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Relationship of selected characteristics of sugarcane growers with knowledge and adoption of soil health management practices

[1]SS Jadhav, [2]HP Sonawane and [3]BD Tayade

[1]PG Scholar, Agricultural Extension Education RCSM, College of Agriculture, Kolhapur, Maharashtra, India

[2]Professor (CAS) of Agricultural Extension Education, RCSM College of Agriculture, Kolhapur, MPKV, Rahuri, Maharashtra, India

[3]Ph.D. Scholar, Department of Agriculture Extension and Communication, B. A. College of Agriculture Anand Agricultural university Anand, Gujrat, India

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Corresponding Author: SS Jadhav

Abstract

The research was conducted in three tehsils of Kolhapur district Karveer, Hatkanangle, and Shirol that are prominent for sugarcane cultivation. A total of 150 sugarcane farmers were selected and interviewed personally using a structured and pre-tested interview schedule. The study considered thirteen independent variables encompassing the personal, socio-economic, communicational, and psychological attributes of the respondents, measured through suitable tools and scales. The present study examined the relationship between selected personal, socio-economic, communicational and psychological characteristics of sugarcane growers with their knowledge and adoption of soil health management (SHM) practices. Karl Pearson's correlation coefficient was employed to analyze the association between thirteen independent variables and the dependent variables, namely knowledge and adoption of SHM practices. The findings revealed that education, farming experience, annual income, size of land holding, cropping intensity, mass media utilization, information seeking behaviour and innovativeness showed significant positive relationships with both knowledge and adoption of SHM practices. Variables such as age, occupation, soil type and social participation were found to be non-significant. The study highlights the importance of educational and communicational factors in enhancing farmers' awareness and adoption of sustainable soil health practices.

Keywords: Soil health management, sugarcane growers, soil health management, knowledge, adoption, correlation analysis

Introduction

Soil health management is a fundamental component of sustainable agricultural production, particularly in intensive commercial cropping systems such as sugarcane cultivation. Continuous cultivation of sugarcane with heavy dependence on chemical fertilizers and irrigation has resulted in deterioration of soil physical, chemical and biological properties, leading to nutrient imbalance, depletion of organic carbon and decline in soil fertility (Rajula Shanthy, 2016) [5]. Adoption of recommended soil health management practices—such as soil testing, balanced nutrient application, use of organic manures, green manuring and bio-fertilizers—is therefore essential for maintaining soil productivity and ensuring long-term sustainability of sugarcane-based farming systems (MoA & FW, 2015; NMSA, 2020) [2, 3].

Despite the availability of proven soil health management technologies, their adoption among sugarcane growers remains uneven. Farmers differ considerably in their level of knowledge and extent of adoption of these practices. Such variations are largely attributed to differences in personal, socio-economic, communicational and psychological characteristics of farmers (Gupta & Nagar, 2017; DAC&FW, 2021) [4., 6]. Attributes such as age, education, farming experience, land holding size, income, access to information sources, social participation and innovativeness are known to influence farmers' decision-making behaviour towards improved agricultural practices (Mohapatra, 2013) [19].

Knowledge plays a pivotal role in the adoption process, as it forms the foundation for favourable attitudes and informed decision-making. Farmers with higher educational attainment, better exposure to mass media and stronger information seeking behaviour generally possess greater awareness and understanding of recommended soil health management practices (Mandal, 2018) [8]. Similarly, adoption behaviour is influenced by socio-economic capacity, resource availability and psychological readiness, particularly innovativeness and willingness to experiment with new practices (Laxttiwar, 2019; Vishwakarma, 2020) [18, 9].

Several studies in the field of agricultural extension have emphasized the importance of analyzing the relationship between farmers' characteristics and their knowledge and adoption behaviour. Correlation studies help identify critical factors that significantly influence adoption, thereby assisting extension agencies in formulating need-based, location-specific and farmer-oriented strategies (Waridullah,

2019) [22].
In view of the above, the present study was undertaken to examine “The relationship between selected personal, socio-economic, communicational and psychological characteristics of sugarcane growers and their knowledge and adoption of soil health management practices”. The findings of this study are expected to provide empirical insights for strengthening extension interventions aimed at enhancing awareness and adoption of sustainable soil health management practices among sugarcane growers.

Objectives
1. To study the relationship between selected characteristics of sugarcane growers and their knowledge of soil health management practices.
2. To analyze the relationship between selected characteristics of sugarcane growers and their adoption of soil health management practices.

Methodology
The present study was conducted in Kolhapur district of Maharashtra, which holds a prominent position in the state's sugarcane production. The tahsils of Karveer, Hatkanangle, and Shirol were deliberately selected as the study area owing to their extensive sugarcane cultivation, high productivity, and better access to irrigation facilities. An ex-post facto research design was employed for the investigation. Kolhapur district consists of twelve tahsils: Karveer, Shahuwadi, Panhala, Hatkanangle, Shirol, Radhanagari, Kagal, Bhudargad, Chandgad, Ajra, Gaganbawda and Gadhinglaj. Among these Karveer, Hatkanangle and Shirol purposively selected based on the predominance of sugarcane farming. From each of these tehsil’s, five villages were identified based on the number of sugarcane cultivators, making a total of 15 villages. A random sampling technique used to select 10 sugarcane farmers from each village, resulting in a total sample size of 150 respondents for the study.

Results and Discussion
A. Relationship between personal, socio-economic, communicational and psychological characteristics of Sugarcane growers with knowledge of soil health management practices
To determine the relationship between independent and dependent variables, the Karl Pearson’s correlation coefficient (r), was calculated. Thirteen independent variables, which divided into (i) personal, (ii) socio-economic, (iii) communicational, (iv) psychological characteristics used to compute the correlation coefficient for farmers' degree of knowledge regarding Soil Health Management procedures. The information regarding this depicted in Table 1.

1. Age with knowledge of soil health management practices
The findings in Table 1 illustrates that, the farmers' age and knowledge about soil health management techniques were positively but not significantly correlated (r = 0.129NS). Accordingly, the null hypothesis, which states "age and knowledge of SHM practices do not significantly correlate," was accepted.
We concluded that, there was no significant correlation between the farmers' age and their degree of knowledge. The results show that farmers' knowledge remained nearly constant regardless of their age.
The results are comparable to those published by Dhivya *et al*. (2021) [12].

2. Education with knowledge of soil health management practices
The data found in Table 1 shows that, the farmers' education and knowledge about soil health management techniques were positively and highly significantly correlated (r = 0.224*). The null hypothesis, according to which "education and knowledge of SHM practices do not significantly correlate," therefore rejected.
It concludes that, farmers' education positively and significantly correlated with their degree of knowledge. The association's findings showed that farmers' knowledge increased in direct proportion to their level of education.
The results are comparable to those published by Dangre.

3. Farming experience with knowledge of soil health management practices
The data included in Table 1 shows that, the farmers' degree of knowledge about soil health management techniques and their farming experience had a positive and significant connection (r = 0.192*). The null hypothesis, according to which "farming experience and knowledge of SHM practices do not significantly correlate," therefore rejected.
We conclude that, farmers' knowledge positively and significantly correlated with their farming experience. The positive correlation showed that the more years of farming experience, the higher the knowledge.
The results are consistent with Dangre.

4. Occupation with knowledge of soil health management practices
The data outlined in Table 1 found that, the farmers' occupation and knowledge about soil health management techniques were positively but not significantly correlated (r = 0.139NS). The null hypothesis, according to which "occupation and knowledge of SHM practices do not significantly correlate," was thus accepted.
We can conclude that there was no significant correlation between occupation and knowledge. The findings indicate that farmers' knowledge were unaffected by their work.
The outcome supports the studies conducted by Sanjana (2019) [20] and Yadav (2021) [15].

5. Annual income with knowledge of soil health management practices
The data in Table 1 indicates that, the farmers' knowledge about soil health management techniques and their annual income were positively and significantly correlated (r = 0.207*). The null hypothesis, according to which "annual income and knowledge of SHM practices do not significantly correlate," therefore rejected.
We can conclude that farmer’s annual income was positive and significantly correlated with knowledge. According to the positive correlation, farmers who earn more money are able to access more resources and information on soil health.

Similar results were also reported by, Mandal (2018) [8] and Choudhary.

6. Size of land holding with knowledge of soil health management practices

The data in Table 1 revealed that, the farmers' of knowledge about soil health management techniques and the size of their land holdings were positively and significantly correlated (r = 0.195*). The null hypothesis, "knowledge of SHM practices and land holding sizes do not significantly correlate," therefore rejected.

We found that knowledge was positive and significantly correlated with land holding size. The positive correlation indicates that farmers who own more land typically know more about Soil Health Management practices.

The results concur with those of Dangre and Mandal (2018) [8].

7. Soil type with knowledge of soil health management practices

The findings in Table 1 found that, there was a positive but non-significant association (r = 0.125NS) between soil type and farmers' awareness of soil health management strategies. The null hypothesis, according to which "soil type and knowledge of SHM practices do not significantly correlate," was thus accepted.

We can conclude that there was no significant correlation between soil type and knowledge. The outcome shows that soil type has no effect on knowledge.

These results are consistent with the observations made by Kumar (2017) [17], Patale (2017) [25] and Waridullah (2019) [22].

8. Cropping pattern with knowledge of soil health management practices

The data shown in Table 1 revealed that, the farmers' degree of knowledge about soil health management techniques and cropping pattern had a positive and highly significant connection (r = 0.249**). The null hypothesis, according to which "cropping pattern and knowledge of SHM practices do not significantly correlate," therefore rejected.

We may conclude that knowledge positively and significantly correlated with cropping pattern. The findings indicate that, more diverse planting pattern aided farmers in gaining knowledge.

Similar conclusions have been reached by Sushma (2016) [21], Waridullah (2019) [22] and Laxttiwar (2019) [18].

9. Cropping intensity with knowledge of soil health management practices

The findings in Table 1 indicates that, there was a positive and significant connection (r = 0.168*) between cropping intensity and farmers' knowledge of soil health management measures. The null hypothesis, "There is no significant relationship between cropping intensity and knowledge of SHM practices" rejected.

Cropping intensity has a favourable and significant relationship with knowledge. The positive connection suggests that farmers with higher agricultural intensity had more knowledge of soil health.

The findings are consistent with Mandal (2018) [8], and Choudhary.

10. Mass media utilization with knowledge of soil health management practices

The findings in Table 1 illustrates that, there was a positive and highly significant a relationship (r = 0.252**) between mass media utilisation and farmers' understanding of soil health management practices. The null hypothesis, "There is no significant relationship between mass media utilization and knowledge of SHM practices" rejected.

It can be stated that utilisation of media has a favourable and significant relationship with knowledge. This demonstrates that increased use of the media assisted farmers in gathering more information.

Rathod (2005) [24], Mandal (2018) [8] and Sanjana (2019) [20] support these findings.

11. Information Seeking behaviour with knowledge of soil health management practices

The findings in Table 1 states that, there was a positive and highly significant relationship (r = 0.293**) between information seeking activity and farmers' knowledge about soil health management measures. The null hypothesis, which stated that there is no significant association between information seeking behaviour and awareness of SHM procedures, rejected.

It stated that information seeking behaviour was positively and significantly associated with knowledge. This suggests that farmers who were actively looking for information possessed greater expertise.

The findings are similar to those reported by Mandal (2018) [8] and Choudhary.

12. Social participation with knowledge of soil health management practices

Table 1 shows a positive but non-significant relationship (r =0.136NS) between social participation and farmers' knowledge of soil health management practices. The null hypothesis, "There is no significant relationship between social participation and knowledge of SHM practices" was accepted.

It inferred that, social participation had no significant relationship with knowledge. This demonstrates that participation in social activities did not significantly increase understanding of soil health.

This is in line with the findings of Yadav (2021) [15].

13. Innovativeness with knowledge of soil health management practices

Table 1 indicates that, there is a positive and significant relationship (r = 0.246**) between innovativeness and farmers' knowledge regarding soil health management approaches. The null hypothesis, that "there is no significant relationship between innovativeness and knowledge of SHM practices" rejected.

Farmers' innovativeness found to be positive and significantly associated with their knowledge. This indicates that more innovative farmers had a better understanding of soil health techniques.

The findings are consistent with Laxttiwar (2019) [18].

Table 1: Correlation between the knowledge of Soil Health Management (SHM) practices and selected independent variables

Sr. No	Independent Variables	Correlation Coefficients (r)
1	Age	0.129 NS
2	Education	0.224**
3	Farming Experience	0.192*
4	Occupation	0.139 NS
5	Annual income	0.207*
6	Size of land holding	0.195*
7	Soil type	0.125 NS
8	Cropping pattern	0.249**
9	Cropping intensity	0.168*
10	Mass Media utilization	0.252**
11	Information Seeking behaviour	0.293**
12	Social participation	0.136 NS
13	Innovativeness	0.246**

* = Significant at 0.05 level, ** = Significant at 0.01 level and NS = Non-significant

B. Relationship between personal, socio-economic, communicational and psychological characteristics of Sugarcane growers with adoption of soil health management practices

A correlation study conducted to determine the impact of several factors on the adoption of soil health management (SHM) techniques. Table 2 shows the association coefficients between different personal, socioeconomic, communicational and psychological characteristics and the adoption of SHM practices.

1. Age with adoption of soil health management practices

The data in Table 2 reveals that, there was a positive but non-significant correlation (r = 0.111NS) between age and the adoption of soil health management practices by sugarcane growers. Thus, the null hypothesis, that "There is no significant relationship between age and adoption of SHM practices" was accepted.

The concluded that, the age of the growers did not have any significant influence on the adoption of SHM practices. This suggests that age did not act as a determining factor for adoption in the present study.

The findings align with the results of Mohapatra (2013) [19], Dangre and Vishwakarma (2020) [9].

2. Education with adoption of soil health management practices

The data in Table 2 shows that, there was a positive and highly significant correlation (r = 0.293**) between education and the adoption of soil health management practices by sugarcane growers. Thus, the null hypothesis that "There is no significant relationship between education and adoption of SHM practices" rejected.

The data concluded that, the education of farmers had a significant and positive effect on adoption. This indicates that, farmers that are more educated are more likely to adopt improved SHM practices.

The findings are in agreement with Mohapatra (2013) [19] and Dangre.

3. Farming experience with adoption of soil health management practices

The data in Table 2 indicates that, there was a positive and significant correlation (r = 0.184*) between farming experience and the adoption of soil health management practices by sugarcane growers. Thus, the null hypothesis, "There is no significant relationship between farming experience and adoption of SHM practices" rejected.

The data concluded that, farming experience had a significant positive influence on adoption. This suggests that experienced farmers are more inclined to adopt Soil Health Management practices.

The findings support the results of Dangre.

4. Occupation with adoption of soil health management practices

The data in Table 2 indicates that, there was a positive but non-significant correlation (r = 0.117NS) between occupation and the adoption of soil health management practices by sugarcane growers. Thus, the null hypothesis that "There is no significant relationship between occupation and adoption of SHM practices" was accepted.

Data concluded that, occupation did not have any significant effect on adoption in the study area.

The findings are in line with Vishwakarma (2020) [9], Kumar (2021) [14] and Waridullah (2019) [22].

5. Annual income with adoption of soil health management practices

The data in Table 2 indicates that, there was a positive and significant correlation (r = 0.193*) between annual income and the adoption of soil health management practices by sugarcane growers. Thus, the null hypothesis, "There is no significant relationship between annual income and adoption of SHM practices" rejected.

The result concluded that annual income had a significant positive effect on adoption. This implies that farmers with higher income are more capable of adopting improved SHM practices.

The findings are consistent with Mohapatra (2013) [19] and Dangre.

6. Size of land holding with adoption of soil health management practices.

The data in Table 2 shows that, there was a positive and significant correlation (r = 0.190*) between size of land holding and the adoption of soil health management practices by sugarcane growers. Thus, the null hypothesis, "There is no significant relationship between size of land holding and adoption of SHM practices" rejected.

The size of land holding had a positive influence on adoption. This means that farmers with larger land holdings tended to adopt SHM practices effectively.

The findings align with Mohapatra (2013) [19] and Vishwakarma (2020) [9].

7. Soil type with adoption of soil health management practices

The data in Table 2 shows that, there was a positive but non-significant correlation (r =0.125NS) between soil type and the adoption of soil health management practices by sugarcane growers. Thus, the null hypothesis that "There is no significant relationship between soil type and adoption of SHM practices" was accepted.

From result, it concluded that soil type did not have any

significant effect on adoption.
The findings agree with Kumar (2017) [17], Patale (2017) [25] and Waridullah (2019) [22].

8. Cropping pattern with adoption of soil health management practices
The data in Table 2 demonstrates that, there was a positive but non-significant correlation (r = 0.101NS) between cropping pattern and the adoption of soil health management practices by sugarcane growers. Thus, the null hypothesis that "There is no significant relationship between cropping pattern and adoption of SHM practices" was accepted.
The result shows that, cropping pattern did not significantly affect the adoption of SHM practices.
The findings do not align with Sushma (2016) [21], Waridullah (2019) [22] and Laxttiwar (2019) [18], who reported significant relationships.

9. Cropping intensity with adoption of soil health management practices
The data in Table 2 indicates that, there was a positive and significant correlation (r = 0.164*) between cropping intensity and the adoption of soil health management practices by sugarcane growers. Thus, the null hypothesis, "There is no significant relationship between cropping intensity and adoption of SHM practices" rejected.
The study revealed that, cropping intensity had a significant positive effect on adoption.
The results are similar to Dholariya (2014) [13].

10. Mass media utilization with adoption of soil health management practices
The data in Table 2 shows that, there was a positive and highly significant correlation (r = 0.257**) between mass media utilization and the adoption of soil health management practices by sugarcane growers. Thus, the null hypothesis, "There is no significant relationship between mass media utilization and adoption of SHM practices" rejected.
Mass media utilization had a significant positive influence on adoption. This indicates that farmers with more media exposure are more likely to adopt SHM practices.
The findings align with Naveen (2016) [23].

11. Information seeking behaviour with adoption of soil health management practices
The data in Table 2 indicates that, there was a positive and highly significant correlation (r = 0.264**) between information seeking behaviour and the adoption of soil health management practices by sugarcane growers. Thus, the null hypothesis, "There is no significant relationship between information seeking behaviour and adoption of SHM practices" rejected.
The study concluded that information seeking behaviour had a significant positive effect on adoption.
The findings are similar to Chimmalagi (2016) [11].

12. Social participation with adoption of soil health management practices
The data in Table 2 reveals that, there was a positive but non-significant correlation (r = 0.146NS) between social participation and the adoption of soil health management practices by sugarcane growers. Thus, the null hypothesis, "There is no significant relationship between social participation and adoption of SHM practices" was accepted.
We concluded that social participation did not have any significant influence on adoption.
The findings align with Mohapatra (2013) [19] and Vishwakarma (2020) [9].

13. Innovativeness with adoption of soil health management practices
The data in Table 2 shows that, there was a positive and highly significant correlation (r = 0.260**) between innovativeness and the adoption of soil health management practices by sugarcane growers. Thus, the null hypothesis, "There is no significant relationship between innovativeness and adoption of SHM practices" rejected.
Results revealed that innovativeness had a significant positive effect on adoption. This implies that innovative farmers are more likely to adopt new SHM practices.
The findings are in line with Laxttiwar (2019) [18].

Table 2: Correlation between the adoption of soil health management (SHM) practices and selected independent variables.

Sr. No	Independent Variables	Correlation Coefficients (r)
1	Age	0.111 NS
2	Education	0.293**
3	Farming Experience	0.184*
4	Occupation	0.117 NS
5	Annual income	0.193*
6	Size of land holding	0.190*
7	Soil type	0.125 NS
8	Cropping pattern	0.101 NS
9	Cropping intensity	0.164*
10	Mass Media utilization	0.257**
11	Information Seeking behaviour	0.264**
12	Social participation	0.146 NS
13	Innovativeness	0.260**

* = Significant at 0.05 level, ** = Significant at 0.01 level and NS = Non-significant

Conclusion
The present study conclusively established that the knowledge and adoption of Soil Health Management Practices among sugarcane growers significantly influenced by a combination of personal, socio-economic, communicational and psychological characteristics. The correlation analysis revealed that variables such as education, farming experience, annual income, size of land holding, cropping intensity, mass media utilization, information seeking behaviour and innovativeness exhibited a positive and significant relationship with both knowledge and adoption of Soil Health Management Practices. These findings indicate that farmers who are better educated, economically stable, information-oriented and innovative are more likely to possess higher knowledge and actively adopt recommended soil health management practices.
On the other hand, variables such as age, occupation, soil type and social participation found to have no significant relationship with knowledge and adoption levels, suggesting that demographic factors alone do not necessarily determine farmers' awareness or adoption behaviour. This emphasizes that access to information; effective communication

channels and psychological readiness play a more decisive role in influencing sustainable agricultural practices than mere personal attributes.

The study highlights the crucial role of extension and communication mechanisms in improving farmers' knowledge and adoption of Soil Health Management Practices. Strengthening mass media exposure, promoting information seeking behaviour and encouraging innovativeness among sugarcane growers can significantly enhance adoption rates. Therefore, extension agencies and policymakers should focus on designing need-based, farmer-centric and location-specific strategies that emphasize capacity building, timely information dissemination and experiential learning.

Overall, the findings of the study provide valuable insights for planners, extension personnel and researchers in formulating effective strategies to promote sustainable Soil Health Management Practices, thereby ensuring long-term productivity and sustainability of sugarcane cultivation.

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