OPEN ACCESS Freely available online

ISSN: 2168-9881
Agrotechnology

Commentary

Modern Approaches to Smart Farming *via* Precision Agriculture

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DESCRIPTION

Precision Agriculture (PA) is the science of employing high-tech sensors and analysis tools to improve agricultural yields and aid management choices. PA is a novel concept that has been applied all over the world to boost yield, decrease labor time, and assure optimal fertilizer and irrigation management. It makes use of a lot of data and information to increase the efficiency of agricultural resources, crop yields, and crop quality. PA is a cutting-edge agricultural innovation and field-level management method that attempts to boost resource production on agricultural fields. As a result, PA is a new sophisticated strategy in which farmers optimize inputs like water and fertilizer to improve productivity, quality, and output. Crop status is monitored in modern agricultural production by watching and measuring factors including soil condition, plant health, fertilizer and pesticide action, irrigation, and crop yield. Crop farmers have a significant task in managing all of these variables. The fast improvement of precise agricultural growth monitoring and health evaluation is critical for efficient use of farming resources and crop output management. Such problems can be solved by using Remote Sensing (RS) technology like hyper spectral imaging to create precise biophysical indicator maps throughout the crop growth cycle.

Precision agriculture is made up of three primary components: information, technology, and management. Precision farming necessitates a lot of data. Precision agriculture is a management method that employs information technology to gather important data from a variety of sources and incorporate it into decision-making. For use with variable rate, it relies on technology such as GPS (Global Positioning Systems), GIS (Geographic Information Systems), yield monitors, remote mapping sensors, and guiding systems, which provide in-depth monitoring of field fluctuations.

Precision agriculture technologies

Global Positioning System (GPS)- is a satellite-based navigation system that allows users to record positional data (latitude, longitude, and elevation) with an accuracy of between 100 m and 0.01 metres. Farmers may use GPS to pinpoint the exact location of field data including soil type, insect incidence, weed invasion, water holes, borders, and impediments. An automatic control system is in place, complete with a light or sound guidance panel, antenna, and receiver. Satellites that transmit GPS signals allow GPS receivers to compute their position. Farmers may use the system to correctly identify field locations so that inputs (seeds, fertilizers, pesticides, herbicides, and irrigation water) can be applied to each field based on performance criteria and past input applications.

It's a system for capturing, storing, manipulating, managing, analyzing, and presenting geographical and geographic data. GIS is a set of hardware, software, and methods for compiling, storing, retrieving, and analyzing geographical features and location data in order to create maps. GIS organizes data in one location so that it may be extrapolated as required. Layers of data like as yield, soil survey, crop type, nutrient levels, and insect proneness are included in computerized GIS maps. Field topography, soil types, surface drainage, subsurface drainage, rainfall, irrigation, chemical application rates, and crop production may all be found in a farming GIS database.

Humidity, vegetation, temperature, texture, structure, physical character, humidity, nutrition level, vapor, air, and other variables are measured using various technologies such as electromagnetic, conductivity, photo electricity, and ultra sound. Crop species are identified, stress conditions are located, pests and weeds are identified, and drought, soil, and plant conditions are monitored using remote sensing data. Sensors allow for the capture of massive amounts of data without the need for laboratory examination.

It significantly enhances crop efficiency and reduces financial expenditures while increasing output. The latter point is crucial since precision agricultural technology appear to be expensive at first look. In the long term, however, the savings are substantially bigger than with traditional farming practices. As a result, producers can calculate the needed fertilizer amount and determine the most effective fertilizer kinds for a certain location. Furthermore, precision farming technologies are

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Received: 08-Mar-2022, Manuscript No. AGT-22-17158; **Editor assigned:** 11-Mar-2022, PreQC No. AGT-22-17158 (PQ); **Reviewed:** 25-Mar-2022, QC No. AGT-22-17158; **Revised:** 01-Apr-2022, Manuscript No. AGT-22-17158 (R); **Published:** 08-Apr-2022, DOI: 10.35248/2168-9881.22.11.252

Citation: Zhang N (2022) Modern Approaches to Smart Farming *via* Precision Agriculture. Agrotechnology. 11:252

important because they improve the long-term planning of agricultural operations by altering the real-time strategy during force majeure.

Precision agriculture benefits both farmers and the environment. Furthermore, these places are linked because environmental deterioration exacerbates agricultural circumstances. Here are a few of the advantages of such a control system: lowering agriculture's reliance on weather conditions; maximization of the genetic potential of the produced crops; minimizing the cost of materials and resources, such as water, seeds, fuel, and so on; maintaining soil health by reducing the number of pesticides; lowering agriculture's reliance on weather conditions.