



**Government of Karnataka**  
**Department of Agriculture**

**Soil Health Mission - Karnataka**

**2014-15**

by  
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# **Soil Health Mission**

**Introduction:** Sustaining agricultural productivity depends on quality and availability of natural resources like soil and water. Agricultural growth can be sustained by promoting conservation and sustainable use of these scarce natural resources through appropriate location specific measures. The components of soils are mineral, organic matter, water and air, the proportions of which vary and together form a system for plant growth. Soils are studied and classified according to their use. Soil Testing is a part of the discipline of Fertilizer Use and Management.

**Nutrient Status of soils of Karnataka:** Intensive agriculture with introduction of improved varieties of seeds, application of fertilisers and assured irrigation has resulted in substantial growth in food grain production. However, extensive use of fertilisers and use of improved varieties has resulted in greater mining of soil nutrients which intern resulted in depleting soil fertility, decline in water table, decrease in organic matter content and deterioration in soil health.

In 2012-13, Karnataka has consumed about 891.69 thousand tonnes of Nitrogen, 389.64 thousand tonnes of  $P_2O_5$  and 249.87 thousand tonnes  $K_2O$  fertilizers at per ha consumption rate of 68.27 kg/ha of N, 29.83 kg/ha of  $P_2O_5$ , and 19.13 kg/ha of  $K_2O$  fertilisers. Fertilizer consumption ratio has increased from 2.1:1.4:1 in 2009-10 to 3.6:1.6:1 in 2012-13. Details are shown in Annexure-I.

In Karnataka around 19.52% of soils are found to be acidic, and 11.21% of soils are alkaline in nature. Around 41.17% , 26.31% and 28.45% soils of the State found to be deficient in N,P and S respectively. Where as only 7.96% of soils are deficient in potassium. Details are furnished in Annexure-II.

Zinc is found be deficient in around 52.24% of soils where as Iron and Boron are found to be deficient in 24.76% and 35.3% of soils respectively. However, Manganese is deficient in 6.23% and copper is deficient in 2.24% of soils in Karnataka.

**Soil Testing Programme:** There are 29 static soil testing laboratories functioning in Karnataka State with analyzing capacity of 2,00,000 soil samples per annum. District wise location is appended in Annexure III. The soil samples are analysed for pH, EC, Major nutrients like Available N, P, K, secondary nutrients like Sulphur and Magnesium and micronutrients such as Zn, Fe, Mn, Cu and Boron. Water samples are also analyzed for pH , EC, Sodium Absorption ratio (SAR), Ca, Mg,  $\text{CO}_3$ ,  $\text{HCO}_3$  ,  $\text{Cl}_2$  to assess the quality of water for irrigation. Well qualified and experienced personnel are working as analysts to ensure the quality of analysis. Every year refresher training is arranged to the Analysts working in the laboratories to upgrade their knowledge and skill in soil and water analysis. The functioning of these Soil Health Centers (SHCs) are reviewed regularly every month by the concerned Joint Director of Agriculture at District level and also at Directorate of Agriculture, Bangalore. The progress achieved in respect of soil sample target and achievement for the past ten years is given below.

Statement showing ten years analysed data:

<b>Year</b>	<b>Target</b>	<b>Achievement</b>
2004-05	2,50,000	2,12,133
2005-06	2,50,000	2,38,185
2006-07	2,50,000	2,07,079
2007-08	2,50,000	1,71,806
2008-09	2,50,000	1,58,475
2009-10	1,75,000	1,24,244
2010-11	1,75,000	1,08,967
2011-12	1,75,000	1,19,659
2012-13	2,00,000	1,35,327
2013-14	2,00,000	1,33,900
<b>Total</b>	<b>21,25,000</b>	<b>16,09,775</b>

After analysis of soil samples suitable recommendations are given to the farmers to enable them for application of fertilizers in order to get better yields besides maintaining soil fertility.

This enables the concerned farmer to apply fertilizer judiciously without resorting to indiscriminate application.

In Karnataka 78,32,000 farm holdings exist. At present, 29 SHC are catering to the needs of state farmers in respect of soil testing. On an average 1.30 to 1.35 lakh soil samples are analysed annually. At present pace it requires long period to analyse the soil samples from all the farm holdings and issue SHCs . Soil test values will remain varied for a period of three years. Hence soil testing has to be done at least once in three years. Realizing this difficulty, it is proposed to implement the soil testing programme on a mission mode for three years in the form of Soil Health Mission with the object of analyzing the samples from all the farm holdings and issue soil health cards by the end of 2016-17. Karnataka State Department of Agriculture (KSDA) has prepared elaborate plan to issue soil health cards to all the farmers in the state by the end of 2016-17.

To achieve this task, State Government is planning for Operation and Maintenance of Soil Health Centers on Public-Private-Partnership mode from Companies/NGOs/Associations / organizations/ Institutes/ Charitable trust/ group of companies through outsourcing.

## **Mission Objectives:**

Objectives of Soil Health Mission are as follows:

1. To issue soil health cards to all farmers of the Karnataka in a span of three years, so as to provide a basis to include nutrient deficiencies in fertilization practices.
2. To diagnose soil fertility related constraints with standardized procedures for sampling and analysis and design taluqa/block level fertilizer recommendations in targeted districts.
3. To develop crops specific nutrient management in the districts for enhancing nutrient use efficiency.
4. To promote soil test based balancing of nutrients to manage fertility related risks for higher production.
5. To conduct demonstrations with diversified crops to quantify benefits of improved nutrient management practices in terms of increased crop yields and economic viability of farmers.

**Mission Components:** The main components of soil health Mission are as follows

- a. **Creating awareness:** Creating awareness among the farmers regarding importance of soil health and fertilization.
- b. **Collection of soil samples-** Under Soil Health Mission collection of soil samples through GPS (Global Positioning System) instruments.
- c. **Transportation:** Transporting soil samples to soil health centres.
- d. **Registration** – The collected soil samples are registered and maintain a separate register.
- e. **Sample coding:** Laboratory serial number/ code number should be allotted to each and every soil sample received during the year. This number is unique for the year.
- f. **Analysis of soil samples:** The soil samples are analysed for below mentioned parameters.
  - I. Qualitative parameters like: pH, EC.
  - II. Major Nutrients: Nitrogen, Phosphorous, Potassium
  - III. Secondary Nutrients: Sulphur and Magnesium
  - IV. Micronutrients : Zinc, copper, Manganese, iron and boron
  - V. District wise specific nutrients to be analysed :  
Enclosed in Annexure IV
- g. **Providing soil health information:** After analyzing of soil samples in Soil Health Centre it is propose to link the fertility status and crop specific nutrient recommendation of farmer to K-



Kissan software in the form of farmer passbook which is to be issued to all the farmers of Karnataka.

- h. Village wise categorization of soil test data into fertility classes.
- i. **Preparation of GPS based Digital soil fertility maps** of state, district, taluks, hoblis and gram panchayts
- j. **Record keeping** : Record keeping of the analytical work, submission of progress report and soft copy of the categorization progress to the department.

### **State Level: I. High Power committee for Soil Health**

#### **Mission:**

Honorable Agriculture Minister	Chairman
Principal Secretary to Government Agriculture /Horticulture/ Sericulture	Member
Commissioner for Agriculture, Bangalore	Member
Vice-Chancellor,UAS, Bangalore/ Dharwad/ Raichur/UAHS, Shimoga	Member
Director IIHR, Hesarghatta, Bangalore	Member.
Director, KSNMDC, Bangalore	Member
Principal Scientist, NBSS& LUP, Bangalore	Member
Director, KSRSAC, Bangalore	Member.
Director of Agriculture	Member Secretary

**II. The State Level Executive Committee (SLEC) will comprise of the following:**

Principal Secretary to Government - Agriculture	Chairman
Commissioner for Agriculture / Sericulture	Member
Director of Agriculture	Member
Director of Horticulture	Member
Additional Director of Agriculture (Organic Farming)	Member Secretary
Professor, Soil Science and Chemistry, UAS, Bangalore./ Dharwad / Raichur / Shimoga	Expert member

The Committee shall approve the Annual Action Plan prepared by the State Department of Agriculture. The SLEC will oversee the implementation of Mission components in the state through regular meetings. It will also provide inputs to the District level Executive Committee for appropriate policy formulation and implementation of Soil Health Mission effectively.

**State Level Executive Committee perform the following functions:**

- i. Prepare annual State Level Action Plan by compiling District-wise Action Plan and submit to the SLEC for approval and there after forward the same to EC.
- ii. 10% of the AAP allocation would be earmarked as flexi-fund to meet local requirements and to pilot innovations.
- iii. Receive funds from DAC for implementing organizations and oversee, monitor & review implementations of the programmes.
- iv. Organise workshops, seminars and training programmes for all interest groups/associations at State level.
- v. Operationalise Information Communication Technology (ICT) enabled management system up to grass-root level.
- vi. Conduct independent evaluation to assess the performance of the Mission in their States.
- vii. 1% of total allocation to the Mission will be earmarked for administrative and other contingent expenses.

## District Level

The District Level Executive Committee (DLEC) will comprise of the following:

Chief Executive Officer	Chairman
District Joint Director of Agriculture	Vice-Chairman
District Head, Horticulture / Sericulture	Member
Scientist (Concerned UAS/ KVK)	Expert Member
Progressive Farmer/ Krishi Pandhith / Krishi Prashsti farmer	Member
Deputy Director of Agriculture (I)	Member Secretary

DLEC will be responsible for carrying forward the objectives of the Mission for project formulation, implementation and monitoring. The office of JDA/DDA shall be the district nodal agency.

DLEC shall have the following functions:

- 1) Preparing roster of villages (all villages will be covered @ 3 ha per soil sample) for sampling of soils
- 2) Detailed analysis and interpretation of nutrient status of soils
- 3) Preparation of soil health cards and distribution.
- 4) Identification of major crops to develop nutrient management practices.
- 5) Ensure procurement of inputs in targeted villages
- 6) Build capacities of stakeholders.

- 7) Conduct village level meetings to disseminate site specific recommendations.
- 8) Identify farmers for demonstrations and identify best nutrient management practices for selected local crops
- 9) Introduce high value crops in improved soils.

**Fund Estimate:** An overall amount required to handle Soil Health Mission in a span of three years in a mission mode would be around 80.00 crore. As per the present estimate this amount would be provided by state government as well as would be appropriated under RKVY and Soil Health Management component of NMSA of Government of India scheme.

## **Monitoring**

- i. The Mission envisages a coordinated approach for monitoring and evaluation with active involvement of implementing agencies, beneficiaries and other stakeholders.
  
- ii. A combination of periodic desk review, field visits, and web-based mechanism will be adopted for releasing of funds, physical and financial progress and monitoring the progress of Mission interventions at State level by Additional Director of Agriculture (Organic Farming) in the State.

## **Impact Assessment, Periodic Evaluation and Reporting:**

- i. KSDA may evaluate efficacy of this Mission through a third party. The agency will assess the efficacy, performance, outcome and shortcomings of the Mission and recommend suitable corrective measures.
- ii. Information and communication technology will be deployed extensively for ensuring transparency in the implementation process and effective monitoring of the Mission programme.

## **Expected Outcome**

The Mission envisages:

- i. Distribution of Soil Health Cards to all the farmers in a round of every three years to promote Soil Health Management.
- ii. It will promote balanced and judicious use of plant nutrients.
- iii. Promotion of integrated nutrient system is expected to reduce the consumption of chemical fertilizers by 20%.
- iv. The productivity of selected crops is expected to increase about 20%.

- v. The demand for organic sources of plant nutrient like bio-fertilizers, organic manure, vermi-compost, slow release nitrogenous fertilizer like Neem/sulphur coated urea will increase, which in turn improve the soil fertility as well nutrient use efficiency.

## **11.0 Interventions**

Interventions proposed for the Mission includes development of modalities for soil sample collection along with standard sampling norms, quality control in the soil analysis, training of sampling staff and SHC personnel, intensive use of ICT for database management for faster delivery of soil health cards in PPP mode and popularizing soil test based INM through field demonstrations/field days.

In addition, state-specific and crop-specific improved package of practices for enhancing nutrient use efficiency will also be developed and made available to the farmers, so as to maximize the benefits of soil health cards.



## **The Soil Health Card:**

Soil health card is field-specific detailed report of soil fertility status and other important soil parameters that affect crop productivity. Besides, soil health, it also provides an advisory on soil test based use of fertilizers and amendments.

State Government is planning to take the support of supplementary institutions for covering large number of holding to generate soil health cards. Their activity can be outsourced or the SHCs can be operated on a Public Private Partnership mode. Standard procedures for the operational work of sampling, analysis, information reports in soil health cards and distribution to farmers will be put in place by the State Government. Soils will be analysed for N, P, K, EC, pH , secondary nutrients and micro nutrients.

Analysis of the massive scale of soil samples will be used to operationalise soil test based, District/Taluqa/Hobli/Grampanchayat wise fertilisers, (organic and inorganic,) recommendation for supplementing deficiencies. District/Taluqa/ Hobli/ Grampanchayat wise recommendations for various crops will make it easier to scale up dissemination to

farmers and popularise various components of nutrient management for relevant crops.

It is estimated that the cultivated area is **133.81** lakh hectares and there are about 78.32 lakh farm holdings in the state. To achieve the target in 2016-17 it is proposed to analyse 29.85 lakh soil samples for three years and 9.94 lakh soil sample per annum.

### **Details in a Soil Health Card**

- i. Information regarding Soil Fertility
- ii. Dosage of fertilizer application in crops.
- iii. Information on soil amendments of saline or alkaline soil
- iv. Recommendation on integrated nutrient management.

### **Norms of soil sampling**

The entire quality of soil testing results and fertilizer recommendation depends upon soil sampling. For this, following scientific norms are prescribed;

- i. Soil samples will be collected as one sample for 3 Ha for dry land and 2 ha for irrigated land and that will be analysed for both macro and micronutrients.

- ii. The ideal time for collection of soil samples is between harvest of one crop and sowing/planting of other crop, when fields are vacant.
- iii. Soil Samples are to be collected before applying manures and fertilizers.
- iv. The sampling depth for field crops should kept 15 cm.
- v. Sample has to be collected preferably with the help of stainless steel tube augur, or alternatively with a khurpi /spade or kassi.
- vi. A brief training to the soil sampling staff/students/farmers/field extension machinery would be necessary to ensure collection of representative soil sample, their labeling and transport to the SHCs.
- vii. GPS co-ordinates have to be essentially recorded at the time of soil sampling which will be downloaded in the SHC computer.
- viii. Since the most important factor that influences effectiveness of soil sampling is soil heterogeneity. It is informed that in rainfed areas, where the use of fertilizers may be relatively low, chemical parameters may be uniform and even a grid samples may represent the whole area. In

watershed that are gently sloping, the results may not differ significantly from 5% sample to 100% sample size. In such cases even a 5% sample can represent the whole area for the soil characteristics studied for soil fertility. Moreover, due to low productivity of dry lands. It is assumed that mining of micro nutrient reserves in soils is much less than in irrigation production systems.

ix. In case of irrigated areas Soil Test based Crop Response (STCR) methodology will be followed.

### **GPS based Soil sampling:**

For further utilization of the soil testing results in developing soil fertility maps, GPS based soil sampling is essentially required. For this, a provision of required number of GPS has been proposed with each hobli. Hence, local field extension functionaries soil sampling staff/students/farmers may be entrusted additional responsibility for collection of 50 samples per day.

### **Transportation of soil sample to SHC.**

The properly packaged and labeled soil samples have to be transported to the concerned SHC as early as possible.

## **Soil analysis by SHC**

- i. Soil samples once received in the SHCs should be processed following standard procedures and analyzed for various parameters namely pH, electrical conductivity (EC), organic carbon (OC), and available P, K, S and micronutrients.
- ii. To overcome staff shortage, the testing of samples in the soil testing laboratories may be outsourced to private agencies. The soil analysis has to be completed within 3 weeks of receipt of soil samples in the SHC.
- iii. In order to monitor the quality of analysis in SHC it is planned to have two referral lab in the state to cross check the soil samples analysed in the laboratory.
- iv. In addition to distribution of SHCs through post/extension staff, mechanism will be developed for online delivery of soil health cards also to the farmers using ICT.
- v. The referral soil test labs shall prepare time lines for scheduling the soil health cards in the district in phases. The year wise coverage of number of taluqas/ blocks may be

prepared so that a continuous nutrient analysis takes place every three years.

**Soil Fertility Map:**Preparation of GPS based digital soil fertility maps of state ,Distict, Taluka, Hobli and Grampanchaya and same will be utilized for creating awareness among the farmers and to apply fertilizers judiciously.

**Random checking of soil analysis for quality improvement**

- i. Mechanism will be developed for random checking of 1% samples of total analyzed samples by referral labs (Bangalore and Dharwad) of state department of Agriculture.
- ii. State Level Monitoring Committee monitoring team would monitor, inspect and evaluate the functioning of SHCs and other concerned agencies pertaining to issue of soil health cards in the respective districts.

## **Enhancing farmer's awareness regarding soil test based nutrient management**

Utility of soil health cards lies in the adoption of recommendations entailed therein by the farmers. For this specific purpose, awareness programmes for farmers and soil sampling teams will be organized by experts under SAUs/KVKs and other agencies.

A feedback mechanism on the adoption of soil test based prescriptions given in the soil health cards will be developed by State involving the experts from SAUs/ICAR institutes and State Department of Agriculture, so as to assess the real utilization of the soil health cards by the farmers.

## **Frontline Field Demonstrations (FFDs) for promotion of Integrated Nutrient Management**

For demonstrating the usefulness of balanced use of fertilizers, it is essential that SHCs' recommendations are taken up for Field demonstrations in villages. It is proposed to adopt 29 villages by 29 Soil Health Centres to conduct frontline field demonstration on balanced use of fertilizers.

A field day shall 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.

### **Training for soil analysis**

One-week hands-on orientation training to Analysts for soil analysis and fertilizer recommendation in the batches of 20 participants will be organized at SAUs/DATCs.

### **Capacity building and regular monitoring and evaluation.**

Diagnostic soil health assessment of farmer fields will be taken up periodically so as to issue health cards at least once in 3 years. Districts and villages within them will be selected in such a way that an action plan is in place to cover them every three years. Timelines will be determined for nutrient status mapping based on soil fertility analysis and productivity enhancement through application of deficient nutrients. Data will be developed for diagnostic soil analysis and deficient fields in each district. Nutrient recommendations will be prepared for Kharif, Rabi and Summer crops. Block wise fertilizer dosage



adjusted for soil test nutrient status for various crops will be developed.

Orientation for technical and line staff along with SAU/ICAR institutions will be conducted by state. Coordination committees will be constituted in the target districts for facilitating implementation for balanced nutrient practice and monetary backstopping. Identified farmers will be registered for financial support for dosage nutrients.

Anexure I: Consumption of Fertilisers in Karnataka during 2012-13

Details	N	P	K
'000 tonnes	891.69	389.64	249.87
per ha consumption in Kgs	68.27	29.83	19.13
fertiliser consumption ratio in 2009-10	2.1	1.4	1
fertiliser consumption ratio in 2012-13	3.6	1.6	1



AnnexureIII a: List of Soil Health Centres

<b>Sl.No.</b>	<b>Soil Health Centres to be under ppp mode.</b>
1	Assistant Director of Agriculture, Soil Health Centre, Near D.C office, Kolar
2	Assistant Director of Agriculture, Soil Health Centre, Near District Court, Tumkur-572101
3	Assistant Director of Agriculture, Soil Health Centre, Near D.C office, Mandya-571 401.
4	Assistant Director of Agriculture, Soil Health Centre, Kudige, Kodagu District.
5	Assistant Director of Agriculture, Soil Health Centre, Nanjanagud-571 301, Mysore district.
6	Assistant Director of Agriculture, Soil Health Centre, Santepet, Hassan.
7	Assistant Director of Agriculture, Soil Health Center, Old Thirthahalli Rd, Shimoga district - 577 202.
8	Assistant Director of Agriculture, Soil Health Centre, Gokak, Belgaum district - 591 307
9	Assistant Director of Agriculture, Soil Health Centre, Bhalkhi, Bidar district-585 328
10	Assistant Director of Agriculture, Soil Health Centre, Joint Director of Agriculture compound, Chikkamagalore-577 101.
11	Assistant Director of Agriculture, Soil Health Centre, Sirsi, Uttara Kannada District - 581402
12	Assistant Director of Agriculture, Soil Health Centre, RMC Yard, Davangere-577 003.
13	Assistant Director of Agriculture, Soil Health Centre, APMC Yard, Gadag-582 101.
14	Assistant Director of Agriculture, Soil Health Centre, Krishi sankirna, Raichur- 585401
15	Assistant Director of Agriculture, Soil Health Centre, APMC Yard, Bellary-583 101.
16	Assistant Director of Agriculture, Soil Health Centre, Jamkhandi, Bagalkot district - 587 302
17	Assistant Director of Agriculture, Soil Health Centre, Vaddarhatti Camp, Gangavathi, Koppal district.
18	Assistant Director of Agriculture, Soil Health Centre, DATC, Devihosur, Haveri district.

19	Soil Health Centre, Near JDA Office, Chamarajnagar,
20	Soil Health Centre, Near JDA Office, Ramanagar
21	Soil Health Centre, Near JDA Office, Chitradurga
22	Soil Health Centre, Kagati, Chikkaballapur
23	Soil Health Centre, Near JDA Office, Udupi
24	Soil Health Centre, Near Krishik Samaj, Bijapur
25	Soil Health Centre, Yadagiri.
26	Assistant Director of Agriculture, Soil Health Centre, Jilla Panchayath compound, Magalore-575 001, Dhakhina Kannada District.
27	Assistant Director of Agriculture, Soil Health Centre, Kotnur, Gulbarga-585 103

AnnexureIII b: List of Soil Health Centres for referral labs

<b>Sl.No.</b>	<b>List of Referral lab</b>
1	Assistant Director of Agriculture, Soil Health Centre, Sheshadri Road, Bangalore (Rural). and Micronutrient Laboratory O/o DDA(Soil Health), Sheshadri Road, Bangalore
2	Assistant Director of Agriculture, Soil Health Centre, Near District Agriculture training centre, Dharwad-580 008.