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Assessing Soil Health Card Awareness and Adoption in Shimla District, Himachal Pradesh: A Case Study of Sustainable Agricultural Practices

Raman Kant

(Master of Arts - Public Administration, IGNOU

Email: loginramankant@gmail.com)

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Abstract:

Shimla, Himachal Pradesh, renowned for its apple production, serves as the backdrop for this investigation into the awareness and implementation of soil health card recommendations. With a purposive sampling technique, we engaged 80 respondents hailing from three subdivisions within Shimla District. These respondents represent a cross-section of apple growers from various villages within the region. A meticulously designed interview schedule was employed to collect primary data. The findings of this study reveal that a significant proportion of respondents possess a moderate level of perception (78.75%) and adoption (66.25%) when it comes to soil health card recommendations. Intriguingly, the correlation coefficients calculated between independent variables and the dependent variables (perception and adoption) indicate non-significant relationships, suggesting that factors beyond those considered in this study play a pivotal role in the decision-making processes of apple growers. This indicates the existence of potential barriers that need to be addressed to encourage greater adoption of sustainable agricultural practices in the region. This study illuminates the intricate landscape of apple cultivation in Shimla District and underscores the need for tailored interventions to bridge the gap between soil health card recommendations and their effective implementation among apple growers. Such efforts hold the potential to enhance the sustainability and productivity of apple cultivation in this vital agricultural region.

Keywords— **Soil Health Card, Awareness, Adoption, Perception**

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INTRODUCTION

Soil health is crucial for both agricultural productivity and sustainability. It encompasses the evolving physical, chemical, and biological attributes of soil that bolster plant growth and the broader ecosystem. Well-maintained soils offer vital nutrients, water, and air to plants, facilitating their growth and leading to abundant yields (FAO, 2015 [1]). In India, nearly 58% of its populace relies on agriculture for their livelihood, and it accounts for approximately 18% of the country's GDP (Chand, 2020 [2]). Hence, preserving soil health is vital for India's food security, the prosperity of its rural sector, and its commitment to environmental conservation. Regrettably, India's soil quality has seen a decline over time, attributed to factors like disproportionate fertilizer use, over-reliance on chemical agents, non-sustainable farming methods, and soil degradation (Ghosh et al., 2018 [3]). The SHC Program aims to: i. Enlighten farmers on soil health and the significance of even nutrient management. ii. Advocate for eco-friendly farming methods and the measured use of chemical fertilizers. iii. Boost both crop yields and farmers' earnings via enhanced soil health. iv. Mitigate the environmental harm stemming from excessive and unbalanced fertilizer usage. Soil health is a cornerstone of agricultural production, acting as a pivotal factor in ensuring sustainable yields while optimizing fertilizer use and minimizing wastage (Patel et al.,

2017 [4]). It's not just about the soil's fertility, but also its ability to sustain agricultural plants, maintain environmental health, and promote optimal nutrient cycles. Neufeld et al. (2006 [5]) emphasized the importance of soil testing, highlighting it as an indispensable tool for accurately gauging soil nutrient levels. Recognizing the significance of this, the Government of India took a proactive step by launching the Soil Health Card scheme on February 19, 2015. This initiative wasn't just a mere policy on paper; it was a targeted approach to encourage farmers to adopt soil test-based and balanced fertilizer applications. By doing so, the scheme's vision is twofold: firstly, to empower farmers to achieve better crop yields without escalating costs, and secondly, to educate them on the precise nutrient requirements for specific crops based on their soil's quality. This holistic approach ensures both economic viability for farmers and the long-term health of the soil.

The Soil Health Card (SHC) is a comprehensive printed report provided to farmers for each of their land holdings, offering a detailed analysis of the soil's health based on 12 critical parameters: Nitrogen (N), Phosphorus (P), Potassium (K), Sulphur (S), Zinc (Zn), Iron (Fe), Copper (Cu), Manganese (Mn), Boron (Bo), and the measures of pH, Electrical Conductivity (EC), and Organic Carbon (OC). This card not only presents the current status of these elements but also provides tailored fertilizer recommendations and necessary soil amendments to optimize crop yield and soil health. Updated every three years, the SHC serves as a periodic check on the soil's health, ensuring farmers are equipped with the latest information about their land's condition. The inception of the SHC scheme was driven by the need to identify specific soil types and guide farmers on enhancing its quality, thereby promoting sustainable and efficient farming practices . Incorporating such tools into agricultural practices can significantly influence productivity and environmental sustainability, making the SHC an invaluable asset for modern agriculture

The Soil Health Card (SHC) initiative is a comprehensive tool designed to guide farmers on the nutrient status of their soil. It evaluates various soil parameters, including both macro and micronutrients, soil pH, electrical conductivity, and organic carbon levels. Using this data, the SHC offers tailored fertilizer advice and crop-specific guidance, such as optimal planting periods, recommended varieties, and intercropping strategies. Rolled out in two phases, from 2015-2017 and then 2017-2019, its implementation involves collaboration between government bodies, agricultural extension officers, soil labs, and the farmers. However, challenges like limited soil testing facilities in distant rural regions and the need for enhanced training for stakeholders have been identified.Since its launch, the SHC initiative has made remarkable strides in enlightening farmers about soil health and endorsing eco-friendly farming methods. By 2021, the Ministry of Agriculture & Farmers Welfare reported the distribution of over 217 million SHCs nationwide. The integration of SHC guidelines has not only balanced fertilizer usage but also bolstered organic farming and enhanced crop yields. (Ghosh et al., 2018 [3]).(Behera et al., 2020 [6]) study found that adhering to SHC advice led to a yield boost of 5% to 15% across various crops and cut fertilizer expenses by 8% to 10%. Moreover, the initiative has played a pivotal role in environmental conservation, curbing groundwater contamination, soil erosion, and excessive fertilizer-induced greenhouse gas emissions.

In the apple-rich terrains of Shimla, Himachal Pradesh, this study delved into the awareness and application of Soil Health Card (SHC) recommendations among farmers. Engaging with 80 respondents across Shimla's subdivisions, the research revealed a moderate perception (78.75%) and adoption (66.25%) of SHC guidelines. However, non-significant correlations between certain variables suggest external factors influencing adoption. This highlights barriers to sustainable farming practices in Shimla, emphasizing the need for tailored strategies to bridge the knowledge-implementation gap among farmers.

MATERIAL AND METHODS

The study in question was carried out in three specific subdivisions within the Shimla district. These subdivisions were deliberately chosen, and a total of 80 respondents participated in the research. The primary objective was to gauge the perception and adoption rates of soil health cards among the participants. To achieve this, an interview schedule was meticulously crafted. Additionally, a detailed questionnaire was developed to conduct a socio-economic survey. This questionnaire delved into various demographic and experiential factors, including gender, age, educational background, and farming experience. The aim was to understand how these characteristics might influence an individual's perception and subsequent adoption of the soil health cards. For the analytical portion of the study, a range of statistical methods, including frequency, percentage, mean, standard deviation (SD), and correlation coefficients, were employed to interpret and present the data in a comprehensive manner.

RESULTS AND DISCUSSION

The research aimed to discern how various socio-economic and personal characteristics influenced farmers' views and utilisation of these recommendations. Two tables are provided to offer a detailed breakdown of the perception and adoption rates, as well as the correlation between personal attributes and these rates.The data reveals that a significant portion of respondents (78.75%) exhibited a medium understanding of the soil health card recommendations. This was followed by 18.75% with a low understanding and a mere 2.5% with a high understanding. When it comes to implementing these recommendations, 66.25% of farmers showed a medium adoption rate, while 33.75% had a low adoption rate (Table 1.). Notably, none fell into the high adoption category. These findings suggest that while many farmers are somewhat familiar with the soil health card recommendations, their implementation is moderate at best. A potential reason for this moderate adoption could be attributed to a general lack of in-depth knowledge about the recommendations.

Table 1. Perception level and Adoption level of farmers

S. No.	Level	Perception		Adoption	
		Frequency	Percentage	Frequency	Percentage
1.	Low	15	18.75	27	33.75
2.	Medium	63	78.75	53	66.25
3.	High	2	2.5	Nil	Nil

Table 2. Relationship between personal, socio economic characteristics of farmers and their perception and adoption of soil health card recommendations.

S.No.	Variables	Frequency	Percentage	Correlation Coefficient 'r'	
				Perception	Adoption

1.	**Gender**				
	Males	52	65	-0.12	0.15
	Females	28	35	0.12	-0.15
2.	**Age**				
	Upto 30 years	17	27.5	0.04	-0.12
	between 30-50 years	41	51.25	0.03	-0.12
	Above 50 years	22	21.25	-0.08	0.23
3.	**Education**				
	Illiterate	19	23.75	0.09	-0.23

	12th pass	36	45	-0.02	0.08
	Graduate and above	25	31.25	-0.07	0.15
4.	**Farming experience**				
	Below 10 years	10	12.5	-0.23	0.32
	Between 10-20 years	28	35	-0.15	0.20
	Above 20 years	42	52.5	0.31	-0.41

The respondent characteristics, as shown in Table 2, reveal that the largest group (58%) falls into the middle age category, trailing by 27% in the older age bracket and 15% in the younger age group. The younger demographic's shift towards urban areas for alternative professions, likely due to the allure of higher urban incomes compared to farming, could explain this distribution. Regarding education, the majority (25%) completed up to high school, while 23% reached the graduate level, and 20% had no formal education. Additionally, 17% had education up to the primary level, and 15% up to the intermediate level. The inclination of those with high school or lower education to remain in villages, possibly due to limited job opportunities elsewhere, and rely on agriculture for livelihood is evident. Table 1 data shows that 47% of respondents have over 20 years of farming experience, with 45% having 10-20 years and 8% less than 10 years. This distribution might reflect the trend of older individuals persisting in farming while the younger generation seeks opportunities in urban areas. In terms of land ownership, the majority (58%) are small farmers, 22% have medium-sized farms, 12% have marginal landholdings, and 8% own large farms

Gender plays a subtle role in both perception and adoption of soil health card recommendations. Males exhibit a slight negative correlation (-0.12) with perception, while females show a slight positive correlation (0.12). In terms of adoption, males have a weak positive association (0.15), indicating they're slightly more inclined to adopt the recommendations, whereas females show a slight negative trend (-0.15). Age-wise, older individuals (above 50) have a faintly diminished perception, but age doesn't significantly influence adoption. Educational background reveals that illiterate individuals have a weak positive correlation (0.09) with perception but a moderate negative association (-0.23) with adoption. Conversely, those with higher education (graduate or above) are slightly more inclined to adopt the recommendations, with a correlation of 0.15. Farming experience also plays a role; those with over 20 years in farming tend to have a slightly reduced perception and a moderately lower adoption rate, while those with less than 10 years of experience are somewhat more receptive. In essence, the correlation values indicate that the relationships between respondent characteristics and their perception and adoption levels in farming range from weak to moderate. While these correlations can shed light on certain trends, it's crucial to remember that correlation doesn't equate to causation. There might be other influencing factors not covered in this analysis that impact perception and adoption rates.

According to a study (Ankhila, R. H. et al. 2020 [7]) the majority of farmers in Andhra Pradesh are well-informed about the soil health card scheme. They've observed a decline in the use of macronutrients, leading to reduced cultivation costs. Additionally, there's been a notable increase in micronutrient application, which was provided alongside the SHC. However, the study also highlighted some challenges. The assurance of yield and consistent scientific guidance were lacking. Delays in the SHC's availability affected the farmers' confidence in the scheme and their trust in extension officials. The complexity of the recommendations and the absence of effective extension services were barriers to the scheme's success. Institutional challenges, such as insufficient infrastructure and a shortage of skilled technical staff, also slowed the scheme's widespread adoption.

Relating this to the present study, we find similarities in the farmers' perceptions and challenges faced. Addressing institutional constraints and enhancing extension services can significantly improve the SHC's effectiveness. Engaging farmers through more interactive training sessions might be a pivotal step towards ensuring the scheme's success and broader adoption.

CONCLUSION

The correlation coefficients presented in Table 1 reveal interesting associations between the characteristics of respondents and their levels of perception and adoption in the context of farming. Gender shows a slight influence on perception and adoption levels, with males tending to have slightly higher adoption levels, while females exhibit marginally greater perception. Age has only weak correlations with perception and adoption, suggesting that age alone is not a strong predictor of these levels. Education appears to play a role, with illiterate respondents showing higher perception but lower adoption, while more educated individuals exhibit slightly higher adoption. Farming experience demonstrates a moderate influence, with those having over 20 years of experience displaying lower adoption levels. It is important to remember that while these correlations provide insights into potential relationships, they do not establish causation, and other unexamined factors may also impact perception and adoption in farming.

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