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Smart Approach to Increase Adaptability of Soil Health Card Schemes of Government of India

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ABSTRACT: Agriculture, said to be a backbone of Indian economy. More than half of the population's income depends on the farm yields. In the era of digitalization, many sectors started adopting digital technologies and getting transformed from traditional methods to modern approaches. Agriculture is also an area where tremendous possibilities are available through adoption of digital technologies. Many countries are performing well and increasing per capita incomes by increasing yields. In India, in spite of all the development, technology adoption rate in agriculture is very poor. Many reasons have been identified to increase the adaptability of digital technologies but their significance is still not communicated or shown to end farmers. To showcase the significance, here in this paper, one of the idea is proposed to increase adoption of Soil health Scheme (SHC) of government of India.

KEYWORDS: Smart soil health card, Soil health scheme, Smart agriculture.

I. INTRODUCTION

Choosing a plant based on soil conditions is one an essential aspect of productivity gains. In Agriculture, the required fertilizer needs to be tested and identified in the field for agricultural protection. Plant classification is done through spatially distributed information Provided by satellite remote sensing. First and foremost, important thing in an agricultural is to choose right crop to harvest maximum yield. Selection procedure depends on following factors, 1) Plant selection and 2) Seed quality. To make accurate decision, a soil testing plays very important role optimization of crop production, to guard the environment from pollution by controlling excess use of fertilizers. The primitive method for soil testing is to collect soil samples, which have been tested in the lab. Test results will be announced in a few days. The problem with the agricultural sector is that farmers have to suffer a lot in order to get reports of agricultural surveys quickly and inability to suggest fertilizers for selected crops. Laboratory test methods cannot visualize soil parameters for live monitoring.

II. EXISTING SYSTEM

Soil Health Card (SHC): The ministry of agriculture and Farmers welfare's department of Agriculture and Co-operation government of India have promoted scheme called SHC which meant to give farmer soil nutrient status and advise them for the usage of fertilizers and also suggest steps to maintain soil health. In SHC, farmers receive printed report describing status of soil with respect to different parameters like (N, P, K (macro nutrients), S(Secondary nutrients), Zn,Fe,Cu,Mn,Bo (Micro Nutrients) and pH,EC,OC(Physical Parameters). The sample of SHC is given below,



Soil Health Card
Format English

Department of Agriculture & Cooperation
Ministry of Agriculture & Farmers Welfare
Government of India

Directorate of Agriculture
Government of India

SOIL HEALTH CARD

Soil Health Card No. _____

Name of Farmer: _____

Validity: From _____ To _____

SOIL HEALTH CARD		Name of Laboratory	SOIL TEST RESULTS			
Farmer's Details		S. No.	Parameter	Test Value	Unit	Rating
Name						
Address						
Village						
Sub-District						
District						
PIN						
Aadhaar Number						
Mobile Number						
Soil Sample Details		1	pH			
Soil Sample Number		2	EC			
Sample Collected on		3	Organic Carbon (OC)			
Survey No.		4	Available Nitrogen (N)			
Khasra No. / Dag No.		5	Available Phosphorus (P)			
Farm Size		6	Available Potassium (K)			
Geo Position (GPS)	Latitude: _____ Longitude: _____	7	Available Sulphur (S)			
Irrigated / Rainfed		8	Available Zinc (Zn)			
		9	Available Boron (B)			
		10	Available Iron (Fe)			
		11	Available Manganese (Mn)			
		12	Available Copper (Cu)			

Secondary & Micro Nutrients Recommendations		
Sl. No.	Parameter	Recommendations for Soil Applications
1	Sulphur (S)	
2	Zinc (Zn)	
3	Boron (B)	
4	Iron (Fe)	
5	Manganese (Mn)	
6	Copper (Cu)	
General Recommendations		
1	Organic Manure	
2	Biofertiliser	
3	Lime / Gypsum	

Fertilizer Recommendations for Reference Yield (with Organic Manure)				
Sl. No.	Crop & Variety	Reference Yield	Fertilizer Combination-1 for N P K	Fertilizer Combination-2 for N P K
1	Paddy (Dhaan)			
2				
3				
4				
5				
6				

International Year of Soils 2015

Healthy Soils for a Healthy Life

Figure 1: Reference (<https://www.soilhealth.dac.gov.in>)

The main objective of SHC is to issue soil health cards every 3 years to all the farmers of the country which provides basis to address nutrient deficiencies in fertilization process, to diagnose soil fertility related constraints and to develop soil test based nutrient management in the district and taluka level for enhancement of nutrient use efficiency. Outcome of scheme achieved so far on desired period but looking to the current scenario, the scheme is not effectively used by all the farmers. Reasons are many, one of the reasons is the traditional process of issuing card with full of technical details which is difficult to rectify from the farmer's end.

III. MODEL OF SMART SOIL HEALTH MONITORING AND CROP RECOMMENDATION SYSTEM

Looking to the use of smart phones and digital technology, traditional methods of maintaining and presenting data is not preferred by the farmers. The scheme should reach to farmer's doorstep and provide soil analysis and land survey report quickly on the smart phones along with the crop predictions and suggestions. The recommendation should not only be based on soil parameters but it should also consider other factors affecting decision of crop selection.

Here, in this model, revision in the SHC is suggested based on consideration of few other factors which in terms give importance of SHC to the farmers. The easy accessibility of schemes, overcoming waiting period of reports and benefits received from the accurate recommendation of crop will help government and farmers to increase its adoption rate and effective utilization of schemes which helps farmers to increase yield.

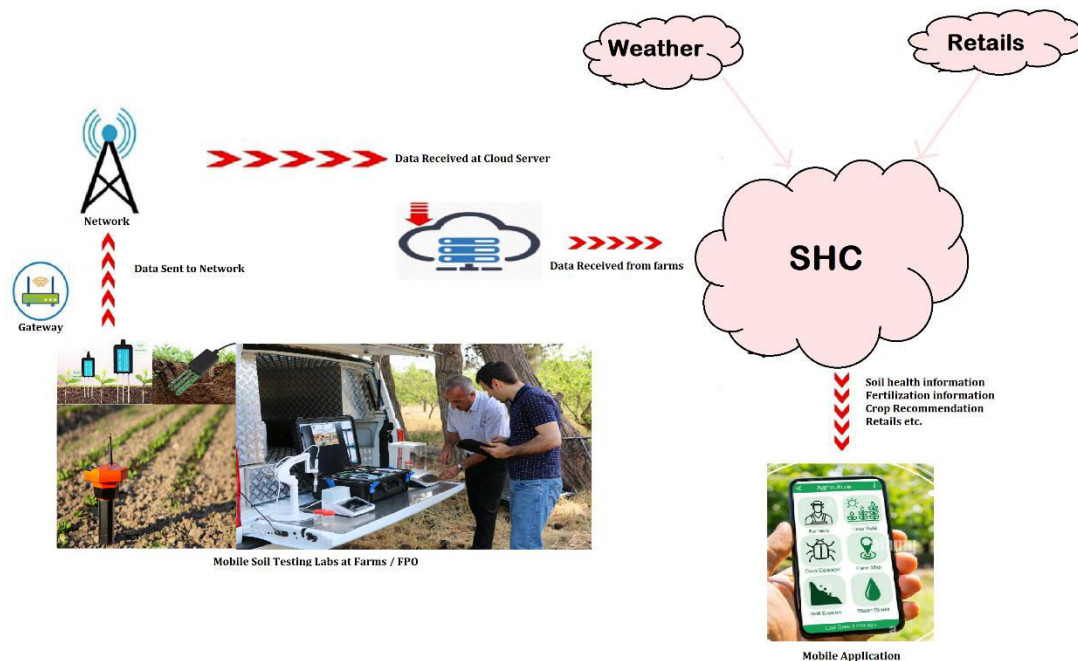


Figure 2: A model of smart soil health monitoring and crop recommendation system.

- **Mobile Soil Testing Labs at Farms:**

The mobile soil laboratory is already designed and built according to industry standards and is equipped with all the analytical equipment needed for soil analysis. It examines various soil parameters and provides farmers with soil health maps and soil recommendations at the front door. The mobile soil laboratory complies with the standards of the soil laboratory. It is also fully functional, including security, and has standby power backup. Also, Different IoT based projects are implemented which will provide soil testing services at the farm's front door by determining all soil parameters such as pH, EC, moisture, nitrogen, potassium and phosphorus levels and recommending fertilizer nutrients for the soil.[1]. Scheme can use this technique of collecting and testing soil at farmers doorstep and result should be uploaded to cloud server via gateway and networks.

- **Cloud Storage:**

The soil testing results generated by mobile labs at farms should be stored to cloud server over a network through gateway interface and then it can be analysed again for the other purpose. The data generated shall be forwarded to SHC portal for the generation of smart soil health card.

- **Smart Soil Health Card (SHC) Portal:**

Soil Health Management (SHM) under the National Mission for Sustainable Agriculture (NMSA) (April 1, 2014) "The National Sustainable Agriculture Mission (NMSA) implemented to make agriculture more productive, sustainable and climate change resistant. Currently, platform is providing soil health related info along with fertilization recommendation to improve and maintain soil health only. In our model, revision is suggested by incorporating information from other departments like Metrological Department for weather and climate related information and Agriculture Retail markets for the prediction of economic benefits based on demand and availability of farm products. Information received from *Weather* and *Retails* portal along with soil testing result will help SHC to provide health details of soil and suggestion related to use of fertilizers. It also recommends crop selection not only based on soil health, but considering all the aspect including weather and climate conditions, supply and demand of particular crop and farm products by analysing agriculture retail market. SHC in this model will use smart phones to reach to the end farmers. All the result will be displayed on the mobile screen of farmers in the language which is understood by farmers in simplest manner.

- **Mobile Application:**

In SHC, new medium of Mobile application will be used for the presentation of information instead of Soil Health Card. This mobile application will receive all the information of SHC portal and the information are as, Soil Health Report (all parameters), health status of soil, weather condition for the season, prediction of crop price range based on retail markets, demand and supply information of particular crop and final recommendation of crop which is best suitable for the farmer based on consideration of all this aspect. It also suggests fertilizer usage based on selected crop and different information to maintain the health of soil in the same language which is comfortable to farmers.

IV. CONCLUSION

Agriculture is one of the sectors which requires most attention. Many countries considerably performing well in the agriculture and the reason is adoption of digital technology. In India, in spite of all the development, the adoption of digitization is very poor. It is there in the scientific labs only. To make it used by all the farmers, different areas restricting adoption of this technology needs to be focused and, in this paper, one of the areas with respect to SHC is discussed and model has been proposed which will give importance of this scheme and farmers will find value of this portal in terms of their personal assistant.

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