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JALA RAKSHAKA: A Low-Cost Dual-Sensor Automatic Irrigation Model for Saving Water in Bagalkot District

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Abstract: In Bagalkot, many farmers travel one to two kilometers at night to switch on their bore well pump. Sometimes they forget to switch off the pump. Sometimes the pump keeps running even when rain starts. This wastes water and electricity. To solve this daily problem, our team made a small model called JALA RAKSHAKA. In Kannada, Jala means water and Rakshaka means protector. The model has two sensors. One sensor checks whether the soil is dry. Another sensor checks whether rain has started. An Arduino Uno board reads both sensors and decides whether the pump should run or stop. We collected black soil from a field near Bagalkot and tested the model. When the soil was dry and there was no rain, the pump started automatically. When the soil became wet or rain drops fell on the rain sensor, the pump stopped automatically. The model works without internet and without a mobile phone. The total cost was eight hundred and seventy rupees only. This model got Second Prize in Project Exhibition at our college.

Keywords: Bagalkot farming, water saving, soil sensor, rain sensor, Arduino Uno, automatic pump

INTRODUCTION

Bagalkot is a dry district. In summer, bore well water goes down to three hundred and fifty to four hundred feet. Farmers grow jowar and bajra and groundnut and onion. These crops need water at the right time. They need neither too much water nor too little water. In our villages, we saw three problems. First problem is that a farmer switches on the pump in the evening and sleeps. Water flows for the full night and goes waste in the morning. Second problem is that if rain comes suddenly, the pump still runs. The farmer does not know about the rain. Third problem is that the electricity bill increases because the pump runs for extra hours. We wanted to make a model which a village electrician can repair. We wanted to make a model which a poor farmer can buy. We wanted to make a model which works even if there is no network in the field. Our objectives are given below in clear sentences. The pump should start only when the soil is dry. The pump should stop immediately when rain starts. The model should work without internet. The cost should be less than one thousand rupees.

LITERATURE SURVEY

3.1 Gutierrez and team, 2014
They made irrigation using wireless sensor network. It was good, but it needed internet and computer. In Bagalkot field, there is no internet. So we decided to make offline model. [1]
3.2 Jalraksha Product by Avan Tech, 2018
This is a patented product for tank overflow. It stops motor when tank is full. It is good for house tank, but it cannot check field soil. Our model checks field soil, not tank. [2]
3.3 Smart Soil Irrigation Paper, IJARCCE, March 2026
This paper used only soil sensor. It did not have rain sensor. If rain comes, their pump will still run. We added rain sensor to solve this. [3]
3.4 JalRakshak Paper, Karad, 2026
This project checks water purity using pH and TDS sensor for ponds. It is for cleaning water, not for watering crops. Our work is different - we save water for crops. [4]
3.5 JalRakshak Project, Indore, 2026
This project finds leakage in city pipelines. It is for Municipal Corporation, not for farmers. [5]

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BLOCK DIAGRAM

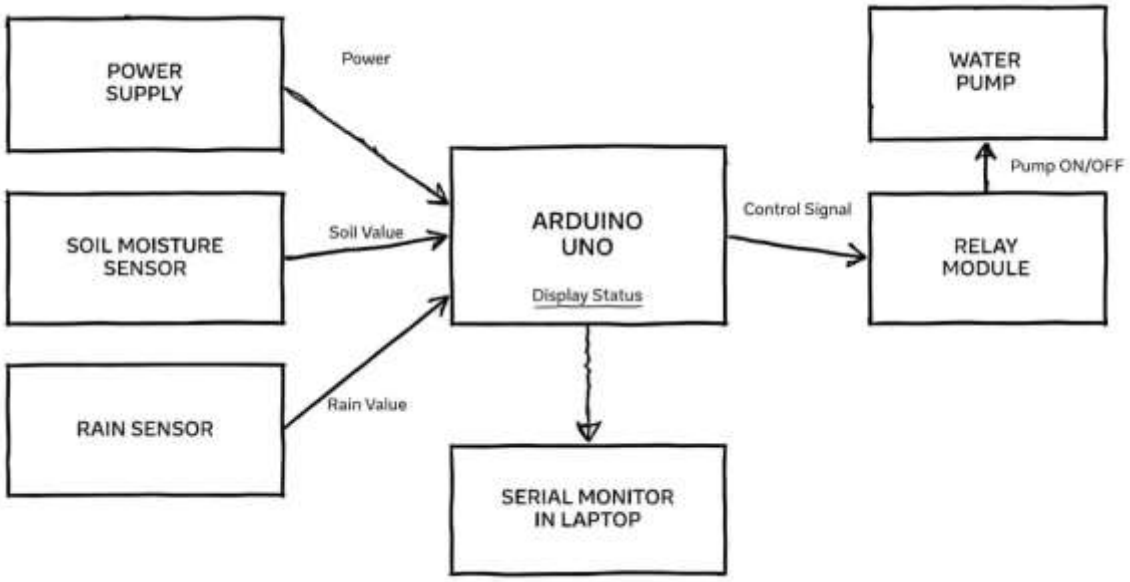


Fig 4.1 Block Diagram of JALA RAKSHAKA

The above figure4.1.Show the JALA RAKSHAKA, the block diagram of our system has seven blocks. The first block is power supply. The second block is soil moisture sensor. The third block is rain sensor. The fourth block is Arduino Uno. The fifth block is relay module. The sixth block is water pump. The seventh block is serial monitor in laptop.

The power supply provides power to the whole system. The soil moisture sensor is placed in the black soil of the field in Bagalkot and it checks whether the soil is dry or wet. The rain sensor is placed in open sky and it checks whether rain has started in Bagalkot or not. The Arduino Uno board is the brain of the system and it reads the values from both the sensors. The Arduino Uno decides whether the water pump should be switched on or switched off based on the sensor values. When the soil is dry in Bagalkot and there is no rain, the Arduino Uno sends signal to switch on the pump. When the soil becomes wet or when rain starts in Bagalkot, the Arduino Uno sends signal to switch off the pump. The relay module works as an automatic switch and it controls the water pump as per the signal from Arduino Uno. The water pump supplies water to the field in Bagalkot when it is switched on and it stops supplying water when it is switched off. The serial monitor in the laptop shows the present condition of the soil and the pump to the students and to the farmers in Bagalkot. The serial monitor shows messages like soil are dry and pump is on or rain is detected and pump is off. This process continues in a loop and it saves water and electricity for the farmers in Bagalkot.

METHODOLOGY

The brain of the model is Arduino Uno. The cost of Arduino Uno is three hundred and fifty rupees. The soil moisture sensor checks dry or wet soil. The cost of soil moisture sensor is eighty rupees. The rain sensor checks rain drops. The cost of rain sensor is ninety rupees. The relay module is a switch for the pump. The cost of relay module is seventy rupees. The twelve volt DC mini pump pumps water in the model. The cost of mini pump is one hundred and eighty rupees. The buzzer and wires and breadboard are used for alert and connection. The cost of buzzer and wires and breadboard is one hundred rupees. The total cost of the project is eight hundred and seventy rupees.

5.1. Connection Method

The soil sensor is connected to A0 pin of Arduino. The rain sensor is connected to A1 pin of Arduino. The relay IN pin is connected to pin seven of Arduino. The buzzer is connected to pin eight of Arduino. The pump is connected through the relay.

5.2. How Model Thinks

We kept Arduino reading values every two seconds. The values are zero to one thousand and twenty three. Dry soil gives a high number which is above six hundred. Wet soil gives a low number which is below three hundred. No rain gives a high number which is above five hundred. Rain gives a low number which is below three hundred.

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Our logic is written in clear sentences. If soil is dry and there is no rain, then pump becomes ON. In all other conditions, pump becomes OFF. At the start, we kept pump OFF for safety. If a wire breaks, the pump will not start and water will not overflow. This is called failsafe.

5.3. How We Tested

We took black soil from a Bagalkot field in a tray. In test one- we kept soil dry in sun for two hours. In test two, we poured five hundred milliliter water in the tray. In test three, we sprayed water on the rain sensor with a bottle to create artificial rain. In test four, we again dried the soil and repeated the test. We noted readings on serial monitor of laptop.

5.4. Cost of proposed system:

SL. NO	Component Name	Quantity	Unit Price in (Rs)
1.	Arduino Uno	1	350
2.	Soil Moisture Sensor	1	80
3.	Rain Sensor	1	90
4.	Relay Module (1 Channel)	1	70
5.	12V DC Mini Pump	1	180
6.	Buzzer, Wires & Breadboard	1 Set	100
Total Cost			870

Table 5.4: Cost of Proposed System

RESULT

We tested our model in Bagalkot black soil. We got the following results in clear sentences. In the first condition, the soil was dry in the morning. The soil value was seven hundred and twenty. The rain value was eight hundred and ten. The pump status was ON. The pump started in two seconds. In the second condition, after pouring water, the soil value was two hundred and eighty. The rain value was eight hundred. The pump status was OFF. The pump stopped and water was saved. In the third condition, the soil was dry and we sprayed rain. The soil value was seven hundred and ten. The rain value was two hundred and fifty. The pump status was OFF. The pump stopped even though soil was dry. Rain saved the water. In the fourth condition, the soil was wet and rain was present. The soil value was two hundred and sixty. The rain value was two hundred and ten. The pump status was OFF. The pump remained OFF. We learnt four points from results. First point is that the model saves thirty to forty percent water because it stops when rain comes. Second point is that the farmer does not need to go to the field at night. Third point is that the model works without internet, so it is best for village. Fourth point is that the cost is low, so a farmer can buy it. The problem we faced is that during uploading code, we got an error named not in sync. We solved it by pressing the reset button on Arduino during upload and changing the USB cable. We also learnt that relay is Active LOW. In Active LOW, HIGH means OFF.

6.1. Output on serial monitor:



Fig. 6.1.1 serial monitor: MOTOR ON

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Fig. 6.1.2 serial monitor: MOTOR OFF

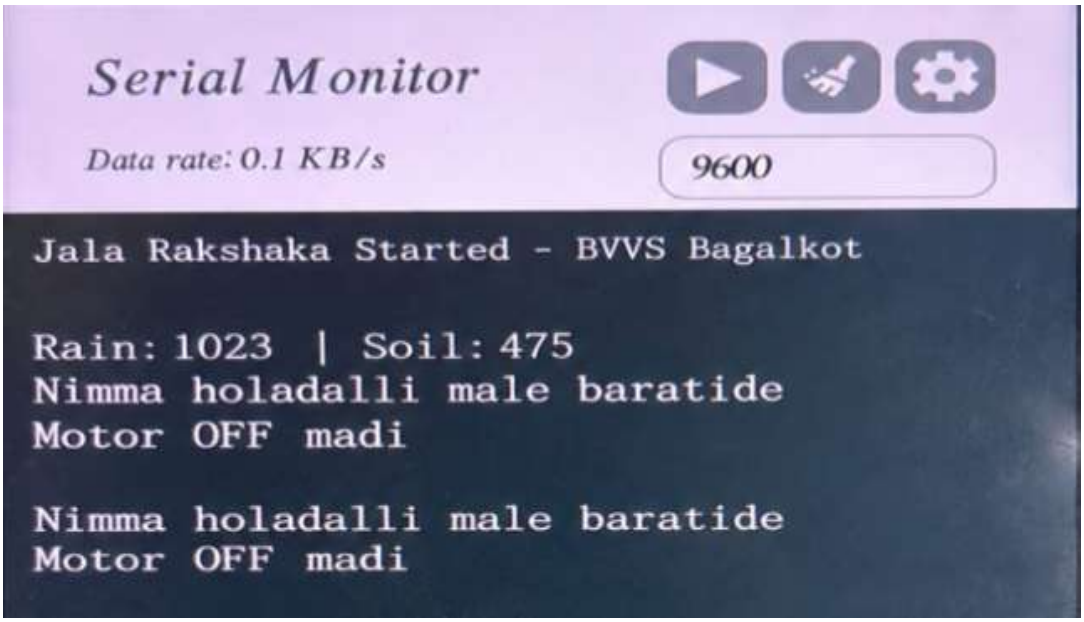


Fig. 6.1.3 serial monitor: RAIN FALL MOTOR OFF

CONCLUSION

JALA RAKSHAKA is a simple and low cost model for Bagalkot farmers. It protects water by using both soil and rain information. It is not a big IoT project. It is a small village friendly solution. Our model won Second Prize because judges liked that it solves a real village problem at eight hundred and seventy rupees.

FUTURE SCOPE

In future, we will add a solar panel so the model works in the field without electricity board power. In future, we will add a GSM module to send SMS message Pump ON to the farmer mobile. In future, we will add a display to show soil value in Kannada language.



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Model with students:





Achievements: Project Exhibition at BITM DIPLOTHON, 2026 (DIPOLOM HACKATHON), BALLARI on 31/10/2026 Secured 2nd prize and cash prize of 6000rs by 3rd sem EC department students.

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