Working of the IOT.

The reading from the different types of sensors (moisture, humidity, temperature etc) will be taken by a microcontroller and transferred wirelessly to a database. The readings will be stored in the database using file handling. The files with the reading will be sorted according to the nodes present on field. A **node** is a region/area on the actual cultivated land whose details can be obtained in order to analyse the condition of the soil and the crops.

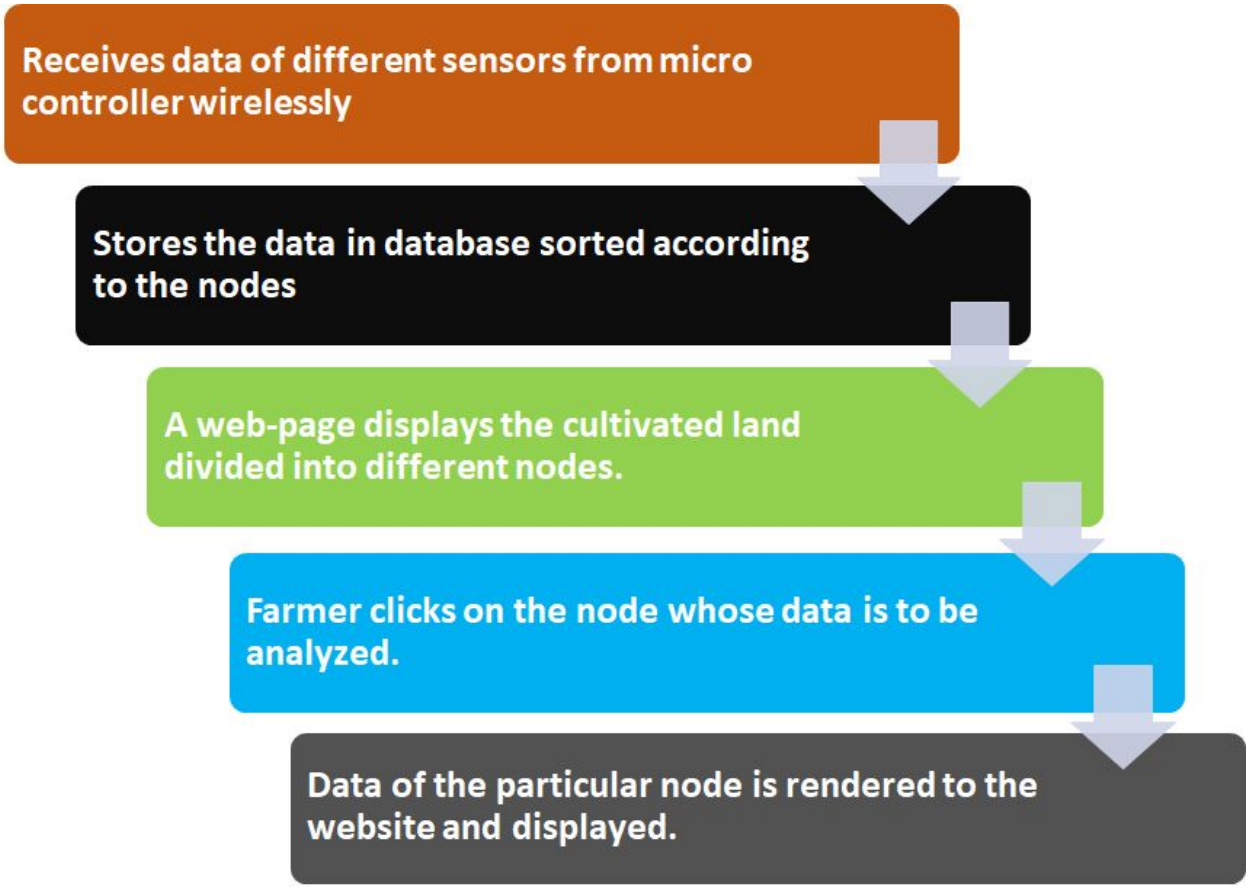
All the sensors are connected to the **Arduino AT Mega** microcontoller, which will be responsible for registering the input data from the sensors . Since Arduino AT-Mega does not have a in-built WiFi or bluetooth system, so a **ESP-8266 NODE-MCU** can be used to transfer the data wirelessly to the database. The transfer of data from arduino to the esp8266 can take place through interrupt pins, then the esp8266 will create a local server, another python script will run in the background on the same local server as created by the esp8266 which will in turn read the data from the esp8266 and store the received data in the database using file handling. The micro-header name **ESP_MICRO.h** is a very important header file needed for the esp8266 which is essential for the data transfer as described.

After the data is stored in the database in a sorted manner, we will need to render the files to the web page which will display the data to the user. The web page is thus an essential entity here. The web page contains a responsive replica of the land under cultivation. A basic snapshot of the web page looks like the picture as shown below.

The Web page Interface

The table on the right hand side is the replica of the cultivated land and in our case is the arena for the problem statement. The table is **responsive** and will respond to the click of the user. Each step is divided into different nodes. It is the region where the agritech bot will take the readings from the sensors. The user has to click on the particular nodes whose conditions/readings he wants to analyze. The details of the sensor reading will be displayed on the box present on the right hand side of the web page. The data from the database will be rendered to the website using flask. A note/message can be delivered regarding what can be expected of the readings.

A simplified flow chart of the process :-



One of the problems faced by the farmers in terrace farming is the lack of data from the land but this feature of the agritech bot is the solution to the problem faced. The agritech robot is envisioned to make the farmers smart, robust and decrease the human dependency.

Weed Detection

Weed detection is another feature that can be added to the agritech bot. Weeds are generally unwanted plants that grow on the farming land and consumes important nutrients from the soil.

Effects of weed on rice

1. Reduce the yield and quality of rice by competing for nutrients, water and sunlight

Upland direct seeded rice	: 35-45% reduction in yield
Direct seeded on puddle land	: 20-25% reduction in yield
Transplanted rice	: 10-15% reduction in yield

2. Weeds intensify the pest and disease problem by serving as alternate host

3. Reduce the efficiency of harvesting

4. Reduce the land value

5. Problems of water contamination

Recognizing the weeds from the crops and removing them manually can be a labour intensive task. So the agritech bot can get the job done in an efficient manner. A high resolution camera is mounted on the bot which can be used to capture video. Image processing techniques can be applied to the video frame and the weed can be discreetly distinguished from the crops. The image processing will be done on python platform and can be used to train the model to detect different types of weed.