# AGRIoT

**P.Magudeswaran, R.Senthilkumar, Indra Getzy David**

***Abstract--- India is an agriculture oriented nation. Our economic growth more depends on agricultural products. So, if we adopt efficient technologies means it will give assurance in our outcome. Internet of Things or IoT is the new paradigm which can raise the potential to latest advancements. Here, the experiment with Internet of Things (IoT) in the area of agriculture will be prepared. Things can refer to sensors that can be used to calculate various parameters of the ground such as soil moisture, humidity, and temperature. The statistics received from the cropland is kept in the server. Using this collected data, investigation is completed to estimate the water required to the crop. It can be calculated using the ET (Evapotranspiration) algorithm. Before choosing the fertilizer values, we should ensure the actual ingredient of the soil. It will lead to effective crop production. The system also schedule the irrigation time and sowing date will be an added advantage of our system. Integrating all this efforts will lead the agricultural system as a smart one for us.***

***Key Words: Internet of Things, ET Algorithm, IoT, Effective Agriculture.***

## I. INTRODUCTION

An IoT device allows identification, remote sensing, actuating, and remote monitoring capabilities. Also, IoT resources are software components for accessing, processing and storing sensor information, or controlling actuators connected to the device. A sensor centered setup is developed to supervise the crop field.

The crop must be provided water in suitable quantity. It is important to regulate the water services to get exact result. Depending on the water requirement only, the crop should be allowed to take it. Because, excess water can choke the crop and also lesser water will not grow the plants. Data collected from sensors, can give the optimum result in water requirement. [1]

With the knowledge about the soil type, soil density, water requirements, pH value can only fulfil the irrigation satisfactorily. It will only increase revenues and enhance the use of technology in agriculture. For the effective operation, it needs to be monitored effectively than continuously. The variations in the climate and the respective field data can be shared to the farmers. Because the system adopts the cloud network, the data can be easily reached to farmers. They can take decision easily with respect to the data they received.

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## II. EXISTING WORK

*Smarter Agri Solutions*

For whole agricultural section, Crop In provides self-improving system that ensures reliable services. The different functions done by Crop In as follows:

1. Smart farm: Total digitalization of the entire farm area.
2. Warehouse: To Trace all the farm area under control.
3. Smart sales: Increase the productivity sales as high as possible.
4 Smart Risk: Building financial products and collecting plot level crop risk assessment. Also to monitor and evaluate insurance claims for crops.

It is possible to provide current trends and compares the real-time data. By doing so, it act as data manipulating system. It is one of the most useful product comes in the agriculture market for farmers.[2]

*SMART Fertilizer Management*

To extract the result from a particular fertilizer which are used in agriculture can be done by SMART Fertilizer Management. With the calculation of such data will increase the profits come from the same land. The platform provisions over 200 different crops.[3]

## III. AGRIoT SYSTEM

IoT presents digital agricultural system to the crop growing industry. Depends on input management it gives an efficient solution. To monitor every inch of the cultivating land it enables the requisite. IoT continuously monitors the plant and enable to send the needed information to farmers. It saves time and update the required status of the plant. Therefore, farmers can be able to take care of their plants such as, soil status and crop diseases, crop growth, etc.

Internet of things technology utilizes sensors and actuators as smart devices that can help farmers to share knowledge about methods of cultivation, automatic climatic action and best tools to be used in agriculture. [4]

i.. Water requirement monitoring
ii. Soil Moisture Monitoring
iii. Water irrigation Quality

Let us take, our system have the ability to monitor the growth of, rice, cotton, wheat, sorghum and groundnut. The next section explains about the structure of AGRIoT and how it can follows the entire cropping process. The system including the following three units:

i.) Fertilizer sanction based on soil Nitrogen, Potassium, Phosphorus values.

ii.) Estimation for water for cropping.
iii.) Irrigation scheduling.

The first unit described by the below steps. First, select any one of the five crops and its respective stage. Add the cropland available for cultivation ($m^2$). Then, Weather report for the cropland will be displayed.

Using the ET algorithm and comparing the calculated parameters, the crop water desirable is calculated. The metrological data for this scheme involves are wind speed, temperature, humidity, and solar hours. Apixu API can be used to found the solar hours and wind speed in our particular field. Each type of crop has its own and distinct characteristics. Also, the local weather contribute on the crop. Using all these points will provide a clear idea behind water requirement for the crop. The water requisite can be obtained for all stages of the yield. It is described in the system page after choosing the crop. [5]

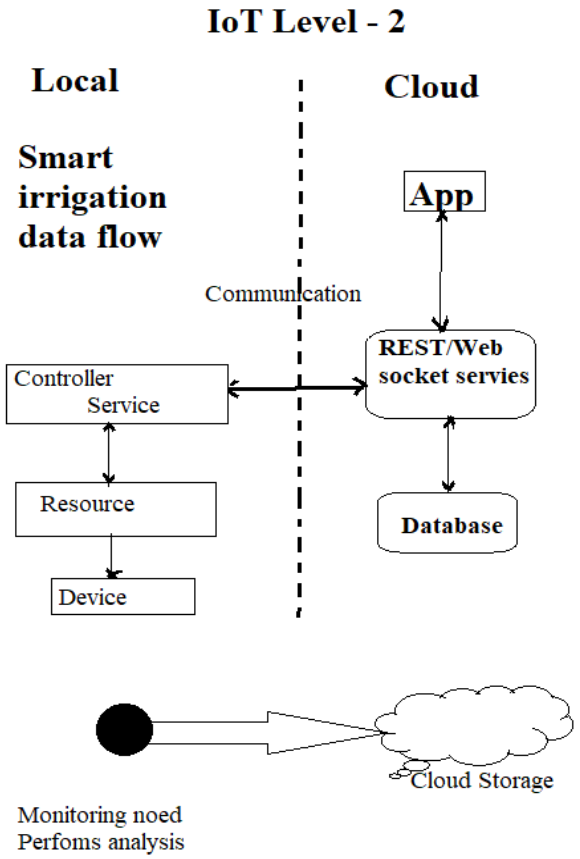


**Fig 1: IoT Level 2 Smart Irrigation planning**

The second strategy described by the following steps. The soil test report will give the values of NPK in our cultivation land. The necessary values of soil ingredients for the crops can be stored in the database. Based on the provided report, the system recommends some fertilizers. There are about 23 fertilizers can be listed in the table which can be used. [6]

The soil contain NPK values can be in four limits: Very low, Moderate, High and Very High. These limits can chose the fertilizers needed for the cropping field. [7], [8]

The third unit described by the following steps:

1. Select the crop.
2. Date of sowing entry.
3. Crop water requirement. (in Liters) as calculated in unit 1.
4. Number of irrigation.

The various functions such as farm preparation, crop establishment and seed treatment can be stored in a detailed document.

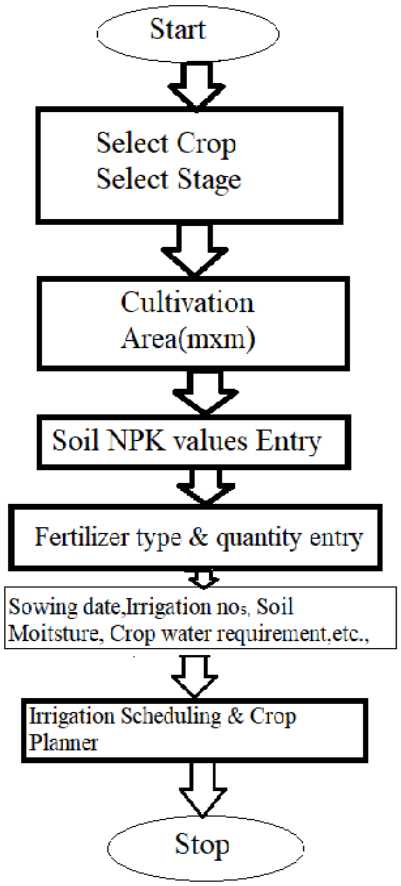


**Fig.2: Flow Chart Representation**

We can take case-study, one of the farming methods relevant. It can be elaborated by using IoT level 2 architecture. Assume the scenario for the smart irrigation system. The irrigation system consists of a single node that monitors the soil moisture level and control the irrigation system. The device used in this system collects soil moisture data from sensors. The controller service continuously monitors the soil moisture levels. If the moisture level drops below a threshold, the irrigation system is turned on. For controlling the irrigation actuators such as solenoid valves can be used. [9] The controller also sends the moisture data to the computing cloud. Smart irrigation system improves can crop yields while saving water.

It uses IoT devices with soil sensors to govern the amount of moisture in the soil and release the flow of water through the irrigation pipes only when the moisture levels go below a predefined threshold. It also collect moisture level measurements on a server or in the cloud where the collected data can be analyzed to plan watering schedules. Cultivar's raincloud is a device for smart irrigation that uses water valves, sensors and a Wi-Fi enabled programmable computer. [10]


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## IV. RESULT

The above units are joined together to form the agriculture process much simpler. Following are some displays of the system:


**Fig.3: Home Page**


**Fig. 4: Select the crop and select the stage**

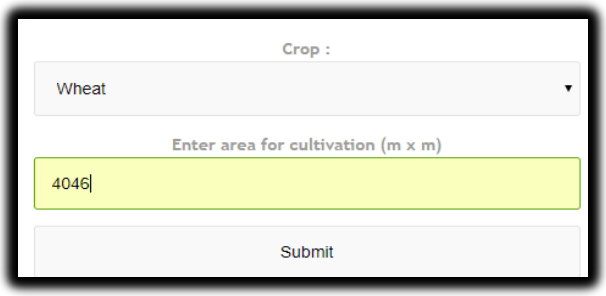



**Fig. 5: Land available for cultivation**

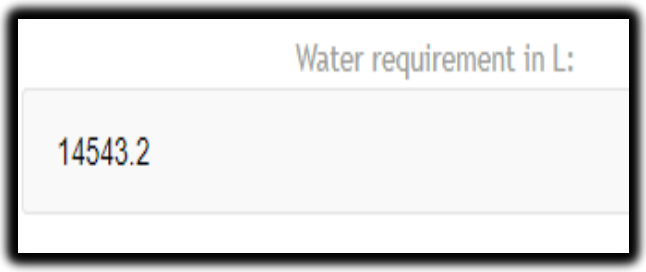
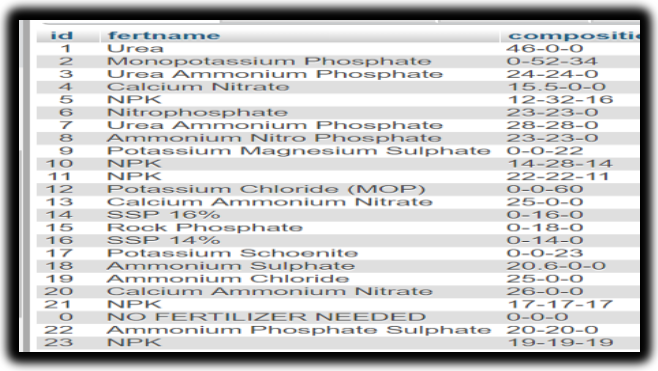



**Fig. 6: Crop water requirement calculation**


**Fig. 7: Display of Fertilizers page. Entry of soil NPK values**


**Fig.8: Recommended Fertilizers quantity**



| id | fertname | compositi |
|---|---|---|
| 1 | Urea | 46-0-0 |
| 2 | Monopotassium Phosphate | 0-52-34 |
| 3 | Urea Ammonium Phosphate | 24-24-0 |
| 4 | Calcium Nitrate | 15.5-0-0 |
| 5 | NPK | 12-32-16 |
| 6 | Nitrophosphate | 23-23-0 |
| 7 | Urea Ammonium Phosphate | 28-28-0 |
| 8 | Ammonium Nitro Phosphate | 23-23-0 |
| 9 | Potassium Magnesium Sulphate | 0-0-22 |
| 10 | NPK | 14-28-14 |
| 11 | NPK | 22-22-11 |
| 12 | Potassium Chloride (MOP) | 0-0-60 |
| 13 | Calcium Ammonium Nitrate | 25-0-0 |
| 14 | SSP 16% | 0-16-0 |
| 15 | Rock Phosphate | 0-18-0 |
| 16 | SSP 14% | 0-14-0 |
| 17 | Potassium Schoenite | 0-0-23 |
| 18 | Ammonium Sulphate | 20.6-0-0 |
| 19 | Ammonium Chloride | 25-0-0 |
| 20 | Calcium Ammonium Nitrate | 26-0-0 |
| 21 | NPK | 17-17-17 |
| 0 | NO FERTILIZER NEEDED | 0-0-0 |
| 22 | Ammonium Phosphate Sulphate | 20-20-0 |
| 23 | NPK | 19-19-19 |

**Fig. 9: Fertilizers list**

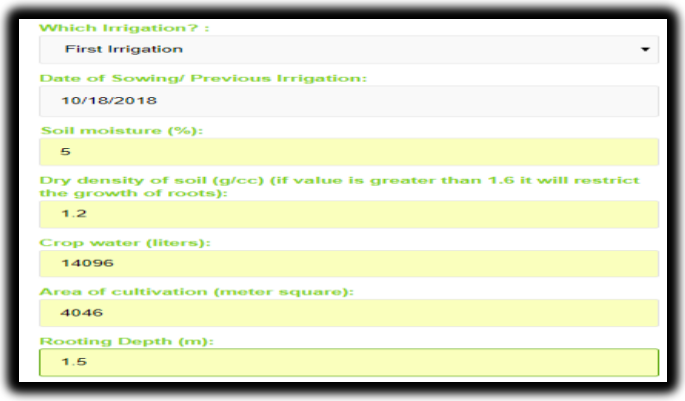



**Fig. 10: Shows the Irrigation plan. Date of sowing entry**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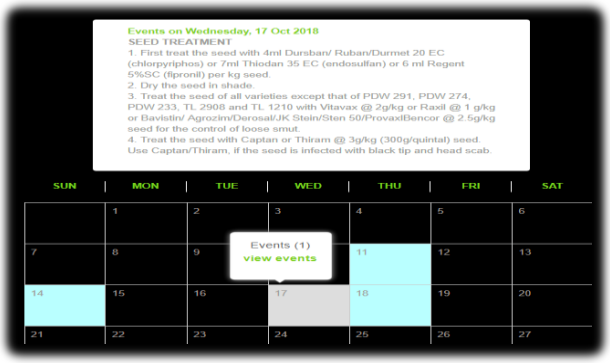


**Fig.11: View events (First Irrigation)**

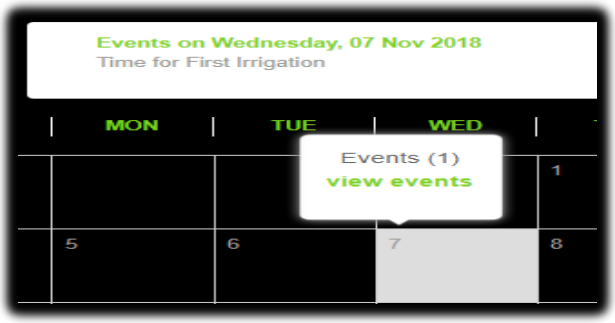


**Fig.12: Display of irrigation date**

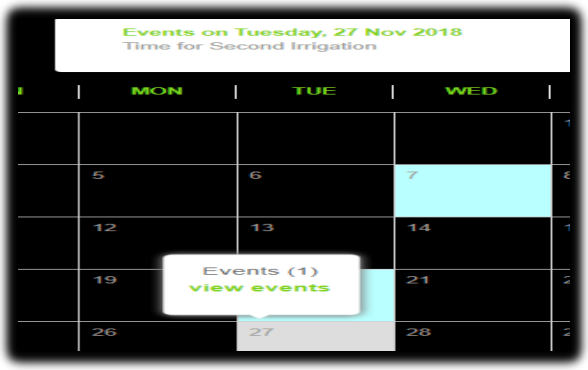


**Fig.13: Next irrigation date**

## V. CONCLUSION

Based on the above result, IoT based method of farming can give efficient output than conventional farming. Gathering real time data is possible due to IoT based applications. Both experienced and inexperienced farmers can utilize the above system give benefits. The IoT (Internet of things) as a tool can be adopted in many fields and positively increase the existing outcome. AGRIoT can help farmers to get a solution for some critical challenges they face in farming. Applying IoT in the agriculture will increase both economy rate and agricultural production. The actual problems like water excessing and unconvincing fertilizer usage can be avoided using this approach. AGRIoT will help the farmers to attain their optimum growth in their objective.

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