Original Research Article

A Study on Profile characteristics of farmers on Soil Health Card in Rangareddy District of Telangana, India

ABSTRACT

Agriculture is the backbone of the Indian economy and the primary source of income for the larger part of the Indian population. The investigation was conducted in two blocks namely Shabad and Kothur of Rangareddy district of Telangana State during the year 2019-2020 to analyse the profile characteristics of farmers on the soil health card. Ex-post-facto-research design was used for investigation. Data were collected using a standardised and pre-tested interview schedule. It was observed that the larger number of farmers were in the categories of middle-aged (45.83 %), small farmers (29.17 %), studied up to PUC (21.67 %), medium level on farming experience (29.17%), medium level on achievement motivation (58.33 %), medium level of management orientation (50.83 %), medium level on scientific orientation (75.00 %), medium level on mass media exposure (55.83 %), medium level on extension participation (40.83 %), membership in one organization about social participation (46.66 %), medium level on innovativeness (70.83 %), medium level extension contact (66.66 %) and a medium level of cosmopoliteness (61.66 %). Less than one-third of farmers had a farming experience of 30.00 per cent, 58.33 per cent of respondents belonged to the low annual income group and 11.66 per cent had a high level of cosmopoliteness. The Panchayat Raj Institutes need to be involved in publicizing demonstrations and training farmers in ensuring farmer participation from nearby areas for widespread dissemination of technology. 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.

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

INTRODUCTION

The global soil partnership was initiated by the United Nations Food and Agriculture Organization at its headquarters (Rome, Italy) in 2011. In response, the Government of India had launched the flagship Programme of Soil Health Card Scheme to cover the entire country with

information communication and soil mapping events, aiming to maintain healthy soils to ensure the food and nutrient security, enhance the life expectancy of people, and maintain agricultural goods export at competitive prices. By 2050 the world population will increase to over nine billion, challenging the world food production and ecological services that rely on healthy soils. 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 Rainfed 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 soil testing labs and expanding their testing capacity in the country. Further, the Nutrient-Based Subsidy (NBS) system was introduced. In recent years, some 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 through improved seeds varieties, assured irrigation & fertilizer 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 has spent nearly 70 billion rupees on fertilizer subsidies. As per estimates, the subsidy amount was around Rs.5000/ha of net cropped area and around Rs.5100 per farmer, resulting in the overuse of fertilizers, especially NPK at the cost of micro-nutrients and manures (Anonymous, 2017). India's arable land area is the second largest with 159.7 million hectares (394.6 million acres) in the world, after the United States. India is the 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 of 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 billion which will affect the world food production and ecological services again which will further pressure on soils. In today's world, soil recognition is still seen as a second priority but climate change is the major driver putting the soils the first priority on the 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 a living medium as it provides nutrition to plant growth and development. Healthy soil contains all 17 elements for crop growth and development. If the soil lacks one or more elements, it either reduces yield production or degrades the quality of crops. "Soil health" is an assessment of the 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 is 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 the coming years. The unbalanced use of fertilizers,

the shortage of organic matter and the insufficiency of micronutrient substitution and secondary nutrients lead 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 are needed. Healthy soils produce healthy crops that in turn nourish people and healthy ecosystem with a healthy planetary process (FAO, 2015). Subhash Chander (2018) revealed that the majority of respondents were in the middle age group (59.44 %), followed by the old age group (22.78 %) and the young age group (17.78 %). Raghavendra Chowdary *et al.* (2018) reported that 28.00, 17.00 and 55.00 per cent of them had a secondary education, and college education and the remaining had a primary level of education, respectively. Raghavendra chowdary *et al.* (2018) stated that the majority of them were in medium annual level income (40.00 %), followed by low annual level income (35.00 %) and high annual level income (25.00 %). Raghuwanshi (2015) observed that 40.00 per cent of farmers were having medium land holding, followed by an equal percentage of farmers (23.00 %) had small and large land holding and 37.00 per cent had marginal land holding. Jaganathan and Nagaraja (2015) revealed that nearly three fourth of the Areca nut-based multi-species cropping system followers (73.40 %) had medium-level farming experience, followed by high level (14.40 %) and low level (12.20 %) of farming experience. Chhodavadia (2016) concluded that more than half of the farmers (56.00 %) were having a medium level of cosmopoliteness, whereas 33.50 and 10.50 per cent of them had a high and low cosmopoliteness, respectively. Chhodavadia (2016) observed that more than half of the farmers had a medium level of mass media exposure (56.00%), while 33.50 and 8.50 per cent of the respondents were having high and low levels of mass media exposure, respectively. Parmar (2014) revealed that nearly three fifth of the respondents (59.00 %) were having a medium-level extension contact, whereas 23.50 and 17.50 per cent of them had a low-level and high-level extension contact, respectively. Parmar (2014) concluded that 45.00 per cent of soybean cultivators were having medium extension participation, followed by high (30.00 %) and low (25.00 %) extension participation. Sihare (2015) revealed that most of the organic respondents (85.00 %) were having a medium level of social participation, followed by a high level (15.00 %) and none of them was in low level of social participation. Asha (2015) indicated that a little less than half of the respondents (47.50 %) were in a medium level of management orientation, whereas 29.17 per cent and 23.33 per cent were having a low and high level of management orientation, respectively. Dhodiya

(2015) reported that the majority of pesticide users (74.67 %) were having medium-level scientific orientation, whereas 15.33 and 10.00 per cent of them had a low level and high-level scientific orientation, respectively. Patel (2014) stated that most of the farmers (95.83 %) were having a medium level of achievement motivation, followed by a high level (4.17 %) and none had a low level of achievement motivation. Sihare (2015) revealed that a large majority of organic respondents (70.00 %) were having medium innovativeness, while 30.00 per cent of the respondents had high innovativeness, whereas no one for low innovativeness.

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 strengthen the fertilizer supply chain along with integrated nutrient management with emphasis on organic fertilizer. Under this programme, the Karnataka government supplied micro-nutrients at a 50% subsidy. The study estimated that the total benefits of 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 (International Crops Research Institute for the Semi-Arid Tropics 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 the 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 suggests pathways 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 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 the 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, and agriculture, as well as in mitigation of climate change, poverty alleviation, and sustainable development. Soil health is proposed to focus on the maintenance of four key functions: carbon transformation; nutrient cycles; maintenance of the soil structure; and control of pests and diseases (Kibblewhite *et al.,* 2007). Naturally, soils contain many nutrients, among these the major elements of prime importance are nitrogen, phosphorus, calcium and potassium. Such nutrients are important for the growth and development of plants (Stevens, 2018). Over the years, the indiscriminate use of fertilizers, the less application of organic matter and the non-replacement of reduced micro and secondary nutrients have contributed to soil nutrient deficiencies. The level of awareness and acceptance of soil fertility management strategies among the farming community is relatively limited and the acceptance of soil test-based fertilisers is also significantly affected by various factors (Chowdary *et al.,* 2017). That's why interpreting soil health management is vital to the sustainability and stability of the climate adaptive farming systems (Xue *et al.,* 2019). In order to achieve this, the application of soil test-based fertilisers as per the recommendations of the 'Soil

Health Card' is a significant move by the Government of India toward sustainable agriculture, which was launched in 2015 (Mukati *et al.*, 2018). The scheme is seen as a holistic measure to achieve sustainable soil health and farm economy with the full use of SHC recommendations, which is a tool to help farmers track and improve soil health and allows farmers to implement soil and crop-specific fertilisers (Jotin and Anup, 2017). An SHC is intended to denote soil nutrient status to each farmer and recommend on the right usage of fertilisers and micronutrients and also the required soil amendments to be applied in the long term to maintain soil health (Subhash *et al.*, 2019). Consequently, soil health needs to be assessed under various management schemes in order to recognise and enhance the functioning of soil ecosystems. Precise and comprehensive measurements of soil health will provide the basis for soil health management (Liu *et al.*, 2018). In view of the increasing importance of soil testing and management of soil health, a study was carried out to examine the farmers' profile characteristics on soil health card holders.

METHODOLOGY

The agencies that implemented the soil health card scheme programme were the Department of Agriculture, State Agriculture Universities, Krishi Vignan Kendras and International Crops Research Institute for the Semi-Arid Tropics. For effective monitoring of schemes, the output and outcome framework was finalized in consultation with National Institute for Transforming India. The scheme is managed by an integrated management division in the ministry of Agriculture Corporation and the farmer's welfare, the government of India. Based on the objectives of the study, the 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, an 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 does not have direct control over independent variables because their manifestations have already occurred. The present study was conducted in the Rangareddy district of Telangana State during the year 2019-2020. Rangareddy district was purposively chosen for the study. The rationale applied for selecting the district was a 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 was obtained from the 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. A total of 6 villages were selected and the top three villages that had a 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 blocks namely Shabad and 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 farmers' profile characteristics on soil health card holders.

Modalities followed for implementation of soil health card

Telangana State Department of Agriculture was the nodal department for the implementation of this scheme. It will provide the necessary support to State Level Executive Committee (SLEC) and had the following functions:

a) Prepare an annual state-level action plan by compiling a district-wise action plan and submit to the state-level executive committee for approval and thereafter forward the same to executive committee.

b) Receive funds from the Department of Agricultural Corporation for implementing / outsourcing organizations and oversee, monitor & review implementations of the programmes.

c) Organize workshops, seminars and training programmes for all interest groups/associations at the state level.

d) Operationalize Information Communication Technology (ICT) enabled management system up to grass-root level.

e) Conduct an independent evaluation to assess the performance of the scheme in the state.

f) One per cent of the total allocation to the state may be earmarked for administrative and other contingent expenses. Expenditure in excess of the one per cent limit was met by the state from their own resources.

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 the 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 homes or farms. To avoid misunderstanding, a friendly atmosphere was created among them. Statistical tools and tests were 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.

RESULTS AND DISCUSSIONS

The data collected from our sampled respondents was 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.

1. Personal characteristics of Soil Health Card Holders

1.1. Age

The data in Table 1 shows that more than two-fifth of soil health card holders (45.83 %) were belongs to the middle age group, while 37.50 per cent and the remaining 16.67 per cent were belonging to old age group and young age group, respectively. The reason may be due to the fact India is having half of its population as youth and rural farmers are a little above youth in age due to lesser preference to have agriculture as their occupation. These findings are in line with the results of Subhash Chander (2018).

1.2. Education

The data disclosed in Table 1 reveals that 21.67, 25.00, 20.00, 10.00 and 7.50 of farmers had studied up to PUC, high school, middle school, primary school, and graduation. None of the farmers had an educational level of post-graduation, respectively, whereas, 15.83 per cent had being illiterate. Probably reason might be that majority of farmers were educated up to high school due to their medium annual family income and high school availability in their village. Insufficient facilities for higher education and the non-availability of colleges nearby their villages, which would have forced them to travel to cities to pursue college education made the percentage lesser. Another reason behind illiterates could be their lack of interest, lack of encouragement from family members and their poor economic status. Therefore, efforts are required to educate the illiterates and school drop-outs through Adult Education and Functional Literacy Programs in villages to increase their education. These findings are in line with the results of Mahadik (1995).

1.3. Land holding

It is observed from Table 1 that 29.17 per cent, 55.00 per cent and 15.83 per cent of farmers were having small, medium and large landholdings, respectively. It might be that majority of soil health card holders had possessed medium land holding due to fragmentation of land within nuclear families in rural areas. These findings are in line with the results of Raghuwanshi (2015).

1.4. Farming experience

The data pertaining to Table 1 states that 40.83 per cent were having a medium level of farming experience, while 30.00 and 29.17 per cent of them had a high and low level of farming experience, respectively. The probable reason for medium to a high level of farming experience might be that elder members working in family involve their next generations also into agriculture like no other alternative employment available in the village. These findings are in line with the results of Hingonekar (2011).

Table 1: Personal characteristics of Soil Health Card Holders (n=120)

Sl. No.	Characteristics	Category	Farmers	
			Frequency	Percentage
1.	Age	Young (<35 years)	20	16.67
		Middle (35-50 years)	55	45.83
		Old (>50 years)	45	37.50
2.	Education	Illiterate	19	15.83
		Primary school	12	10.00
		Middle school	24	20.00
		High school	30	25.00
		PUC	26	21.67
		Graduation	09	7.50
		Post-graduation	0	0.00
3.	Land holding	Small Farmers (upto 2 acres)	35	29.17
		Medium Farmers (2 acres - 4 acres)	66	55.00
		Big Farmers (>4 acres)	19	15.83
4.	Farming experience	Low (upto 14 years)	35	29.17
		Medium (15-30 years)	49	40.83
		High (>30 years)	36	30.00

2. Socio-economic characteristics of soil health card holders

2.1. Annual income

The data depicted in table 2, shows that the majority of farmers were belonging to low income group (58.33 %), while 26.67 and 15.00 per cent were belonging to medium and high-income groups, respectively. The probable reasons might attribute to varied income categories of farmers could be variations in land holding, adoption of improved practices and level of practising of subsidiary occupations. These findings are in line with the results of Dhodiya (2015).

2.2. Cosmopoliteness

The data in table 2 shows that most of the farmers (61.68 %) were having a medium level of cosmopoliteness, whereas a little over one-fourth (26.66 %) and 11.66 per cent had low and high levels on cosmopoliteness, respectively. Here farmers had medium cosmopoliteness as they have medium economic conditions and moderate resources that decide the movement's frequency of farmers. These findings are in line with the results of Sunil Vasant More (2014).

2.3. Mass media exposure

The data presented in Table 2 states that 55.83 per cent had a medium level of mass media exposure, while 22.50 and 21.67 per cent were falling under the low and high level of mass media exposure, respectively. Mass media contact increases farmers' ability in knowing recent information and technology and also widens the mental horizon of farmers to accept and adopt practices in agriculture. Various channels such as television, radio, newspaper *etc.*, we're reinforcing the confidence in farmers to take up new activities or new innovations. These findings are in line with the results of Garg (2014), Parmar (2014) and Raghuwanshi (2015).

2.4. Extension contact

66.66 per cent of farmers were having a medium level of extension agency contact, while 19.16 per cent and 14.18 per cent of them had a low and high level of extension contact, respectively (Table 2). The liable reason for medium extension contacts of farmers might be that, farmers' regular and frequent visits to Krishi Vignan Kendra's in finding information on soil testing analysis and also information provided by agriculture officers on improved practices whenever needed. These findings are in line with the results of Sunil Vasant More (2014) and Parmar (2014).

2.5. Extension participation

The results shown in Table 2 state that 40.83 per cent of respondents had a medium level of extension participation, whereas 34.17 and 25.00 per cent had a high and low level of extension participation, respectively. The pertinent reasons may be that most of the farmers had good contact with extension functionaries of line departments and private companies as a result they could have participated actively in various extension activities for gathering the recent

information and to know the worth of technologies. These findings are in line with the results of Parmar (2014).

Table 2: Socio-economic characteristics of soil health card holders (n=120)

Sl. No.	Characteristics	Category	Farmers	
			Frequency	Per cent
1.	Annual income	Low (Up to 50,000)	70	58.33
		Medium (50,001 - 1,00,000)	32	26.67
		High (Above 1, 00,000)	18	15.00
2.	Cosmopoliteness Mean = 22.99 SD= 3.48	Low (<13.84)	32	26.66
		Medium (13.84 to 17.33)	74	61.68
		High (>17.33)	14	11.66
3.	Mass media exposure Mean = 6.39 SD = 1.36	Low (<5.71)	27	22.50
		Medium (5.71 to 7.07)	67	55.83
		High (>7.07)	26	21.67
4.	Extension contact Mean = 7.33 SD = 1.10	Low (<6.78)	23	19.16
		Medium (6.78 to 7.88)	80	66.66
		High (>7.88)	17	14.18
5.	Extension participation Mean = 10.94 SD = 1.84	Low (<10.01)	30	25.00
		Medium (10.01 to 11.86)	49	40.83
		High (>11.86)	41	34.17

3. Psychological characteristics of soil health card holders

3.1. Achievement motivation

The results shown in Table 3 states that the majority of farmers (58.33 %) had a medium level on achievement motivation, while 20.00 per cent and 21.67 per cent of them had high and low level of achievement motivation, respectively. Achievement motivation is a psychological variable which differs from individual to individual; thereby it forces the individual toward reaching the set goals. The reasons behind the majority of farmers having medium achievement motivation could be that they are operating small size land holding and socio-economic

conditions, may not have permitted them to have higher achievement orientation. These findings are in line with the results of Makashre (2014) and Madhushree (2014).

3.2. Management orientation

The results appearing in Table 3 reveals that half of the farmers (50.83 %) were having medium level of management orientation, while one-third 24.17 per cent and 25.00 per cent of them had a high and low level of management orientation, respectively. The probable reason for the above trend might be that field extension officers and functionaries do have interactions with farmers to manage the crop planning, production and marketing activities and re-orient the level of management. These findings are in line with the results of Lavanya (2010) and Asha (2015).

3.3. Scientific orientation

The data presented in Table 3 indicates that three fourth of farmers (75.00 %) were having medium level on scientific orientation, whereas 15.84 and 09.16 per cent had low and high level on scientific orientation, respectively. This might be due to the farmer's medium level of education and limited educational institutions in the study area. These findings are in line with results of Avinashilingam (2013), Patel (2013) and Dhodiya (2015).

3.4. Social participation

The results in Table 3 indicate that little less than half of farmers (46.66 %) had membership in one organization, whereas 25.00 and 16.68 per cent of them had membership in more than one organization and no membership in any organization, respectively. While one-tenth (11.66 %) had membership along with position holding in the organization. It clearly indicates that nearly half of soil health card holders (70.83 %) were having a membership in one or more than one organizations. The village organizations are important and deliver various services for the farmers. The existence of different kinds of cooperative organizations opens avenues for them to be a member in the rural areas. These findings are in line with the results of Ghintala and Singh (2013), Patel (2013) and Dhodiya (2015).

3.5. Innovativeness

The data in Table 3 show that 70.83 per cent of farmers were having a medium level of innovativeness, whereas 19.17 and 10.00 per cent of them had low and high levels of innovativeness, respectively. It is reported that the majority of soil health card holders (90.00 %)

possessed medium to lower levels of innovativeness. Constraints of resources in a rural area and the need for moving profitability from nature-dependent agricultural enterprises would have put the respondents to be in the medium innovativeness category. These findings are in line with the results of Makashre (2014) and Patel (2014).

Table 3: Psychological characteristics of soil health card holders. (n=120)

Sl. No.	Characteristics	Category	Farmers	
			Frequency	Per cent
1.	Achievement motivation Mean=13.89 SD=0.90	Low(<13.43)	26	21.67
		Medium(13.43 to 14.34)	70	58.33
		High(>14.34)	24	20.00
2.	Management orientation Mean=46.12 SD=4.51	Low(<43.86)	30	25.00
		Medium(43.86 to 48.38)	61	50.83
		High(>48.38)	29	24.17
3.	Scientific orientation Mean=6.29 Sd=0.84	Low(<5.86)	19	15.84
		Medium(5.86 to 6.71)	90	75.00
		High(>6.71)	11	09.16
4.	Social participation Mean=23.17 SD=4.38	No Membership	20	16.68
		Membership in 1 organization	56	46.66
		Membership in more than 1 organization	30	25.00
		Holding position in organization	14	11.66
5.	Innovativeness Mean=11.36 SD=0.92	Low(<10.90)	23	19.17
		Medium(10.90 to 11.82)	85	70.83
		High(>11.82)	12	10.00

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 the soil test laboratory. Once

registered, the farmer can track test results through soil testing labs, fertilizer and nutrient recommendations and soil health card generation. It was observed that the larger number of farmers were in the categories of middle-aged (45.83 %), small farmers (29.17 %), studied up to PUC (21.67 %), medium level on farming experience (29.17%), medium level on achievement motivation (58.33 %), medium level of management orientation (50.83 %), medium level on scientific orientation (75.00 %), medium level on mass media exposure (55.83 %), medium level on extension participation (40.83 %), membership in one organization about social participation (46.66 %), medium level on innovativeness (70.83 %), medium level extension contact (66.66 %) and a medium level of cosmopoliteness (61.66 %). Less than one-third of farmers had a farming experience of 30.00 per cent, 58.33 per cent of the respondents belonged to the low annual income group and 11.66 per cent had a high level of cosmopoliteness. Extension personnel involved in conducting capacity building programmes need to be evolving an exercise that makes the farmers comprehend soil health card values and the right way of making inferences for cropping decisions. Field days need to be arranged at appropriate crop growth stages 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 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 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 through 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 the participation of farmers from nearby areas for widespread dissemination of technology. 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 practice 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 cards may not be applicable to farmers who practice less application of fertilizers or opt for sustainable agriculture of natural farming. Knowledge management for farmers, policymakers 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 the 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.

REFERENCES

Asha, A., 2015, A study on the performance of Self Help Groups in Ramanagara District of Karnataka, *M.Sc. (Agri.), Thesis (Unpub.),* U.A.S., Bangalore.

Avinashilingam, N. A. V., 2013, Productivity enhancement of Wheat through FLD in hilly areas – A study in Uttarkashi District of Uttarkhand. *Indian Journal Extension Education and Rural Development,* 21 **(1)**: 30-33.

Chander, G., Wani, S.P., Sahrawat, K.L., Dixit, S., Venkateswarlu, B., Rajesh, C., Rao, P.N. And Pardhasaradhi, G., 2014, Soil test-based nutrient balancing improved crop productivity and rural livelihoods: case study from rainfed semi-arid tropics in Andhra Pradesh, India. Archives of Agronomy and Soil Science, 60(8): 1051-1066.

Chhodavadia Harshadbhai Chhaganbhai, 2016, Impact of improved varieties on livelihood on farmers of KVK Adopted villages in Saurstra Region of Gujarat, *Ph.D. Thesis (Unpub.),* Jungadh Agricultural University Jungadh, Gujarat.

Chowdary, R.K., Theodore, RK., Anandarja, N., Santhi, R., 2017, Factors Determining the Use of Soil Health Card (SHC) Recommendations in Kurnool District of Andhra Pradesh, International Journal of Pure & Applied Bioscience, 5 (6), 1689-1694.

Dhodiya, U. N., 2015, Aptitude of Pesticides users of Tapi District of South Gujarat. *M.Sc. (Agri.), Thesis (Unpub.),* N.A.U., Navsari.

FAO. 2015, Healthy soils are the Basis for Healthy.

Garg, J. 2014, A study on Training needs of Chickpea growers in Tikamgarh District of Madhya Pradesh. *M.Sc. (Agri.), Thesis (Unpub.),* Department of Extension Education, College of Agriculture, Tikamgarh, J.N.K.V.V. Jabalpur, M.P.

Ghintala, A. and Singh, K., 2013, Knowledge and Adoption of Sprinkler irrigation system by the farmers of Banaskantha District of North Gujarat. *Indian Journal of Extension Education, and R.D.* 21 **(1)**: 26-29.

Hingonekar, S. S., 2011, Role Perception and role performance of FIGs working under ATMA project at Tapi and Valsad District of South Gujarat. *M.Sc. (Agri.), Thesis (Unpub.),* N.A.U., Navsari.

Jaganathan, D. And Nagaraja, N. R., 2015, Perception of farmers about Arecanut based multi-species cropping system. *Indian Research Journal of Extension Education,* 15 **(2)**: 49-54.

Jotin Bordoloi and Anup K. Das. 2017. Impact of Soil Health Card Scheme on Production, Productivity and Soil Health in Assam. Agro-Economic Research Centre for North-East India, Assam Agricultural University, Jorhat - 785 013, Assam, 5op.

Kibblewhite, M. G., Ritz, K., & Swift, M. J. 2007. Soil health in agricultural systems. Philosophical Transactions of the Royal Society B: Biological Sciences, 363(1492), 685-701.

Lavanya, B. T., 2010, Assessment of farming system efficiency in Theni District of Tamil Nadu, *M.Sc. (Agri.), Thesis (Unpub.),* U.A.S. Bangalore.

Liu, J., Wu, L., Chen, D., Yu, Z., Wei, C., 2018. Development of a soil quality index for Camellia oleifera forestland yield under three different parent materials in Southern China, Soil Tillage Research, 176, 45–50.

Madhushree, A., 2014, Decision making pattern and achievement motivation of farm women under dry land condition in Tumkur District, *M.Sc. (Agri.), Thesis (Unpub.),* U.A.S, Bangalore.

Mahadik, K. P.,1995, A study of the knowledge trend of the members of panchayat raj institution about agricultural development programme, *M.Sc.(Agri.), Thesis (Unpub.),* Konkan Krishi Vidyapeeth, Dapoli, Maharashtra.

Makashre, S.., 2014, A study on Knowledge and Adoption of Soybean's production technology by the farmers of Tikamgarh District Madhya Pradesh. *M.Sc. (Agri.), Thesis (Unpub.),* Department of Extension Education, College of Agriculture, Tikamgarh, J.N.K.V.V. Jabalpur, M.P.

Mukati, A., Bisht, K., Singh, S.P. and Raghuwanshi S. 2018. Farmer's perception regarding soil health card, International Journal of Chemical Studies, 6(6), 307-310.

Parmar L., 2014, An Evaluation study of Farmers Field School on soya bean management practices conducted by agriculture department of Tikamgarh District of Madhya Pradesh. *M.Sc. (Agri.), Thesis (Unpub.),* Department of Extension Education, College of Agriculture, Tikamgarh, J.N.K.V.V., Jabalpur, M.P.

Patel, J. 2014, A study on Impact of Income generating activities on Sustainable Livelihood of SGSY Beneficiaries of Tikamgarh District of Madhya Pradesh. *M.Sc. (Agri.), Thesis (Unpub.),* Department of Extension Education, College of Agriculture, Tikamgarh, J.N.K.V.V. Jabalpur, M.P.

Patel, N. G., 2013, Attitude of the farmers towards soil health card programme. *M.Sc. (Agri.), Thesis (Unpub.),* A.A.U., Anand.

Raghavendra Chowdary, K. Prasad Babe and Ravi Kumar, G, Theodore, 2018, Soil Health Card Adoption Behaviour of Farmers in Andhra Pradesh State of India, *International Journal Curriculum Microbial Applied Sciences.*

Raghuwanshi N. 2015, Impact of front line demonstration on scientific temperament of Wheat growers in Tikamgarh District of Madhya Pradesh. *M.Sc. (Agri.), Thesis (Unpub.),* Department of Extension Education, College of Agriculture, Tikamgarh, J.N.K.V.V. Jabalpur, M.P.

Sihare, A.., 2015, A study on farmers Knowledge, Attitude related to Organic farming in Tikamgarh District of Madhya Pradesh., *M.Sc.(Agri.), Thesis (Unpub.),* Department of Extension Education, College of Agriculture, Tikamgarh, J.N.K.V.V. Jabalpur, M.P.

Stevens, A.W., 2018, Food Policy, https://doi.org/ 10.1016/j.foodpol.2018.08.005.

Subhash Chander, 2018, Impact of Agricultural Technology Management Agency on Adoption of Wheat Production Technology by the Farmers in Sri Ganganagar District of Rajasthan, *M.Sc. (Agri.), Thesis (Unpub.),* Rajasthan Agricultural University, Bikaner.

Subhash, R., Monika, J., Himanshu, T., Vani, D.K. and Gupta, M.K. 2019, Study on knowledge and adoption of soil health card based fertilizer application in Khandwa district (M.P.), International Journal of Chemical Studies, 7(3), 3152-3155.

Sunil Vasant More, 2014, Perception of the beneficiaries about Farmers Field School programme in Konkan Region of Maharashtra, *M.Sc. (Agri.), Thesis (Unpub.),* Dr Balasaheb Sawant Konkan Krishi Vidyapeeth., Dapoli.

Xue, R., Wang, C., Liu, M., Zhang, D., Li, K., & Li, N. 2019, A new method for soil health assessment based on Analytic Hierarchy Process and meta-analysis. Science of the Total Environment, 650, 2771-2777.