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Article

The use of GIS Methodology in Agriculture

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A B S T R A C T

Droughts, floods, swarms and bugs have affected the farming community for centuries. Enhancements have been made to ensure the protection and growth of crops worldwide and yet these issues and many more continue to make or break individuals or groups affected by them. Consistent and periodic information of land with respect to their nature and spatial distribution is very critical for best use of available natural resources on a sustained basis. The technological advances in the field of remote sensing, Global Positioning System (GPS) and Geographic Information System (GIS) have growthd the efficiency in agriculture. GIS Remote Sensing are very helpful in being able to map and project current and future variations in temperature, crop output and more. Mapping geographic and geologic features of current farmland allows scientists and farmers to work together to create more effective and efficient farming technique. This growths food production in parts of the world in which it is difficult to produce enough food.

Keywords: GIS, GPS, Agriculture, Remote Sensing

Introduction

Farming is full of uncertainty and unpredictable. Soil is a non-renewable outcomes are resource which provides crucial sustenance to ecosystems and exists throughout the world in different behavior and properties. In today's word it's about precision breaking fields into zones. Technical agriculture by advancess occurred in 20th century led to the advances of the idea of precision farming. The accomplishment of the precision farming system depend on the amalgamation of these technologies into a single system that can be operated at farm level with sustainable effort.

[1]GIS has developed as an effective tool for mapping of natural resources. GIS can inspect land data combined with old farming practices to decide what best crops to plant and how to maintain soil nutrition levels to best benefit the plants. GIS plays a very important role in monitoring farming. Use of GPS devices in-built within smart phones or hand held devices leads to actual mapping of the fields and farmers can actually get site specific and more accurate solutions for their problem.

Agricultural Geographic Information Systems (AGIS) can map not only crop health, but also helps solving wider economic issues that may originate from rural farming practices. Farmers are able to access the IS data of their lands. GIS allows farmers to interact with the data as well as provide valuable on-ground data. Use of GIS and Remote Sensing in the field of farming is increasing day by day and the applications varying from Spatial Decision Support System (SDSS), yield estimation, food and security analysis, Crop simulation models, Pest management, Livestock mapping, potential sites identification are some of the most commonly used ones.

Today's requirement has too elevated a essential to share the information ended internet and thus many online web based flows has proved to be very beneficial to those real-time application have substituted the outdated stand alone application.

Literature Review

Significance of precision farming to control spatial and temporal variability associated with all aspects of

agricultural production. Technological advancess in the last decade has improvised the concept of precision farming. The precision farming depends on the integration and utilization of modern advance farm technologies days technologies such new with the single system site specific technologies.Precision Farming is an information and agricultural management system that is designed to improve the whole farm production efficiency with the low cost effect while avoiding the unwanted effects of chemical loading to the environment. The focus under, Precision Farming is to gather information about soil and crop condition and capture the sequence on the soil and crop conditions at spatial level.

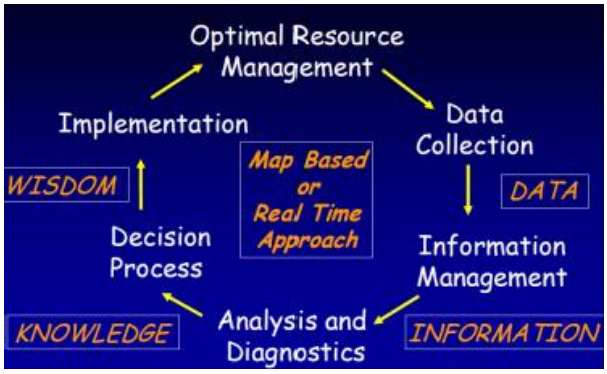

Figure 1.Integration of Methodology

[5]The database for Precision farming generally comprises (Venkataratnam, 2001):

- Crop information such as growth stage, health, nutrient requirement.
- Soil physical and chemical properties, depth, texture, nutrient status, salinity and toxicity, soil temperature, productivity potential.
- Microclimatic data (seasonal and daily) such as canopy temperature, wind direction and speed, humidity.
- Surface and sub-surface drainage conditions.

Irrigation facilities, water availability and planning of other inputs.

Geographic Information System

[6]GIS is set of tools for collecting, storing, and retrieving the data and then transforming and displaying the spatial data for particular purpose. The GIS is able to analyze and visualize agricultural environments and work involved in the farming industry. Balancing the inputs and outputs on a farmland is important to its success and profitability. Spatial data are commonly in the form of layers that may represent topography or environmental elements. GIS nowadays are becoming an essential tool for integrating various map and satellite information sources in models that control the interactions of complex natural systems. GIS can be used to make images, not just maps, but drawings, animations, and other cartographic products. GIS is playing an significant role in agriculture production in the world by helping farmers growth production, reduce costs, and manage their land professionally.

Natural inputs in farming can be better understand and managed using GIS applications such as soil alteration examines, crop yield approximations, and erosion identification and remediation. The spatial crop model is developed by integrating Geographical Information System (GIS) with Environmental Policy Integrated Climate (EPIC) model to control crop productivity. Wu Bingfng and Liu Chenglin. 2000 worked on Crop Growth Monitor System with Coupling of VGT and AVHRR data. Various ways provided by GIS to overlay different layers of data: the ecological conditions, the actual physiognomy and human pressure indices. The methodology is utilized to its fullest in the planning and managing.

Remote Sensing (RS)

[3]Remote sensing is the gaining of data about an object without making any physical contact with the thing. It's an occasion that has frequent submissions counting surveying, photography, forestry, geology and lots of more. Remote sensing has originate substantial use within the field of agriculture. There are many applications of remote sensing within the agricultural sector. Below may be a summary of those applications.

Crop production forecasting: Remote sensing is employed to forecast the expected crop production and yield over a given area and determine what proportion of the crop are going to be harvested under specific conditions. Researches are often ready to predict number of crop which will be produced during a given farmland over a given period of your time.

Assessment of crop damage and crop progress: within the event of crop damage or crop progress, remote sensing methodology are often wont to penetrate the farmland and determine exactly what proportion of a given crop has been damaged and therefore the progress of the remaining crop within the farm.

sources to be integrated, examined, and even modeled owing to its powerful analytical functionality. These functions, however, cannot be fully realized if the GIS database is incomplete, inaccurate, or obsolete. By their nature, the data contained in a GIS database are either spatial (e.g., administrative boundaries and boundaries of land-cover parcel) or thematic (e.g., types of land cover). Spatial data and a few thematic data related to them are digitized from existing topographic or land-use maps. Nevertheless, these maps are secondary in nature.

They might not demonstration all required geographies since of map generalization. Second, topographic or land-use maps may be obsolete due to rapid changes on the

ground. These limitations can be overcome with the use of remote sensing and/or GPS. Aerial photographs and satellite images are original and are able to offer more current areal-based data than do topographic and thematic maps, while GPS is an efficient method of collecting data in a timely fashion. GIS and GPS are intrinsically complementary to one another in their primary functions. Each of the technologies has its limitations. Their strengths be fully utilized only through integration. Integration will not only ease their applications in resource management and environmental monitoring (e.g. ,pest incidences, hot spots), but also broaden the:

Horticulture, Cropping Systems Analysis: Remote sensing methodology has also been instrumental within the analysis of varied crop planting systems. This methodology has mainly been in use within the horticulture industry where flower growth patterns are often analyzed and a prediction made out of the analysis.

Crop acreage estimation: Remote sensing has also played a really important role within the estimation of the farmland on which a crop has been planted. This is often usually a cumbersome procedure if it's administered manually due to the vast sizes of the lands being estimated.

Crop condition assessment and stress detection: Remote sensing methodology plays a crucial role within the assessment of the health condition of every crop and therefore the extent to which the crop has withstood stress. This data is then wont to determine the standard of the crop.

Identification of planting and harvesting dates: due to the predictive nature of the remote sensing methodology, farmers can now use remote sensing to watch a spread of things including the weather patterns and therefore the soil types to predict the planting and harvesting seasons of every crop.

Crop yield modelling and estimation: Remote sensing also allows farmers and experts to predict the expected crop yield from a given farmland by estimating the standard of the crop and therefore the extent of the farmland. This is often then wont to determine the general expected yield of the crop.

Identification of pests and disease infestation: Remote sensing methodology also plays a big role within the identification of pests in farmland and provides data on the proper pests control mechanism to be wont to get obviate the pests and diseases on the farm.

Integrated applications of GIS and RS in Precision Farming

[2]GIS distinguishes itself from the other two technologies in that it enables data from diverse scope to which they are applicable (e.g., real-time emergency disease response and early warning mechanism). As a matter of fact, the integration of GPS, remote sensing, and GIS in combination with ground monitoring systems has proved to be an efficient method of managing and analyzing spatial data for regional water resources management. Such integration is indispensable in devising an effective approach for selectively applying pesticides and fertilizers to improve farming efficiency and reduce environmental hazards (Runyon, 1994).

Conclusion

GIS allows the precise tracking and tuning of production. It makes farm planning both easier. There are lots of map data to utilize in determining future cropping plans, erosion controls, salinity controls and assessment of tillage systems. But because the amount of knowledge grows, more work is required to interpret the info and this growths the danger of misinterpretation. Farmers implementing GIS will likely work closer with several professionals in the agricultural, GPS and computing sciences. The value of integrating GPS with remote sensing and GIS is the greatest in applications that require comprehensive, geo-referenced, real-time or almost real-time data. These uses comprise mobile mapping, disaster mitigation, and emergency response. The future prospects for integrating GPS with remote sensing and GIS are in the advances of improved location aware multi- media PDA systems. Many new applications will developed possible if the obstacles to integration and mobile communications are successfully tackled.

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