	(10.02)
Tank	0.00	0.72	0.36
	(0.00)	(6.67)	(3.34)
Others *	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)

Figure in the parenthesis shows percentage area under irrigation

It is clear from the data that at overall level dug well (45.00%) and bore well (41.65%) were found to be main sources of irrigation among the sample HHs. The dug well (70%) followed by bore well (23.30%) and canal (6.70%) in case of control farmers, while bore well (60%) followed by dug well (20%), canal (13.33%) and tank (6.67%) in case of soil tested farmers were found to be major sources of irrigation in the area under study.

2.4 Cropping Pattern

The Cropping pattern of control and soil tested farmers' and their overall picture is presented in table 2.4.

It is observed from the data that at overall level an average sample farmer devoted more gross cropped area (9.53 acres) in kharif (60.95%) as compared to rabi (39.05%) season. Soybean (53.60%) followed by paddy (24.97%), urd (17.57%), maize (3.42%) and tur (0.44%) were found to be major crops of kharif season (5.79 acres), while wheat (69.72%), gram (11.24%), lentil (10.02%), were found to be major crop of rabi season (3.74 acres).

Table 2.4: Cropping pattern of the sample HHs (% of area)

Season	Crops	Control Farmers	Soil Tested Farmers	Overall
Kharif	Soybean	2.56 (46.13)	3.68 (61.08)	3.12 (53.60)
	Paddy	1.40 (25.23)	1.49 (24.71)	1.45 (24.97)
	Maize	0.24 (4.32)	0.15 (2.51)	0.20 (3.42)
	Tur	0.04 (0.72)	0.01 (0.16)	0.02 (0.44)
	Other (Urd)	1.31 (23.60)	0.71 (11.54)	1.00 (17.57)
	Total Kharif	5.55/63.07	6.03/58.83	5.79/60.95
Rabi	Wheat	2.13 (65.54)	3.11 (73.70)	2.62 (69.62)
	Gram	0.43 (13.23)	0.39 (9.24)	0.41 (11.24)
	Lentil	0.32 (9.85)	0.43 (10.19)	0.38 (10.02)
	Mustard	0.37 (11.38)	0.29 (6.87)	0.33 (9.13)
	Total Rabi	3.25/36.93	4.22/41.17	3.74/39.05
Gross Cropped Area		8.80 (100.00)	10.25 (100.00)	9.53 (100.00)

Figures in the parenthesis show percentage to total of respective season whereas figures in the slashes show percentage to gross cropped area

The remarkable difference in cropping pattern of an average control and soil tested farmers was not found. However, an average soil tested farmer (61.08%) devoted his more kharif area in soybean as compared to an average control farmer (46.13%), while an average soil test farmer devoted his more area of kharif season in paddy, maize, tur and urd than the control farmer. In rabi an average soil test farmer was found to devote his maximum area in wheat and lentil as compared to an average control farmer, while an average control farmer was

found to devote has maximum area in gram and mustard as compared to soil tested farmer.

2.5 Gross Income realized by the Sample HHs through Agricultural Production

The percentage of farmer used to sell out the produce of the crops grown in kharif season. The price and gross income obtained by an average HH is presented in table 2.5.

It is clear from the data that majority of the control farmers cultivated Soybean (46.7%) followed by Paddy (40.0%), Urd (33.3%), Maize (16.7%) and Tur (6.7%) in kharif season. The majority of soil tested farmers also cultivated these crops with minor variation. An average control HH received highest gross income from Paddy (Rs. 23785) followed by Tur (Rs. 17220), Soybean (Rs. 17028), Maize (Rs. 8657) and Urd (Rs. 6160), while an average soil tested HH received highest gross income from Soybean (Rs. 53676) followed by Paddy (Rs. 28160), Tur (Rs. 17759), Urd (Rs. 10101) and Maize (Rs. 9281).

Table 2.5: Gross income realized by the sample HHs through agricultural production

(perHH)

Crops	Control Farmers				Soil Tested Farmers			
	% of farmers	Avg. qty sold (Qtls)	Avg. price (Rs/Qtl)	Gross income obtained (Rs)	% of farmers	Avg. qty sold (Qtls)	Avg. price (Rs/Qtl)	Avg. income obtained (Rs)
Soybean	46.7	5.7	2970	17028	50.0	18.9	2835	53676
Paddy	40.0	17.5	1359	23785	50.0	20.1	1403	28160
Maize	16.7	5.5	1574	8657	10.0	6.3	1485	9281
Tur	6.7	4.1	4200	17220	10.0	4.3	4130	17759
Other (Urd)	33.3	2.2	2800	6160	36.7	2.6	3900	10101

Thus, it can be concluded from the above findings that there was no variation in the socio-economic characteristics of the control and soil tested sample HHs except in education, which was higher in soil tested HHs. The average size of operational holding was found to be of 5.79 acres with rental value of land of Rs. 9854 / acre which ranged between Rs. 9375 (soil tested HHs) to 10333 / acre (control HHs). Leased out land was not found in practice among the sample Hhs. The major sources of irrigation were found to be bore & dug well, canal and tanks. Soybean

followed by paddy, maize, tur and urd were found to be major kharif crops, while wheat, gram and lentil were found to be major rabi crops cultivated by sample HHs and soil tested farmers were found to obtain more income from the production of these crops as compared to control farmers in the area under study.

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CHAPTER-III

STATUS OF AWARENESS ON SHC SCHEME

This chapter deals with the awareness of soil testing among the sample respondents with their sources of information about soil testing, training programs attended on application of chemical fertilizers, method of application of fertilizers, details of soil sampling, sources for fertilizers purchase and sources of soil sample collection

3.1 Awareness of Soil Testing

Awareness of soil testing includes knowledge with regards to Integrated Nutrient Management (INM), experience of reduction in consumption of chemical fertilizers due to INM, imbalance application of fertilizers and its effects, knowledge about ongoing programmes on Soil Health Mission, Soil Health Cards and grid system under SHC scheme were identified for control as well as soil tested farmers and presented in Table 3.1.

The knowledge/awareness about all these parameters viz. awareness with regards to INM, experience of reduction in consumption of chemical fertilizers due to INM, imbalanced application of fertilizers and its effects, knowledge about ongoing programmes on Soil Health Mission, SHCs and grid system under SHC scheme were found to be more in case of soil tested farmers as compared to control farmers (Table 3.1).

Table 3.1: Awareness on soil testing among sample households (% of farmers)

Particulars	Control Farmers	Soil Tested Farmers	Overall
Households know about INM	23.30	26.70	25.00
Households experienced of reduction in consumption of chemical fertilizers due to INM	13.30	16.70	15.00
Households awareness on imbalanced application of fertilizers and its effects	20.00	70.00	45.00
Households knowledge about ongoing programmes on Soil Health Mission	30.00	65.00	47.50
Households aware of Soil Health Cards	33.30	93.30	63.30
Households awareness on grid system under SHC scheme	3.30	3.97	3.64

At overall level the majority of the HHs reported that they are aware about SHCs (63.30%) and have knowledge about ongoing programmes on Soil Health Mission (47.50%). They were also about aware imbalance application of fertilizers and its effects (45.00%) and know about INM (25%). The experience about the reduction in consumption of chemical fertilizers due to INM was reported by only 15 per cent of HHs. Further, it was also noticed that the awareness on grid system under SHC scheme was found to be negligible amongst the control (3.30%) as well as soil test farmers (3.97%).

3.2 Sources of Information about Soil Testing

The sources of information about soil testing viz. Agriculture Department, Krishi Vigyan Kendras (KVKs), Private companies, State Agriculture Universities (SAUs), friends and neighbours were reported by sample HHs and presented in Table 3.2.

Table 3.2: Sources of information about soil testing (% of farmers)

Sources	Soil Tested Farmers
State Agriculture Universities (SAUs)	6.70
Krishi Vigyan Kendra (KVKs)	10.00
Private companies	6.70
Agriculture Department	46.30
Friends	2.30
Neighbors	10.10

It is observed from the data that the major source of information amongst the HHs was found to be Agriculture Department (46.30%). The 10.10, 10.00, 6.70, 6.70 and 2.30 per cent of HHs also got information on soil testing from neighbours, KVKs, Private companies, SAUs and friends respectively.

3.3 Training Programs Attended on Application of Chemical Fertilizers

The training programs on application of chemical fertilizers viz. Judicious use/ application of chemical fertilizers on the right crop at the right time in approved doses and as per approved methods such as broadcasting, top dressing, foliar application, placement were found to be attended by more number of soil tested farmers (43%) as compared to control farmers (18%). The duration of training programme attended was also more in case of soil tested farmers (2 days) as compared to control farmer (1 day). (Table 3.3)

Table 3.3: Training programs attended on application of chemical fertilizers

Particulars	Control Farmers	Soil Tested Farmers
% of farmers attended	18.00	43.00
Average number of days	1.00	2.00

Government of Madhya Pradesh is also promoting and recommending soil test based balanced and integrated nutrient management through conjunctive use of both inorganic and organic sources of plant nutrient management to sustain good soil health and higher crop productivity under soil health management (SHM), which is a component of National Mission for Sustainable Agriculture (NMSA).

3.4 Method of Application of Fertilizers

The per cent of farmers which were found to apply different fertilizers through various methods are presented in table 3.4.

Table 3.4: Method of application of fertilizers (% of farmers)

Method of fertilizer application	Urea	DAP	SSP	Potash	Micro nutrients	Complex fertilizers	Other fertilizers ($S,ZnSo_4$)
Control Farmers							
Broadcasting	100	100	100	100	-	100	10
Spraying	20	-	-	-	-	15	15
Fertigation	-	-	-	-	-	-	-
Drilling		-	-	-	-	-	-
Soil Tested Farmers							
Broadcasting	100	100	100	100	-	100	5
Spraying	20	-	-	-	-	15	50
Fertigation	-	-	-	-	-	-	-
Drilling	-	-	-	-	-	-	-

It is observed from the data that broadcasting method of application of fertilizer was found very common in control as well as soil test farmers in the area under study. All the sample HHs were found to apply Urea, DAP, SSP, Potash, and Complex fertilizers by this method only. Although 15 per cent control and soil test farmers used to apply complex fertilizer and other fertilizer by spraying method. The Urea was also applied by spraying method by 10 and 30 percent control and soil test farmers respectively. None of the farmer was found to apply fertilizer through fertigation and drilling methods in cultivation of crops.

3.5 Details of Soil Sampling

The details of soil sampling such as average cost of soil testing, distance from field to soil testing lab, samples taken, No. of plots considered and area covered under soil testing

are presented in table 3.5.

It is clear from the data that an average soil tested farmer used to cover the distance of 27 kms from field to soil testing lab for getting his soil tested. He used to take on an average 2 soil samples from 3 plots covering approximately 5 acres of land.

Table 3.5: Details of soil sampling

S.No.	Particul ars	Soil Tested Farmers
1	Average cost of soil testing (Rs/sample)	35
2	Average distance from field to soil testing lab (kms)	27
3	Average samples taken for soil testing (Numbers)	2
4	Average no. of plots considered for soil testing	3
5	Average area covered under soil testing (Acres)	5

The cost of soil testing incurred to test a sample was found to be Rs. 35/- only. Looking to the present situation it is becoming imperative need that the soil testing labs should be in reach of the farmer and should not be more than 10 kms radius. So that the soil testing labs can be easily approachable and farmers will not hesitate in getting their soil tested before every season and the practice of soil testing can be easily inculcated in their mind.

3.6 Sources for Fertilizers Purchase

The per cent of control as well as soil tested farmers purchasing different fertilizers across various sources is presented in table 3.6.

Table 3.6: Sources for fertilizers purchase (% of farmers)

Sources	Urea	DAP	SSP	Potash	Complex fertilizer	Micro nutrients	Bio-fertilizers
Control Farmers							
Private fertilizer shops/dealers	42.30	38.00	27.00	9.70	36.00	72.00	25.00
Company authorized dealers	-	3.30	-	-	-	-	-
Co-operative societies	54.50	53.50	68.00	83.20	54.00	-	43.00
Government agency	-	-	-	-	-	16.00	18.00
Soil Tested Farmers							
Private fertilizer shops/dealers	44.3	42.00	33..00	13.9	44.00	88.00	35.00
Company authorized dealers	-	3.7	-	-	-	-	-
Co-operative societies	58.9	59.9	72.00	93.2	66.00	-	57.00
Government agency	-	-	-	-	-	24.00	22.00

It is observed from the data that the major source of purchase of Urea, Di-Ammonium Phosphate (DAP), Single Super Phosphate (SSP), Potash and Complex fertilizer was found to be co-operative societies followed by private fertilizer shops/dealers while, the secondary and micronutrients were found to be purchased from private fertilizers shops and government agencies in case of control as well as soil test farmers. The major source of purchase of Bio-fertilizers-culture (Rizobium, Azetobector, Ajospyrilum and Phosphorus Solubilising Bacteria) was found to be co-operative societies, private fertilizer shops/dealers, and government agency both in case of control as well as soil tested farmers.

3.7 Sources of Soil Sample Collection

The information on sources of soil sample collection was also gathered from the sample HHs and present in table 3.7.

The majority of farmers were found to collect their soil sample by themselves (83%),. Only 11, 5 and 1 per cent HHs were found to collect their soil samples with the help of the farmer facilitator, scientists of SAUs, and KVKs respectively. (Table 3.7)

Table 3.7: Sources of soil sample collection (% of farmers)

Particulars	Soil Tested Farmers
Self	83
Department of Agriculture	5
State Agriculture Universities	0
Krishi Vigyan Kendra	1
Farmer facilitator	11

It can be concluded from the above results that 63.30 per cent were found to be aware about SHC scheme and 25.0 per cent have knowledge of INM due to wider campaign put in place by the State government. Only 15 per of HHs experienced that use of INM curtailed fertilizer consumption. Only 3(control) - 4(soil tested) per cent of HHs were found to be aware about grid system under the scheme. The Department of Agriculture Development and Farmers' Welfare, was found to be most important source of information of SHC scheme among the HHs. Only 18 (control) to 43 (soil tested) HHs were found to attend training programmes on application of fertilizers for 1-2 days only. The sample HHs were found to adopt

broadcasting and spraying method of fertilizer application and none of the them found to apply fertilizer through fertigation and drilling method. The total cost incurred to test a sample was found to be Rs. 35/- only including family labour charges. An average HH used to take on an average 2 soil samples from 3 plots and approximately covering 5 acre of land. Cooperative societies followed by private shops/dealers were found to be major sources to purchase Uera, DAP, SSP, MOP, micronutrients and bio-fertilizers for cultivation of crops.

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CHAPTER-IV

ADOPTION OF RDF AS PER SHC SCHEME

This chapter deals with the recommended doses of fertilizers, application of organic fertilizers, problems encountered, while implementation of the SHC scheme and suggestions for improvement of SHC scheme as reported by the sample HHs.

4.1 Recommended Doses of Fertilizers

The average recommended dose of fertilizers (RDF) based on the soil test results as mentioned in the SHCs as well as farmers opinion are presented in Table 4.1.

Table 4.1: Average recommended quantity of fertilizers based on soil test results (as mentioned in the SHC Vs farmers' opinion.) (Kgs/acre)

Crops	FYM* (t)	Urea	DAP	MOP	MgSo4	Potash	SSP	Any other (Bio -fertilizers)
Average Recommended Quantity								
Paddy	8-10	88	62	27	-	-	152	5 gm/kg seed
Soybean	8-10	18	62	14	-	-	152	5 gm/kg seed
Maize	8-10	105	52	20	-	-	127	5 gm/kg seed
Farmers Opinion								
Paddy	6-8	101	68	24	-	-	123	-
Soybean	6-8	26	69	9	-	-	148	-
Maize	6-8	124	58	13	-	-	99	-

* Once in three Year

It is observed from the data that on an average 88, 62, 27 and 152 kg per acre of Urea, DAP, MOP and SSP was recommended by respective soil testing laboratory for cultivation of paddy. In cultivation of soybean the RDF was 18 (Urea), 62 (DAP), 14 (MOP) and 152(SSP) kg/acre, while 105 (Urea), 52 (DAP), 20(MOP) and 127 (SSP) kg/acre for cultivation of maize in the area under study. Apart from these RDF, the soil testing laboratories also recommended 8-10 tonnes of FYM once in three years and 5 gm/kg of seed of bio fertilizers viz. Rhizobium (Soybean), Azotobactor (paddy & maize) & Azospiralum (paddy) and PSB (all the crops) in cultivation of these crops.

As for as the farmers' opinion is concerned, the average quantity of fertilizers in cultivation of soybean and maize were found to be more as compared to the average quantity based on soil test results except SSP and MOP across all the selected crops. As per farmers opinion the average quantity of FYM (6-8 t/acre) required to be applied across selected crops, which was found to be less than the average recommended quantity based on soil test results (8-10 t/acre).

Table 4.2: Application of organic fertilizers

Particulars	FYM	Vermi Compost /Biogas	Bio - fertilizer	Green manure	Other organic manure
% of farmers applied organic fertilizers	74.0	-	46	-	-
Average area covered under organic fertilizers (Acres)	1.79	-	1.2	-	-
Average quantity applied (Kgs/acre)	760	-	0.2	-	-
Price (Rs/kg)	1.5	-	270	-	-

4.2 Application of Organic Fertilizers

The application of organic fertilizers applied by the sample respondents are presented in Table 4.2. It is observed from the data that majority of HHs used to apply organic fertilizer in the form of FYM (74%) and bio fertilizers (46%) in average quantity of 760 and 0.2 kg/acre with average price of Rs. 1.30 and 270 per kg respectively. The area covered under FYM and bio fertilizer was found to be 1.79 and 1.2 acres respectively. None of the farmer was found to apply vermi c/biogas, green manure,other organic manure in cultivation of crops in the area under study.

4.3 Problems Encountered while Implementation of the SHC Scheme

The problems which were faced by the farmers in implementation of SHC scheme and utilization of SHCs in cultivation of crops at their field are presented in table 4.3.

Table 4.3: Problems faced by the farmers in utilization of SHC (% of farmers)

Problems	Soil Tested Farmers
Recommended fertilizers not available in adequate quantity in the local market	63
High price of fertilizers	79
Lack of capital to purchase fertilizers	34
Lack of technical advice on method and time of fertilizers application	53
Difficult to calculate the required quantity of fertilizers as per SHC	87
SHC not available in time	23
Lack of knowledge about method of collecting ideal soil sample	56
Soil testing laboratories are located far away	45
Soil testing not required for my field as crop yield is good	19
Recommendation of SHC is not creditable	47
Lack of training	74
Lack of knowledge regarding advantages of SHC	35

The major problems reported by the majority of soil tested farmers were found to be difficulty in calculating the required quantity of fertilizers as per SHC (87%) followed by high price of fertilizers (79%), lack of training (74%), recommended fertilizers not available in adequate quantity in the local market (63%), lack of knowledge about method of collecting ideal soil sample (56%), lack of technical advice on method and time of fertilizers application (53%), lack of capital to purchase fertilizers (34%), recommendation of SHC is not creditable (47%), soil testing laboratories are located far away (45%), lack of knowledge regarding advantages of SHC (35%) SHC not available on time (23%) and soil testing not required for my field as crop yield is good (19%).

4.4 Suggestions for Improvement of SHC Scheme

The major suggestions for improving SHC scheme as reported by the respondents are presented in table 4.4.

It is observed from the data that ensured and timely availability of SHC on mobile/internet (85%), SHC should be in local and regional language (83%), more training programm should be organized regarding procedure of collection of representative soil sample (81%), ensured availability of recommended fertilisers in the market (68%), ensured soil testing lab at least at block level to increase the assess at farmers door step to promotion of soil testing (66%), more awareness complain about advantaged of SHC scheme (62%) and rural Agriculture Extension Officer should visit the village at least twice in a week so that farmer will be able to get proper/timely advice for his problems (23%) were the major suggestions given by the sample HHs for improving SHC scheme in the area under study.

Table 4.4: Major suggestions for improving SHC scheme (% of farmers)

Suggestions	Soil Tested Farmers
More Awareness complain about advantaged of SHC Scheme	62
Ensured and timely availability of SHC report	85
SHC should be in local and regional language	83
More training programm should be organized	81
Soil testing lab at least at block level	66
Regular visit of Agriculture officers in the villages	23
Ensured availability of recommended fertilisers in market	68

It is concluded from the above finding that only some of sample HHs used to adpot RDF, FYM and bio-fertilizers after obtaining SHC. They were not able to use RDF due to difficulty in calculating the required quantity of fertilizers as per SHC (87%), high price of fertilizers (79%), lack of training (74%), recommended fertilizers not available in adequate quantity in the local market (63%), lack of knowledge about method of collecting ideal soil sample (56%), lack of technical advice on method and time of fertilizers application (53%). The majority of sample HHs suggested that they will be able to adopt RDF only by ensuring timely availability of SHC on their mobile/internet and recommended fertilisers in the local market.

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CHAPTER-V

IMPACT OF SHC SCHEME ON CROP PRODUCTION

This chapter deals with the impact of soil testing and application of RDF on the yield, visible changes and economics of cultivation of major selected kharif crops viz. Paddy, Soybean and Maize before and after introduction of SHC Scheme in the area under study.

5.1 Impact of Application of RDF on Yield

The impact of RDF was observed on the yield of the major selected crops viz. paddy, soybean and maize depicted in table 5.1. It is observed from the data that a remarkable change in yield of the major kharif crops was observed. The yield of paddy, soybean and maize was found to be increased by 19.42, 13.79 and 9.30 per cent respectively after application of RDF.

Table 5.1: Impact of application of recommended doses of fertilizers on yield (Kharif-2015)

Crop	Average Yield (Quintal/acre)		% Change
	Before	After	
Paddy	20.60	24.60	19.42
Soybean	5.80	6.60	13.79
Maize	6.30	9.30	3.00

5.2 Visible Changes found after the Application of RDF

The most important, important and least important visible changes were found to be observed by the HHs after the applications of RDF are presented in table 5.2.

It is clear from the data that the most important changes which were observed by the majority of HHs were reduction in application of other inputs like seed, labour, pesticides etc. (66.70%), improvement in soil texture (60.00%) and increase in crop yield (55.60%).

The important changes which were observed by the majority of HHs were found to be improvement in crop growth (70%) and improvement in grain filling (61%). The less incidences of pest and diseases after application of RDF was observed as least important visible change as reported by majority (66.70%) of HHs.

Table 5.2: Visible changes found after the application of recommended doses of fertilizers

(% of farmers)

Reasons	Most important	Important	Least important	Total
Increase in crop yield	55.60	11.40	33.00	100
Improvement in soil texture	60.00	13.30	26.70	100
Improvement in crop growth	13.33	70.00	16.67	100
Improvement in grain filling	11.10	61.00	27.90	100
Less incidence of pest and diseases	10.00	23.30	66.70	100
Reduction in application of other inputs like seed, labour, pesticide etc.	66.70	13.30	20.00	100

5.3 Impact of Soil Testing on Economics of Cultivation of Crops

The impact of soil testing on economics of cultivation of crops viz. paddy, soybean and maize analysed for the study.

The impact of soil testing on economics of cultivation of paddy was analysed and presented in table 5.3.

Table 5.3: Impact of soil testing on economics of cultivation of paddy (q/acre)

Variables	Unit	After soil testing		Before soil testing		Difference	
		Qty	Cost (Rs)	Qty	Cost (Rs)	Qty	Cost (Rs)
Total labour cost			13002		15015	0.0	2013.1 (15.48)
Manure/ FYM	Kg/acre	240.7	310	194.7	248	46.0	61.6 (24.84)
Seed	Kgs	28.6	1442	31.4	1432	-2.7	10.4 (0.73)
Urea	Kgs	23.2	127	29.9	156	-6.8	-28.4 (-18.22)
DAP	Kgs	71.3	1894	89.9	2325	-18.6	-430.7 (-18.53)
MOP	Kgs	0.0	0	0.0	0	0.0	0.0 (0.00)
SSP	Kgs	0.0	0	0.0	0	0.0	0.0 (0.00)
Zinc	Kgs	3.7	230	3.9	252	-0.2	-21.9 (-8.71)
PPC	Litres	1.7	1260	1.87	1039	-0.2	221.2 (21.29)
Irrigation	Acre inch		0		0		0.0 (0.00)
Others miscellaneous charges			211		269		-58.0 (-21.56)
Rental value of land			6186		4902		1284.7 (26.21)
Land revenue			15		15		0.0 (0.00)
Total Cost			26691		23639		3052.0 (12.91)
Main product yield		24.6	37118	20.6	29410	4.0	7708.1 (26.21)
By- product yield (RS/Qtl)		34.7	6958	25.3	5460	9.3	1497.3 (27.42)
Gross Income			44076		34870	0.0	9205.5 (26.40)
Net Income			17385		11231	0.0	6153.5 (54.79)
B:C Ratio			1.7		1.5	0.0	

Figure in the parenthesis shows percentage difference after soil testing

Table 5.4: Impact of soil testing on economics of cultivation of soybean (q/acre)

Variables	Unit	After soil testing		Before soil testing		Difference	
		Qty	Cost (Rs)	Qty	Cost (Rs)	Qty	Cost (Rs)
Total labour cost			2187		2450	0.0	-263.3 (-10.8)
Manure/ FYM	Kg/acre	366.6	627	506.6	882	-140.1	-255.4 (-29.0)
Seed	Kgs	34.4	1652	39.9	1861	-5.5	-209.6 (-11.3)
Urea	Kgs	3.9	23	4.8	26	-0.9	-3.1 (-11.6)
DAP	Kgs	50.0	1389	50.0	1325	0.0	64.0 (4.8)
MOP	Kgs	0.0	0.0	0.0	0.43	0.0	-0.4 (-100.0)
SSP	Kgs	126.8	761	147.0	821	-20.2	-59.9 (-7.3)
Zinc	Kgs	0.8	73	0.9	92	-0.1	-19.7 (-21.3)
PPC	Litres	0.8	532	0.97	588	-0.2	-55.8 (-9.4)
Irrigation	Acre inch		0		0		0.0 (0.00)
Others miscellaneous charges			183		247		-64.0 (-25.9)
Rental value of land			3272		2590		681.6 (26.3)
Land revenue			15		15		0.0 (0.00)
Total Cost			10714		10900		-185.6 (-1.7)
Main product yield		6.7	19632	5.8	15542	0.9	4089.6 (26.3)
By-product yield (RS/Qtl)		6.6	2310	5.9	2054	0.7	256.7 (12.5)
Gross Income			21942		17596	0.0	4346.3 (24.7)
Net Income			11228		6696	0.0	4531.9 (67.7)
B:C Ratio			2.0		1.6	0.0	

Figure in the parenthesis shows percentage difference after soil testing

It is observed from the data that in cultivation of paddy per acre expenditure on urea, DAP, Zinc and other miscellaneous charges was found to be decreased by 18.22, 18.53, 8.71 and 21.57 per cent respectively. The expenditure on labour (15.48%), manures/FYM (24.84%), seed (0.73%), plant protection chemicals (21.29%) were found to be increased. The rental value of land was also found to be increased by 26.21 per cent after soil testing by the farmers. The total cost of cultivation of paddy was found to be increased by 12.91 per cent from Rs. 23639 to Rs. 26691 per acre with the increase in net income by 54.79 per cent from Rs. 11231 to 17385 /acre. The return per rupee investment was also found to increase from Rs.1.50 to 1.70 after soil testing by the farmers (Table 5.3).

The impact of soil testing on economics of cultivation of soybean was analysed and presented in table 5.4.

It is observed from the data that in cultivation of Soybean per acre expenditure on labour (-10.8%), seed (-11.3%), manures/FYM (-29.0%), urea (-11.6%), Zinc (-21.3%), SSP (-7.3%), MOP (-100%) and plant protection chemicals (-9.4%) was found to be decreased,. while rental value of land (26.3%), DAP (4.8%) was increased after soil testing by the farmers. The total cost of cultivation of Soybean was found to be decreased by 1.7 per cent from Rs. 10900 to Rs. 10714 per acre with the increase in net income by 67.7 per cent from Rs. 6696 to 11228 per acre. The return per rupee investment was also found to be increased from Rs.1.60 to 2.00 after soil testing by the farmers (Table 5.4).

The impact of soil testing on economics of cultivation of maize was analysed and presented in table 5.5.

It is observed from the data that in cultivation of maize per acre expenditure on labour, seed, urea, DAP, SSP and plant protection chemicals was found to be decreased by 8.72, 16.67, 14.84, 1.60, 13.74, 13.95 percent respectively, while expenditure on manures and fertilizers, zinc and rental value of land was increased by 1.73, 44.44 and 80.06 per cent after soil testing by the farmers.

The total cost of cultivation of maize was found to be increased by 12.94 per cent from Rs. 8176 to Rs. 9235 per acre with the increase in net income by 139.83 per cent from Rs. 3380 to 8105 per acre. The return per rupee investment was also found to increase from Rs. 1.40 to 1.90 after soil testing by the farmers (Table 5.5).

Table 5.5: Impact of soil testing on economics of cultivation of maize (q/acre)

Variables	Unit	After soil testing		Before soil testing		Difference	
		Qty	Cost (Rs)	Qty	Cost (Rs)	Qty	Cost (Rs)
Total labour cost			2932		3212	0.0	-280.0 (-8.72)
Manure/ FYM	Kg/acre	235.0	540	231.0	531	4.0	9.2 (1.73)
Seed	Kgs	4.5	135	5.4	162	-0.9	-27.0 (-16.67)
Urea	Kgs	21.8	109	25.6	128	-3.8	-19.0 (-14.84)
DAP	Kgs	36.9	959	37.5	975	-0.6	-15.6 (-1.60)
MOP	Kgs	0.0	0.0	0.0	0.0	0.0	0.0 (0.00)
SSP	Kgs	18.2	109	21.1	127	-2.9	-17.4 (-13.74)
Zinc	Kgs	1.3	58	0.9	40	0.4	18.0 (44.44)
PPC	Litres	1.7	765	1.9	889	-0.2	-124.0 (-13.95)
Irrigation	Acre inch		0.0		0.0		0.0 (0.00)
Others miscellaneous charges			143		171		-28.0 (-16.37)
Rental value of land			3468		1926		1542.0 (80.06)
Land revenue			15.		15		0.0 (0.00)
Total Cost			9235		8176		1058.2 (12.94)
Main product yield		9.3	13020	6.3	8820	3.0	4200.0 (47.62)
By- product yield (RS/Qtl)		24.0	4320	15.2	2736	8.8	1584.0 (57.89)
Gross Income			17340		11556		5784.0 (50.05)
Net Income			8105		3380		4725.8 (139.83)
B:C Ratio			1.9		1.4		0.5

Figure in the parenthesis shows percentage difference after soil testing

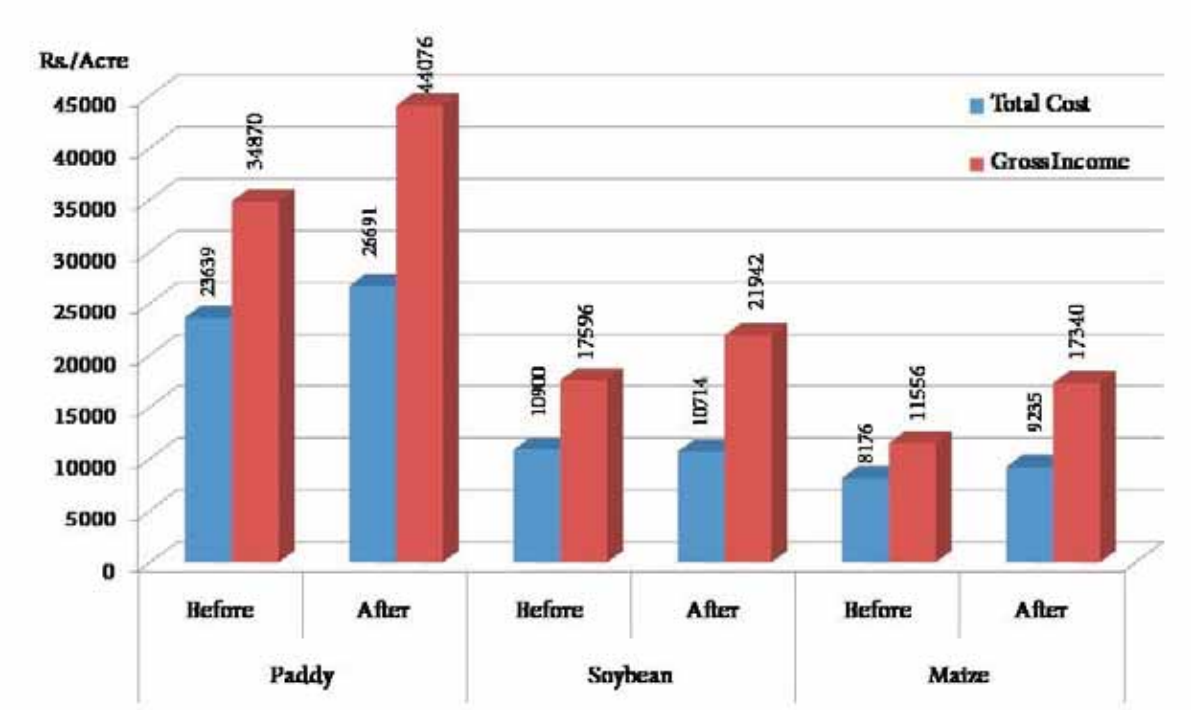

Fig 5.1: Total cost of cultivation and gross income after adoption of RDF

It can be concluded from the above findings that the reduction in application of other inputs like seed, labour, pesticides etc. improvement in soil texture and increase in crop yield were observed by the majority of HHs after application of RDF. At the same time they were also started adopting recommended package of practices (RPP) for cultivation of crops as they got the opportunity to come in close contact with officials of Department of Agriculture, scientists of SAUs & KVKs and farmer facilitators while collecting and analysing the soil sample of their land resulting into reduction in expenditure on fertilizers and other inputs. After adoption of SHCs recommendation in cultivation of crops net income, gross income of soil tested farmers were found to be increased manifolds. (Fig. 5.1)

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CHAPTER-VI

SUMMARY CONCLUSION AND POLICY IMPLICATION

This chapter deals with the background of the study, summary of findings, conclusions drawn from the findings and policy recommendations related to the Soil Health Card (SHC) scheme in Madhya Pradesh

6.1 Background

The SHC is a complete evaluation of the quality of soil right from its functional characteristics to water and nutrients content and other biological properties. It contains corrective measures that a farmer should adopt to obtain a better yield. SHC help the farmers as with the issue of the card, the farmers get a well-monitored report of the soil which is utilized for cultivation of crops and they were guided by the experts along with solutions to improve the quality of the soil. It also helps the farmers to get a long-term soil health record and accordingly can study and evaluate the results of different soil management practices. The SHC can become most helpful and effective when filled out regularly by the same person over a period of time. The idea is not to compare the varied soil types but to find out methods to improve soil fertility to access the different types of soil and their ability to support crop production in spite of their limitations and as per their abilities. The SHC help the farmers to get an idea on the crop-wise recommendations of nutrients and fertilizers required in each type of soil. This can help in increasing the crop yield.

The SHC scheme was launched in February 2015, in the first phase, the target was to distribute 84 lakh cards in 2015-16. But till July 2015, 34 lakh cards have been issued. This is a flagship programme for the agricultural sector of the country.

This scheme is being implemented in all the districts of the Madhya Pradesh 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.

How far, SHC scheme is beneficial scheme for farmers? As there are so many illiterate farmers in India and they do not know, which type of crops they should grow to get maximum yield. Basically, they do not know the quality and the type of their soil. They might know by experience which crops can be grown and which crops fail. But they don't know what they can do to improve the condition of their soil.

Box. 1: Key Features of the Soil Health Card Scheme

1. The government is planning to cover as many as 14 crore farmers under the scheme.
2. The scheme covers all parts of the country.
3. In the form of SHC, the farmers get a report. And this report contains all the details about the soil of their particular farm.
4. The soil health card is prepared once in every 3 years.

Considering all these facts in mind the present study was formulated with following specific objective:

1. To identify socio economics characteristics of soil tested and control farmers.
2. To study the awareness of SHC among the farmers
3. To determine the adoption of RDF as per SHC scheme by the farmers.
4. To analyse the impact of soil test technology on crop production, productivity and income of the farmers.

The study confined to two districts (Jabalpur & Sehore) of Madhya Pradesh, in which the SHC Scheme was implemented since its inception year 2015-16 and running successfully in the State. (Fig. 1.2) A block in each selected district was further selected purposively for the study from where maximum number of soil sample has been collected by soil testing laboratories. A village in each block was selected on the basis of same criteria and 15 soil tested farmers from each selected village were selected randomly for detailed study. An equal number of control farmers were selected from the same selected villages from where SHC beneficiaries were interviewed. Thus, the study comprises of 30 soil tested farmers/beneficiaries and 30 control farmers of 2 villages, 2 blocks and 2 districts of Madhya Pradesh. The sample farmers were interviewed through interview schedule provided by the Coordinator (Agriculture Development and Rural Transformation Centre, Institute of Social Change, Bangalore) and tested in local condition of the Madhya Pradesh. Collected data were classified, tabulated and analysed in the light of stated objectives of the study. The 3 major kharif crops i.e. Paddy, Soybean and Maize grown by the farmers were taken into consideration to analyze the impact of soil test technology on crop production, productivity and income of the farmers. Suitable statistical tools viz. mean, percentage etc. have been used to draw conclusions from the data.

6.2 Summary of Findings

The summary of findings includes the results which are emerged through analysis of data related to socio economic characterises of the sample households, awareness of SHC scheme, adoption of RDF as per SHC scheme and impact of SHC scheme on crop production and soil health

6.2.1 General Characteristics of the Sample HH

An average household (HH) was of 48 years of age in which he spends only 6 years in schooling and have 7 members in his family out of which 4 members were found to be engaged in farming. The 95 per cent of HHs engaged themselves in agriculture as a main occupation. All the respondents were found to be male and have 27 years of experience in farming. The farming was found to be dominated by male. The composition of caste was found to be

dominated by OBC (75%) followed by General (23%) and SC (2%) categories. The similar findings were observed in control as well as soil tested farmers with almost negligible variation, except in case of average years in schooling, which was found to be 7 in case of soil test farmers and 4 in case of control farmers.

The land owned by an average sample respondent on overall basis was found to be 5.20 acres along with 0.59 acres of leased in land constituting net operated area of 5.79 acres. The practice of leasing out land was not observed among the sample HHs in the area under study. More than 55 per cent of gross cropped area was found to be irrigated. The rental value of Rs.9854 per acre for leased in land was reported by the sample HH at over all level. On overall basis an average sample respondents devoted his 3.74 acres of net area sown under double cropped area constituted gross cropped area of 9.53 acres with cropping intensity of 164.27 per cent.

The remarkable difference between different parameter of operational holdings as regards to control and soil tested farmers was not found in the area under study. However, an average soil tested farmer (6.03 acres) was found to cultivate more operated land as compared to an average control farmer (5.55 acres). The gross cropped area was also found more in case of average soil tested farmer (10.25 acres) than an average control farmer (8.80 acres) resulting into 169.98 and 158.50 per cent cropping intensity respectively.

At overall level dug well (45.00%) and bore well (41.65%) were found to be main sources of irrigation among the sample HHs. The dug well (70%) followed by bore well (23.30%) and canal (6.70%) in case of control farmers, while bore well (60%) followed by dug well (20%), canal (13.33%) and tank (6.67%) in case of soil tested farmers were found to be major sources of irrigation in the area under study.

An average sample farmer devoted with more gross cropped area (9.53 acres) in kharif (60.95%) as compared to rabi (39.05%) season. Soybean (53.60%) followed by paddy (24.97%), urd (17.57%), maize (3.42%) and tur (0.44%) were found to be major crops of kharif season (5.79 acres), while wheat (69.72%), gram (11.24%), lentil (10.02%), were found to be major crop of rabi season (3.74 acres).

6.2.2 Awareness of SHC Scheme

The knowledge/awareness about all these parameters viz. awareness with regards to INM, experience of reduction in consumption of chemical fertilizers due to INM, imbalanced application of fertilizers and its effects, knowledge about ongoing programmes on Soil Health Mission, Soil Health Cards and grid system under SHC scheme were found to be more in case of soil tested farmers as compared to control farmers.

The majority of the HHs reported that they are aware about Soil Health Card scheme (63.30%) and have knowledge about ongoing programmes on Soil Health Mission (47.50%).

They were also aware on imbalanced application of fertilizers and its effects (45.00%) and know about INM (25%). The experience about the reduction in consumption of chemical fertilizers due to INM was reported by only 15 per cent of HHs. The awareness on grid system under SHC scheme was found to be negligible amongst the control (3.30%) as well as soil test farmers (3.97%).

The major source of information amongst the HHs was found to be Agriculture Department (46.30%). The 10.10, 10.00, 6.70, 6.70 and 2.30 per cent of HH also reported to got information on soil testing from neighbour, KVKs, Private companies, SAUs and friends respectively.

The training programs on application of chemical fertilizers was found to be attended by more number of soil tested farmers (43%) as compared to control farmers (18%). The duration of attended training programme was also more in case of soil tested farmers (2 days) as compared to control farmer (1 day).

The broadcasting method of application of fertilizer was found very common in control as well as soil test farmers in the area under study. All the farmers were found to apply Urea, DAP, SSP, Potash, and Complex fertilizers by this method only. Although, 15 per cent control and soil test farmers used to applied complex fertilizer and other fertilizer by spraying method. The Urea was also applied by spraying method by 10 and 30 percent control and soil test farmers respectively. None of the farmer was found to apply fertilizer through fertigation and drilling methods in cultivation of crops.

An average soil tested farmer covers distance of 27 kms from field to soil testing lab for getting his soil tested. He used to take on an average 2 soil samples from 3 plots covering approximately 5 acres of land. The cost of soil testing incurred to test a sample was found to be Rs. 35/- only.

The major source of purchase of Urea, Di-Ammonium Phosphate (DAP), Single Super Phosphate (SSP), Potash and Complex fertilizer was found to be co-operative societies followed by private fertilizer shops/dealers while, the secondary and micronutrients were found to be purchased from private fertilizers shops and government agencies in case of control as well as soil test farmers. The major source of purchase of Bio-fertilizers-culture (Rizobium, Azetobector, Ajospyrilum and Phosphorus Solubilising Bacteria) was found to be co-operative societies, private fertilizer shops/dealers, and government agency in both the cases.

The majority of farmers were found to collect their soil sample by themselves (83%). Only 11, 5 and 1 per cent were found to collect their soil samples with the help of the farmer facilitator, scientists of SAUs, and KVKs respectively.

6.2.3 Adoption of RDF as per SHC Scheme

On an average 88, 62, 27 and 152 kg per acre of Urea, DAP, MOP and SSP was recommended by respective soil testing laboratory for cultivation of paddy. In

cultivation of soybean the RDF was 18 (Urea), 62 (DAP), 14 (MOP) and 152(SSP) kg/acre, while 105 (Urea), 52 (DAP), 20(MOP) and 127 (SSP) kg/acre for cultivation of maize in the area under study. Apart from these RDF, the soil testing laboratories also recommended 8-10 tonnes of FYM once in three years and 5 gm/kg of seed of bio fertilizers viz. Rhizobium (Soybean), Azotobactor (Paddy & Maize) & Azospiralum (Paddy) and PSB (all the crops) in cultivation of these crops. As for as the farmers' is opinion is concerned, the average quantity of fertilizers in cultivation of soybean and maize were found to be as compared to the average quantity based on soil test results except SSP and MOP across all the selected crops. The average quantity of FYM (6-8 t/acre) required to be applied across selected crops was also found to be less than the average recommended quantity based on soil test results (8-10 t/acre).

The majority of HHs used to apply organic fertilizer in the form of FYM (74%) and bio fertilizers (46%) in average quantity of 760 and 0.2 kg/acre with average price of Rs. 1.30 and 270 per kg respectively. The area covered under FYM and bio fertilizer was found to be 1.79 and 1.2 acres respectively.

The major problems reported by the majority of soil tested farmers were found to be difficulty in calculating the required quantity of fertilizers as per SHC (87%) followed by high price of fertilizers (79%), lack of training (74%), recommended fertilizers not available in adequate quantity in the local market (63%), lack of knowledge about method of collecting ideal soil sample (56%), lack of technical advice on method and time of fertilizers application (53%), lack of capital to purchase fertilizers (34%), recommendation of SHC is not creditable (47%), soil testing laboratories are located far away (45%), lack of knowledge regarding advantages of SHC (35%) SHC not available on time (23%) and soil testing not required for my field as crop yield is good (19%).

The ensured and timely availability of SHC on mobile/internet (85%), SHC should be in local and regional language (83%), more training programm should be organized regarding procedure of collection of representative soil sample (81%), ensured availability of recommended fertilisers in the market (68%), ensured soil testing lab at least at block level to increase the assess at farmers door step to promotion of soil testing (66%), more awareness complain about advantaged of SHC scheme (62%) and rural Agriculture Extension Officer should visit the village at least twice in a week so that farmer will be able to get proper/timely advice for his problems (23%) were the major suggestions reported by the sample HHs for improving SHC scheme in the area under study.

6.2.4 Impact of SHC Scheme on Crop Production and Soil Health

The remarkable change in yield of the major kharif crops was observed. The yield of paddy, soybean and maize was found to be increased by 19.42, 13.79 and 9.3 per cent respectively after application of RDF.

The most important changes which were observed by the majority of HHs were reduction in application of other inputs like seed, labour, pesticides etc. improvement in soil texture and increase in crop yield.

The important changes which were observed by the majority of HHs were found to be improvement in crop growth and improvement in grain filling. The less incidences of pest and diseases after application of RDF was observed as least important visible change as reported by majority of HHs.

In cultivation of paddy per acre expenditure on urea, DAP, Zinc and other miscellaneous charges was found to be decreased by 18.22, 18.53, 8.71 and 21.57 per cent respectively. The expenditure on labour (15.48%), manures/FYM (24.84%), seed (0.73%), plant protection chemicals (21.29%) were found to be increased. The rental value of land was also found to be increased by 26.21 per cent after soil testing by the farmers. The total cost of cultivation of paddy was found to be increased by 12.91 per cent from Rs. 23639 to Rs. 26691 per acre with the increase in net income by 54.79 per cent from Rs. 11231 to 17385 /acre. The return per rupee investment was also found to be increased from Rs.1.50 to 1.70 after soil testing by the farmers.

In cultivation of Soybean per acre expenditure on labour (-10.8%), seed (-11.3%), manures/FYM (-29.0%), urea (-11.6%), Zinc (-21.3%), SSP (-7.3%), MOP (-100%) and plant protection chemicals (-9.4%) was found to be decreased. while rental value of land (26.3%), DAP (4.8%) was increased after soil testing by the farmers. The total cost of cultivation of Soybean was found to be decreased by 1.7 per cent from Rs. 10900 to Rs. 10714 per acre with the increase in net income by 67.7 per cent from Rs. 6696 to 11228 per acre. The return per rupee investment was also found to be increased from Rs.1.60 to 2.00 after soil testing by the farmers.

In cultivation of maize per acre expenditure on labour, seed, urea, DAP, SSP and plant protection chemicals was found to be decreased by 8.72, 16.67, 14.84, 1.60, 13.74, 13.95 percent respectively, while expenditure on manures and fertilizers, zinc and rental value of land was increased by 1.73, 44.44 and 80.06 per cent after soil testing by the farmers. The total cost of cultivation of maize was found to be increased by 12.94 per cent from Rs. 8176.40 to Rs. 9234.60 per acre with the increase in net income by 139.83 per cent from Rs. 3379.6 to 8105.4 per acre. The return per rupee investment was also found to increase from Rs. 1.40 to 1.90 after soil testing by the farmers.

6.3 Conclusions

The conclusions which were drawn from the above findings are as follows

- There was no variation in the socio-economic characteristics of the control and soil tested sample HHS except in education, which was higher in soil tested HHs. The

average size of operational holding was found to be of 5.79 acres with rental value of land of Rs. 9854 / acre which ranged between Rs. 9375 (soil tested HHs) to 10333 / acre (control HHs). Leased out land was not found in practice among the sample HHs. The major sources of irrigation were found to be bore & dug well, canal and tanks. Soybean followed by paddy, maize, tur and urd were found to be major kharif crops and soil tested farmers were found to obtain more income from the production of these crops as compared to control farmers in the area under study.

- The 63.30 per cent were found to be aware to SHC scheme and 25.0 per cent have knowledge of INM due to wider campaign put in place by the State government. Only 15 per of HHs experienced that use of INM curtailed fertilizer consumption. Only 3(control) - 4(soil tested) per cent of HHs were found to be aware about grid system under the scheme. The Department of Agriculture Development and Farmers' Welfare was found to be most important source of information of SHC scheme among the HHs. Only 18 (control) to 43 (soil tested) HHs were found to attend training programme on application of fertilizers for 1-2 days only. The sample HH were found to adopt broadcasting and spraying method of fertilizer application and none of the them found to apply fertilizer through fertigation and drilling method. The total cost incurred to test a sample was found to be Rs. 35/- only including family labour charges. An average HH used to take on an average 2 soil samples from 3 plots and approximately covers 5 acre of land. Cooperative societies followed by private shops/dealers were found to be major sources to purchase Uera, DAP, SSP, MOP, micronutrients and bio-fertilizers for cultivation of crops.
- Some of sample HHs used to adpot RDF, FYM and bio-fertilizers after obtaining SHC. They were not able to use RDF due to difficulty in calculating the required quantity of fertilizers as per SHC, high price of fertilizers, lack of training, recommended fertilizers not available in adequate quantity in the local market , lack of knowledge about method of collecting ideal soil sample, lack of technical advice on method and time of fertilizers application. The majority of sample HHs suggested that they will be able to adopt RDF only by ensuring timely availability of SHC on their mobile/internet and recommended fertilisers in the local market.
- The reduction in application of other inputs like seed, labour, pesticides etc. improvement in soil texture and increase in crop yield were observed by the majority of HHs after application of RDF. At the same time they were also started adopting recommended package of practices (RPP) for cultivation of crops as they got the opportunity to come in close contact with officials of department of agriculture,

scientists of SAUs & KVKs and farmer facilitators while collecting and analysing the soil sample of their land resulting into reduction in expenditure on fertilizes and other inputs.

- After adoption of SHCs recommendation in cultivation of crop, Net income, gross income of soil tested farmers were found to be increased.

6.4 Policy Recommendations

The policy recommendations which were drawn from the above findings and observations during the course of investigation are as follows:

- The present infrastructure of soil testing facility is found to be insufficient in different districts of Madhya Pradesh. Whatever infrastructure is available is not functioning properly. Hence, coverage of target/achievement needs to be increased by employing skill and trained staff in these labs. There is an urgent need to increase quantity as well as quality of soil sample testing.
- There is an ample scope to improve the analyzing capacity as well as dissemination ability of the soil testing laboratories in different districts of Madhya Pradesh. If this, coupled with professional management through proper linkages, can bring radical changes in the SHC scheme in the state to the extent of farmers' satisfaction.
- It is observed during the course of investigation that there is lack of staff in soil testing labs and capacity building is required for the staff members. Each laboratory may be provided with the required staff according to its capacity. Each laboratory may be headed by a technical person having M.Sc. (Soil Science & Agri. Chemistry) as an essential qualification or B.Sc. (Ag.) with a minimum of 5 years experience of working in soil testing / soil Survey / fertilizer testing lab. There should be no relaxation in this stipulation so that the technical flaw in the programme can be removed.
- Special care may be taken for collection of representative soil samples. Validity of sample is to be ensured at all levels-starting from collection stage to storage in lab even after analysis.
- The Department of Agriculture Development and Farmers Welfare, ensures an effective and live linkage between the field and the laboratory. It will be appreciable if each lab may adopt at least one nearby village from where sample may be collected by the laboratory staff and recommendations are also communicated / handed over directly by the laboratory staff to the farmers and to follow the outcome of the SHC scheme.
- Each lab can take up one village as a mission to see the utility of the SHC scheme by itself and find out shortcomings so that the whole

SHC scheme can be improved on the basis of such direct observation / study. Presently, the labs are literally cut off from the field and work in isolation of the whole SHC scheme.

- Soil analysis and fertilizer recommendation in SHC is only a part of the soil testing service. To a good measure, the efficiency of the service depends upon the care and efforts put forth by extension workers and the farmers in collection and dispatch of the samples to the laboratories and obtaining reports timely. Its effectiveness also depends upon the proper follow up in conveying the recommendations to the farmers, including the actual use of fertilizer according to the recommendations. The role of extension service, soil chemists and the agronomists in the field is important. The service is suffering both from technological aspect and due to inadequate and untrained manpower.
- The SHC so issued to the farmers may be periodically updated to more farmers aware about the changing fertility status of their land. This card may also be useful to the farmers in getting loans for agriculture purposes where agricultural value of the land may be one of the factors.
- If the fertilizer industry will venture to produce and promote the products on the basis of requirement of specific soil nutrient deficiency, the industry will have to get into the SHC scheme in a big way and generate such information as a measure of good supplement to soil testing programme basically being run by the Government. The fertilizer industry may adopt at least one district in a State and ensure that the fertilizer in the adopted district is used on the basis of plant nutrient deficiency as determined through accurate soil testing.
- There is an urgent need to make the SHC available to the farmers in their finger tips with the help of information technology through internet and mobile. At the same time they should be made aware about these facilities so that it can be accessed it at any time anywhere, where ever it is required then only the purpose of soil testing can be fulfilled in a right way.
- The awareness regarding spraying, fertigation and drilling method of fertilizers application is required to be created among the farmers in cultivation of crops for its efficient and optimal utilization, not only to save the precious fertilizer at one end but to increase the production on the other and ultimately increasing the profitability of different crop enterprises.
- The awareness about SHC scheme, its need and importance at the farmers' level must be taken up by extension agencies. As the adoption of recommendations of soil testing reduces cost of production of crops and increases returns. This fact may be popularized among the farmers' so that they can be benefitted. Sufficient field staff with trained personal should be kept at village level and method as well as result

demonstrations of these technologies may be taken up at the village level to popularize the impact of these technologies in front of the cultivators.

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ANNEXURE-I

REVIEWER COMMENTS AND ACTION TAKEN REPORT

1. **Title of the draft report examined:** "Impact of Soil Health Card Scheme on Production, Productivity and Soil Health in Madhya Pradesh"
2. **Date of receipt of the Draft report:** 30th March, 2017
3. **Date of dispatch of the comments:** 31st March, 2017
4. **Comments on the Objectives of the study:** All the objectives of the study have been addressed
5. **Comments on the methodology**

   Common methodology proposed for the collection of field data and tabulation of results has been followed.

6. **Comments on analysis, organization, presentation etc.**

   The information provided in Table 1.2 can also be supported with the information on the SHC Scheme exclusively provided in the http://www.soilhealth.dac.gov.in/; may be separate Table can be provided, next to Table 1.2.

   Action: The requisite information is given in annexure-II for your ready reference as desired information is not supporting table 1.2

   (i) In Table 2.2, the irrigated land and un-irrigated land can be given in % of GCA instead of total acres. At the same time, the rental value of leased-in land and leased-out land can be given separately, as there will be an huge difference between these two.

   Action: Done as per comments

   (ii) In Table 2.3 - Sources of Irrigation is indicated in % of Hhs. It is much meaningful to workout GCA under different sources of Irrigation.

   Action: Done as per comments

   (iii) In Table 2.4 - Cropping pattern of sample households can be mentioned both in quantity as well as in % GCA.

   Action: Done as per comments

   Chapter -III can be given a title "Status of Awareness on SHC Scheme" instead of Awareness of SHC Scheme.

   Action: Done as per comments

It is worth to mention the complete details of training programmes attended (Table 3.3) on application of chemical fertilizers.

Action: Done as per comments

The information in Table 3.4 and 3.6 should be bifurcated for soil tested farmers and control farmers.

Action: Done as per comments

The average recommended quantity of fertilizers based on soil test results can also include the quantity as per the farmer's opinion for better understanding the knowledge of the farmers on soil testing and its usefulness.

Action: Done as per comments

Throughout the report, the units mentioned in Tables should be in two digits for better clarity on the information provided.

Action: Done as per comments

(iv) It is suggested to copy edit the report before finalizing.

Action: Done as per comments

7. Overall view on acceptability of report

Authors are requested to incorporate all the comments and submit the final report along with soft copy of the data for consolidation.

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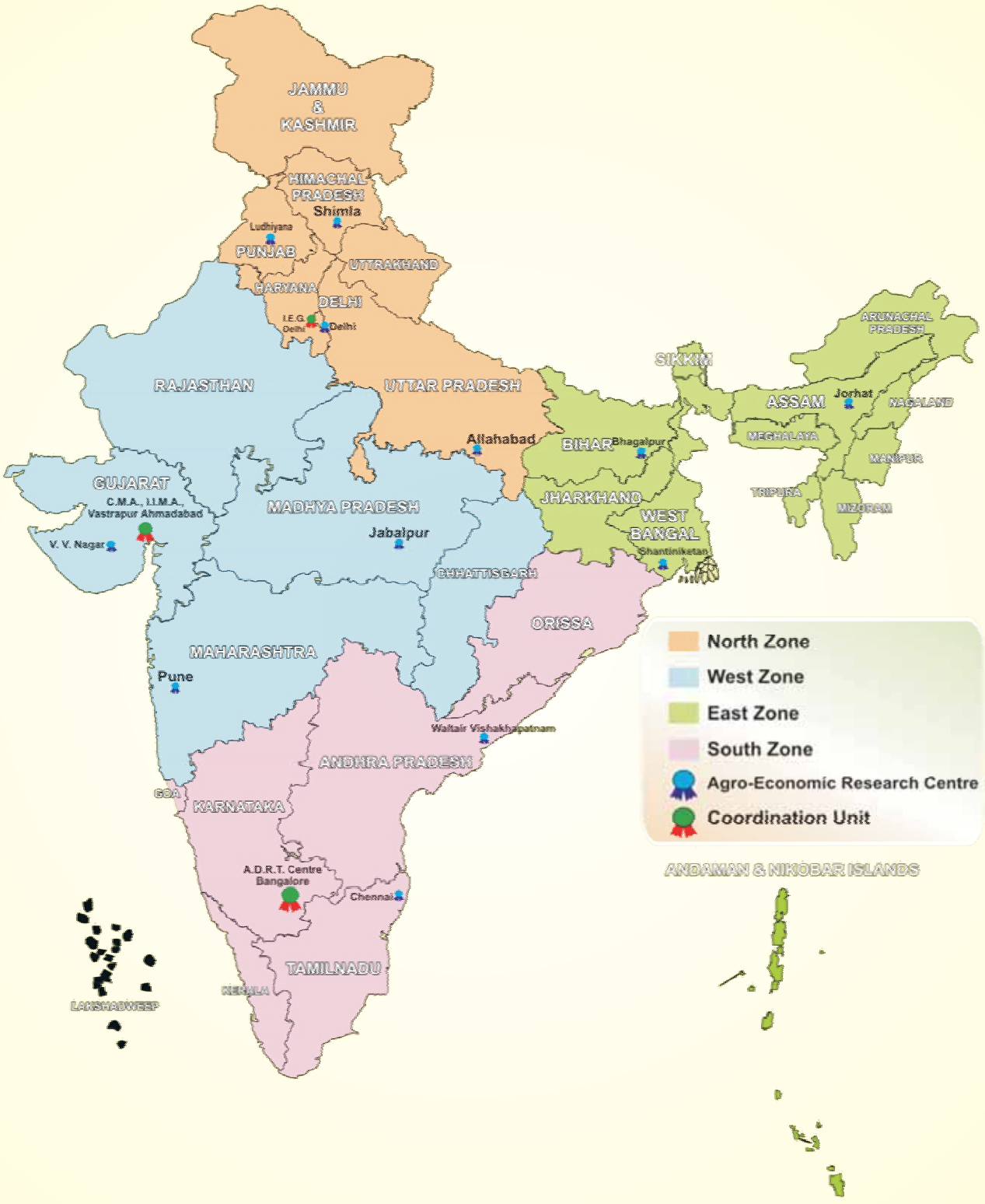
ANNEXURE: II

Status of Soil Samples Collection, Testing & Soil Health Cards Printing and Distribution in Madhya Pradesh as on 27.12.2016 (in Lakh)

Component	Target	Achievement	Shortfall	Grand Total No. of Labs	Per Month capacity of Testing Samples
Collection	23.14	21.09	2.05	72	72,000
Testing	23.13	9.79	13.34		
Printing	127.94	30.40	97.54		
Distribution	127.94	30.39	97.55		

Source: http://www.soilhealth.dac.gov.in



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