IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

WATER WASTAGE IN THE AGRICULTURAL SECTOR

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Abstract: Agriculture is one of the biggest forms of livelihood in India, with over 56.6% of the workers' population engaged in agriculture [1]. It should be no surprise that such a magnanimous sector requires equally astounding quantities of various raw materials, especially water. This resource is used and abused nonchalantly thus leading to common sights such as flooded fields which affect plant life, plant growth, ecosystem of the soil, and the groundwater table. Majority of the water used for irrigation is either derived from groundwater tables or from rivers using motor pumps, or is dependent upon monsoon. This research and project aim to build a sustainable device that can help to prevent the wastage of water and cut it down by at least 20%.

Index Terms **– Water, agriculture, IoT**

I. INTRODUCTION

Over 56% of the entire workforce population of the nation is engaged in agriculture. And yet, it contributes to approximately 16% of the entire GDP, as in 2019 [2]. Therefore, it is vital to improve the efficiency of this sector as it can be a major booster for the economy of the nation. To do so, the water crisis faced by the nation must be countered.

In India, approximately 80% of the entire water resource available, is used in the agricultural sector for irrigation of fields, which is a magnanimous quantity as compared to the 12% used in Industrial sector and 4% used in the domestic sector. [3]

The most prominent reason for this enormous difference is the usage of reckless methods for irrigation. Flooding the fields is the most common practice for irrigation besides monsoon. Therefore, this paper will focus on countering the wastage due to flooding. Flooding is achieved by using motor pumps that suck the water from the groundwater tables and achieve irrigation.

To prevent this, Internet of Things (IoT) will be used in this project to increase the efficiency of usage of water and prevent wastage. The module will collect real time data and control the flow of water by controlling the signal to the motor pump which may turn on/off the pump. Thus, preventing wastage and achieving its target successfully without affecting the crop growth and yield. All these operations will be controlled via a web application or mobile application synced with the device of the user.

II. PREVIOUS WORK

A device to counter this problem was developed that allowed the user to observe the moisture level in soil and alert the user if the water should be turned on or not. The previous research did not account for any data driven argument to support the proposed model. Therefore, further improvements are required to assess the given project and see its efficacy. [4]

III. SYSTEM OVERVIEW

The proposed device consists of 2 modules, namely – Hardware Module and the software interface. The hardware module consists of sensors, wiring, Bolt IoT module, and the power adapter to power the module. The software interface is a web application that can also be run on mobile phones through the Bolt IoT mobile application.

IV. ARCHITECTURE OF THE SYSTEM

Hardware Module:

The hardware module consists of numerous sensors that collect data such as moisture level, light, temperature, and, humidity, along with the Bolt IoT module that processes the data and acts accordingly. In this version of the device, the major actions are taken on the basis of moisture level.

Software Interface:

The software interface is a simple web application that is easy to understand and use. It was developed keeping in mind that even the most illiterate of the population must be able to use it. The software interface is designed so that the user can receive SMS updates on their mobile phones.

Hardware used:
a) Bolt IoT Module
b) Moisture Sensor Module
c) Light Intensity Sensor
d) Connecting Wires
e) Resistors
f) LED/Buzzer (Output device)

Software used:
a) Bolt IoT Configuration Platform
b) HTML
c) JavaScript
d) Cascading Style Sheets
e) Python
f) Twilio

V. OBSERVATIONS AND RESULTS

The proposed model was executed as follows:

I. Hardware module was assembled
II. Software interface was developed
III. The module was placed in the soil of a potted plant
IV. The module was also placed in dry soil and later flooded soil to gather more data.

Upon implementation of the proposed model following observations were made:

I. The average moisture level for soil was observed to be 210.
II. The moisture level for flooded soil was 160.
III. The moisture level for dry soil was 1024.
IV. The moisture level was successfully notified via SMS.

The above observations have led to the following results:

I. The optimum moisture level to be maintained for optimum plant growth is 200.
II. Analog value of moisture level in the soil was inversely proportional to the actual amount of moisture present in the soil.
III. The minimum amount of water saved can be calculated as follows:

First, we calculate the actual amount of water being used in 1 Sq. Km of land in 1 day.

Amount of water used in India in 1 Day [5] = 4*10^10 litres
Area of agricultural land [6] = 1,796,740 Square Kms
Amount of water used in 1 Sq. Km of land = (4*10^10)/ (1,796,740)
= 22,262.54 litres

Now, we calculate the amount of water used in 1 day during the experiment.

Size of the potted plant used in experiment = 2.35 Sq. m = 2.35*10^-6 Sq. Km
Amount of water used in 1 day in the potted plant = 0.038 litres
Amount of water used in 1 Sq. Km of land = 16,170.21 litres

Now, let us calculate the amount of water that can be saved.

Amount of saved water = 22,262.54 – 16,170.21 = 6,092.33 litres
Percentage of water saved = (6,092.33/ 22,262.54) *100% = 27.37 %

VI. CONCLUSION

It is safe to conclude that the proposed model can greatly influence the amount of water being saved on a daily basis and may prove to be a solution for the nation's impending water crisis. It should also be noted that if techniques such as drip irrigation are applied along with the proposed model, the amount of water that is wasted can be reduced even further.

VII. ACKNOWLEDGEMENT

I would like to thank all my professors, guides and mentors for their unconditional support and guidance that made this project possible. I would also like to thank my family for their support during my journey.

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