



Remote Sensing – A futuristic technique in soil health management

Dr. V.D. PATIL¹

*Professor and Head, Soil Science and Agricultural Chemistry, Vasantrao Naik
Marathwada Agricultural University, Parbhani - 431 402 (Maharashtra)*

**Email : vilas_222902@rediffmail.com*

During the year 1967-97 the country witnessed Green revolution characterized by beneficial fusion of professional skill, political will and farmer enthusiasm. However from 1997 onwards India is witnessing a stagnation in production and productivity and a fatigue in green revolution. This was the reflection of declined soil fertility and increased nutrient mining. The soil health/fertility status of Indian soils has declined drastically over the years and is marked by a negative balance of 8-10 million tonnes between nutrients removed by crops and those added through manures and fertilizer. Considering the projected food grain demand and fertilizer consumption by 2025, this gap is likely to increase to 13.3 Mt of NPK. Total food grain production increased from 51 million tones (Mt) in 1950-51 to 72 Mt in 1965 -66 and touched around 257 Mt in 2012-13. Estimated requirement in 2030 and 2050 is 345 and 494 Mt, respectively. Where from and at what and whose cost will this additional food grain production come? Under this paradigm situation we are mainly concern how to manage soil health. Particularly depletion of soil fertility due to nutrient mining, soil erosion, salinity, alkalinity, soil acidity, water logging & some other concern problems. The conventional diagnostic techniques of soil fertility evaluation, are not reaching to the masses in time because they requires more time and labor intensive. Therefore we need the technique which will cover large area in a unit time and can have a synoptic coverage.

As such, from last several decades remote sensing has become an invaluable tool in soil research because of its ability to nondestructively analyze soil properties and characterize the heterogeneity of the soil in spatial and temporal domain. The study of spectral reflectance of soils has ability to provide rapid predication of soil physical, chemical and biological properties. Under laboratory conditions, for sensing soil organic matter content in the field and for the discrimination of major soil types from satellite data and hyper spectral data. In India, spectral libraries were developed using spectro-radiometer with spectral range of 350 nm - 2500 nm for about 600 pedons and 2500 surface and subsurface soils covering all major soil orders in major physiographic units in the country. Such hyper-spectral libraries will be of immense use for characterization of soils. Remote sensing techniques (both optical and microwave) by virtue of their large area coverage, frequent revisit capability enabling repeated estimates on regular basis are highly suitable for soil moisture estimation. The microwave remote sensing techniques can prove very promising for soil moisture studies.

The main application of RS in soil fertility is primarily in spatial assessment of soil fertility in terms of nutrient deficiency represented by poor crop growth. The components of soil fertility that can be addressed with RS include organic carbon, NPK and micronutrients (Fe, Mn, Zn, Cu) levels. Diagnosing specific nutrient deficiency with remote sensing data can be difficult when plants are subjected to deficiencies of multiple nutrients. However recently, Hyper spectral remote sensing was found to be an important tool for the diagnosis of nutrient stress, the utility of hyper spectral data in distinguishing differences in N and P at the leaf and canopy level has been proved. Another main application of RS data is in preparation of soil fertility maps that help in reducing frequency of field observations.

The application of remotely sensed data to study the soil resources particularly soil health is being operational and can be used for soil and land degradation mapping of the country. However its use in soil fertility studies is not wide spread. Hence it is the need of hour to develop the spectral library in relation to plant nutrient sufficiency / deficiency. The more studies are to be centralized in Hyper Spectral Remote sensing. Looking in to the forth coming high resolution hyper spectral remote sensing data a technical human resource should be developed from the State Agricultural Universities and ICAR institutes. So that they became capable to handle and use the recent RS techniques for soil resource management and monitoring of soil health.

***Dr. Patil** started his service carrier as JRA in 1981 and at present working as Professor and Head, Soil Science and in-charge Associate Dean, College of Agriculture, Golegaon, VNMKV, Parbhani. His area of research is soil fertility and soil resource management. From last 10 years he is working on spectral reflectance behavior of crops under nutrient stress condition. He received appreciation Prof. K Kasturirangan Ex ISRO chairman for his work on identification of nutrient deficiency by remote sensing. Guided 22 M Sc and 9 Ph.D. students. Published 52 research papers and 6 books and more than 105 technical papers in local language, Marathi. He worked in Germany under INSA-DFG bilateral scientist exchange program. Presented his research at Turkey, Thailand, Israel, UK and Germany. Recipient of many awards and recognitions, including International Liebig Award for 25 years of research in soil science., *Mrudgandh* award, Best Teacher award for two times to list few. He is a recipient of appreciation letter from Hon. Prime minister Shri. Atal Bihari Bajpai for inculcating Gandhian thoughts among the college youth.