



## **A Study on Farmers' Use Efficiency of Soil Health Card in Rangareddy District of Telangana State, India**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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### **ABSTRACT**

Soil is natural non-renewable resources on human time scale which is the foundation for sustainable agriculture. In view of this, Global soil partnership was 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 India had launched the Soil Health Card Scheme (SHCs) in 2015. The scheme main objective is to distribute 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 research study was conducted during 2019-2020 to analyse farmers' Use efficiency of SHC. Data was collected using a standardised and pre-tested interview schedule. It was revealed

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that slightly more than the three fifth SHC holders had partially used of overall use efficiency on SHC information (60.83 %), followed by not used (20.00 %) and fully used (19.17 %) of overall use efficiency on SHC information, respectively. All profile characteristics of farmers except mass media exposure had a significant to highly significant association with regard to use efficiency of SHCs. The results also revealed that there is a significant association between attitude and use efficiency (chi-square value 29.66).

*Keywords: Farmers; soil health card; use efficiency; soil health; farmers; association.*

## 1. 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. The present work will be a complementary contribution to the comprehensive study of the Farmers' Use Efficiency 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. Soil is living medium as it provides nutrition to the plant growth and development. 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, 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. 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. 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 [1]. Majority of chilli growers (68.33%) were having medium level adoption on recommended plant protection measures while, 20.00 per cent and 11.67 per cent of the growers were having a high level adoption and low level adoption, respectively [2]. Majority of the respondents (68.33%) were having medium level of adoption with regard to recommended coriander production technologies, followed by low level (19.17%) and high level (12.50%) of adoption regarding recommended coriander production technology [3]. 47.00 per cent of paddy growers were having a medium level of adoption of improved paddy cultivation practices while, 31.00 per cent and 22.00 per cent were having higher level and lower level of adoption on improved paddy cultivation practices, respectively [4]. 45.33 per cent of potato growers were having a medium level of adoption on fertilizers and manure while, 32.00 per cent were having high level adoption on fertilizer and manure. Only 20.00 per cent of Potato grower

had low adoption level on fertilizers and manure and 35.00 per cent of paddy growers had used recommended dose of fertilizers, while potato growers 45.00 per cent had applied not according to recommendation dosage of fertilizers [5]. Slightly more than three fifth (60.83 %) of the soil health card holders were having a medium level of use efficiency on soil health card information, followed by low level (20.83%) and high level (18.34%) of use efficiency on soil health card information [6]. In view of this, the present study was undertaken with the following objectives: to assess the farmers' use efficiency towards soil health card and to study the association between profile characteristics of farmers' with use efficiency variable.

## 2. METHODOLOGY

The agencies that implemented the soil health card 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 does not have direct control over independent variables because their manifestations have already occurred. The present study was conducted in two blocks namely Shabad and Kothur of 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 large number of soil samples collected (93,912) and farmers covered (1, 67,041) were more compared to other districts in the state. Again from each block top three villages having more soil health card holders of small, medium and large farmers were selected. 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. In each of the identified villages 20 farmers were randomly selected for collecting the required data for the research. Thus, 60 respondents were selected from each of the block. Totalling the sample constituted for the study to 120 farmers. 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. One district X two blocks X three villages X 20 farmers. The study aimed to assess the statements about the Use efficiency of soil health card recommendations and to find out the Association between farmers profile characteristics with their use efficiency on soil health card in relation to SHC recommendations. Statistical tools and tests used such as arithmetic mean, Frequency, percentage, standard deviation, rank, chi-square test and Yates' correction for continuity. In the current study, it is an efficiency of using soil health card benefits or features by the holders in terms of applying fertilization practices for farm sustaining and improving soil health status or It is the ratio of the useful soil health practices performed in the farming day by a farmer to the total set of soil health card recommended practices. Use efficiency is efficiency of soil health card holders to use soil health cards benefits or features in terms of the applying in farm for maintaining and improving soil health status. Procedure followed by Charel [6] with suitable modifications was used for the study. With eleven statements was prepared by using teacher made scale technique with the help of research reviews and consulting experts of soil science, agronomy and extension discipline for deriving meaning of conclusions. The responses of the respondents on each statement was obtained on three point continuum via fully used, partially used and not used with weightage of 3, 2 and 1 scores, respectively. Thus, the possible score for farmers use efficiency of soil health card ranges between minimum of 11 and maximum of 33. The respondents were grouped into three categories on the basis of mean and standard deviation.

### 2.1 Status of Rangareddy District

The following table shows the distribution of number of soil samples collected, analysed, number of farmers covered, number of soil health cards printed and number of soil health cards issued to the farmers in district.

**Table 1. Block wise distribution of respondents**

Name of the Villages	Name of the Block	No. of Farmers
Shabad	Shabad	20
Rudraram	Shabad	20
Hayathabad	Shabad	20
Anthireddyguda	Kothur	20
Chegur	Kothur	20
Thimmapur	Kothur	20
Total sample size		<b>120</b>

**Table 2. Distribution of number of soil samples, and number of soil health cards**

Sl. No.	Soil samples for 2015-16 & 2016-17 (cycle I)	Soil samples		No. of Farmers covered	No. of Soil health cards printed	No. of soil health card issued
		Collected	Tested			
1.		93,912	2,691	1,66,861	6,440	3,42,671

Source: Soilhealth.dac.gov.in

**Table 3. Distribution of soils in Rangareddy district**

Sl. No.	Soil types	Area in Hectares	Locations
1.	Red sandy loams (Red chalka)	125000	Medchal, Shameerpet, Hayathnagar, Saroornagar, Rajendranagar etc.
2.	Red loamy sands (Dubba soil)		Ibrahimpattam, Yacharam, Maheshwaram, Kandukur, etc.
3.	Black cotton soils	98000	Chevella, Shabad, Kothur, Vikarabad, Tandoor etc.

Source: Rangareddy.telangana.gov.in

**Table 4. Distribution of soil testing laboratories (STL) in Rangareddy district**

Sl. No.	Particulars	No. s	Location
1.	Agriculture Market Committee (STLs)	4	Ibrahimpattam, Medchal, Parigi and Vikarabad
2.	Main Lab and ( Mobile soil testing lab at ARI)	1	Rajendranagar
3.	Total	5	

Source: Rangareddy.telangana.gov.in

## 2.2 Modalities Followed for Implementation of Soil Health Card

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

- a) Prepare annual state level action plan by compiling district-wise action plan and submit to the state level executive committee for approval and there after forward the same to executive committee.
- b) Receive funds from 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 state level.
- d) Operationalize Information Communication Technology (ICT) enabled management system up to grass-root level.
- e) Conduct independent evaluation to assess the performance of the scheme in state.

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

### 3. RESULTS AND DISCUSSION

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 Use Efficiency of Soil Health Card by Farmers

It was clear from the data in Table 5 revealed that slightly more than the three fifth soil health card holders had partially used of overall use efficiency on soil health card information (60.83 %), followed by not used (20.00 %) and fully used (19.17 %) of overall use efficiency on soil health card information, respectively. It might be due to that farmers have understood that using fertilizers efficiently would decrease the cost of cultivation and helps to sustain and maintain the production and productiveness of their soil. These findings are in line with results of [2,7,3,6].

#### 3.2 Statement-wise Use Efficiency of Soil Health Card by Farmers

The results are shown in Table 6. Most of the farmers (99.16 %) were either from partially used efficiency to fully used efficiency with the statement that “Did you incorporate organic matters into the soil as per soil health card recommendations?”, “Did you take corrective measures like use of quality water, green manuring, etc. to overcome the problem related to E.C. as recommended in the soil health card?”

and “Did you follow the fertilizer combination for your crop as recommended in soil health card. Probable reason might be following the soil health card recommendations.

It was clear from Table 6 that among 11 statements these three statements “Did you apply secondary nutrients into the soil also as per soil health card recommendations, “Did you grow only the recommended crops in the soil health card?” and “Did you use the soil health card to get benefited under govt. schemes. Probable reason might have applying secondary nutrients as per card, growing the recommended crops and using soil health card in getting benefits of programme were either from partially used efficiency to fully used efficiency with 98.33 per cent of farmers.

The statement “Did you apply micronutrients into the soil as per information given in the soil health card”. Probable reason might have applying micronutrients nutrients as per card, obtained an (98.32 %) were either from partially used efficiency to fully used efficiency.

It observed that 96.66 per cent of respondents were either from partially used efficiency to fully used efficiency with the statement that “Did you apply primary nutrients (NPK) into the soil as per soil health card recommendations. Probable reason might be applying primary nutrients nutrients as per card.

The remaining two statements, namely, “Did you apply lime or gypsum into the soil as per recommendation given in soil health card to have optimum pH?” and “Did you grow only the recommended varieties in the soil health card”. Probable reason might have growing the recommended varieties as per card, obtained a 95.82 per cent of respondents were either from partially used efficiency to fully used efficiency.

**Table 5. Overall Use efficiency of soil health card by farmers (n=120)**

Sl. No.	Use Efficiency category	Farmers	
		Frequency	Per cent
1.	Not used efficiency of SHC (< 28.51)	24	20.00
2.	Partially used efficiency of SHC (28.51 to 30.73)	73	60.83
3.	Fully used efficiency of SHC (> 30.73)	23	19.17
Total		120	100.00

*Mean=29.62; Standard deviation= 2.22*

**Table 6. Statement-wise use efficiency of soil health card by farmers (n=120)**

Sl. No.	Statements	Fully used		Partially used		Not used	
		f	%	f	%	f	%
1.	Did you incorporate organic matters into the soil as per SHC recommendations?	89	74.16	30	25.00	01	0.84
2.	Did you apply primary nutrients (NPK) into the soil as per SHC recommendations?	83	69.16	33	27.50	04	3.34
3.	Did you apply secondary nutrients into the soil also as per SHC recommendations?	78	65.00	40	33.33	02	1.67
4.	Did you apply Micronutrients into the soil as per information given in the SHC?	88	73.33	30	24.99	02	1.68
5.	Did you apply bio fertiliser cultures into the soil as per information given in the SHC?	83	69.16	30	25.00	07	5.84
6.	Did you apply lime or gypsum into the soil as per recommendation given in SHC to have optimum pH?	71	59.16	44	36.66	05	4.18
7.	Did you take corrective measures like use of quality water, green manuring, etc to overcome the problem related to E.C. as recommended in the SHC?	90	75.00	29	24.16	01	0.84
8.	Did you follow the fertilizer combination for your crop as recommended in SHC?	89	74.16	30	25.00	01	0.84
9.	Did you grow only the recommended crops in the SHC?	84	70.00	34	28.33	02	1.67
10.	Did you grow only the recommended varieties in the SHC?	86	71.66	29	24.16	05	4.18
11.	Did you use the SHC to get benefited under govt. schemes?	85	70.83	33	27.50	02	1.67

*F*= Frequency of farmers      %=*per cent*

Farmers opined that 94.16 per cent they were either from partially used efficiency to fully used efficiency with the statement that "Did you apply bio fertiliser cultures into the soil as per information given in the soil health card. Probable reason might have applying bio fertiliser cultures as per card.

The statements "Did you incorporate organic matters into the soil as per soil health card recommendations?", "Did you apply secondary nutrients into the soil also as per soil health card recommendations?", "Did you apply micronutrients into the soil as per information given in the soil health card?", "Did you take corrective measures like use of quality water, green manuring, etc to overcome the problem related to E.C. as recommended in the soil health card?", "Did you follow the fertilizer combination for your crop as recommended in soil health card?", "Did you grow only the recommended crops in the soil health card?" and Did you use the soil health card to get benefited under govt. schemes? Obtained an (0.84 %), (1.67 %), (1.68 %) of them were not used soil

health card. Probable reason might be due to their unawareness level, primary education and illiterate farmers.

Association between farmers profile characteristics with their use efficiency of soil health card.

The association between profile characteristics of farmers with their use efficiency of soil health card states in Table 7. This results revealed that variables such as, mass media exposure had a no association with use efficiency on farmers, similarly, age, education, cosmopolitanness, extension contact, extension participation, innovativeness of farmers had being significant association with use efficiency of soil health card at five per cent level. Likewise, land holding, scientific orientation, management orientation, annual income, farming experience, social participation, achievement motivation of farmers had being highly significant association with regard to use efficiency on soil health card at one per cent level. These findings are in line with results of [8-12].

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

### **3.3 Age and Use Efficiency of Soil Health Card**

As a result age had positive and significant association with use efficiency of soil health card at five per cent level. Probably reason might be most of the farmers were from middle to young age and they have medium on use efficiency with regard soil health card.

These findings are in line with results of Ranganatha Babu [8], More et al. [10] and Meenal Dubey [11].

### **3.4 Education and Use Efficiency of Soil Health Card**

Probably reason in having a significant association exist between education of farmers with their use efficiency of soil health card at five per cent level and had positive could be due to educated farmers have more use efficiency of soil health card information therefore farmers increased their use efficiency on soil health cards.

These findings are in line with results of Ranganatha Babu [8], Koli [13] and Meenal Dubey [11].

### **3.5 Annual Income and Use Efficiency of Soil Health Card**

The chi-square test revealed a highly significant association exists between annual income of farmers and had positive with use efficiency of soil health card at one per cent level. Probable reason might have annual income effects on social-economic technological aspects of an individual and therefore, may effect on use efficiency with regard to soil health card.

These findings are in line with results of Dhodiya [14].

### **3.6 Land holding and Use Efficiency of Soil Health Card**

A highly significant association exist between land holding of farmers and had positive with

regard to use efficiency on soil health card at one per cent level. Probable reason might be more the land more will be income which will helps the enhancing educational mobility. The educational mobility of farmers might be helpful to increase use efficiency on soil health card.

These findings are in line with results of Singh and Chauhan [15].

### **3.7 Farming Experience and Use Efficiency of Soil Health Card**

It indicates that farming experience had positive and highly significant association with regard to use efficiency of soil health card at one per cent level. Probable reason might have majority of farmers felt easy to follow the recommendations of soil health cards information and need to have high farming experience.

These findings are in line with results of Sharma et al. [12].

### **3.8 Cosmopolitaness and Use Efficiency of Soil Health Card**

Probable reason could be having a significant association exist between cosmopolitaness of farmers and had positive with their use efficiency on soil health card at five per cent level, interacted with agricultural extension officers with use efficiency of soil health cards information.

These findings are in line with results of Meenal Dubey [11] and Ranganatha Babu [8].

### **3.9 Mass Media Exposure and Use Efficiency of Soil Health Card**

The chi-square test revealed that non-significant association exist between mass media exposure of farmers with regard to use efficiency on soil health card. Hence, null hypothesis was accepted.

These findings are in line with results of Sharma et al. [12].

### **3.10 Extension Contact and Use Efficiency of Soil Health Card**

Probable reason might be the farmer's frequent contacts with agricultural extension officers in knowing about soil health card benefits. Therefore, farmers believe that use efficiency on

soil health card would help in increasing crop productivity and income. Thus, there exists a extension contact had positive and significant association with use efficiency of soil health card at five per cent level.

These findings are in line with results of Ranganatha Babu [8].

### 3.11 Extension Participation and Use Efficiency of Soil Health Card

As a consequence, extension participation had positive and significant association with regard to use efficiency of soil health card at five per cent level. Probable reason might have farmers frequent and active participation in the extension activities organized about soil health card might act as the strong motivational factor in use efficiency of soil health cards.

These findings are in line with results of Ranganatha Babu [8].

### 3.12 Social Participation and Use Efficiency of Soil Health Card

Probable reason might be a highly significant association exist between social participation of farmers with regard to use efficiency on soil health card at one per cent level. Social participation increase the farmer's

cosmopolitaness, daily interactions with agricultural officer's and by this increases their use efficiency on soil health cards. These findings are in line with results of Ranganatha Babu [8], Payal [4] and More et al. [10].

### 3.13 Management Orientation and Use Efficiency of Soil Health Card

It indicates that management orientation had positive and significant association with use efficiency of soil health card at five per cent level. Probable reason might be a chance for better management of chemical fertilizers resulting in greater efforts toward excellence in farming. Soil health card provide information on balanced use efficiency of fertilizers and increases the income of farmers. These findings are in line with results of Ranganatha Babu [8].

### 3.14 Scientific Orientation and Use Efficiency of Soil Health Card

Probable reason might be farmers had a good scientific information and made easy to adapt the soil health cards information in fields and by this increase use efficiency. It shows that scientific orientation had positive and highly significant association with use efficiency of soil health card at one per cent level. These findings are in line with results of Rathod [2] and More et al. [10].

**Table 7. Association between profile characteristics of farmers with their use efficiency of soil health card by the farmers (n=120)**

Sl. No.	Characteristics	$\chi^2$	C-value
1.	Age	08.94 *	0.35
2.	Education	06.38 *	0.30
3.	Annual income	37.17 **	0.48
4.	Land holding	29.60 **	0.33
5.	Farming experience	23.00 **	0.40
6.	Cosmopolitaness	08.12 *	0.25
7.	Mass media exposure	0.33 <sup>NS</sup>	0.05
8.	Extension contact	06.51 *	0.16
9.	Extension participation	09.31 *	0.26
10.	Social Participation	10.24 **	0.19
11.	Management orientation	09.69 *	0.27
12.	Scientific orientation	11.77 **	0.19
13.	Achievement motivation	13.75 **	0.24
14.	Innovativeness	07.03 *	0.23

NS=Non-significant, \*=Significant at 5% level, \*\*=Significant at 1% level





### 3.15 Achievement Motivation and use Efficiency of Soil Health Card

It indicates that achievement motivation had a positive and highly significant association with use efficiency of soil health card at one per cent level. Probable reason might be farmers would have availed the soil health card benefits and use efficiency of soil health card in the form of reducing input cost through balanced use efficiency of chemical fertilizers.

These findings are in line with results of More et al. [10].

### 3.16 Innovativeness and Use Efficiency of Soil Health Card

Probable reason might be innovative farmers are always ready for adopting new things and same may have happened in use efficiency on soil health cards. It indicates that innovativeness had significant association with use efficiency of soil health card at five per cent level.

These findings are in line with results of Ranganatha Babu [8], Satasiya [9] and Meenal Dubey [11].

## 4. CONCLUSION

The farmers need to register at the web portal [www.soilhealth.dac.gov.in](http://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 possessed partially used efficiency on 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 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.

### 4.1 Suggestions and Opportunities for the Future Research

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

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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