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Environment Monitoring and Agriculture Internet of Thing Based Application

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Abstract

Environment plays a very important role in agriculture because crops, soil, water, and climate are all part of the environment. Changes in environmental conditions such as temperature, rainfall, soil quality, and pollution can directly affect agricultural productivity. Therefore, monitoring the environment is essential for sustainable agriculture.

Environmental monitoring involves observing and measuring different environmental factors like soil moisture, temperature, humidity, water quality, and air conditions. Modern technologies such as sensors, satellites, and data analysis help farmers and researchers collect accurate information about these factors. This information helps in making better farming decisions.

In agriculture, environmental monitoring helps farmers manage water resources efficiently, protect soil fertility, and reduce the harmful effects of pests and diseases. It also helps in predicting weather changes and preventing crop losses. By using monitoring systems, farmers can apply fertilizers and pesticides in the right amount and at the right time, which reduces environmental pollution.

KEYWORDS: *Internet of Things (IoT), Smart Agriculture, Environmental Monitoring, Soil Moisture Sensors, Temperature and Humidity Monitoring, Precision Farming, Wireless Sensor Networks (WSN), Data Analytics, Climate Monitoring, Sustainable Agriculture, Crop Management, Automation in Agriculture, Remote Sensing, Smart Irrigation, Agricultural IoT Systems*

1. Introduction

Environment plays a very important role in agriculture because crops, soil, water, and climate are all part of the environment. Changes in environmental conditions such as temperature, rainfall, soil quality, and pollution can directly affect agricultural productivity. Therefore, monitoring the environment is essential for sustainable agriculture.

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In agriculture, environmental monitoring helps farmers manage water resources efficiently, protect soil fertility, and reduce the harmful effects of pests and diseases. It also helps in predicting weather changes and preventing crop losses. By using monitoring systems, farmers can apply fertilizers and pesticides in the right amount and at the right time, which reduces environmental pollution. One of the most important aspects of environmental monitoring is soil monitoring. Soil quality plays a vital role in crop productivity. Monitoring soil parameters such as moisture, temperature, pH level, and nutrient content helps farmers determine the best time for irrigation and fertilizer application. For example, if soil moisture levels are low, farmers can irrigate their fields at the right time, preventing water stress in crops and improving yield. Weather monitoring is another key component of environmental monitoring in agriculture. Weather conditions such as rainfall, temperature fluctuations, humidity, and wind speed significantly affect crop growth and pest activity. By monitoring weather conditions, farmers can plan agricultural activities more effectively. For instance, weather forecasts can help farmers decide the best time for sowing seeds, applying pesticides, or harvesting crops.

2. Related work

Environment monitoring in agriculture means observing and checking environmental conditions that affect farming and crop production. It helps farmers understand changes in soil, water, air, and climate so they can take the right actions for better agricultural productivity and environmental protection.

Environmental monitoring includes the regular collection and analysis of information about natural resources. Farmers and scientists monitor soil quality, water availability, weather conditions, and pollution levels. This monitoring helps in maintaining a balance between agricultural activities and the natural environment.

Soil monitoring is very important in agriculture. It involves testing soil fertility, nutrient content, pH level, and moisture. By understanding soil conditions, farmers can decide the correct amount of fertilizers and improve crop growth.

Water monitoring is also necessary for agriculture. Farmers check the quality and quantity of water used for irrigation. Monitoring groundwater levels and preventing water pollution helps in maintaining a reliable water supply for crops.

Weather and climate monitoring help farmers plan their farming activities. Information about temperature, rainfall, humidity, and wind helps farmers decide the right time for sowing, irrigation, and harvesting.

3. Data and sources of data

Environmental monitoring in agriculture refers to the systematic observation and measurement of environmental conditions such as soil quality, temperature, rainfall, humidity, water availability, and air quality that influence

crop growth and agricultural productivity. It helps farmers and researchers understand how environmental factors affect crops and enables them to make better decisions about irrigation, fertilization, pest control, and crop management, which ultimately improves yield and promotes sustainable farming practices.

The data used for environmental monitoring in agriculture is collected from various sources, including weather stations that provide information about temperature, rainfall, and wind speed; soil sensors that measure soil moisture, pH, and nutrient levels; satellites and remote sensing technologies that monitor crop health and land use; government agricultural departments and research institutions that provide scientific reports and statistics; and direct observations made by farmers in their fields. This collected data helps in planning agricultural activities, predicting weather conditions, managing natural resources efficiently, and reducing environmental risks in farming.

4. Research Methodology:

Environmental monitoring in agriculture refers to the systematic observation and measurement of environmental conditions such as soil quality, temperature, rainfall, humidity, water availability, and air quality that influence crop growth and agricultural productivity. It helps farmers and researchers understand how environmental factors affect crops and enables them to make better decisions about irrigation, fertilization, pest control, and crop management, which ultimately improves yield and promotes sustainable farming practices.

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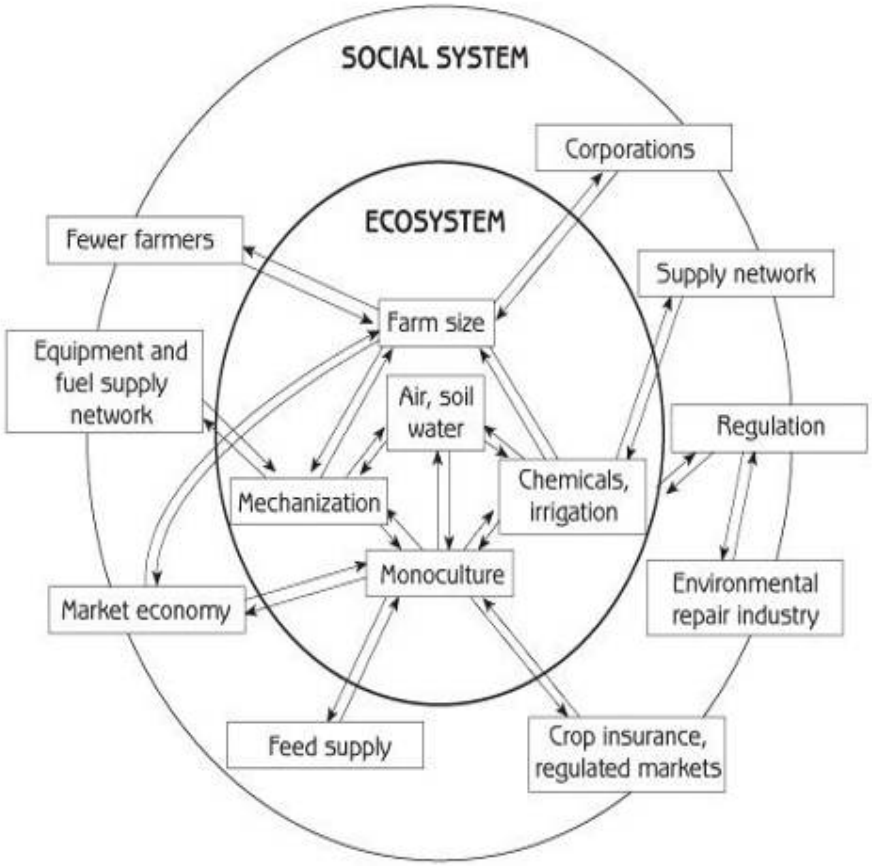


1. Environment Monitoring in Agriculture

Environment Monitoring means observing and measuring environmental factors that affect agriculture. It helps farmers and researchers understand how soil, water, air, and climate impact crop growth.

Main Components

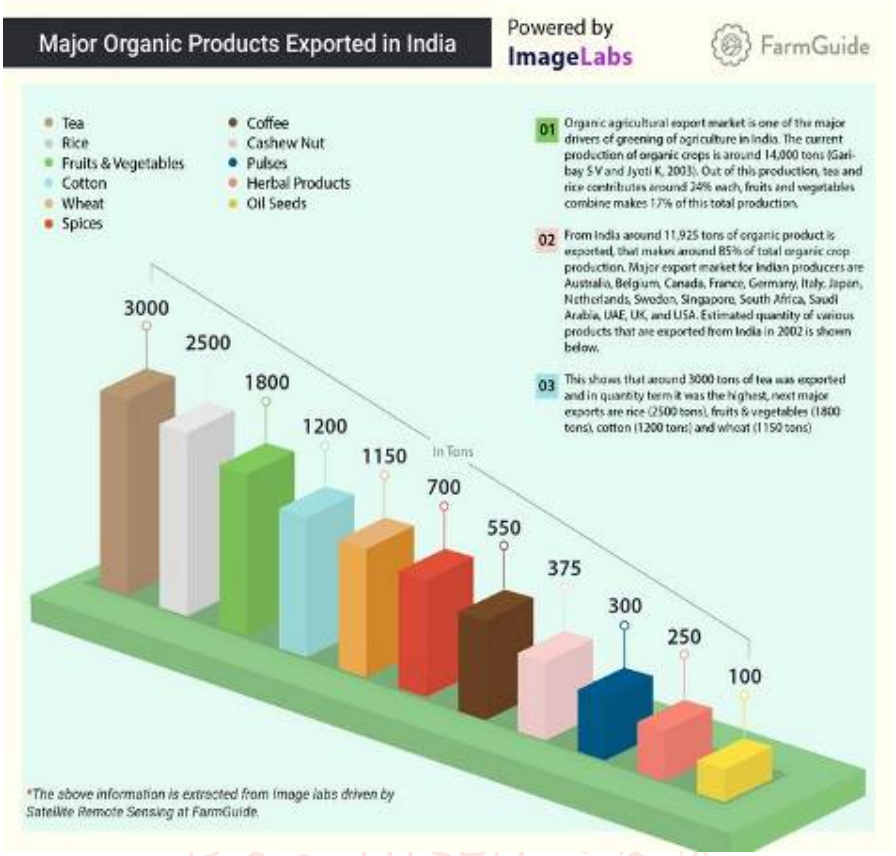
1) **Soil Monitoring**
- Checks soil nutrients, pH level, and fertility.
- Helps decide which crop to grow.

2) Water Monitoring
- Measures water quality and availability for irrigation.

3) **Weather & Climate Monitoring**
- Tracks rainfall, temperature, humidity, and wind.

4) **Crop Health Monitoring**
- Detects pests, diseases, and crop growth conditions.

5) **Air Quality Monitoring**
- Measures pollution or harmful gases affecting crops



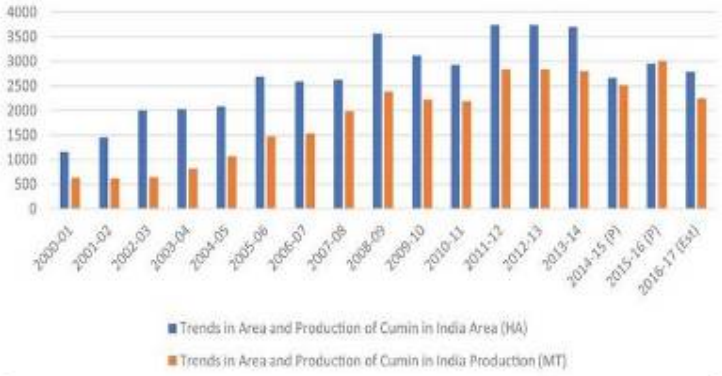


Figure 5.1 Trends in area and production of cumin in Gujarat

Source: Kumar (2017)

Figure 5.2 Patan soil type and soil on PH scale

5. Result and Discussion

The environmental monitoring study in agriculture showed that factors like temperature, rainfall, soil moisture, and humidity strongly affect crop growth and productivity. During the monitoring period, it was observed that fields with balanced soil moisture and proper temperature conditions produced healthier plants and higher yields. On the other hand, areas with irregular rainfall or poor soil quality showed slower crop growth and lower production.

The collected data also indicated that continuous monitoring of environmental conditions helps farmers make better decisions about irrigation, fertilizer use, and pest control. For example, when soil moisture levels were low, irrigation was applied at the right time, which helped maintain plant health. Similarly, monitoring humidity and temperature helped predict pest and disease outbreaks, allowing farmers to take preventive actions

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