

# Site Specific Soil and Crop Management

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**Abstract:- This Paper Speaks About Site Specific Soil And Crop Management The soil varies from place to place and many of its properties change from time to time. The variation is due to space and time variations of edaphic, biological topographic, anthropogenic characters and climate. The change is influenced by different interactions of soil forming factors along with space and time. Information about soil variability is important in ecological model designing, environmental forecast, precision agriculture and natural resources conservation. There is a need in modern agriculture in understanding spatial and temporal variations within a field. Understanding such variation is essential for site specific soil and crop management, which requires the portraying of management areas.**

## I. INTRODUCTION

Site specific soil and crop management is also called as precision farming or satellite farming. It is based upon observing different parameters like measuring, observing, responding to inter and intra variability of soils. It is the most efficient and modern agriculture technique for better production of yield and it also conserves the natural resources, minerals, maintain soil productivity and fertility. Without causing damage to the soil structure. SSCM require information about variability of soil within the site and variability of climate.

## II. APPLICATION OF SSCM

Sensors are placed throughout the field. These sensors detect the micro changes in soil as well as plants and send the data. The data can be analyzed and the information is given to the farmer about the nutrient status, planting space, seed rate, fertilizer requirement, irrigation, application of weedicides and fungicides. This data helps farmer where to apply and how to apply so that there will be less wastage of resources and less damage to soil and contamination air underground water leaching of minerals can be prevented which conserves Farmers lots of expenditure and increases the income to the farmers. Now-a-days these sensors or connected to drip systems for computer operated irrigation systems. Tractors, harvesters, tillers, levelers are operated through computers which cause least damage to the crop and soil.

Farmers using (SSCM) have data related to humidity, weather data, temperature, rainfall, relative humidity, growth rate, yield, light intensity and agro Meteorological data. They use variable rate technology for efficient management of fertilizer, seeds, weedicides, fungicides, variable rate technology provide information about change in soils with in the specified site. Crops can be grown on any type soil but sscm provide information which crop can be

grown on which type of soil. Soils with poor soil conditions grasses can be grown for grazing of animals, where soils with loamy, clay, clay loam wide range of crops can be grown.

Climatic variability is also a major factor, and may often be even highly important, than space variability. The difference in crop yield between poor and good climatic years can often be one order of magnitude. The effectiveness of space variability on crop yield may be less in few years. Site specific farming management decisions have largely focused on strategies for managing space variability in an average to good growing season climate, rather than managing for both space and time variability.

If fields were unique, there would be no need for site specific farming. Since fields contain a wide arrangement of soils properties and crop productivity is the normal rather than the exception in most fields. Mean values for crop yields within sub regions of a field can vary from 1500 to 3500 kg/ha for rice (*Oryza sativa* L.) or from 2000 to 6000 kg/ha for sorghum (*Sorghum bicolor*). Soil fertility can be so extensively varied that some parts of a field require no fertilizer application, while other parts require high amount of N or P. With such massive variations, a great lurking exists for adopting site specific farming.

## III. VARIATION OF SOILS

The main aim of SSCM is to find the variability in soils. There are two types of variability in soil 1.SPATIAL VARIABILITY 2.TEMPORAL VARIABILITY.

*Spatial:-* Spatial variability takes place when a thing that is measured at different locations exhibits values that differ from one location to location. Spatial is relating to space, area, position and size of things. Spatial variability can be assessed by spatial descriptive statistics such as range.

*Temporal:-* It refers to changes occurred with elapsing time and spatial to geographical or horizontal variations which represent vertical horizontal variations.

*Variogram:-* A variogram is a unique function calculated by using of measuring variation across two or more points which are at different locations. The gap between the points should be minimum, it must be within the site of the given area. It gives the space variation of random fields when compared together. It is just a theoretical prediction of sampled data not accurate data. For examples sample collected from a field for moisture percentage check .when the two samples are compared the mean of the samples is collected and the moisture level of entire field is predicted.

**IV. KRIGING METHOD**

Kriging is an interpolation technique based on the theory of regionalized variables developed by G. MATHERON. Kriging offers a wide and flexible variety of tools that provide estimates for UN sampled locations using weighted average of neighbouring field values falling within a certain distances called the range of influence. kriging require a variogram model. The variogram functionality in conjunction with kriging allow us to estimate the accuracy with which the value at an un sampled location can be predicted given the sample values at other locations. Kriging provides optimal interpolation of soil moisture. At grid points in a spatial domain based on auto correlation in the variograms.

**V. VARIABLE RATE APPLICATION OF INPUTS**

This is the simple idea of site specific soil and crop management is that instead of applying a single fertilizer throughout the field, the rate should be modified according to matching ranges of regional requirements. VAR can be focused at any rate based on operation that influence crop yield and can be done with the help of variable rate technology or by using manual switching or multi pass applications. Using VRT just makes the job easier and allows more sophisticated placement and rate adjustment. The use of VRA should optimize both the environmental and economic outcome of a field. The major benefits of VRA are generally higher when the amount of space variation is higher the pattern of space variability tends more towards consistent patches. This usually means fewer rate changes are observed the pattern of variability is driven by space rather than time factors, so it is likely to be relatively constant from season to season and easier to tabulate VRA plans and the unit cost of input is high relative to the price paid for the crop.



Fig 1:- this shows the moisture level variation with in a site, the dark color indicate moisture level and light color indicate dryness.

LOCATION: MEHERU, JALANDHAR, PUNJAB

Geographical coordinates are 31° 15' 47" North, 75° 41' 20" East

PROCEDURE OF SITE SPECIFIC AND SOIL MANAGEMANT:

We need to confirm that site specific farming should be the average potential to the farm. There should not be any problems related to soil properties, soil biology, climate etc.

Use various maps of soil, crop yield, biomass get a better knowledge about amount and pattern of variability with in the site .analyze if the variability

Find what or the main causes that are affecting the variability of sol within the site. Measure its consequences like weeds, pest and insect.

Get information about the problem areas which affect the retaining of the fertility  
Of the soil like gypsum, soil ph. Sodicity, weeds, pest etc.

The amount and pattern of any remaining yield variability is mainly due to natural variation in yield potential in combination with weather conditions. If sampling of the soil/crop has shown build up or deficiencies in nutrients in association

Improve farm production records with space information, use data for marketing improvements and work on managing quality to

**VI. CONCLUSION**

A fruitful precision farming management system is to maintain the optimum profitability with few restrictions and environmental protection can be found out, characterized and managed at the appropriate spaces and times. Site specific management programs based upon soil testing may not be successful if the major limitation to crop profitability is soil water availability, poor aeration, or weed pressure. A few key process control crop productivity, nutrient and water availability, or pest competition and control.

**REFERENCES**

- [1]. <http://imap.newagsystems.com/downloads/SSCM1.pdf>.
- [2]. [https://sydney.edu.au/agriculture/pal/documents/How\\_to\\_begin\\_with\\_SSCM.pdf](https://sydney.edu.au/agriculture/pal/documents/How_to_begin_with_SSCM.pdf).
- [3]. <https://site-closed.wikispaces.com/>.
- [4]. <http://desktop.arcgis.com/en/arcmap/10.3/tools/3d-analyst-toolbox/how-kriging-works.htm>.
- [5]. <http://www.croplnutrition.com/efu-site-specific-nutrient-management>.
- [6]. [https://www.researchgate.net/publication/228770164\\_Delineating\\_site-specific\\_crop\\_management\\_units\\_Precision\\_agriculture\\_application\\_in\\_GIS](https://www.researchgate.net/publication/228770164_Delineating_site-specific_crop_management_units_Precision_agriculture_application_in_GIS).
- [7]. <https://gisgeography.com/kriging-interpolation-prediction/>.
- [8]. <https://www.sciencedirect.com/science/article/pii/S0168169995000437>.
- [9]. <https://academic.oup.com/aep/article-abstract/21/2/455/7439?redirectedFrom=PDF>
- [10]. <https://agrihunt.com/recent-researches/what-is-site-specific-crop-management/>
- [11]. <https://agex.org.au/media/site-specific-crop-management-for-precision-ag/>.
- [12].