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Knowledge Level on Soil Health Management among Soil Health Card Holders of Namakkal District, India

N. Dhivya[1*], R. Rajasekaran[2], T. Dhamodaran[1] and R. Pangayar selvi[3]

[1]Department of Social Sciences, Agricultural College and Research Institute, Tamil Nadu Agricultural University, Killikulam, Thoothukudi - 628 252, Tamil Nadu, India.
[2]Department of Agricultural Extension and Rural Sociology, Tamil Nadu Agricultural University, Coimbatore - 641 003, Tamil Nadu, India.
[3]Department of Physical Sciences and Information Technology, Tamil Nadu Agricultural University, Coimbatore - 641 003, Tamil Nadu, India.

Authors' contributions

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

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ABSTRACT

Aims: Soil structural deterioration and degradation is a major concern in the present-day agriculture scenario. Poor soil health directly affects the health of the plant and its productivity; indirectly the health of human beings as well as animals. So, scientific knowledge of soil management on the part of the farmer-producers is necessary. So, the main aim of the study is to identify the knowledge level on soil health management among the soil health card holders.
Study Design: Ex-post facto research.
Place and Duration of Study: The study was carried out in the Namakkal district of Tamilnadu during the months of July-August 2021. All the selected respondents were the holders of soil health card as it contains physical and chemical characteristics of soil, they have a working knowledge of research problem and were able to provide responses.

**Corresponding author: E-mail: dhivyanatarajan1198@gmail.com;*

Methodology: Data were collected by using a pre-tested and structured questionnaire through a face-to-face interview method. The sample size is 120 selected from four blocks of Namakkal district.
The statistical analysis applied were frequency distribution, percentage analysis, mean, and standard deviation.
Results: The study shows that more than half of the soil health card holders (55.83 percent) had an overall high level of knowledge about soil health management practices.
Conclusion: The soil health card scheme was brought to bring improvement of soil health in the long run by farmers all over the country. Thus, the knowledge of soil health management practices including modern technology can be disseminated to a greater extent for the benefit of the farmers including non-holders of soil health cards through formal and informal meetings and training.

Keywords: Soil degradation; soil health management; soil health card; knowledge test; ex-post facto research.

1. INTRODUCTION

Soil is the basic component for the growth and development of all economic plants. It is a combination of organic as well as inorganic materials, liquids, gases, and countless organisms. Berry (1978) opined that "Soils as the connectors of life". It's the main component needed for cultivating as it gives supplements to the plant, acts as a growing medium, and contributes to biodiversity by providing habitat for billions of organisms.

Green revolution technologies achieved significant growth in food production which turned India into a country with overflowing granaries. As a result, soil resources have been over-exploited where most of the soil-based production systems have started showing signs of fatigue [1]. The majority of the farmers are persistently applying large quantities of chemical inputs indiscriminately for enhanced crop production in their fields without knowing the productive capacity of the soil leading to the increased pace of soil degradation in the post-green revolution period. Nacke et al*.,* [2] mentioned in their study that "reducing mineral P fertilizers help decrease the input of harmful trace elements such as cadmium or uranium in agricultural soil". So, knowledge of nutrient application on the part of the operational farmers calls for the attention of policymakers. Soil degradation is a major concern in modern agriculture. Soil science has addressed grand environmental challenges such as climate change, global food production, biodiversity loss, water quality and quantity, and biodiversity [3]. It is the outcome of natural and anthropogenic factors regulating dynamic soil degradative and restorative processes. The susceptibility of soil to degradative processes, land usage pattern, degradative land usage durability, and management influence the extent of soil degradation [4]. Many threats (soil erosion, land-use change, overexploitation, pollution, biological invasion, etc.) have been identified as directly disturbing soil organism abundance, distribution, and activity [5].

Soil health is defined “as the capacity of a living soil to function, within an ecosystem's boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and promote plant and animal health" [6]. Poor soil health directly affects the health of the plant and its productivity, indirectly the health of human beings as well as animals. In India, various initiatives have been taken by the government for a long period of time to sustain soil health in good condition and through agriculture. In recent times, more emphasis was given to soil health management which is an integral part of achieving sustainable agricultural production. Wani et al*.,* [7] reported that "Rural farmers in the rainfed semi-arid tropics in India are unaware of soil health issues and are entrapped in a poverty trap and so not in a position to implement the science-led strategy of their own."

Soil Health Management (SHM) focuses on promoting Integrated Nutrient Management (INM) by judiciously combining chemical fertilizers, with organic fertilizers to improve soil health and productivity. Organic fertilizers, like manure and compost, release nutrients more slowly than chemical fertilizers. Compost, on the other hand, aids in the storage of organic matter in the soil and promotes soil biological activity[8]. In addition, training and demonstrations have been provided to improve the skills and understanding of soil health management among

soil testing laboratory workers, extension staff, and farmers, etc. On 19 February 2015, the Government of India launched a centrally sponsored Soil Health Card scheme in order to promote crop and location-specific sustainable soil health management. Under the scheme, the Department of Agriculture Cooperation and Farmers Welfare (DAC&FW) in all the States and Union Territory of India issues a soil health card (SHC) to every farmer, which contains details about the nutrient status of soil under 12 parameters. However, the efficiency of the scheme largely depends upon the judicious use soil nutrients by the farmers. The pertinent question is that whether they have adequate technical knowledge in regards to have the best advantage of the scheme.

In view of the above, the research study was carried out to estimate the level of knowledge on soil health management among soil health card holders of Namakkal district. The information will help assess the requirement of appropriate extension strategies for the improvement of soil health management practices through the utilization of the Soil Health Card (SHC) in the area under study.

2. MATERIALS AND METHODS

Ex-post facto research which is a descriptive research design was used in this study with consideration to the objective. The targeted respondents for this research were soil health card-holding farmers residing in the Namakkal district. The information needed for the study was collected using a structured and pre-tested interview schedule consisting of ten questions related to soil health management practices followed. The schedule was prepared and data was collected using the face-to-face interview method among the selected respondents. Out of the fifteen blocks in Namakkal district, four were selected viz., Erumapatti, Kabilarmalai, Paramathi Velur, and Sendamangalam. The blocks were selected based on increased progress on the issuing of soil health cards under the soil health card scheme, and information was gathered from Namakkal district officials at soil testing laboratories. The model village from each block such as Varagur from Erumapatti, Sirunallikovil from Kabilarmalai, Koodacheri from Paramathi Velur, and Melapatti from Sendamangalam, were selected respectively. Thirty soil health card holders from each village were selected randomly and, thus, made a sample size of 120. The analysis was done by applying statistical tools such as frequency distribution, percentage analysis, mean, and standard deviation, which was carried out using the SPSS.16 software. The overall knowledge level on soil health management among soil health card holders of Namakkal district was analyzed with Knowledge index as followed by [9] using the formula

$$\text{Knowledge index } (K_i) = \frac{X_1 + X_2 + \ldots\ldots X_n}{N * n} \times 100$$

Where,

K_i = Knowledge index
$X_1 + X_2 + \ldots\ldots X_n$ = Total number of correct response
N = Total number of respondents
n = Total number of items in the test

The items for the knowledge test on soil health management was selected based on arbitrary scaling technique. Using mean and half standard deviation values, the respondents were categorized into low, medium, and high levels of knowledge.

3. RESULTS AND DISCUSSION

The data regarding practice-wise knowledge level on soil health management among soil health card holders of Namakkal district was analyzed using frequency and percentage analysis and the results are presented in Table 1.

Results in table 1, show that the majority of the respondents show a similar trend in giving correct answers as listed below. 96.67 percent of SHC holders correctly responded that soil health card is useful for assessing the status of soil health, 90.83 percent of the surveyed farmers had knowledge on the effect of environmental pollution on the soil, 90.00 percent of the responders were aware of the ill effects of poor quality irrigation water led to the deterioration of soil health, 98.33 percent of the cardholders know that applying organic manures such as compost, farmyard manure, green manure, and green leafy manure to soil improves soil nutrient and water holding capacities. 85.83 percent of the farmers responded correctly to the question regarding whether integration of livestock would promote soil health and plant growth, 93.33 percent of the respondents had knowledge that chemical fertilizers should be applied in split dosage as recommended in the soil health card to maintain soil health, 88.33 percent of the farmers agreed that mixed crop cultivation

increases total crop productivity, balances soil nutrient absorption and reduces soil erosion. A major proportion of the respondents (90.83 percent) are aware that mechanical disturbance of soil should be avoided to maintain soil physical property, 92.50 percent answered correctly that crop rotation should be done to improve soil health and combat pest, disease, and weed occurrences. Around 85.00 percent of the respondents are knowledgeable that integrated soil fertility and nutrient management system enhances crop yield and maintains soil fertility in the long run. While the rest of the respondents made the incorrect response with the respective questions in the knowledge test.

The overall level of knowledge on soil health management was evaluated using the knowledge index, mean, half standard deviation value, frequency, and percentage analysis. Estimates are shown in Table 2.

Results in table 2, show that more than half of the soil health card holding respondents (55.83 percent) had a high level of knowledge on soil health management followed by low level (23.33 percent) and medium level (20.83 percent) respectively. The results may be due to the fact that soil health management was given importance over a long period of time through various government and non-government initiatives. The findings of this study show in conformity with the study of Patel et al. 10] who found that more than half of the respondents (52 percent) had a high to the very high level of understanding about soil testing and perception regarding the utility of soil health cards in advanced agriculture systems.

Table. 1 Practise-wise knowledge level on Soil Health Management (SHM) among Soil Health Card holders

S. No	Statements	Response (n=120)	Frequency	Percent
1.	The usefulness of soil health card for assessing the status of soil health	Correct	116	96.67
		Incorrect	4	3.33
2.	Various environmental pollutants affect soil property and soil health	Correct	109	90.83
		Incorrect	11	9.17
3.	The ill-effects of poor quality irrigation water are deteriorating soil health	Correct	108	90.00
		Incorrect	12	10.00
4.	Application of organic manure such as compost, FYM, green manure, and green leafy manure in the soil to improve soil nutrient and water holding capacities	Correct	118	98.33
		Incorrect	2	1.67
5.	Integration of livestock would promote soil health and plant growth	Correct	103	85.83
		Incorrect	17	14.17
6.	Chemical fertilizers should be applied in split dosage as recommended in the soil health card to maintain soil health	Correct	112	93.33
		Incorrect	8	6.67
7.	Mixed cropping to increase total crop productivity, balances soil nutrient absorption and reduces soil erosion	Correct	106	88.33
		Incorrect	14	11.67
8.	Mechanical disturbance of soil should be avoided to maintain soil physical property	Correct	109	90.83
		Incorrect	11	9.17
9.	Crop rotation should be done to improve soil health and combat pest, disease, and weed occurrences	Correct	111	92.50
		Incorrect	9	7.50
10.	Integrated soil fertility and nutrient management system enhances crop yield and maintains soil fertility in the long run	Correct	102	85.00
		Incorrect	18	15.00

Table 2. Categorization of farmers based on the estimates of Knowledge Index

S. No	Categories	Frequency	Percent
1.	Low level of knowledge (Less than mean - 0.5*S.D)	28	23.33
2.	Medium level of knowledge (Mean ± 0.5*S.D)	25	20.83
3.	High level of knowledge (More than mean+ 0.5*S.D)	67	55.83

Mean = 0.76, Standard deviation (S.D) = 0.10

4. CONCLUSION

The ex-post analysis of the study on the knowledge level of soil health card holders shows that respondents have an overall high to medium level of knowledge as confirmed by the value of the Knowledge Index. This is satisfactory and shows progress on the part of the launching the scheme by the government. However, maintaining the pace of awareness and further improvement of the farmer's knowledge as well as the health of the soil may be a priority strategy of the policymakers. Soil health management practices like utilization of soil health cards, application of quality irrigation water and organic fertilizer, more crop diversification, and rotation, cover crops, integrated nutrient management, avoiding mechanical disturbance of soil, etc. including modern technology can be disseminated to a greater extent for the benefit of the farmers including non-holders of soil health card through formal and informal meetings and training. Besides, digitalization of information regarding land, soil, agricultural practices may be officially maintained.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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