AgriCos e-Newsletter
ISSN: 2582-7049
Volume : 01 Issue : 04 August 2020 Article No: 16

Importance of Remote sensing in Soil Science

Kabir Debbarma
PhD Scholar, College of Post Graduate Studies in Agricultural Sciences, CAU, Imphal, Manipur

SUMMARY

Global environmental changes are continuously altering land use system. Therefore, it is important to know about the changing soil information on local, regional and global scales to monitor the soil fertility and agricultural development. In this case, remote sensing and digital soil mapping provides and advance data collection and analyses large, medium, small-scale mapping and monitoring of soil properties. At present timely and accurate information on soils properties with respect to crop yield is very important for proper utilization of amendments, fertilizers and composts on a sustained basis. Now the advances technological of Remote sensing, Global Positioning System (GPS) and Geographic Information System (GIS) is becoming the important part of soil science. So far high resolution remote sensing sensor like IRS-P6 LISS IV, PAN, Cartosat-I, IKONOS, GPS and GIS has been used to generate maps of different soil properties. Different experiment has been conducted for soil erosion, degradation, problem soil mapping by remote sensing technique to improve soil health and agriculture productivity in national and international basis.

INTRODUCTION

Remote sensing refers to techniques and methods used to examine the upper most surface of the earth and to create of a stationary or mobile image in a position at a specific level. Its consists of several machines carried on a satellite which collect information of a particular object on the Earth surface without making any kind of contact with the object. Basically there are two types of sensors i.e passive and active. A passive sensor system requires source of external energy i.e sun. It is depends on reflective and emitted energy wave lengths from a light source, where as an active sensor system can generates its own energy source. A radar sensor emits sound waves and records the reflected waves coming back from the surface. Remote sensing records the electromagnetic energy beyond from 400 to 700 nm . The amount of radiation from an object is known as radiance. The sun is the major source of radiation. Sun emits different wavelengths of electromagnetic radiation i.e visible light, infrared, radio and microwaves. Agricultural and crop production follows depends on the physical factors (e.g., soil, slope) and climatic factor (precipitation, temperature, humidity). So in this case the application of remote sensing plays important role in analysis of agricultural field, crop & soil health, water management and its quality, and also favourable climatic conditions with related to yield. Different techniques of remote sensing applications including visual interpretation and digital image interpretation have been applied in different areas to generate land use mapping. Remote sensing methods helps in different way (1) Determination of homogenous and heterogeneous soil properties in a particular area by mean of soil sampling. (2) Its allow to determine soil properties by mean of physically-based and empirical methods. (3) Spatial analysis of soil properties in a particular area. Remote sensing provides valuable data for soil mapping in a space and time which is very essential for land use land planning. Remote sensing determine soil mineralogy, texture, soil iron, soil moisture, soil organic carbon, soil salinity and carbonate content. Remote sensing along with the other advanced techniques such as global positioning systems and geographical information systems are playing a major role in the assessment and management of different soil properties.

Remote sensing in Soil Science

In present generation Remote Sensing and GIS has become very much important both in the field of pedology, geography and agricultural science. Digital Soil Mapping uses statistical tools to measure the spatial relationship between soil properties. It has been observed that the soil properties (textures, organic and inorganic carbon content, macro- and micro-nutrients, moisture content, cation exchange capacity, electrical conductivity, pH, and iron) were determined with RS successfully. The visible and near-infrared regions are most commonly used to examine soil properties. The importance of remote sensing is as follow:

1. **Soil Organic carbon mapping :** Remote sensing and GIS gives perfect prediction of spatial variation of soil organic carbon by generating a spatial variability map of soil organic carbon. The systematic proper satellite imagery depends on various factors such as roughness, soil moisture, vegetation cover which can be also the

major issue of quantifying soil organic carbon. Therefore, the use of remote sensing will allow generating the digital soil maps in terms of carbon, and further it will sort out the strategic management for soil conservations or agricultural areas.

2. **Soil Fertility Mapping:** Soil current nutrients status, fertilizer recommendation map can be created by remote sensing and GIS software with five individual color zones; namely normal, marginal, medium, high and very high. It will be very easy for scientists and farmers to recognize the fertile and unfertile soil area. Different Soil properties such as pH, electrical conductivity (EC), available macro and micro nutrients were determined in surface soil can be prepared by using remote sensing.
3. **Soil Degradation and Erosion Mapping:** Combine uses of GIS and remote sensing imagery creates prediction mapping of soil physical condition which helps to mitigate soil erosion and degradation in a specific area. Therefore, the application of remote sensing and GIS is very useful to minimize or eradicate land degradation and conserve land resources in an efficient manner.
4. **Acid Soil, Saline and Alkaline Soil Mapping:** The soil acidification, salinity, alkaline depends on a number of factors such as cation exchange capacity, base saturation, texture, organic matter content, anion mobility, thickness, precipitation rate and vegetative cover of the area. GIS software can be used to develop spatial distribution soil maps showing the acidity level and vulnerability classes of the agricultural soils in a particular region.
5. **Soil Moisture Mapping:** A soil moisture map can be created based on land use, remote sensing data indexes, and spatial interpolation of the field survey sample data. The several interpolation methods i.e inverse distance weighting, kriging, and co-kriging can be used for generating soil moisture maps from the sample data for a particular zone.

Conclusions:

Several high resolution satellite data were utilized successfully for deriving the spatial and temporal soil information at different scale level. It is sure that proper management and use of satellite derived spatial data and ground observations helps to develop soil fertility and increase crop yield of the specific region. However more remote sensing experiment has to be carried out for accurate prediction in differentiating soil properties and landuse in various agro-climatic zones.

REFERENCES

Gharechelou, S., Tateishi, R., Sharma, R..C and Johnson, B.L.(2016). Soil Moisture Mapping in an Arid Area Using a Land Unit Area (LUA) Sampling Approach and Geostatistical Interpolation Techniques. Int. J. Geo-Inf., 5(35):1-17.

Karale, R.L., Bali, Y.P. And Rao, K.V.S. (1983). Soil mapping using remote sensing techniques. Proc. Indian Acad. Sci. (Engg. Sci),6 (3):197-208.

Manchanda, M.L., Kudrat,M. and A.K.Tiwari (2002). Soil survey and mapping using remote sensing. Tropical Eco., 43(1): 61-74.

Nawaz, R., Tripathi, N.K. and Parkpian, P. (2011). Soil Acidity Ranking, Soil Sensitivity and Vulnerability to Acid Deposition in the Northeast Region of Thailand. In: International Conference on Biology, Environment and Chemistry. Pp 415-419.

Rahman, M.A.E.A., Natarajan,A., Srinivasamurthy, C.A. and Hegde, R. (2016). Estimating soil fertility status in physically degraded land using GIS and remote sensing techniques in Chamarajanagar district, Karnataka, India. The Egyptian J. of Remote Sensing and Space Sci., 19:95-108.