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Perception of farmers towards soil testing in different farming situations

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Abstract

The present study was conducted in Mandya, Chikkaballapura and Tumakuru districts of Karnataka state in 2022-23 to analyze the perception of farmers towards soil testing in different farming situations and to find out the relationship and extent of contribution of profile characteristics of farmers on their perception towards soil testing. Sixty soil tested farmers from each of the districts were personally interviewed using a pre-tested interview schedule. The results revealed that a vast majority of farmers (76.10%) had good to better perception towards soil testing. The correlation test revealed that 14 out of 19 independent variables were found to be have a significant ($p<0.05$) to highly significant ($p<0.01$) relationship with the perception of farmers towards soil testing in all three situations. Further, all the 19 profile characteristics of farmers had contributed to the tune of 73.80, 74.90 and 69.90 percent in assured, protected and rainfed situations respectively in developing better perception towards soil testing. The study implies how soil testing is an important practice to be adopted by the majority of farmers.

Keywords: Extent of contribution, irrigation, perception, relationship, soil testing

Introduction

Agriculture is the backbone of Indian economy and food is a physiological necessity for the survival of human being. During the early phases of agricultural development, much emphasis was placed on increasing agricultural production through adoption of high-yielding varieties along with use of chemical fertilizers and pesticides. This led to intensive use of land and agricultural inputs particularly in the regions endowed with irrigation facilities. It has been established that the high-yielding varieties technology helped to improve the income, employment and nutrition of farm households (Foster and Rosenzweig 1996) [3]. India is third producer and consumer of fertilizers following China and USA. It accounts for 12.20 percent of the world's production of nitrogenous and phosphatic nutrients and 12.60 percent of the world's consumption of N, P and K nutrients (Anon, 2016) [2]. Indian farmers are facing challenges such as low productivity, poor quality of seed, poor irrigation facilities, higher cost of cultivation, ground water depletion, unfavourable weather conditions and other situational problems concerning market.

Soil is one of the elements required for farming as it provides nutrients to the plants. Soil nutrient management is very important for sustainable development of agriculture. The adoption of balanced fertilization helps to reduce the cost of cultivation and environmental degradation. Soil testing is known as a precise management method for determining and assessing soil fertility that enables farmers to assess the impact of management methods and identify what changes are needed each year. Many efforts were put forth by the central and state government to evaluate the soil health status of farmer's fields by introducing soil health card scheme (SHC), but the quantum of scientific information the farmers have, how they perceive the soil testing and its recommendations and how efficiently they adopt the recommendations given in the soil test report makes the difference. With this background, the present study was undertaken with the following specific objectives:

1. To analyze the perception of farmers towards soil testing in different farming situations
2. To find out the relationship and extent of contribution of profile characteristics of farmers on the perception towards soil testing.

Methodology

The study was conducted in Mandya, Chikkaballapur and Tumakuru districts which falls in assured irrigation situation, protected irrigation situation and rainfed situation, respectively. In each selected district 60 farmers each who have tested their soils during last 3 years were

selected. Thus 180 soil tested farmers constituted the sample of the study.

A standardized scale was developed specifically for the research study to analyze the perception of farmers towards soil testing. The developed perception scale was found to be highly reliable (0.75) and valid (0.86). Based on the mean (56.47) and standard deviation (6.37) the respondents could be categorized into three perception categories, *viz.*, poor, good and better. Higher score on this scale indicates that the respondent has better perception towards soil testing and the lower perception score indicates that the respondent has poor perception towards soil testing. The perception of farmers towards soil testing was considered as the dependent variable for the study. Information regarding 19 profile characteristics (independent variables) of farmers in different farming situation were collected using a structured schedule with suitable scales. The collected data were scored, tabulated and analyzed using frequency, mean, percentage, correlation test and multiple regression analysis.

Results and Discussion

1. Statement-wise perception of farmers towards soil testing in different farming situations

The results in the table 1 represents the statement-wise perception of farmers towards soil testing in different farming situations. In assured irrigation situation, the statements in top order were “Soil testing is first step towards proper soil fertility management” had a mean score of 4.05 (Rank I) and “Training on Integrated nutrient management influence farmers to follow soil testing recommendations” had a mean score of 3.68 (Rank II). On the contrary, the statements which are in bottom order were “Problematic soils can be reclaimed by using suitable reclamation activities with the help of soil testing” had a mean score of 3.18 (Rank XV) and “Applying fertilizers without knowing the actual nutrient needs of the soil might lead to over-fertilization and soil degradation” had a mean score of 3.11 (Rank XVI).

In protected irrigation situation, the statements in top order were “Soil testing helps in practicing farming in scientific way” had a mean score of 4.18 (Rank I) and “Soil testing is first step towards proper soil fertility management” had a mean score of 4.08 (Rank II). On the contrary, the statements which are in bottom order were “Applying fertilizers without knowing the actual nutrient needs of the soil might lead to over-fertilization and soil degradation” had a mean score of 3.45 (Rank XIII) and “Soil testing can be helpful and effective only if the recommendations are followed by farmers on a regular basis” had a mean score of 3.41 (Rank XIV).

In rainfed situation, the statements in top order were “Soil testing is first step towards proper soil fertility management”

had a mean score of 3.89 (Rank I) and “Training on Integrated nutrient management influence farmers to follow soil testing recommendations” had a mean score of 3.85 (Rank II). On the contrary, the statements which are in bottom order were “Soil samples need to be collected by making ‘V’ shaped cut and removing thick slices of soil from top to bottom of exposed face” had a mean score of 2.84 (Rank XV) and “Applying the fertilizers without knowing the actual nutrient needs of the soil might lead to over-fertilization and soil degradation” had a mean score of 2.74 (Rank XVI).

In pooled sample, the statements in top order were “Soil testing is the first step towards proper soil fertility management” had a mean score of 4.10 (Rank I) and “Training on Integrated nutrient management influence farmers to follow soil testing recommendations” had a mean score of 3.84 (Rank II). On the contrary, the statements which are in bottom order were “Soil testing can be helpful and effective only if the recommendations are followed by farmers on a regular basis” had a mean score of 3.23 (Rank XIII), “Problematic soils can be reclaimed by using suitable reclamation activities with the help of soil testing” had a mean score of 3.21 (Rank XIV) and “Applying the fertilizers without knowing the actual nutrient needs of the soil might lead to over-fertilization and soil degradation” had a mean score of 3.10 (Rank XIV).

2. Overall perception of farmers towards soil testing in different farming situations

Table 2 depicts overall perception of farmers towards soil testing. The results revealed that 43.30 percent of farmers in the assured irrigation situation belonged to good perception category followed by better (31.70%) and poor (25.00%) category. In the protected irrigation situation 45.00 percent of farmers belonged to good perception category followed by better (36.70%) and poor (18.30%) category. In the rainfed situation 41.70 percent of farmers belonged to good perception category followed by better (30.00%) and poor (28.30%) category. In pooled sample, 43.30 percent of farmers belonged to good perception category followed by better (32.80%) and poor (23.90%) category. Chi-square value (1.81) reveals that there was non-significant difference among the different farming situations. Similar findings are obtained by Sanjana (2019) [8] and Patel (2021) [7].

Farmers in the all the situations had good to better perception towards soil testing which may be attributed to the feeling of the farmers that soil testing will helps to assess the soil properties for better crop production. Among all the situations, farmers of protected irrigation situation had better perception compared to assured and rainfed situation, because the farmers realized the importance of soil testing in terms of increasing yield and income in protected irrigation situation.

Table 1: Statement-wise perception of farmers towards soil testing in different farming situations

Sl. No.	Perception statements	Soil tested farmers							
		Assured irrigation situation (n ₁ =60)		Protected irrigation Situation (n ₂ =60)		Rainfed situation (n ₃ =60)		Pooled (N=180)	
		Perception Score	Rank	Perception Score	Rank	Perception Score	Rank	Perception Score	Rank
1	Soil testing is first step towards proper soil fertility management	4.05	I	4.08	II	3.89	I	4.00	I
2	Training on Integrated nutrient management influence farmers to follow soil testing recommendations	3.68	II	4.00	III	3.85	II	3.84	II
3	Soil testing helps in practicing farming in scientific way	3.55	IV	4.18	I	3.80	III	3.84	II
4	Benefits of Soil testing motivate other famers to take up Soil testing	3.58	III	4.00	III	3.61	V	3.73	III
5	Awareness campaigns on benefits of soil testing helps the farmers to go for soil testing	3.53	V	3.93	IV	3.53	VII	3.66	IV
6	Adopting soil test recommendations helps to get good crop yield and higher returns	3.32	X	4.08	II	3.48	VIII	3.62	V
7	Soil testing is waste of time and money	3.48	VI	3.68	IX	3.56	VI	3.57	VI
8	Soil testing is like blood test to human beings	3.25	XIII	3.85	VI	3.16	XI	3.56	VII
9	Soil testing is useful to adopt integrate nutrient management practices in crops by farmers.	3.30	XI	3.62	XI	3.68	IV	3.53	VIII
10	Soil tests needs to be done once in every 2-3 years for most of the crops.	3.43	VII	3.86	V	3.28	X	3.52	IX
11	Soil testing is a valuable tool for farm development as it determines the inputs required for efficient and economic production	3.26	XII	3.81	VII	3.31	IX	3.46	X
12	Soil sampling as to be avoided in dead furrows, wet spots, areas near main bund, trees, manure heaps and irrigation channels	3.41	VIII	3.70	VIII	2.85	XIV	3.32	XI
13	Soil samples need to be collected by making 'V' shaped cut and removing thick slices of soil from top to bottom of exposed face	3.35	IX	3.41	XIV	3.03	XII	3.26	XII
14	Soil testing can be helpful and effective only if the recommendations are followed by farmers on a regular basis	3.20	XIV	3.65	X	2.84	XV	3.23	XIII
15	Problematic soils can be reclaimed by using suitable reclamation activities with the help of soil testing	3.18	XV	3.58	XII	2.88	XIII	3.21	XIV
16	Applying fertilizers without knowing the actual nutrient needs of the soil may lead to over-fertilization and soil degradation	3.11	XVI	3.45	XIII	2.74	XVI	3.10	XV

Table 2: Overall perception of farmers towards soil testing in different farming situations

Sl. No.	Perception categories	Soil tested farmers								X ² value
		Assured irrigation Situation (n ₁ =60)		Protected irrigation Situation (n ₂ =60)		Rainfed Situation (n ₃ =60)		Pooled (N=180)		
		No.	%	No.	%	No.	%	No.	%	
1.	Poor (<53.29)	15	25.00	11	18.30	17	28.30	43	23.90	1.81 ^{NS}
2.	Good (53.29-59.65)	26	43.30	27	45.00	25	41.70	78	43.30	
3.	Better (>59.65)	19	31.70	22	36.70	18	30.00	59	32.80	
Total		60	100	60	100	60	100	180	100	
Mean		56.47								
Standard deviation		6.37								

NS= Non-Significant; * = Significant at 5 %; ** = Significant at 1 %

3. Relationship between profile characteristics and Perception level of farmers towards soil testing in different farming situations

A correlation test was applied to know the relationship between profile characteristics and perception level of farmers on soil testing in different farming situations. Table 3 indicated that the variables, achievement motivation ($r=0.387$) and extension agency contact ($r=0.353$) had positive and significant relationship at one percent level. Similarly, education ($r=0.251$), livestock possession ($r=0.269$), annual income ($r=0.281$), innovativeness ($r=0.274$), scientific orientation ($r=0.253$), risk orientation ($r=0.268$), cosmopolitaness ($r=0.243$), management orientation ($r=0.277$), social participation ($r=0.263$), mass media exposure ($r=0.282$), social media exposure ($r=0.283$) and extension participation ($r=0.263$) had positive and significant relationship with perception at five percent level. The remaining variables age, family size, land holding, farming experience and material possession had non-significant relationship with perception level of farmers in assured irrigation situation towards soil testing.

In protected irrigation situation, variables viz., achievement motivation ($r=0.419$), scientific orientation ($r=0.417$), risk orientation ($r=0.392$), and extension agency contact ($r=0.431$) had positive and significant relationship at one percent level. Similarly, education ($r=0.297$), livestock possession

($r=0.243$), annual income ($r=0.317$), innovativeness ($r=0.321$), cosmopolitaness ($r=0.283$), management orientation ($r=0.231$), social participation ($r=0.264$), mass media exposure ($r=0.311$), social media exposure ($r=0.320$) and extension participation ($r=0.311$) had positive and significant relationship with perception towards at soil testing at five percent level. The remaining variables namely age, family size, land holding, farming experience and material possession had non-significant relationship with perception level of farmers on soil testing.

Further, in rainfed situation, education ($r=0.287$), livestock possession ($r=0.298$), annual income ($r=0.253$), innovativeness ($r=0.255$), achievement motivation ($r=0.281$), scientific orientation ($r=0.261$), risk orientation ($r=0.293$), cosmopolitaness ($r=0.247$), management orientation ($r=0.262$), social participation ($r=0.283$), mass media exposure ($r=0.298$), social media exposure ($r=0.292$), extension participation ($r=0.311$) and extension agency contact ($r=0.261$) had positive and significant relationship with perception on soil testing at five percent level. The remaining variables age, family size, land holding, farming experience and material possession had non-significant relationship with perception level of farmers. Similar findings were obtained by Jaiswal and Singh (2018) [5], and Mukati *et al.*, (2018) [6].

Table 3: Relationship between profile characteristics and the Perception level of farmers towards soil testing in different farming situations

Sl. No.	Characteristics	Correlation coefficient 'r' values		
		Assured irrigation situation ($n_1=60$)	Protected irrigation situation ($n_2=60$)	Rainfed situation ($n_3=60$)
X ₁	Age	0.177 ^{NS}	0.131 ^{NS}	0.192 ^{NS}
X ₂	Education	0.251*	0.297*	0.287*
X ₃	Family size	0.118 ^{NS}	0.188 ^{NS}	0.091 ^{NS}
X ₄	Land holding	0.058 ^{NS}	0.097 ^{NS}	0.089 ^{NS}
X ₅	Farming experience	0.165 ^{NS}	0.181 ^{NS}	0.174 ^{NS}
X ₆	Livestock possession	0.269*	0.243*	0.298*
X ₇	Annual income	0.281*	0.317*	0.253*
X ₈	Innovativeness	0.274*	0.321*	0.255*
X ₉	Achievement motivation	0.387**	0.419**	0.281*
X ₁₀	Scientific orientation	0.253*	0.417**	0.261*
X ₁₁	Risk orientation	0.268*	0.392**	0.293*
X ₁₂	Cosmopolitaness	0.243*	0.283*	0.247*
X ₁₃	Material possession	0.193 ^{NS}	0.188 ^{NS}	0.152 ^{NS}
X ₁₄	Management orientation	0.277*	0.231*	0.262*
X ₁₅	Social participation	0.263*	0.264*	0.283*
X ₁₆	Mass media exposure	0.282*	0.311*	0.298*
X ₁₇	Social media exposure	0.283*	0.320*	0.292*
X ₁₈	Extension agency contact	0.353**	0.431**	0.311*
X ₁₉	Extension participation	0.261*	0.311*	0.261*

NS= Non-significant; *=Significant at 5%; **= Significant at 1%

4. Extent of contribution of profile characteristics on the perception of farmers towards soil testing in different farming situations

The contribution of independent variables towards perception of farmers in assured irrigation situation was assessed and illustrated in the Table 4. The findings reveals that thirteen out of nineteen independent variables such as education, livestock possession, annual income, innovativeness, achievement motivation, scientific orientation, risk orientation, cosmopolitaness, management orientation, mass media exposure, social media exposure, extension agency contact and extension participation had contributed

significantly towards perception of farmers towards soil testing. The remaining variables have not contributed significantly towards variability in perception. The R^2 value (0.738) indicated that all the 19 independent variables have contributed to the tune of 73.80 percent of variation in perception of farmers towards soil testing.

The contribution of independent variables towards perception of farmers in protected irrigation situation was assessed and illustrated in the Table 4. The findings indicates that fourteen out of nineteen independent variables such as education, livestock possession, annual income, innovativeness, achievement motivation, scientific orientation, risk

orientation, cosmopolitaness, management orientation, social participation, mass media exposure, social media exposure, extension agency contact and extension participation have contributed significantly towards perception of farmers towards soil testing. The remaining variables have not contributed significantly towards variability in perception. The R² value (0.749) indicated that all the 19 independent variables have contributed to the tune of 74.90 percent of variation in perception of farmers towards soil testing.

The contribution of independent variables towards perception of farmers in rainfed situation was assessed and illustrated in the Table 4. The findings reveals that thirteen out of nineteen independent variables such as education, livestock possession,

annual income, innovativeness, achievement motivation, scientific orientation, risk orientation, cosmopolitaness, management orientation, mass media exposure, social media exposure, extension agency contact and extension participation have contributed significantly towards perception of farmers towards soil testing. The remaining variables have not contributed significantly towards variability in perception. The R² value (0.699) indicated that all the 19 independent variables had contributed to the tune of 69.90 percent of variation in perception of farmers towards soil testing. These findings were in line with the findings of Sayaji (2021)^[9] and Shastri *et al.*, (2020)^[10].

Table 4: Extent of contribution of profile characteristics on the perception of farmers towards soil testing in different farming situations

Sl. No	Characteristics	Assured irrigation situation			Protected irrigation situation			Rainfed situation		
		Regression coefficient	SE of Regression coefficient	't' value	Regression coefficient	SE of Regression coefficient	't' value	Regression coefficient	SE of Regression coefficient	't' value
X ₁	Age	0.68	0.70	1.02 ^{NS}	0.68	0.70	1.02 ^{NS}	0.72	0.48	0.66 ^{NS}
X ₂	Education	0.16	0.42	2.57*	0.16	0.42	2.57*	0.28	0.61	2.17*
X ₃	Family size	0.49	0.38	0.77 ^{NS}	0.49	0.38	0.77 ^{NS}	0.37	0.63	1.70 ^{NS}
X ₄	Land holding	0.58	0.68	1.17 ^{NS}	0.58	0.68	1.17 ^{NS}	0.61	0.52	0.85 ^{NS}
X ₅	Farming experience	0.45	0.52	1.15 ^{NS}	0.45	0.52	1.15 ^{NS}	0.58	0.61	1.05 ^{NS}
X ₆	Livestock possession	0.36	0.83	2.27*	0.36	0.83	2.27*	0.36	0.79	2.19*
X ₇	Annual income	0.32	0.82	2.52*	0.32	0.82	2.52*	0.29	0.62	2.13*
X ₈	Innovativeness	0.23	0.51	2.18*	0.23	0.51	2.18*	0.17	0.39	2.23*
X ₉	Achievement motivation	0.22	0.92	4.05**	0.22	0.92	4.05**	0.31	0.72	2.28*
X ₁₀	Scientific orientation	0.18	0.70	3.72**	0.18	0.70	3.72**	0.42	0.89	2.11*
X ₁₁	Risk orientation	0.39	0.41	2.05*	0.39	0.41	2.05*	0.18	0.42	2.29*
X ₁₂	Cosmopolitaness	0.28	0.62	2.19*	0.28	0.62	2.19*	0.33	0.70	2.12*
X ₁₃	Material possession	0.41	0.38	0.92 ^{NS}	0.41	0.38	0.92 ^{NS}	0.68	0.11	0.16 ^{NS}
X ₁₄	Management orientation	0.12	0.29	2.36*	0.12	0.29	2.36*	0.11	0.28	2.47*
X ₁₅	Social participation	0.28	0.65	2.29*	0.28	0.65	2.29*	0.33	0.61	1.80 ^{NS}
X ₁₆	Mass media exposure	0.33	0.83	2.45*	0.33	0.83	2.45*	0.31	0.66	2.12*
X ₁₇	Social media exposure	0.20	0.48	2.32*	0.20	0.48	2.32*	0.41	0.85	2.05*
X ₁₈	Extension agency contact	0.15	0.59	3.91**	0.15	0.59	3.91**	0.29	0.68	2.29*
X ₁₉	Extension participation	0.24	0.59	2.41*	0.24	0.59	2.41*	0.29	0.72	2.43*

NS= Non-significant; *=Significant at 5%; **= Significant at 1%

The above pattern of results obtained may be due the fact that selected profile characteristics of farmers are the deciding factors of perception level of farmers. The extent of contribution of independent variables also reflects on the perception level of farmers on soil testing.

Conclusion

The results revealed that, majority of farmers (76.10%) possessed good to better perception towards soil testing. The correlation test revealed that 14 out of 19 independent variables were found to be having a significant to highly significant relationship with the perception of farmers towards soil testing in all three situations. Further, all the 19 profile characteristics of farmers had contributed to the tune of 73.80, 74.90 and 69.90 percent in assured, protected and rainfed situations respectively in developing better perception towards soil testing. This is an indication of how soil testing is an important practice to be adopted by majority of farmers. Further, the study reveals that farmers have perceived that soil testing is first step towards proper soil fertility management, training on integrated nutrient management influence farmers to follow soil test recommendations and soil test helps in practicing farming in scientific way were the highly perceived characters of soil testing. Hence, the State Agricultural

Universities and developmental departments should emphasis more on soil test and also ensure the adoption of the soil test recommendations in farmers' field.

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