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GIS and Remote Sensing Techniques For Agricultural Land Use / Cover:A Concise Review

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Abstract

Agriculture plays an important role in economy's growth of countries. The food is important for everyone, due to the climates changes, water & soli pollution. The production of food is less than previous years. Farmer and an Agricultural Agency face a problem to producing food in a cost-effective manner. GIS, Remote Sensing Technique for agricultural/LC are use for decision support in a production of a food.GIS &Remote sensing image are benefit in agricultural production because It gives the accurate information of agricultural land like crop identification, crop classification, crop condition, crop & soil monitoring. This paper attempts a concise review for GIS and Remote sensing Techniques for Agricultural Land Use/ Cover.

Keywords –Classification, Crop area, crop yield estimation Soil Mapping.

I. INTRODUCTION

Due to rapid growth of population, urbanization, industry, the agricultural land is decreasing day by day. In small & large area in agriculture the information about Land cover/ use play are play an important role [1]using GIS& Remote Sensing Technique are support to take decision & planning in more effective &realistic [2]. In Land cover there are a different factors of the earth are included like Mountain, Rocks, Water, Crop, Building, Trees, and Soil etc .Human can be use land for to produce food, developing area for their need [3]. All countries economic growth & food security is dependent on agriculture. In many countries Agriculture is primary source to maintain the food requirement for everyone. The goal of every farmer and agricultural agencies are to production food in a cost-effective manner.

Remote Sensing, GIS and GPS technologies gives the information to farmer about the crop condition, damage, and yield& soil condition. Every country first priority is to production food in sufficient quantity. For growing crops water and nutrients are required.

Weather condition & changes are effect on crop growth. So, avoid this problem Remote Sensing & GIS data are used in monitor crops and identified problem& supports in decision about crops & agricultural strategies [4].The information about land use/cover is useful in developing, planning & decision in, planning in agriculture [5]. The different parts are important in the study of Land use/ cover for effective planning like Soil survey, flood area, maps, Arial photography , vegetation survey etc. [6].

In urban planning the Remote Sensing & GIS information are used in rapidly changes in land use/ cover [7].

Remote sensing is art of science which gives the information about the earth withouttouch it.

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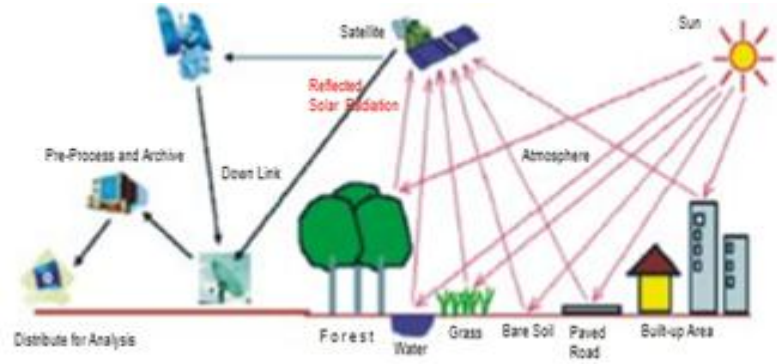

Fig . 1.1 Remote Sensing process

GIS are used for to store the information about the image, storing, integrating, analysis and displaying data on a system. The store the information in digital format three types features can be used. **a) Points:** are used for building, school, hospital etc .**b) Lines:** are used for road, mountain range& railway track etc. **c) Polygon:** are used for forest, water bodies etc.

II.AGRICULTURAL APPLICATIONS

2.1.Cropidentification & Classification

Remote sensing technology can be used to prepare maps of crop identification & classification .As compare to ground surveying method the information from satellites is accurate &systematic. Remote sensing gives the information for farmer & agricultural agencies about which crop grown in certain area &when. This information are used to serves predict grain crop yield, crop production statistics, crop rotation, soil type or soil monitoring.

2.2 What kind of images can be used?

There are two types of remote sensing system passive & active system, Plant reflects electromagnetic energy which is senses by passive system. Multi-spectral sensors measured and monitored vegetation spectral reflection on the basis of crop type, crop growth, crop health. Remote sensing sensors can be operating in RGB infrared region in Electromagnetic spectrum, which measure absorption & reflection energy associated with Vegetation. For observation of vegetation multi-temporal images from different sensors provide complementary information.

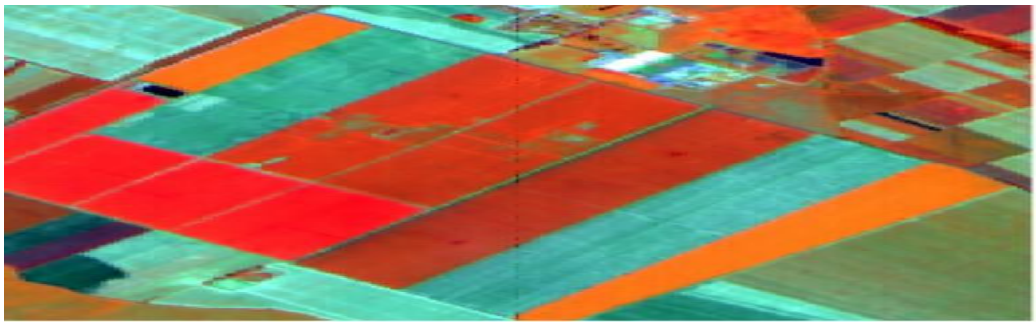

Fig.2.2 some species (red color) of cultivated plant on satellite image

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2.3 Crop monitoring and damage

Remote sensing has a number of attributes that lend themselves to monitoring the health of crops. The optical (VIR) sensing advantage is that it can see the infrared, where wavelengths are highly sensitive to crop vigor as well as crop stress and crop damage. Remote sensing aid are used dry or wet area , damage by insect , Fungal infection or weather related damages as shown in fig 2.3.Foe detecting damage & monitoring crop high resolution & multi spectral Images are required. Most critical factors in making imagery is to quick changes crop rotation in time.

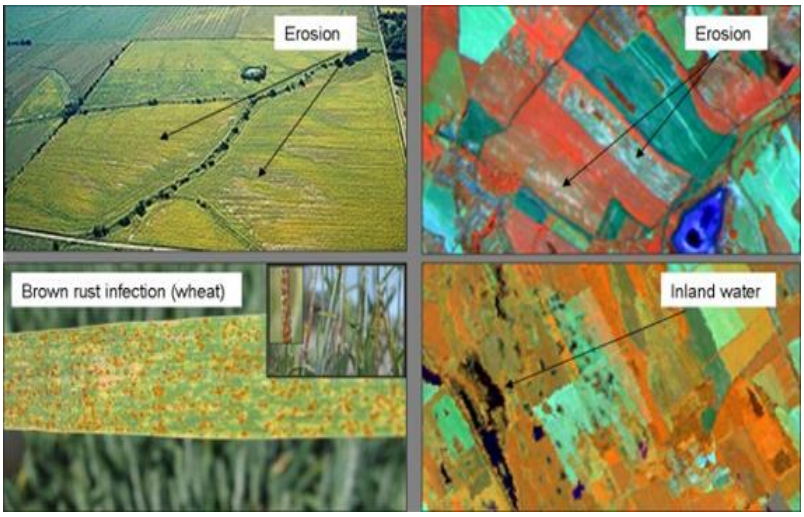

Fig. 2.3 problems inside the agricultural fields

2.4 Crop Inventory

Two crops have same spectral information at given date then Remote sensing data can be used to crop classification, crop monitor &crop health.

Remote Sensing applications in agriculture:

a) Crop classification& identification

b) Crop condition& monitoring assessment

c) Crop area and yield estimation

d) Soil mapping & its characteristics

e) Precision farming practices, etc.

2.5.Directmonitoring method

Depend upon Vegetation indices crop condition are decided if indices is low then condition is not better& if high then condition is better. This direct monitoring method is depends on vegetation indices which are easy to use and promised but if large area or complex area will be big then it should be failed.

2.6 Image classification method

To monitor the crop growth status two methods are very important i.e. supervised and unsupervised classification methods using multi temporal satellite imagery.

IJARSE
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2.7 Same-period comparing method

Comparing same period remote sensing data i.e. NDVI, LAI for instance new one gives the crop growing status. In these method vegetation indices such as differences, ratios are mostly used.

2.8 Crop growth profile monitoring method

The crop growth profiling method is the different between the crop growing seen year & year in same duration of the growing season .During crop season a data of NDVI time series are used for crop profile. In the crop growth profile using NDVI different crops have different characteristics even same crop grow in different environment having different crop growth profile.

2.9 Crop growing & Diagnosis models method

The various stages in the crop life cycle are used in crop growing model. In Diagnosis model crop condition & environment effect on crop are included.

2.10. Crop area and yield estimation

In agricultural purchasing, storing, import export of food are planning depend on yield estimation thus, it is the backbone of agricultural activities.

This crop yield estimation classification:

a) Data selection with maximum vegetation crop growth in Single date,

b) Crop identification through ground survey,

c) Signature generation for the training site,

d) Classification of image through training statistics,

e) District boundary crop area estimation using administrative.

The crop yield estimation areas as follows:

2.10.1.Pixel counting or pixel analysis

Remote sensing image pixel counting or pixel analysis is used in crop yield estimation but having some limitations in this method for image classification due to same order.

2.10.2.Regression and small area estimates

In small area information from ground surveys is accurate than remote sensing images. In crop yield estimation the combination of resolution in fine& medium images are used. As compare to Remote sensing images information ground surveys information are possible in low cost.

2.10.3.Supporting area frame surveys

Frame survey is sampling ground layer information in a unit. If farmer have an information about the crop yield at early stage

It is profitable for farmer & country growth.

The vegetation images generated from remote sensed images are usable for crop yield estimation. This vegetation images are used to calculated yield at district.

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2.11.Soil mapping or Characteristics

Different area having different type of soil, soil problems are Salinity, soil acidification and erosion. For soil mapping & degradation remote sensing is a good method. During surface erosion soil layers that rise different color shade & structure than non erosion soils thus the erosion parts of soil can be easily identify in image. Multi-temporal images are used to study soil mapping& soil erosion, soil moisture.

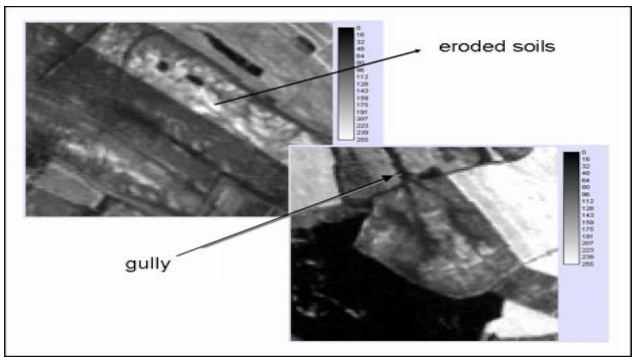

Fig. 2.15some kind of erosion in satellite image

Soil mapping are beneficial in agriculture for management &developing. Traditional soil sampling & laboratory analyses methods are very slow, costly and they could not they cannot be required information. In this condition active and passive remote sensing are used for soil mapping &its quality. The important of soil Mapping is useful for crop management, crop yield estimation, planning land use for crop. Different model are used for study like for watershed management runoff model, climate changes model for land& atmosphere biogeochemical cycles study for agriculture etc.

Using Remote sensing data soil property can be described as follows:

2.11.1Soil texture& Hydraulic Properties

For water flow &soil resources and estimation of soil texture & hydraulic properties is necessary. For improving crop production sufficient water &soil resources information is required. To Measure soil physical properties are time- consuming.

2.11.2 Soil Surface Roughness

Soil surface roughness (SSR) is used to study about soil for ex. thermal properties, infiltration rate, and surface run-off of soil to erosion.

III. GIS & REMOTE SENSING TECHNIQUES FOR AGRICULTURE LAND USE/ COVER

To study or analyze any area GIS or remote sensing data are required. This data can be gathered from Remote Sensing images, Arial photography, maps &topological sheet. For Land use/cover analysis in any area researchers used a lot of Remote sensing techniques. This Techniques are used for crop classification, monitoring, identification; changes occur in certain period& water bodies in land use/cover. The main techniques are as follows:

3.1. Supervised& Unsupervised classification

Supervised classification is used to indentify land cover type. Supervised classifiers are based on the statistics for ex. maximum likelihood classifier, minimum distance classifier, mahalanobis classifier.

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Unsupervised classification is a method in which large number of unknown pixels is examined and divides into classed on the bases on natural groupings present in the image values. For Unsupervised classification analyst-specified training does not require. The two types of unsupervised classifiers are K-means clustering and Iterative Self- Organizing Data Analysis (ISODATA).

3.2 Maximum likelihood & Minimum distance classification

Maximum Classification is most popular classification technique used in Remote Sensing, in which a pixel with the maximum likelihood is classification in corresponding class. It is a statistical decision in the classification of overlapping. Highest probability pixels are assigned to the class. For Unknown pixel Gaussian maximum likelihood classifier issued. Classification is based on probability density function associated with a particular area or site.

The Minimum classification is used for unknown image data which minimize the distance between image data and the class in multi-feature space.

The distance is defined as an index of similarity.

3.3 Hybrid classification

Hybrid classifier is the combination of supervised and unsupervised classification. This classification produced more accurate classifications than the supervised classification; but till date it did not improve the accuracy as comparison to the unsupervised classification.

3.4 Fuzzy classification

It is a soft computing technique& better than hard computing techniques. Because in this techniques fuzzy logic, neural network, machine learning, can gives better facility to handle mixed pixels. In Fuzzy classified process grouping elements classified into a fuzzy set whose membership function is defined by the truth value between TRUE or FALSE (1.0 and 0.0).

IV. CONCLUSION

There are various Remote sensing techniques used for Agriculture land use/ cover for classification, identification & analysis of any particular area or region. In this technique Maximum likelihood classification technique is first important technique, second important method are Supervised & Unsupervised classification technique for classification& identification. Fuzzy classified same elements. Hybrid classification is the lowest useful technique in classification. Soil mapping &characteristics are important for crop production &growth. Precision farming is useful in agricultural production& helps to reduce the use of chemical, water resources in production &to enhanced quality, quantity. GIS & Remote Sensing information helps to reduced cost of production in agricultural crops.

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