Original Research Article

A STUDY ON FARMERS' PERCEPTION ON SOIL HEALTH CARD IN RANGAREDDY DISTRICT OF TELANGANA STATE

Abstract: Agricultureis the backbone of Indian economy and primary source of income of larger part of Indian population. In view of this, Global soil partnershipwas conducted by the United Nations Food and Agriculture Organization at its headquarters in Rome, Italy, from 7 to 9 September 2011. With this, Government of Indiahad launched the Soil Health Card Schemein 2015. The scheme main objective is to distribute soil health cards (SHCs) to each farmer in the country with advanced technologies such as GPS-enabled tablets and mass testing, along with better fertilizer subsidy policies. The soil samples were tested in laboratories across the India. Government conducted soil testing and issued soil health cards that carry crop specific recommendations of fertilizers required to enable more judicious use of fertilizers to improve productivity and decline cost of cultivation. The present study was conducted in two blocks namely Shabad and Kothur of Rangareddy district of Telangana State during the year 2019-2020 to analyse farmers' perceptionon soil health card.Data was collected using a standardised and pre-tested interview schedule. It was observed that majority of the SHC holders were having moderate perception (71.66 %), followed by good (15.00 %) and poor perception (13.33 %). All profile characteristics of farmers except mass media exposure and innovativeness had significant to highly significant association with regard to perception.The results also revealed that there is a significant association between perception and attitude (chi-square value 44.01) and between attitude and use efficiency(chi-square value 29.66).

Keywords: Soil Health Card, Farmers, Soil Health, perception, Profile characteristics, Association

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1.INTRODUCTION

For the first time during the 11th plan, National Mission for Sustainable Agriculture (NMSA) was introduced as a part of the National Action Plan on Climate Change (NAPCC). The National Project on Management of Soil Health and Fertility and the Rain fed Areas Development Programme (RADP) was also introduced. It is recommended that conservation agriculture, integrated nutrient management, carbon sequestration, erosion control, saline and alkaline soils management, legislation for soil protection, development of remote sensing and

GPS (Global Positioning System) - based Decision Support System (DSS) and amelioration of polluted soil to rejuvenate deteriorated soils. This was followed up in the 12th plan by introducing a new scheme: 'National Project on Management of Soil Health & Fertility' (NPMSH&F). Under this scheme, soil health cards were introduced along with strengthening of soil testing labs and expanding their testing capacity in the country. Further, Nutrient-Based Subsidy (NBS) system was introduced. During the recent years, some of the states like Karnataka, Gujarat, etc., have introduced soil management programmes like Bhoochetana and Krishi Mahotsav programmes. These programmes have provided insights and learnings for the central schemes.In India, intensive farming has led to impressive growth in food grain production by improved seeds varieties, assured irrigation & fertilizers application. States like Rajasthan, Maharashtra, Gujarat, Jammu and Kashmir, Karnataka, Jharkhand, Orissa, Madhya Pradesh, and Telangana account 24 % of the country's degraded area.As the extent of degradation increased over years, soil conservation has gained policy attention. Every year, India was spent nearly 70 billion rupees on fertilizer subsidy. As per estimates, subsidy amount was around Rs.5000/ha of net cropped area and around Rs.5100 per farmer, results in overuse of fertilizers, especially NPK at the cost of micro-nutrients and manures (Anonymous, 2017). India's arable land area is second largest with 159.7 million hectares (394.6 million acres) in the world, after the United States. India is largest fertilizer producer and consumer in the world after China and U.S. The main objectives of present and future agricultural development are food security, nutritional security, sustainability and profitability. In 2025, the demographic projections indicated that land availability per capita of 0.14 hectares will now be reduced to 0.10 hectares. As per World Watch Institute; India has to import 45 million tons of food grains by 2025, if the current growth rate of agricultural production continues. Therefore, focus on improving agricultural productiveness per unit area (159.7 million ha) per unit time. Its gross irrigated area of (82.6 million ha) is the largest in the world.The present work will be a complementary contribution to the comprehensive study of the Farmers' perception about Soil Health Card in relation to maintaining healthy soils to ensure food and nutrition security which is required for feeding the growing population of the country and meeting their fast changing needs for biomass (energy), fibre, fodder, and other products can only be ensured with Nation's life expectancy of people with organic consumption of evergreen sustainable basis. By 2050 world population growth will increase over nine billions which will affect the world food production and ecological services again which will further pressure on soils. Today's world,

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soils recognition is still seen as a second priority but climate change is the major driver putting the soils in the first priority in global agenda. The conservation and, where possible, enhancement and restoration of world soil resources through sustainable and productive use should therefore be the ultimate twinned goal of the Global Soil Partnership.However, despite the essential role that soil plays in the life of people, there is increasing degradation of soil resources due to inappropriate practices, burgeoning population pressures and inadequate governance over this essential resource.The green revolution led to a quantum leap in food production and bolstered world food and nutrition security. In order to meet projected demands over the next 40 years, farmers in the developing world must double food production, a challenge made even more daunting by the combined effects of climate change and growing competition for land, water and energy. Soil is living medium as it provides nutrition to the plant growth and development. Healthy soil contains all 17 elements for crop growth and development. If soil lacks one or more elements, it either reduces yield production or degrades quality of crops. “Soil health” is an assessment of ability of a soil to meet the range of ecosystem functions. Soil health has been defined as "the ability of the soil to sustain the productivity, diversity, and environmental services of terrestrial ecosystems” (Intergovernmental Technical Panel on Soils 2020).In simple words, soil health defined as the “fitness of soil for use”. Soil health is the integration of three forms such as physical, chemical and biological approaches with their functions; a healthy soil can balance all these three components. Soil health plays an imperative role in improving sustainable farming production and food and nutrition security in coming years. The unbalanced use of fertilizers, the shortage of organic matter and the insufficiency of micronutrients substitution and secondary nutrients leading to decrease in soil fertility in many parts of the country. Soil health assessment at regular intervals and a recommendation to ensure that the farmers follow required nutrients to harness the soil’s native nutrients is needed. Healthy soils produce healthy crops that in turn nourish people and healthy ecosystem with healthy planetary process (FAO, 2015). Rathor (2018) observed that majority of farmers (83.00 %) were having favourable perception about soil health card, while 11.00 and 6.00 % of the farmers were with less favourable perception and most favourable perception on soil health card, respectively.Charel (2016) concluded that a good majority of soil health card holders (70.83 %) were having medium level of perception on soil health card, followed by high level (15.00 %) and low level (14.17 %) of perception on soil health card.Chauhan (2015) indicated that a good majority of farmers (71.00 %) were having moderate level of perception on

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low-cost greenhouse technology, while 18.00 and 11.00 % of them had poor level and good level of perception on low-cost greenhouse technology, respectively. Mukati (2016) stated that great majority of the soil health card holders (83.76 %) were having a favourable perception towards soil health card, followed by less favourable (11.97 %) and most favourable (4.27 %) of perception on soil health card.On the other hand, studies have shown that when awareness programmes are followed up by supporting programmes like inputs, etc., soil improvements and increased crop yields were conspicuous. For instance, the Bhoochetana programme in Karnataka has introduced direct benefit transfer in fertilizer subsidy to increase efficiency and strengthening fertilizer supply chain along integrated nutrient management with emphasis on organic fertilizer. Under this programme, Karnataka government supplied micro-nutrients at 50% subsidy. The study estimated that total benefits with soil health mapping and soil test based fertilizer recommendations along with improved practices would be Rs.4.33 lakh crore, against the estimated cost of Rs 0.254 lakh crores (ICRISAT research report IDC-6). The benefit-cost ratio would be 17:1. Besides, economic benefits several environmental benefits, employment generation and several environmental benefits including enhancing the sustainability of Indian agriculture will be additional benefits.In a study of on-farm trails in 8 districts of Andhra Pradesh, it is shown that balanced nutrient treatment in the widespread multi-nutrient (including micronutrients) deficient soils has resulted in significantly higher yields. Balanced nutrition while increasing crop yields maintained plant nutrient composition. Post-harvest soil testing in Nalgonda district showed higher contents of soil organic carbon and available nutrients like P, S, B and Zn in plots with balanced nutrition treatment. In the absence of balanced nutrition, farmers were losing 8% to 102% of current yields in season 1 and 15% to 24% in each of the succeeding 3 to 4 seasons (Chander, *et al*., 2014). 2000- MDG's - Soil management and prevention of desertification. Implementation of soil erosion control (by wind and water) by planting windbreaks and cover crops; improvements in soil fertility with agroforestry systems, cover crops, and conservation of ground and surface water.2008- This UNCCD policy brief "A Sustainable Development Goal for Rio+20: Zero Net Land Degradation" provides a snapshot of the world's land, explains causes and impacts of land degradation and suggestspathways to land-degradation neutrality. The brief reveals that sustainable land-use is a prerequisite for ensuring future water, food and energy security. Given the increasing pressure on land from agriculture, forestry, pasture, energy production and urbanization, urgent action is needed to halt land degradation.2011- The Global Soil Partnership for Food Security and Climate Change Mitigation

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and Adaptation (GSP) brings together international, regional and national organizations that are working in the area of soil protection and sustainable management.The partnership aims to implement the provisions of the 1982 World Soil Charter, and to raise awareness and motivate action by decision-makers on the importance of soils for food security and climate change adaptation and mitigation. 2013- The Intergovernmental Technical Panel on Soils (ITPS) was established at the first Plenary Assembly of the Global Soil Partnership held at FAO Headquarters on 11th and 12th of June, 2013. The ITPS is composed of 27 top soil experts representing all the regions of the world. The main function of the ITPS is to provide scientific and technical advice and guidance on global soil issues to the Global Soil Partnership primarily and to specific requests submitted by global or regional institutions. The ITPS will advocate for addressing sustainable soil management in the different sustainable development agendas. 2015- The International Year of Soils, 2015 (IYS 2015) was declared by the Sixty-eighth session of the United Nations General Assembly on December 20th, 2013 after recognizing December 5th as World Soil Day. The purpose of the IYS is to raise awareness worldwide of the importance of soils for food security, agriculture, as well as in mitigation of climate change, poverty alleviation, and sustainable development.

2. METHODOLOGY

The agencies that implemented the soil health card scheme programme were Department of Agriculture, State Agriculture Universities, Krishi Vignan Kendras and International Crops Research Institute for the Semi-Arid Tropics. For effective monitoring of schemes, output and outcome framework was finalized in consultation with National Institute for Transforming India. The scheme is managed by integrated management division in the ministry Agriculture Corporation and farmer's welfare, government of India.Based on objectives of the study, Ex-post-facto-research design is most often used with social and behavioural sciences because it is difficult to assign a respondent dynamic behavioural condition. Thus, Ex-post-facto-research design was used for the study. It was considered appropriate because the event has already happened. It was a systematic empirical study in which the researcher doesnot have direct control over independent variables because their manifestations have already occurred.The present study was conducted in Rangareddy district of Telangana State during the year 2019-

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2020. Rangareddy district was purposively chosen for the study. The rationale applied for selecting the district was large number of soil samples collected (93,912) and farmers covered (1, 67,041) were more compared to other districts in the state.The village-wise information relating to soil health card holders were obtained from Department of Agriculture, Indian Council of Agricultural Research, Krishi Vignan Kendras,Agricultural extension officers and Agricultural officers. Two blocks namely Shabad (60 respondents)and Kothur (60 respondents) were selected on the same criteria. Again from each block top three villages having more soil health card holders of small, medium and large farmers were selected. In each of the identified villages 20 farmers were randomly selected for collecting the required data for the research. The total of 6 villages were selected and top three villages had maximum number of soil health cards had been issued were chosen in each block through simple random sampling 20 respondents per village were selected. Thus, 60 respondents were selected from each of the blocksnamely Shabadand Kothur. One district X two blocks X three villages X 20 farmers.Totalling the sample constituted for the study to 120 farmers.The study aimed to assess the statements about the perception on soil health card recommendations and to find out the Association between farmers profile characteristics with their perception on soil health cardin relation to SHC recommendations. Perception is defined as the process of understanding sensation or become aware by the farmers on soil health card.Procedure followed by Charel (2016) with suitable modifications was used for present study with 21 statements administered on the sample farmers and asked to express their reaction of each item on three-point continuum as given Table 2. Thus, the possible score for farmer's perception on soil health card ranges between minimum of 21 and maximum of 63. The respondents were classified into three categories on the basis of mean and standard deviation as a measure of check.

2.1. Statistical tools and tests used

The data collected for the purpose of the study was objectively scored, categorized and tabulated. The following statistical tools were used in the study to analyse the data which was collected using personal interview method. To achieve the defined objectives, the filed survey method was adopted. Before the interview, the investigator had introduced her to the respondents and explained the purpose or objective of the study. Respondents were interviewed at their home or farms. To avoid misunderstanding, a friendly atmosphere was created among them. Statistical

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tools and tests used such as arithmetic mean, Frequency, percentage, standard deviation, rank, chi-square test and Yates' correction for continuity. Most popular Software like Spps was used to analyse the collected data.

3. RESULTS AND DISCUSSIONS

The data collected from our sampled respondents tabulated and analysed using suitable statistical tools and techniques. The results are explained along with the inferences drawn in relation to the objectives set forth for the study.

3.1. Overall perception of farmers about soil health card

15.00 %of the farmers were having good perception regarding soil health card, while 71.66 and 13.34 % of them had moderate and poor level of perception regarding soil health card, respectively. The probable reason for majority of farmers were having moderate perception might be due to lack of awareness of soil health card scheme and limited understanding about soils health. Further the respondents mostly had education at secondary level, medium level of mass media exposure and scientific orientation. Therefore, the perception of soil health card holders was too good with 86.66 % of farmers. These results shown in Table 1 and Figure 1. These findings are in line with results of (Kadam *et al.* 2012; Chauhan 2015; Sonawane *et al.* 2015 and Charel 2016).

Table 1: Overall perception of farmers about soil health card(n=120)

Sl. No.	Perception category	SHC holders	
		Frequency	Per cent
1.	Poor perception(< 51.68)	16	13
2.	Moderate perception (51.68 to 53.89)	86	72
3.	Good perception (> 53.89)	18	15
Total		120	100.00

Mean= 52.79; Standard Deviation= 2.21

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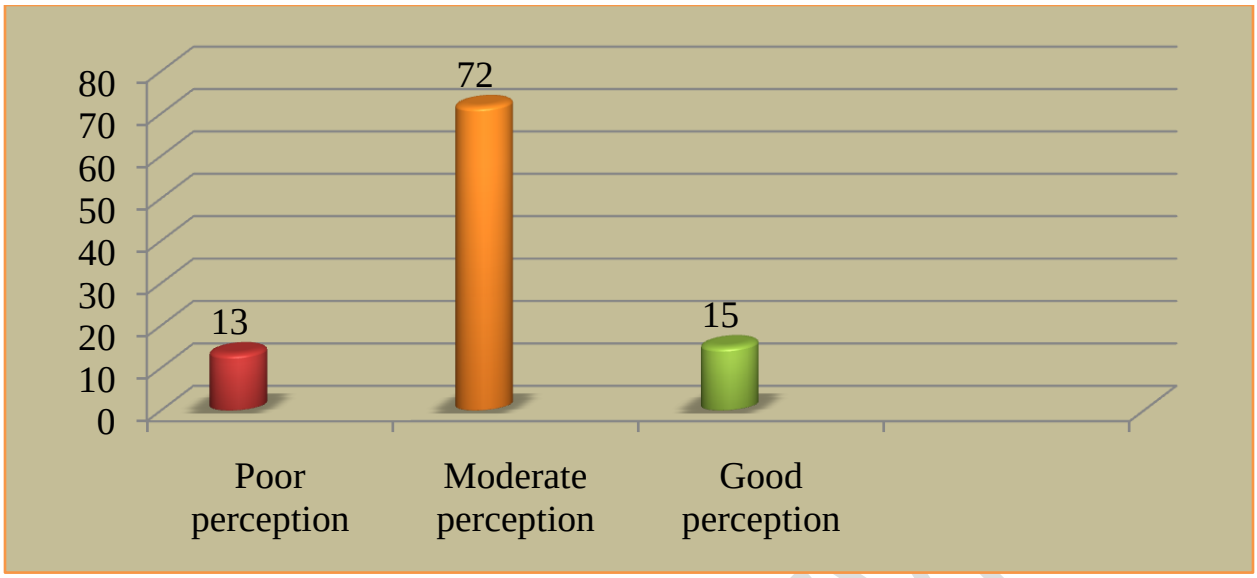

Fig. 1: Overall perception of farmers about Soil Health Card

3.2. Statement-wise perception of farmers about soil health card

These results are shown in Table 2.Most of the farmers (98.33 %) were either from agree to undecided with the statement that "We can know the acidity or alkaline levels of soil by referring the pH value with the normal range given in soil health card". Probable reason might be to know the saline and alkaline soils which are unsuitable for crop cultivation thereby can be corrected by amendments like gypsum.

The remaining three statements, namely, "Soil health card intends to provide the information of primary and secondary nutrients, "Soil health card suggests suitable reclamation measure to correct problem soils" and "Adoption of recommended varieties and level of nutrients will ensure in getting the reference yield of the area", were either from agree to undecided (98.32 %). Probable reason might be farmers understood correcting the problematic soils to ensure good crop yield

97.50 %of farmers were either from agree to undecided with the statement that "Soil health card helps in arriving commonality among the farmers, extension workers and experts in levels of nutrients application for the soil". Probable reason might be organising the awareness programmes on healthy soils by extension agencies tie up all in arriving commonality among the farmers, change agents and experts.

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Most of the farmers (97.49 %) were either from agree to undecided with the statement that “Soil health card suggests suitable corrective measures to deficient soils in order to increase the soil health status for better yield”. Probable reason might be farmers understood to correct deficient soils to improve soil status and good crop yield

The four statements, namely, “ Indication of soil nutrients availability in soil health card helps to decide the quantity of organic and inorganic nutrients required for the crop, “Soil health card recommendations help to remove unnecessary expenditure on fertilizers, “Soil health card helps to know recommended crops varieties and their reference yields for the land under consideration” and “Farmers can access their soil health card information 24X7 through online soil health card portal were either from agree to undecided of (96.66 %). Probable reason might be farmers understood the importance of soils, input cost savings and online platform of various services.

The statement “The validity of soil health card is lifelong and no further soil health card needs to be obtained”, were either from agree to undecided with95.82 % of farmers. Probable reason might be farmers practising traditional practices.

95.00 %of farmers were either from agree to undecided with the statement “Soil health card helps to check the excessive application of fertilizers”. Probable reason might be farmers understood that fertilizers application should be reduced to save input cost and improve better crop yields.

94.99 % of farmers were either from agree to undecided with two statements namely “Scientific crop planning can be done by referring the soil health range parameters mentioned in the soil health card” and “The results of soil health card is an authenticated one, as it indicates date of soil sampling, geo positioning system coordinates and testing laboratory in which it was analysed”. Probable reason might be farmers understood the scientific methods of farming to improve healthy soils.

Most of the farmers (94.16 %) were either from agree to undecided with the statement that “Having the soil health card is a must for getting benefits under government schemes”. Probable reason might be farmers will know the recommended inputs for their cost of cultivation practices.

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The statement “On the basis of EC value given in soil health card, we can know the salinity level in the soil and take necessary action for improvement, “Soil health card indicates available organic matter in the soil which could serve as a basis for working out required quantity of organic matter application in the soil” and “Soil health card suggests us multiple combinations of NPK fertilizers to choose the fertilizers available in the market to meet the recommended fertiliser ratio”, obtained an (93.33 %) were either from agree to undecided. Probable reason might be farmers knowing the right quantity of fertilizer application either organic or inorganic

Most of the farmers (93.00 %) were either from agree to undecided with the statement that “Proper utilization of soil health card information will leads to economic benefits”. Probable reason might be farmers understood that healthy soils lead to better yield cum income.

It revealed that (92.50 %) of respondents were either from agree to undecided with the statement that “Famers can know the quantity of plant nutrient elements available in the soil through soil health card”. Probable reason might be farmers understood that elements available in soil.

Table 2: Statement-wise perception of farmers about soil health card (n=120)

SI. No.	Statements	A		UD		DA	
		f	%	f	%	f	%
1	SHC intends to provide the information of primary and secondary nutrients.	80	67	38	32	02	1
2	SHCs recommend the levels of micro nutrients for soil application.	61	51	49	41	10	8
3	Proper utilization of SHC information will leads to economic benefits.	65	54	46	39	09	7
4	Soil Health Card helps in arriving commonality among farmers, extension workers and experts in levels of nutrients application for the soil.	66	55	51	43	03	2
5	Soil Health Card helps to check the excessive application of fertilizers	73	61	41	34	06	5
6	Famers can know the quantity of plant	66	55	45	38	09	7

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	nutrient elements available in the soil through SHC.						
7	Soil Health card suggests suitable corrective measures to deficient soils to improve soil health status for better yield.	67	56	50	42	03	2
8	The indication of soil nutrients availability in SHC helps to decide the quantity of organic and inorganic nutrients required for the crop.	69	58	47	39	04	3
9	Scientific Crop planning can be done by referring the soil health range parameters mentioned in the SHC.	73	61	41	34	06	5
10	SHC recommendations help to remove unnecessary expenditure on fertilizers.	69	58	47	39	04	3
11	We can know the acidity or alkaline levels of soil by referring the pH value with the normal range given in SHC.	61	51	57	48	02	1
12	SHC suggests suitable reclamation measure to correct problem soils.	71	59	47	40	02	1
13	On the basis of EC value given in SHC, we can know the salinity level in the soil and take necessary action for improvement.	66	55	46	38	08	7
14	SHC indicates available organic matter in the soil which could serve as a basis for working out required quantity of organic matter application in the soil.	64	53	48	40	08	7
15	Having the SHC is a must for getting benefits under government schemes.	64	53	49	41	07	6
16	Adoption of recommended varieties and level of nutrients will ensure in getting the reference yield of the area.	68	57	50	41	02	2
17	The validity of SHC is lifelong and no further SHC needs to be obtained.	65	54	50	42	05	4
18	The results of SHC is an authenticated one, as it indicates date of soil sampling, GPS coordinates and Testing Laboratory in which it was analysed.	67	56	47	39	06	5

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19	SHC helps to know recommended crops, varieties and their reference yields for the land under consideration.	63	53	53	44	04	3
20	Farmers can access their SHC information 24X7 through online SHC portal.	70	58	46	39	04	3
21	SHC suggests us multiple combinations of NPK fertilizers to choose the fertilizers available in the market to meet the recommended fertiliser ratio.	60	50	52	43	08	7

A-Agree, UD- Undecided, DA- Disagree

f=frequency of Farmers, %=Per cent

The statement “Soil health cards recommend the levels of micro nutrients for soil application”, were either from agree to undecided categories by 91.66 %of farmers. Probable reason might be farmers understood that application of micro nutrients also plays a vital role in plant anatomical system.

The statements“Soil health card intends to provide the information of primary and secondary nutrients”, “we can know the acidity or alkaline levels of soil by referring the pH value with the normal range given in soil health card”, “soil health card suggests suitable reclamation measure to correct problem soils” and “adoption of recommended varieties and level of nutrients will ensure in getting the reference yield of the area” were disagree category by (1.67 %) and (1.68 %) of farmers. Probable reason might be due to their primary education level or illiterate.

3.3. Association between farmers profile characteristics with their perceptionon soil health card.

Chi square test was being employed to know association between profile characteristics of farmers with perception, attitude and use efficiency of soil health card.

These results of analysis of association between farmer’s profiles characteristics with regard to perception on soil health card are presented in Table 3. The variablesmass media exposure and innovativeness had no association with perception level of farmers.Whereasvariables such as education, land holding, management orientation of farmers had significant association with

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perception on soil health card at five per cent level.Variables such as, age, scientific orientation, annual income, farming experience, cosmopoliteness, extension contact, extension participation, social participation, achievement motivation of farmers were highly significant association withfarmers perception on soil health card at one per cent level.

The explanation for the profile characteristics of farmers were having significant to highly significant association with perception on soil health card is discussed in the following paragraphs.

3.3.1. Age and perception about soil health card

There exists a highly significant and positive association between farmer's age and their perception on soil health card at one per cent level. The probable reason could be that most of farmers were in middle to young age group would have more educationresulting in medium level perception on soil health card.

These findings are in line with results of Chand (2012).

3.3.2. Education and perception about soil health card

It is a fact that education can improve a farmer's understanding. Educated farmers can easily perceive scientific facts that enhance their perception. The education of an individual gives farmers the opportunity to expose themselves to the media (radio, television, newspapers, etc.), which convey messages about the peculiarities and advantages of the soil health card scheme. Thus, there was positive andsignificant association exists between farmers education with perception on soil health card at five per cent level.

These findings were in line with study conducted by Hingonekar (2011) and Badhe (2012).

3.3.3. Annual income and perception about soil health card

The chi-square test observed a highly significant association exist between farmers annual income and had positive with perception regarding soil health card at one per cent level. Probable reason could be that the farmers had good incomes that they could have spent on education, improve their participation in the extension and thus can increase their perception.

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These findings are in line with results of Badhe (2012) and Chand (2012).

3.3.4. Land holding and perception about soil health card

It was clear from the data that positive and a significant association between farmers land holding with perception on soil health card at five per cent level. The likely reason could be that large farmers were perceived to reduce the cost of fertilizers and a willingness to use all components wisely by using the information from their soil health cards.

These findings are in line with results of Hingonekar (2011), Badhe (2012), Shiroya (2014) and Chauhan (2015).

3.3.5. Farming experience and perception about soil health card

As a consequence, there exists a positive and highly significant association between farming experience of farmers with perception on soil health card at one per cent level. The probable reason could be that most farmers would have understood and easy to follow the soil health card information. With this the farmers had a great agricultural experience.

These findings are in line with results of Shiroya (2014).

3.3.6. Cosmopoliteness and perception about soil health card

Probably the reason could be a cosmopolitan farmer in having highly significant association exist between the farmers cosmopoliteness and had positive with perception on soil health card at one per cent level could be due to the farmers perceived during their visit to agricultural extension personnel offices located in the district, they could be seen the information display on soil health card. He may have interacted with agricultural extension personnel regarding the procedure of obtaining benefits under scheme.

These findings are in line with results of Chauhan (2015).

3.3.7. Mass media exposure and perception about soil health card

There exists a non-significant association between farmers mass media exposure with perception on soil health card. Hence, null hypothesis was accepted.

These findings are in line with results of Kesha Ram *et al.* (2015).

3.3.8. Extension contact and perception about soil health card

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Probably reason could be a literate and most of the farmers had an education up to and above middle school level. Agricultural extension professionals not only communicate on the latest farm technologies to farmers, but they also inform farmers on various agricultural or extension programs /schemes /reforms implemented by state department of agriculture, which enhance their perception. The chi-square test revealed a positive and highly significant association exist between the extension contacts of farmers with perception on soil health card at one per cent level.

These findings are in line with results of by Patidar and Patidar (2015).

3.3.9. Extension participation and perception about soil health card

Probably reason could have a participation in extension activities such as, group discussion, demonstrations, training programs, field days, farmers field school, krishimelas, *etc.* organized would percieved among farmers regarding the scope and benefits of soil health card in having positive and highly significant association exist between farmers extension participation with perception on soil health card at one per cent level.

These findings are in line with results of Chauhan (2015).

3.3.10. Social participation and perception about soil health card

There exists a social participation with positive and highly significant association with perception on soil health card at one per cent level. Probable reason might have most of soil health card holders will be stay connected with cooperatives societies and organizations which enhance their perception.

These findings are in line with results of Hingonekar (2011), Kadam *et al.* (2012) and Shiroya (2014).

3.3.11. Management orientation and perception about soil health card

Probably reason could be an inculcation of managerial abilities in farmers having a positive and significant association between farmers management orientation with perception on soil health card at five per cent level, who were perceived through extension activities like (meetings/discussion, capacity building, field visits, demonstrations, exposure visits, farm school etc.) organized.

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These findings are in line with results of Chauhan (2015).

3.3.12. Scientific orientation and perception about soil health card

It observed that scientific orientation had positive and highly significant association with perception on soil health card at one per cent level. The probable reason might be farmers had used the educational qualifications to understand soil health cards scientific information and therefore, increase their perception.

These findings are in line with results of Hingonekar (2011), Badhe (2012) and Chauhan (2015).

3.3.13. Achievement motivation and perception about soil health card

The farmers were perceived on knowing and obtaining the soil health card benefits to excel in agriculture by contacting and participating in the extension functionaries and extension activities. As a result, there was a positive and highly significant association between achievement motivations on farmers with their perception on soil health card at one per cent level. Probably reason could be an achievement motivation was important determinant on excellence or perfection in what one does.

These findings are in line with results of Shiroya (2014).

3.3.14. Innovativeness and perception about soil health card

The chi-square test revealed that non-significant association exist between the innovativeness of farmers with perception on soil health card. Hence, null hypothesis was accepted.

These findings are in line with results of Chand (2012).

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Table 3: Association between farmers profile characteristics and their perception about soil health card

(n=120)

Sl. No.	Characteristics	$\chi 2$	C-value
1.	Age	17.36 **	0.28

2.	Education	6.59 *	0.16
3.	Annual income	56.49 **	0.43
4.	Land holding	8.72 *	0.18
5.	Farming experience	41.76 **	0.38
6.	Cosmopoliteness	20.97 **	0.28
7.	Mass media exposure	5.55 NS	0.15
8.	Extension contact	10.47 **	0.20
9.	Extension participation	21.47 **	0.28
10.	Social Participation	13.75 **	0.23
11.	Management orientation	9.71 *	0.19
12.	Scientific orientation	15.25 **	0.24
13.	Achievement motivation	16.69 **	0.34
14.	Innovativeness	1.75 NS	0.08

NS=Non-significant, *=Significant at 5% level, **=Significant at 1% level, **C**value=Critical value

4. CONCLUSION

The farmers need to register at the web portal *www.soilhealth.dac.gov.in* along with the characteristics of collected soil samples and reports from soil test laboratory. Once registered, the farmer can track test results through soil testing labs, fertilizer and nutrient recommendations and soil health card generation. The majority of respondents possessedhad medium perception about soil health card information. Extension personnel involved in conducting capacity building programmes need to be evolving an exercise that makes the farmers to comprehend soil health card values and right way of making inferences for cropping decisions.Field days need to be arranged at appropriate crop growth stage for farmers of the same and nearby villages. Subject matter specialists should explain the advantages of soil test based fertilization and need based use of soil amendments like for acidic soils (pH below normal) and alkaline or saline soils (pH above normal), Gypsum or liming materials are to be used. Also the Agriculture Officer of the area

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needs to be contacted for reclamation of soil. Intensive use and need of Information and Communication Technologies for database management for faster delivery of soil health cards in Public Private Panchayat Raj Partnership mode and popularizing soil test based Integrated Nutrient Management through field demonstrations or field days.

Soil and Water Conservation through Land Shaping Techniques in Coastal Regions should be strengthened for sustainable and conservative agriculture.The Panchayat Raj Institutes (PRIs) need to be involved in publicizing the demonstrations and training of farmers and in ensuring participation of farmers from nearby areas for widespread dissemination of technology.The follow-up activities by extension agency to make the best use on soil health card recommendations are inadequate was another constraint. Undertaking appropriate follow-up activities is a must for the success of any program or project. Timely reminding farmers through online platforms and giving holding hands in the procurement of fertilizers need to be carried out by extension agencies to win the confidence of the farmers.

Last but not least, in grid sampling soil mapping should be strengthened as it provides soil data of both farmers who practices chemical and natural farming side by side in farming locations irrespective of soil physical, chemical and biological properties and conditions along with specific site location on grid basis. In some cases soil health card may not be applicable to farmers who practice less application of fertilizers or opt for sustainable agriculture of natural farming.Knowledge management for farmers, policy makers and producers associations.To save healthy soils for sustainable agriculture to “Save and Grow” – farmers need to be facilitated to stop soil degradation and restore degraded soils through targeted soil research and development of robust soil information systems. The government need to promote inclusive policies in its governance with adequate investment for sustainable soil management and provide effective education / extension programmes at various levels.

4.1. Suggestions and opportunities for the future research

1. The similar investigation can be taken in other districts with varied agro climatic conditions.

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2. The current investigation was conducted with limited sample size. To derive wider generalization about the usage of the soil health card, a research study with a higher sample size could be taken up.

3. The case studies of popular and successful farmers who have followed the nutrients management concerning soil health card recommendations can be documented and publicised.

4. The impact on techno and socio-economic aspects may be studied with selected beneficiaries and non-beneficiaries farmers through action and participatory research with financial support from Governments, Private firms and Non-Government organisations to see the success and failure of soil health card scheme in the parts of country.

5. There is need to study the sustainability of the soil health card scheme under different topographical situations in the long run for ever green revolution for sustainable agriculture to ensure nations' life expectancy of people food and nutrition security as climate change is putting soils in the first priority in the global agenda.

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