SENSORS:
AGRI-TECH TOOLS FOR SMART AGRICULTURE

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Rapid societal expansion, climate change, decreasing rainfall, and the desire for extra food to feed billions of people globally are all exerting significant effect on agriculture. This has an adverse effect on traditional farming practises. Smart sensors in agriculture are on the way. The current scenario calls for agriculture to become "smarter" by using new and clever technology. To create solutions for the optimal resource utilisation while fulfilling the ever-increasing consumption requirements of the global population. Smart sensors in agriculture collect data that farmers may use to monitor and optimise their crops, as well as keep up with changing environmental and ecological elements.

Agri-based sensors are extremely useful in agriculture because they provide data that allows farmers to not only monitor but also enhance their goods and stay up with changes in the field and environment. By recognizing, detecting, and following herds, intelligent agricultural sensors make it easier to recognize animals, sense heat, and monitor their health, simplifying the isolation and treatment of ill cows. Farmers may now remotely record their crops and monitor their efficacy, manage agricultural pests, and take quick action to safeguard their crops from environmental threats by using smart sensors in agriculture.

WHAT SENSORS DO?

Sensors collect data on-

- Yields
- Rainfall and irrigation
- Soil properties such as moisture, pH, nutrient levels, and temperature
- Vegetation cover (as an indication of crop health).
- Atmospheric conditions such as temperature, humidity, and light levels

TYPES OF SENSORS

❁ Location Sensor

The range, distance, and height of any point within the necessary region are determined by these sensors. They rely on GPS satellites to accomplish this.

❁ Optical Sensor

These types of sensors use the light to analyze soil components and track the predominance of various light sources. These sensors may be mounted on autos, satellites, drones, or robots, allowing the soil to reflect as well as the collection and analysis of plant color data. Optical sensors are also capable of conditioning the clay, natural matter, and humidity qualities of the soil.

❁ Dielectric Soil Moisture Sensors

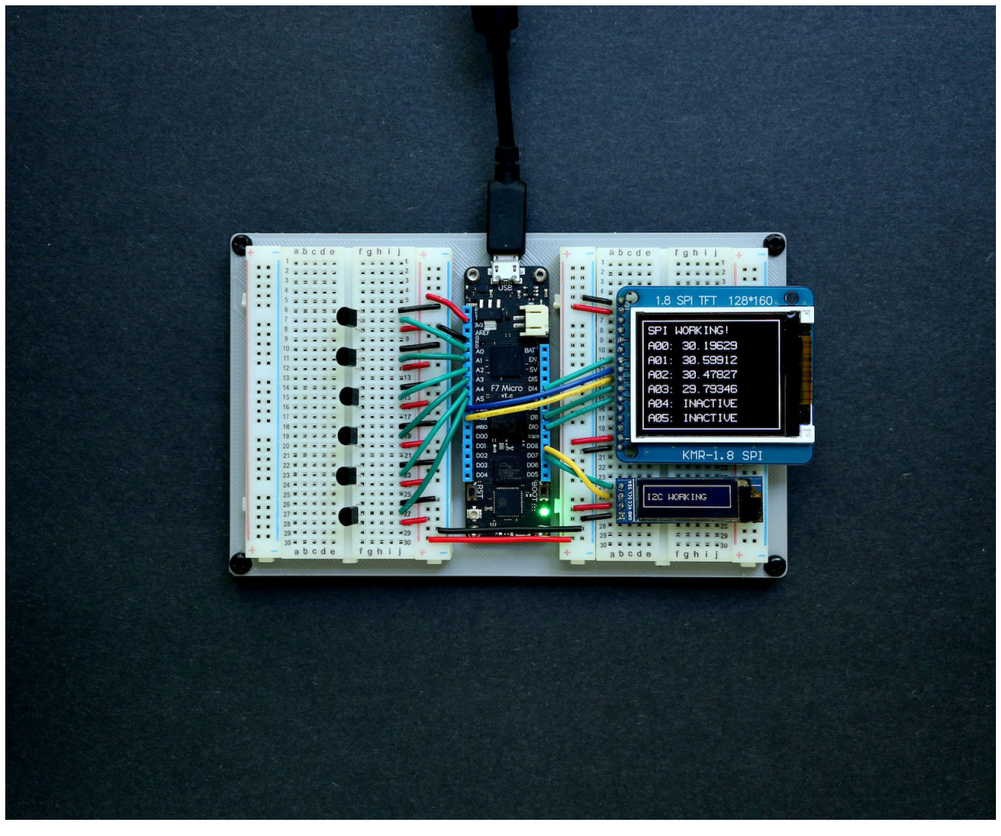
It measures the level of moisture in the soil. The moisture sensors use in connection with rain check locations throughout the field. This allows the observation of soil moisture conditions when vegetation level is low.

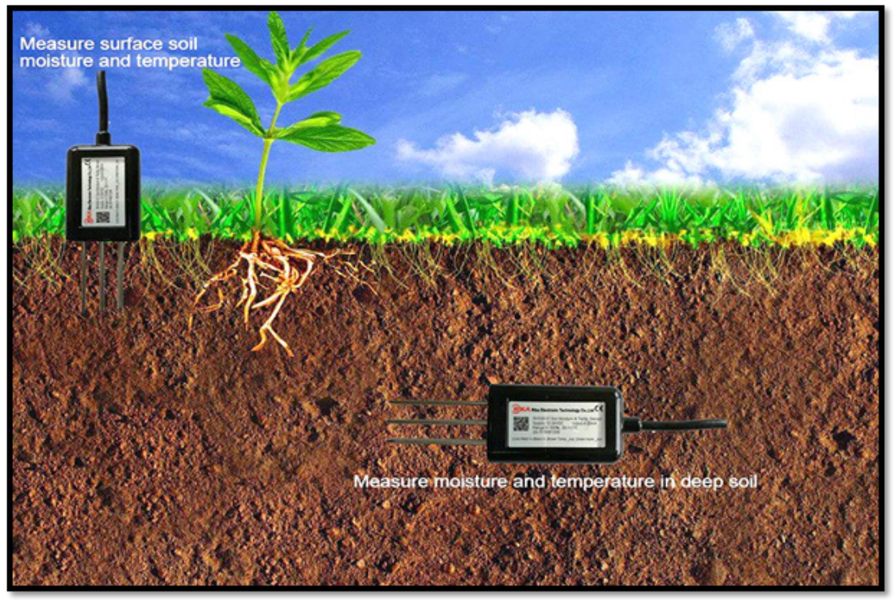
❁ Airflow Sensors

Its measurements may be taken at specific areas while moving. They measure the air penetration of the soil. The pressure required to push a predetermined amount of air into the ground at a predetermined depth is the expected outcome. Soil variables such as moisture levels, soil type, compaction, and structure all generate a unique distinguishing signature.

❁ Electronic Sensor

It is used to test the operation of tractors and other agricultural equipment. Then, cellphone





and satellite communication networks were utilized to send data directly to computers or to individuals via e-mail. The information may then be recovered by the field executive using their office computer or cell phone.

❁ Electrochemical Sensors for Soil Nutrient Detection

The electrochemical sensors help in the collection, processing, and mapping of soil chemical data. They are often installed on specialized sleds. They provide precise agricultural information. This covers soil nutrient levels as well as pH. The soil samples are subsequently transported to a soil testing facility, where conventional processes are followed. The use of an ion-selective electrode allows for error-free readings, particularly for determining pH. The chase of certain ions, such as hydrogen, nitrate, and potassium, is detected by these electrodes.

❁ Temperature sensors

This sensor provides information such as air temperature, soil temperature at various depths.

❁ GPS Sensors

This sensor is often found in the automotive and cellular communications sectors. They are extremely beneficial to smart agriculture. One important issue that early settlers faced was sheep herding, which required them to utilize wooden staffs to move their herds. Farmers prioritize flock tracking since it is critical to their livelihood. Tracking livestock is no longer an issue with the use of contemporary GPS, which is enhanced with the ability to monitor the animals with the easy click of a button.

❁ Mechanical soil sensors

These sensors are used to determine soil compression or mechanical resistance. This sensor makes use of a soil-passing application. The force computed using pressure scales or load cells is then recorded by this sensor. When a sensor goes through the soil, it records the holding forces caused by dirt cutting, shattering, and displacing. Soil mechanical resistance is measured in units of pressure and represents the ratio of the force required to enter the soil channel to the frontal area of the tool in contact with the soil.

WAY FORWARD:

Without sophisticated farm technology, farming is scarcely sustainable today. Farmers can accomplish good crop production with the rapid development of precise technology based on sensors. Digital information on weather, soil conditions, and crop health has the potential to assist modern farmers in optimizing yields and increasing farm output. As a result, farming is being modernized and is rapidly becoming data-driven. Sensors are the most crucial equipment in modern farm management. Sensors for soil condition analysis to sensors for real-time nitrogen, growth regulators, and water application are among them. Sensors assist farmers in rapidly and readily determining numerous soil and crop parameters that are critical for farming. In order to manage good farm production, crop attributes must be carefully considered. The farmer can improve crop conditions by measuring plant water potential, yield quality, stage of development (ripeness), nutrient levels, pest and disease infections, and various morphology factors such as biomass, leaf area, and plant and organ distribution using crop sensing technology.