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Perception and Adoption of Soil Health Card by Paddy Growers of North Coastal Andhra Pradesh

Chundru Ramya Madhuri[1], Akkamahadevi Naik[2]*, Ashokkumar[2], Chitrasena Padhy[3] and Soumik Ray[4]

[1]PG Scholar, [2]Assistant Professor, [3]Associate Professor, Department of Agricultural Extension Education, M.S. Swaminathan School of Agriculture, CUTM, Paralakhemundi-761211, Odisha, India
[4]Assistant Professor, Department of Agricultural Economics and Statistics, M.S. Swaminathan School of Agriculture, CUTM, Paralakhemundi-761211, Odisha, India
*Corresponding author email id: akkammaagri@gmail.com

HIGHLIGHTS

- Many paddy farmers unaware of Soil Health Cards' benefits and how they improve soil quality and crop yield.
- Farmers faced challenges in obtaining SHCs due to limited lab access, distant testing facilities, or administrative hurdles in card acquisition.
- Farmers doubted SHCs' immediate benefits, unsure if following suggestions would significantly improve crop yield or save costs, contributing to hesitation.

ARTICLE INFO

Keywords: Soil Health Card (SHC), Adoption, Perception, Paddy growers, Correlation analysis.

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ABSTRACT

The study examines the perception and adoption of Soil Health Card (SHC) practices among paddy growers in the North Coastal region of Andhra Pradesh for the years 2023-2024. The Soil Health Card Scheme, launched by the Indian government to support sustainable agriculture, provides farmers with tailored recommendations for crop-specific fertilizers, and detailed insights into soil nutrition and improve crop productivity. Despite its potential advantages, the extent of SHC adoption and its impact on paddy cultivation in this region remain insufficiently explored. Using a mixed-methods approach, the study combines quantitative surveys and qualitative interviews with paddy farmers who had Soil Health Cards across the North Coastal regions like Srikakulam and Vizianagaram districts. It examines factors influencing SHC perception and adoption, including demographic characteristics, awareness levels, and service accessibility. The research also evaluates the scheme's effects on crop productivity, economic returns, and soil fertility management. Findings reveal that while many paddy growers have Soil Health Cards and (40%) report a moderate perception of the scheme, the actual adoption rate is relatively low at (43.8%). Barriers such as delays in card issuance and soil sample processing contribute to farmers' reluctance to fully implement the scheme, despite their awareness of its benefits.

INTRODUCTION

Soil health is crucial for sustainable agriculture, yet its deterioration is a growing concern due to suboptimal resource use and excessive fertilizer application. Over the past two decades, soil fertility has declined, with the Soil Nutrient Response Ratio falling from 14.06 in 1990-91 to 8.59 in 2010-11 (Chowdary & Theodore, 2016), particularly affecting rural areas where farming is central to the economy (Mihailova et al., 2022). In Andhra Pradesh, paddy cultivation depends on soil quality, making the Soil Health Card (SHC) scheme essential for farmers (Kumar et al., 2021). The SHC, introduced by the Indian Government on February 19, 2015, aims to mitigate the overuse of chemical nutrients through soil testing and provides crop-specific recommendations every three years

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(Patel et al., 2021). The Soil Health Card scheme has been integrated into the Rashtriya Krishi Vikas Yojana (RKVY) cafeteria scheme, now functioning as a component titled 'Soil Health & Fertility' starting from the fiscal year 2022-23. This initiative helps improve fertilizer efficiency, enhance farmer knowledge, and increase crop productivity (Manimekalai et al., 2021). The SHC offers detailed insights into soil nutrient levels and recommends necessary amendments for long-term soil health (Subhash et al., 2019). India's soil testing program started in 1955-56 with 16 laboratories and saw significant expansion during the 11th five-year plan (2007-2012), with Rs. 429.85 crores invested to establish and upgrade labs (Fishman et al., 2016). The SHC assesses soil based on 12 factors, including macronutrients, secondary nutrients, micronutrients, and physical parameters, aiding farmers in making informed soil management decisions (Sahay et al., 2020). By March 2020, Andhra Pradesh achieved a 100% distribution of 6,967,162 SHCs for the 2018-2020 cycle (Ankhila et al., 2023). The Soil Health Index (SHI) and the Soil Management and Assessment Framework (SMAF) are used to create soil health indicators, and guide crop management practices (Purakayastha et al., 2019). Despite these advancements, the adoption of Soil Fertility Management (SFM) techniques remains low, with only 8 percent of farmers implementing these practices (Yadav et al., 2006), as many continue to rely on excessive chemical fertilizers without fully understanding soil fertility levels (Srivastava & Pandey, 1999).The SHC provides a comprehensive approach to soil quality, including its functional attributes and nutrient status, offering tailored fertilizer recommendations for different soil types and crops (Singh et al., 2023). Research shows that 74 per cent of farmers in the Khandwa district adopted SHC-based fertilizer applications during 2016-2017 (Rawat et al., 2019), while adoption in Madurai was at 45.50 per cent (Kumar et al., 2018). Additionally, initiatives like Bhoochetana in Karnataka and Krishi Mahotsav in Gujarat highlight broader efforts to enhance soil health and agricultural productivity across India (Rani et al., 2022).

METHODOLOGY

The study employed an exploratory research design. It was conducted in Srikakulam and Vizianagaram districts, known for prevalent paddy cultivation, the research aimed to encourage the perception and adoption of soil health cards among farmers in these areas, where no prior studies had been conducted. Six blocks were selected-three each from Srikakulam and Vizianagaram. The total sample of 180 paddy growers, is evenly split between the districts. Data collection utilized a simple random sampling technique among paddy growers in the selected villages. The statements were given to holders of Soil Health Card, and each of the five points- strongly agree, agree, undecided, disagree, and strongly disagree was given a comprehensive response, with a score of 5, 4, 3, 2, and 1.Adoption levels were categorized into "Not Adopted," "Below Adopted," "As Per Recommendation," and "Over Adopted," each assigned scores of 0, 1, 2, and 3. Statistical analyses included Arithmetic mean, standard deviation, percentages, correlation analysis, and arbitrary categorizations (low, medium, high).

RESULTS

Information presented in Table 1, revealed that 27.2 percent of the participants strongly disagreed with the statement that a Soil Health Card can be obtained after soil sample testing. 28.3 per cent of Paddy growers strongly disagreed with the statement that the Soil Health Card (SHC) helps to maintain soil fertility and productivity. 29.4 per cent of Paddy growers strongly disagreed with the statement that farming cannot be done in a scientific manner using information from Soil Health Card. 30 per cent of respondents strongly disagreed with the statement that SHC provides information about the soil's current fertility status. About 30.5 per cent of respondents strongly disagreed with the statement that SHC helps apply the right amount of nutrients and reduces the need for unnecessary fertilizer use. 31.1 per cent of respondents who held a Soil Health Card strongly disagreed with the statement that the organic carbon status of the soil can be known with the help of SHC information, 27.7 per cent of respondents strongly disagreed with the statement that agriculture departments do not provide adequate and proper information about SHC. The maximum (30%) of Paddy growers strongly disagreed with the statement that SHC helps to establish coordination among farmers, extension workers, and experts. 29.4 per cent of respondents strongly disagreed with the statement that the number of available nutrients in the soil cannot be determined with the assistance of SHC. 31.6 per cent of respondents strongly disagreed with the statement that deficient soils can be recovered through appropriate reclamation activities. It showed that 31.6 per cent of respondents strongly disagreed with the statement that "Soil Health Card holders can use this information to determine the acidity and alkalinity of their soils. The data indicated that 33.3 per cent of Paddy growers strongly disagreed with the statement that SHC provides information about the amount of fertilizer to be applied. 34.4 per cent of the participants expressed strong disagreement with the assertion that SHC reports provide recommendations and instructions that are challenging to comprehend and calculate fertilizer quantities. It showed that 35.5 per cent of respondents strongly disagreed with the statement that using the information provided in SHC can reduce unnecessary expenditures. 35 per cent of respondents strongly disagreed with the claim that the reports on soil health are valuable for balancing the usage of chemical fertilizers. Additionally, 32.7 per cent of participants expressed strong disagreement with the claim that the reports on soil health provide information about the amount of nutrients present in the soil and that fertilizer use can be balanced. The data revealed that 33.3 per cent of the participants strongly disagreed with the statement, I believe that SHC is useful to reduce soil degradation and help to maintain fertility and productivity of the soil. It showed that 33.8 per cent of respondents strongly disagreed with the statement that SHC provides information about N, P, and K as well as assistance in applying fertilizer dosage. The majority (31.6%) of the participants strongly disagreed with the statement, "I think that SHC is useful in crop planning." According to the findings, 28.8 per cent, expressed strong disagreement with the notion that SHC offers insights into the pH, EC, and O.C. levels of soil.

Table 1. Statement-wise distribution of respondents according to their perception on utility of Soil Health Card

S.No.	Statement	SA	A	UD	DA	SDA
1.	SHC can be obtained after the soil sample testing	49 (27.2%)	46 (25.5%)	17 (9.4%)	19 (10.5%)	49 (27.2%)
2.	Soil fertility and productivity can be maintained with the help of SHC	47 (26.1%)	40 (22.2%)	28 (15.5%)	14 (7.7%)	51 (28.3%)
3.	Farming cannot be done in scientific ways by using SHC information	48 (26.6%)	8 (4.4%)	51 (28.3%)	20 (11.1%)	53 (29.4%)
4.	SHC provides information about current fertility status of soil	46 (25.5%)	27 (15.0%)	41 (22.7%)	12 (6.6%)	54 (30%)
5.	SHC is helpful in applying proper required nutrient dosage and reduce unnecessary use of fertilizers	48 (26.6%)	20 (11.1%)	49 (27.2%)	8 (4.4%)	55 (30.5%)
6.	Organic carbon status of soil can be known with the help of SHC information	49 (27.2%)	16 (8.8%)	52 (28.8%)	7 (3.8%)	56 (31.1%)
7.	Proper and sufficient information about SHC is not given by agriculture department	44 (24.4%)	25 (13.8%)	36 (20%)	25 (13.8%)	50 (27.7%)
8.	SHC helps to establish, coordination among farmers, extension worker and experts	48 (26.6%)	12 (6.6%)	54 (30%)	12 (6.6%)	54 (30%)
9.	The quantity of available nutrient in soil can't be known with the help of SHC	44 (24.4%)	17 (9.4%)	28 (15.5%)	38 (21.1%)	53 (29.4%)
10.	Deficient soils can be reclaimed by using suitable reclamation activities	43 (23.3%)	26 (14.4%)	33 (18.3%)	20 (13.3%)	58 (31.6%)
11.	Acidity, alkalinity of the soils can be known with the help of SHC information	46 (25.5%)	20 (11.1%)	33 (18.3%)	24 (13.3%)	57 (31.6%)
12.	SHC gives correct information about amount of fertilizer to be applied	45 (25.0%)	24 (10.5%)	32 (17.7%)	19 (10.5%)	60 (33.3%)
13.	SHC report recommendation/ instruction difficult to understand and calculate dose of fertilizer	46 (25.5%)	19 (10.5%)	35 (19.4%)	18 (10%)	62 (34.4%)
14.	Unnecessary expenditure can be reduced by using information given in SHC	48 (26.6%)	14 (7.7%)	36 (20%)	18 (10%)	64 (35.5%)
15.	SHC reports is worth for balance use of chemical fertilizers	44 (24.4%)	16 (8.8%)	34 (18.8%)	23 (12.7%)	63 (35.0%)
16.	SHC reports gives information about amount of nutrient present in soil and balanced use of fertilizers can be possible	44 (24.4%)	30 (16.6%)	24 (13.3%)	23 (12.7%)	59 (32.7%)
17.	I think that SHC useful to reduce soil degradation and help to maintaining fertility and productivity of soil	42 (23.3%)	31 (17.2%)	30 (16.6%)	17 (9.4%)	60 (33.3%)
18.	SHC provide information about N, P, K status in soil and help to how much apply the dose of fertilizers	38 (21.1%)	46 (25.5%)	20 (11.1%)	15 (8.3%)	61 (33.8%)
19.	I think that the SHC useful in crop planning	47 (26.1%)	20 (11.1%)	40 (22.2%)	16 (8.8%)	57 (31.6%)
20.	SHC provide information about PH, EC, O.C of soil and on the basis, we can reclaim the soil	47 (26.1%)	27 (15%)	26 (14.4%)	28 (15.5%)	52 (28.8%)

Table 2 shows that the majority (40%) of Paddy growers with Soil Health Card reported medium levels of perception about the card, followed by low (32.2%) levels of perception and high (27.8%) levels of perception.

From Table 3 it is revealed that secondary and micronutrients recommendations of the Soil Health Card were followed by almost 35 per cent, accepted ferrous sulphate by 26.6 per cent adopted, calcium, copper, & magnesium, 23.3 per cent manganese sulphate, gypsum (21.1%) and zinc sulphate (19.4%). The substantial portion was not adopting the practices regarding the secondary and micronutrients. It was shown that paddy growers followed low adoption rates for zinc sulphate (32.2%), calcium (31.6%), magnesium (29.4%), ferrous sulphate (25.5%), copper sulphate (19.4%), gypsum (18.8%), manganese sulphate (17.7%). The majority of Paddy growers have not followed the recommendation of the Soil Health Card regarding the use of FYM for late varieties (31.6%), medium to late varieties (29.4%), sowing (27.7%), early varieties (22.2%). Whereas adopted as per recommendation for early varieties (35%), sowing (26.6%), late varieties (23.3%), and medium to late varieties (19.4%). Whereas over adoption for medium to late varieties (27.2%), sowing (26.1%), 18.8 per cent for medium

Table 2. Overall distribution of respondents to level of perception about utility of Soil Health Card

Category	Percentage
Low (Up to 42.84)	32.2
Medium (42.84 to 72.08)	40
High (Above 72.08)	27.8
Total	100

Mean = 55.51 SD= 30.45

Table 3. Practice-wise adoption of the recommendation of Soil Health Card by Paddy growers

S. No.	Adoption of Soil Health Card	Over Adoption	As per Recommendation	Below Adoption	Not Adopt
A.	Adoption of primary nutrients				
1.	For Paddy (sown), How much Urea/DAP/MOP use as per Soil Health Card recommendation? (20 kg/ha fertilizer as per SHC recommendation)				
I.	Urea- 75 kg/h as per Recommendation of SHC	40 (22.2%)	62 (34.4%)	29 (16.1%)	49 (27.2%)
II.	DAP- 50 kg/h as per recommendation of SHC	52 (28.8%)	60 (33.3%)	21 (11.6%)	47 (26.1%)
2.	For early varieties (transplantation), how much of Urea/MOP/DAP use as per Soil Health Card recommendation?				
I.	Urea- 85 kg/h as per recommendation SHC	56 (31.1%)	39 (21.6%)	26 (14.4%)	59 (32.7%)
II.	DAP- 60 kg/ha as per recommendation of SHC	64 (35.5%)	51 (28.3%)	5 (2.7%)	60 (33.3%)
3.	Utilizing Urea/DAP/MOP by the Soil Health Card recommendations, how many of you employ medium to late varieties for transplanting?				
I.	Urea-100 kg/h as per recommendation of SHC	46 (25.5%)	51 (28.3%)	20 (11.1%)	63 (35%)
II.	DAP-65 kg/h as per recommendation of SHC	52 (28.8%)	25 (13.3%)	54 (30%)	49 (27.2%)
4.	For late varieties (transplanting), how much of UREA/MOP/DAP use as per Soil Health Card recommendation?				
I.	Urea-150 kg/ha as per recommendation of SHC	59 (32.7%)	51 (28.3%)	12 (6.6%)	58 (32.2%)
II.	DAP-65 kg/h as per recommendation of SHC	59 (32.7%)	54 (30%)	12 (6.6%)	55 (30.5%)
B.	Adoption of secondary nutrients				
1.	For soil management, how much of gypsum you use as per Soil Health Card recommendation?	28 (15.5%)	38 (21.1%)	34 (18.8%)	80 (44.4%)
2.	For magnesium, how much you use of magnesium fertilizer as per the recommendation of Soil Health Card?	34 (18.8%)	47 (26.1%)	53 (29.4%)	46 (25.5%)
3.	For calcium, how much use of fertilizer as per recommendation of Soil Health Card?	43 (23.8%)	48 (26.6%)	57 (31.6%)	32 (17.7%)
C.	Adoption of Micronutrients				
1.	For Copper, how much use of Copper Sulphate fertilizer as per recommendation of Soil Health Card?	47 (26.1%)	48 (26.6%)	35 (19.4%)	50 (27.7%)
2.	For Iron, how much Ferrous Sulphate fertilizer use as per recommendation of Soil Health Card?	31 (17.2%)	63 (35%)	46 (25.5%)	40 (22.2%)
3.	For Zinc, how much Zinc Sulphate fertilizer use as per recommendation of Soil Health Card?	34 (18.8%)	35 (19.4%)	58 (32.2%)	53 (29.4%)
4.	For Manganese, how much Manganese Sulphate fertilizer use as per recommendation of Soil Health Card? Manganese sulphate	48 (26.6%)	42 (23.3%)	32 (17.7%)	57 (31.6%)
D.	How much use or adopt of FYM as per recommendation of Soil Health Card?				
1.	10t/ha FYM for Paddy (sowing) as per recommendation of SHC	47 (26.1%)	48 (26.6%)	35 (19.4%)	50 (27.7%)
2.	6t/ha FYM for Paddy (early varieties) asper recommendation of SHC	31 (17.2%)	63 (35%)	46 (25.5%)	40 (22.2%)
3.	10t/ha FYM for Paddy (medium to late varieties) asper recommendation of SHC	34 (18.8%)	35 (19.4%)	58 (32.2%)	53 (29.4%)
4.	10t/ha FYM for Paddy (late varieties) as per the recommendation of SHC	49 (27.2%)	42 (23.3%)	32 (17.7%)	57 (31.6%)
	Average	24.9%	26.3%	19.3%	29.1%

to late varieties, and 17.2 per cent for early varieties, followed by less adoption for medium to late varieties (32.2%), early varieties (25.5%), sowing (19.4%), and late varieties (17.7%).

According to the statistics in Table 4, Paddy growers adopted the Soil Health Card at low levels (43.8%), medium (28.4%) level, and high (27.8%) level of adoption, respectively.

From the Table 5 it revealed that the correlation analysis of adoption indicated that positive and significant relationship at a five percent level with education, farming experience, social participation, extension contact, and attitude towards the card. In contrast, age, occupation, land holding, annual income, information-seeking behavior, and scientific orientation, had a non-significant

Table 4: Overall adoption of Soil Health Card recommendation

Category	Percentage
Low (Up to 11.30)	43.8
Medium (11.30 to 16.81)	28.4
High (Above16.81)	27.8
Total	100

Mean = 14 SD= 5.50

Table 5. Relationship between personal, socio-economic, communicational, and psychological factors with adoption & perception

Variables	Correlation coefficient	
	Adoption	Perception
Age	-0.025^{NS}	0.114^{NS}
Education	0.293*	0.282*
Farming experience	0.294*	0.301*
Occupation	0.0203^{NS}	0.0241^{NS}
Social participation	0.203*	0.321*
Landholding	0.0250^{NS}	0.0265^{NS}
Annual income	0.039^{NS}	-0.110^{NS}
Extension contact	0.304*	0.397*
Information seeking behaviour	0.0226^{NS}	0.234*
Scientific orientation	0.0274^{NS}	0.0295^{NS}
Attitude towards soil testing	0.202*	0.232*

relationship with the extent of adoption of Soil Health Card by Paddy growers.

The correlation analysis of perception indicated that positive and significant relationship at a five percent level with education, farming experience, social participation, extension contact, information-seeking behaviour, and attitude towards the card whereas age, occupation, land holding, annual income, and scientific orientation had a non-significant relationship with perception of Paddy growers about the utility of Soil Health Card.

DISCUSSION

The results indicate that the majority of Paddy growers reported medium to low levels of perception about the cards because they likely perceive it as beneficial but might still have reservations or uncertainties compared to those with lower or higher levels of perception. The levels of perception among the respondents vary widely, with a significant portion falling into the medium category. This suggests a moderate endorsement of SHC utility, while some hold low or high perceptions, indicating different levels of confidence in its efficacy. Correlation analysis identifies key factors influencing perception. Education, farming experience, social participation, extension contact, information-seeking behavior, and attitude toward soil testing show positive correlations with favorable SHC perceptions. In contrast, demographic factors like age, occupation, landholding, and income exhibit negligible correlations, suggesting limited influence on perception. Overall, the findings highlight a nuanced landscape of SHC perception among paddy growers, with varying levels of endorsement and skepticism regarding its potential to enhance agricultural practices and sustainability. Tailored strategies are crucial to enhance SHC adoption and acceptance (Charel, 2018) differed with (Sunil et al., 2012)

The acceptance of Soil Health Cards (SHCs) by Paddy growers exhibits a diverse response, with several significant factors influencing the adoption rates. Factors such as education, farming experience, social engagement, extension contacts, and attitude toward soil testing are positively associated with adoption levels, indicating their pivotal roles in influencing farmer behaviour toward SHCs. On the other hand, age, occupation, landholding, annual income, information-seeking behavior, and scientific orientation do not have a significant impact on adoption rates. The attitude towards soil testing emerges as a critical psychological factor influencing adoption, highlighting the significance of farmer perceptions and beliefs in determining their willingness to adopt SHC recommendations. Positive attitudes indicate trust and confidence in the SHC process, motivating farmers to incorporate recommended practices into their farming practices.

The varying adoption rates of Soil Health Card (SHC) suggests a complex combination of factors. Initially, the prevalent use of traditional fertilizers such as Urea and DAP indicates a reluctance to change established practices, potentially due to familiarity or perceived dependability. Delays in the issuance of SHCs and processing of soil samples further hinder adoption, underscoring infrastructural obstacles. Conversely, insufficient adoption of others implies limited availability or affordability. In terms of Farm Yard Manure (FYM), inconsistent adoption suggests a lack of awareness or understanding of its advantages, possibly exacerbated by logistical challenges. The findings suggest that Paddy farmers have implemented Soil Health Card suggestions minimally due to insufficient knowledge, resource availability, and perceived initiative complexity (Prakash et al., 2003).

CONCLUSION

The study reveals that while paddy growers in North Coastal Andhra Pradesh are moderately aware of Soil Health Cards, actual adoption rates are low. Barriers include delays in issuance and scepticism about immediate benefits. Improved access to SHCs and better communication are needed to enhance adoption and perception among farmers. Factors like age, occupation, landholding size, annual income, and information-seeking behavior do not significantly affect adoption rates. Perceptions are influenced by education, farming experience, social participation, extension contact, and attitude toward soil testing. Strategic interventions should focus on improving educational outreach, community engagement, extension services, and farmer attitudes to maximize SHC impact on rice farming sustainability and productivity in the region.

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