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Impact Assessment on Adoption of Soil Health Cards for Fertilizer Management in Tiruvallur District

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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

Soil Health plays a vital role to ensure agricultural production in a sustainable manner. The basic objective of the soil testing is to provide recommendations to the farmers for the optimum and economic use of fertilizers and better soil management practices to increase agricultural production in their farm. The present study was conducted to analyze the adoption of soil testing and Soil Health Cards for fertilizer management conducted by Krishi Vigyan Kendra (KVK), Tirur, Tiruvallur district. The data revealed that the number of conduct of awareness and training programmes on soil health management and soil samples analysed (30 nos. to 240 nos.) at KVK Tirur increased from 2012 to 2018. Results indicated that highest percentage of beneficiaries belonged to the middle age group of 36-55 years (48.75%) followed old age (37%). Most of the farmers were practicing agriculture in Semi Medium (28%) followed by medium land holdings (24%) among the SHC beneficiaries and small (35%) and Marginal land holdings (30%) among non-SHC beneficiaries. It was observed that medium level of knowledge was obtained (48%) by SHC beneficiaries followed by high level (20%) whereas 60% of non-beneficiary was having low level of knowledge on SHC. On an average majority of the SHC beneficiary were lying in the medium adoption level (43%) followed by high adoption category (21%). Reason behind the partial adoption and no adoption might be due to their unawareness on the benefits of optimum fertilizer application.

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Comparative analysis between adopted beneficiaries and SHC non-beneficiaries on crop productivity in paddy, Greengram Blackgram and groundnut indicated 11.66%, 16.12%, 8.67 and 15.10% increase in productivity over non-beneficiaries.

Keywords: Soil health management; soil health card; soil esting; SHC adoption; comparative analysis; optimum fertilizer application.

1. INTRODUCTION

Paddy is the principal crop extensively cultivated during three seasons, Sornavari (April to July), Samba (August to November) and Navarai (December to March) in Tiruvallur district. The agricultural production and productivity depends upon number of factor of which soil fertility plays an important role. Soil fertility is identified by the nutrient status of the soil. Soil Health is a holistic concept which includes chemical, physical, biological health of the soil [1]. Soil testing is known as a precise management method for determining and assessing soil fertility that enables farmers to assess nutrient status and the impact of management and identify what changes are needed each year [2] Deteriorating soil health in Indian agriculture has become a cause of concern, which has led to sub-optimal utilization of farm resources. Particularly, imbalanced use of fertilizers, affects the agricultural productivity [3]. The soil testing is a proven scientific tool to evaluate soil fertility and recommending balanced nutrition to crops [4]. Soil testing is a gateway technology to the adoption of other precision-agriculture technologies, which is why disseminating information about advances in soil-testing strategies and how they are used is important. Central and State government have launched the Soil Health Cards (SHC) Scheme in February 2015.

A SHC is meant to give each farmer soil nutrient status of his holding and advise him on the dosage of fertilizers and micronutrient and also the needed soil amendments that he should be applied to maintain soil health in the long run. The scheme is considered as a holistic measure for soil health and farm economy. A SHC carries crop wise recommendation of nutrients and fertilizer required for the individual farms to help farmers to improve productivity through judicious use of inputs [5].The types of soil, predominantly found in Tiruvallur district are red non calcareous and coastal alluvial. The soil found in the coastal region of Tiruvallur is of the erinaceous type (sandy), suitable for casuarina plants. The other soil types are sand and sandy loams which are found in all taluks with red loam in part of Tiruthani Taluk (District Statistical Hand Book [6]. Saline and alkaline soils are also noticed in some patches of Ambathur, Ponneri and Tiruvallur Division. In this study it was proposed toanalyze role of extension and awareness programmes by KVK Tirur on Soil Health Management and to study the extent of adoption of nutrient management practices by the beneficiary farmers as recommended by the Soil Health Card for major crops in Tiruvallur district.

2. MATERIALS AND METHODS

The Mini Soil Testing Lab *(Mrida Parikshak)* developed by ICAR- Indian Institute of Soil Science, Bhopal in collaboration with Nagarjuna Agro-Chemicals (NAC) Pvt. Ltd., Hyderabad was established at Krishi Vigyan Kendra, Tirur, Tiruallur district during the year 2012. With the help of this Mini Lab, 15 parameters of a soil sample can be analyzed. During pre*kharif* and pre *rabi* seasons various extension programmes*viz*, awareness campaigns, trainings, demonstrations, exhibitions, farmers day,, Soil health day, fertilizer awareness campaign., are being organized to farmers to motivate the farmers to go for soil testing periodically and apply fertilizers based on Decision Supporting System for Integrated Fertilizer Recommendation software developed by TNAU. Number of samples analysed at ICAR-KVK, Tirur from the year 2012 to 2018 were collected and taken for analysis. The study was conducted at Tiruvallur district, Tamil Nadu. From each block 20 Soil Health Card beneficiaries and 20 non-beneficiaries were randomly selected to constitute the sample size of 100 for the study. The response was taken out with the help of well developed semi-structured interview schedule. Independent variables *viz.,* Age, Education, Land holding and Knowledge about SHC (Soil sampling and testing, General knowledge on SHC, Contents of SHC, Usefulness of SHC, Knowledge on Soil health and management (22 questions) and Knowledge Index was calculated) Dependent variable *viz*., Impact of SHC scheme on adoption of recommendations and the profitability of SHC farmers compared to non-

beneficiary farmers. The data was analysed using descriptive statistics like frequency, simple percentage analysis andt-testwas conducted to test the difference between beneficiary and non-beneficiary in adoption of SHC recommendations.

3. RESULTS AND DISCUSSION

The present study deals with the impact of the awareness programmes on soil health management conducted by KVK, Tiruvallur, independent and dependent variables and their impact on adoption level of recommendations of Soil health Cards. The number of the awareness programmes conducted by the KVK was 123 programmes from 2012 to 2019 (Table 1). The results indicated that the number of soil sample analysis increased with the year from 30 numbers during 2012 to 240 numbers during 2018. The reason behind this might be due to the conduct of series of awareness programmes for the benefit of farming community, which facilitated high extent of adoption of soil testing. The findings of present study are in accordance with the findings reported by Yadav et al. [7]. Diraj [8] reported that training is vital and essential to induce motivation, create confidence and increase the efficiency of farmer. It is a process by which desire, ideas, positive attitude, knowledge and skill are inculcated and reinforced. Morwal and Pagaria [9] reported that the gain in knowledge depends on various factors like easiness of technologies, educational background of the participating farmers, extension approaches handled in technology transfer, farmers' attitude, ability of extension personnel, teaching and learning situation.

3.1 Independent Variables

Independent variables *viz.,* Age, Education, Land holding and Knowledge about SHC were taken for analysis. The results indicated that highest percentage of beneficiaries belonged to the middle age group of 36-55 years. 37.5 % are old age group followed by 11% under young age group in SHC beneficiary farmers (Table 2). More number of young and middle age group in non SHC beneficiary farmers may be concentrated to get motivated and follow the Soil testing.

Results on the distribution of beneficiaries according to their education (Table 3) revealed that 37.50% and 40% of SHC and Non-SHC beneficiaries had high school education. Subsequently middle school and Primary education were the major categories. The good education background of the respondents was observed which may be due to the presence of government schools.. More percentage of farmers having school/college education indicate the motivation among the educated farmers to adopt soil test based fertility management in Tiruvallur district. Marenya and Barett [10] have reported that education level as one of the factors influencing adoption of Integrated Soil Fertility Management.

Most of the farmers selected in above blocks were practicing agriculture in Semi Medium (28%) followed by medium land holdings (24%) among the SHC beneficiaries (Table 4). While in non-SHC beneficiaries most of farmers are practicing agriculture in small (35%) and Marginal land holdings (30%). Hence small size land holdings may be a factor for non-adoption of SHC technology.

Analysis on knowledge gain recorded that the medium level of knowledge was obtained (48%) by SHC beneficiaries followed by high level (20%) and low level (12%) whereas 60% of non-beneficiaries were having low level of knowledge on SHC followed by medium (35%) and high (5%)level of knowledge (Table 4). Reason for more knowledge obtained by SHC beneficiaries might be due to their regular and periodical contact with the Agriculture department and also with the Krishi Vigyan Kendra of Tiruvallur Distirct. Patel et al. [11] and Mukati (2016) reported that the SHC holders obtained high level of awareness on the utility of SHCs.

The extent of adoption of nutrient management practices recommended by the SHC was categorized into full adoption (Score2), partial (Score1) adoption and no adoption(Score 0) and Adoption index was calculated by Obtained score/Attainable score (6) x 100. In the analysis it was found that most of the farmers followed full adoption of macro nutrients (Urea, DAP and MOP) and not the micronutrients and organic manures. On overall basis, majority of the SHC beneficiary (43%) were lying in the medium adoption level followed by 21% in the high adoption category (Table 6). Reason behind the partial adoption and no adoption might be due to their unawareness on the benefits of optimum fertilizer application and need further motivation and demonstrations on optimum fertilizer application especiialy micronutrient application.

Table 1. Details on extension programme on soil health management and soil analysis at KVK, Tirur, Tiruvallur from 2012-2018

S. No	Year	No. of trainings	No. of Soil Samples analysed	No. of villages covered
1	2012-2013	26	30	12
2	2013-2014	23	87	55
3	2014-2015	12	85	48
4	2015-2016	11	nil	-
5	2016-2017	19	100	40
6	2017-2018	12	88	18
7	2018-2019	20	240	52
	Total	**123**	**428**	**110**

Table 2. Distribution of SHC beneficiaries based on their age

S. No	Age	SHC Beneficiaries (n=80)		SHC Non-Beneficiaries (n=20)	
		Frequency	Percentage	Frequency	Percentage
1	Young (<35 years)	11	13.75	5	25
2	Middle(36-55 Years)	39	48.75	8	40
3	Old (>55 years)	30	37.5	7	35

Table 3. Distribution of SHC beneficiaries based on their education (Scale by Supe, 2007)

S. No	Education	SHC Beneficiaries (n=80)		SHC Non-Beneficiaries (n=20)	
		Frequency	Percentage	Frequency	Percentage
1	Illiterate	4	5.00	-	-
2	Primary	13	16.25	4	20.00
3	Middle School	23	28.75	7	35.00
4	High School	30	37.50	8	40.00
5	Graduate	10	12.50	1	5.00

Table 4. Distribution of SHC beneficiaries according to their Land holding (Scale by Markad, 1996)

S. No	Education	SHC Beneficiaries (n=80)		SHC Non-Beneficiaries (n=20)	
		Frequency	Percentage	Frequency	Percentage
1	Marginal (upto 1.00Ha)	4	5.00	6	30.00
2	Small (1 to 2 Ha)	9	11.25	7	35.00
3	Semi-Medium (2 to 4 Ha)	28	35.00	5	25.00
4	Medium (4 to 10 Ha)	24	30.00	2	10.00
5	Big (>10 Ha)	15	18.75	-	-

Table 5. Distribution of beneficiaries according to their overall Knowledge level on SHC

S. No	Education	SHC Beneficiaries (n=80)		SHC Non-Beneficiaries (n=20)	
		Frequency	Percentage	Frequency	Percentage
1	Low (33.33%)	12	15.00	12	60.00
2	Medium (33.34 to 66.66%)	48	60.00	7	35.00
3	High (>66.66%)	20	25.00	1	5.00

Table 6. Distribution of beneficiaries according to their overall adoption level regarding SHC recommendations

S. No	Education	SHC Beneficiaries (n=80)	
		Frequency	Percentage
1	Low (37%)	16	20.00
2	Medium (37-68%)	43	53.75
3	High (>68%)	21	26.25

Table 7. Average yield (Crop Productivity) of various crops grown by the beneficiaries

S. No	Crop	Average yield (q/ha)			p-value	% yield increase over non-beneficiary
		SHC Beneficiaries (n=80)	SHC Non-Beneficiaries (n=20)	t - value		
1	Paddy	34.75	31.15	7.2**	<0.00001	11.56
2	Greengram	3.60	3.10	4.85**	0.0002	16.12
3	Blackgram	4.15	3.82	2.46**	0.0050	8.63
4	Groundnut	28.2	24.5	5.70**	<0.00001	15.10

*** Significant at p<.0.01*

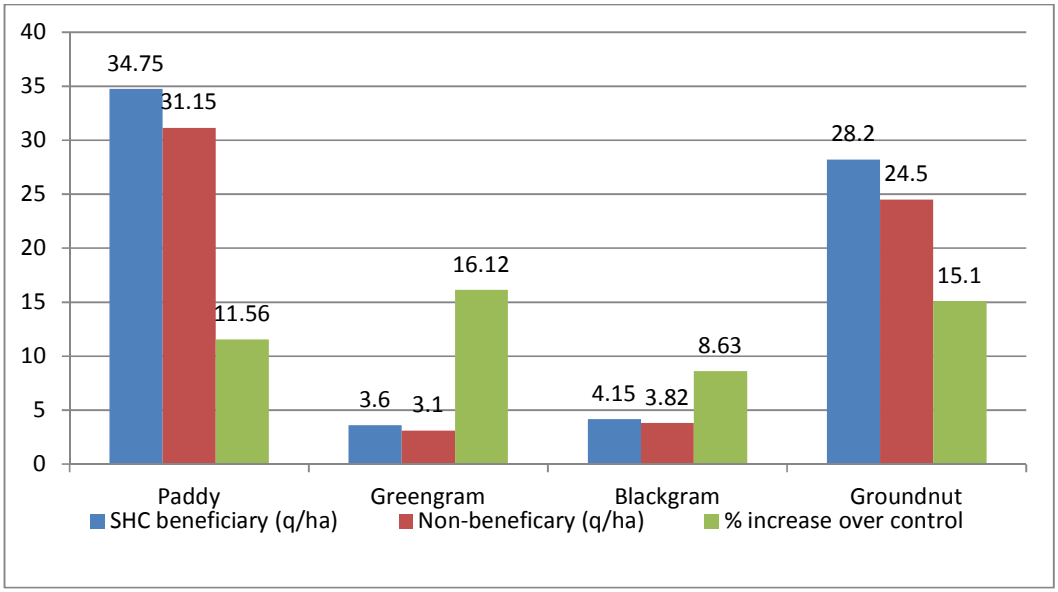

Fig. 1. T- test results showed that the SHC and non-SHC beneficiary differs significantly for Paddy, Greengram, Blackgram and groundnut productivity

The results on the productivity of various crops grown by the SHC and non-SHC beneficiary indicated that the average yields of major crops *viz*., Paddy, Greengram, Blackgram and Groundnut in the fields of SHC beneficiary were 34.75, 3.60, 4.15 and 28.2 q/ha, respectively whereas that of non-SHC beneficiary were 31.15, 3.10, 3.82 and 24.5 q/ha, respectively. Maximum of 16.12% increase in productivity was observed for greengram crop followed by groundnut (15.10%), and Paddy (11.56%) (Table 7). The t- test results showed that the SHC and non-SHC beneficiary differs significantly for Paddy, Greengram, Blackgramand groundnut productivity at 0.01 level of significance. The results show a higher per cent increase in yield among the beneficiaries for green gram followed by groundnut, paddy and blackgram. The reason might be due to non adoption of proper fertilizer and pest management practices.

4. CONCLUSION

The study was undertaken to assess the impact of soil health analysis done by KVK, Tiruvallur and the awareness programmes and trainings

organizedon the adoption level of the soil health card based nutrient management. The results indicated the varied adoption level among the beneficiaries who belonged to various age groups, educational status, size of land holding and the type of crops grown. In general the adoption level was found to be on the higher side among the soil health card beneficiaries compared to the non beneficiaries under all categories. The adoption level increased with the level of education and size of land holding and showed a declining trend with the increase in age. The knowledge on soil health card scheme as imparted through awareness programmes and trainings by KVK, Tiruvallur shows aclearcut beneficialeffect among the farmers in the adoption level of soil health card based nutrient management. Hence the farmers can be motivated through awareness programmes and also through cross learning among the progressive farmers and adoptive farmers to promote the soil health card based nutrient management in Tiruvallur district.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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