Solar Based Water Quality Management System in Agriculture

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Abstract. The huge expansion in worldwide mechanical yield, country to metropolitan float and the over-use of land and ocean assets, the nature of water accessible to individuals has crumbled incredibly. The high utilization of fertilizers in agriculture and furthermore different synthetic substances in areas, for example, mining and development have contributed massively to the general decrease of water quality universally. A sunlight based Smart water system framework has been proposed. The horticultural land is checked with the assistance of five sensors and water system is computerized with the assistance of Microcontroller. The status of the water system of the specific land is suggested to the clients Mobile utilizing GSM Technique. By utilizing this water system framework, assets like water and Electricity can be minimalistic ally utilized with increment in water system productivity, and decrease in labour cost. The entire unit is given force flexibly with the assistance of solar panels which is been connected to the battery. We also use ultrasonic sensor to check any illegal entry of animals or birds into our land.

Keywords: Sun light, Microcontroller, Electricity, Framework, animals and birds.

1. Introduction
Horticulture assumes significant job in the economy of the nation. Over 70% of Indian population depends on farming for their sustenance [1][2][3]. As the commitment of horticulture to Gross Domestic item is declining these days, we are in inclination to build crop profitability with productive and successful water utilization. In agribusiness water system is the significant factor as the rainstorm rainfalls are flighty and unsure [4][5][6]. Farming even with water shortage has been a major test. There exists an interest for titanic specialized information to make water system frameworks more efficient. To improve conventional techniques, there have been numerous frameworks created utilizing trend setting innovations that help to diminish crop squanders, counteract exorbitant and rare watering to crops and in this way increment the harvest yield [7][8]. There are numerous cutting edge water system frameworks grew up until this point. One such strategy is trickle water system that is utilized to spare both water and manure. Crude dribble water system has been utilized since antiquated occasions. In this technique water and manure as water beads are trickled legitimately to the base of the plants intermittently [9][10][11]. The plan for water application changes as indicated by the harvest type.

When contrasted with conventional strategy it utilizes 30-half less water. The other strategy is pot water system which is increasingly appropriate for territories having sparse rainfall. The pitchers utilized here are repaired to the ground to the neck. The openings are made in pitchers which make the water to permeate around the dirt and keep the dirt clammy for the plants. This strategy is effective in territories where stream water system can’t be utilized. The other strategy incorporates sprinkler...
technique which is like that of characteristic precipitation [12]. The water is circulated through an arrangement of channels and afterward it is spread into air utilizing sprinkler with the goal that it separates into little water beads that fall into the ground. The siphons supply ought to be structured so that there ought to be uniform use of water on the dirt surface. There are a few parameters to decide water system of harvests [13]. Evapotranspiration (ET) is a system where of dampness from the earth is moved to the climate by dissipation of water and transpiration from plants. It relies upon climatic changes. ET controllers can be utilized to plan water system. It has been demonstrated that utilizing ET strategy the water investment funds is up to 47% [14]. Soil dampness and temperature of the field are the most basic parameters [15].

The remote sensor hubs constantly faculties the yield field and send it to the facilitator hub where basic leadership is done to mechanize water system dependent on the field conditions.

2. Related Work

Anand Nayyar[6](2016): proposed this Agriculture Stick based on Novel Smart IoT to assist farmers in obtaining live data (temperature, soil moisture) for efficient monitoring of the climate that will empower them to do savvy cultivating and to expand their general yield and item quality. The proposed agricultural stick is integrated with Arduino Engineering, Breadboard mixed with different sensors.

Pankaj Mohan Gupta[5] (2018): proposed this work. Many cultivating networks, for example, Indians, keep on utilizing common cultivating techniques. Nonetheless, they need to manage consistently expanding interest for nourishment (suggest more significant returns), water deficiency, accessibility of arable land, crop bug assaults, and atmosphere fancies. The Internet of Things can help change cultivating and furnish ranchers with convenient and exact data on crop yield alarms, precipitation, bother pervasion, and soil sustenance that can help improve yields. This paper tends to the utilization of IoT in various procedures in horticulture. The board of water supply, control of bugs, yield the board and wellbeing. It additionally depicts how cloud based information examination going about as backend to IoT sensor biological system and aides in upgrading the asset utilization but then at same time improve in yield size.

Aadil Imam(2018): worked with smart Green House system is essentially a device where different sensors are used to regulate and track different parameters in a greenhouse such as temperature, heat, humidity, soil moisture, ph sensors, etc. And green house is basically where plants like vegetables and bloom and develop and are generally covered with glass. The reason for this task is to structure a simple, simple to-introduce, easy to understand to screen and follow the estimations of parameters, for example, temperature, stickiness, characteristic daylight that are persistently checked and controlled with the point of advancing them to expand plant development and yield.

Ravi Kishore Kodali, SubbachariYerroju, ShubhiSahu (2018): proposed the work, So as to defeat future nourishment deficiencies because of overpopulation around the world, farming practices should be changed. By utilizing new, problematic innovations, for example, IoT in the horticultural segment, rural fields can be controlled utilizing minimal effort and low-power expending instruments, and water system frameworks can be mechanized for proficient utilization of water assets. This diminishes the negative effects of unsure climate changes, for example, yield misfortunes. LPWAN arrangements better serve IoT applications with the goal that they can handle transfer speed, force and inclusion impediments that are significant burdens in different remote correspondence innovations.

Swetha B (2017): proposed that Internet of Things (IoT) describes the interconnection of number of gadgets through the Internet. Each article is associated by a special identifier to one another so information can be moved to human cooperation without human collaboration. It empowers the advancement of answers for better characteristic asset the executives. In light of the idea of IoT, brilliant articles implanted with sensors permit communication with the physical and legitimate universes. The proposed framework in this paper depends on IoT utilizing ongoing information. Brilliant ranch water system framework utilizes android telephone to screen and control trickles remotely through remote sensor network. Zigbee are utilized to speak with the base station between
the sensor hubs. Using on the web java graphical UI, consistent data dealing with and presentation on the server is developed. Remote checking of the water framework system in the field lessens human mediation and enables remote watching and control on android phones. Distributed computing is an alluring answer for the enormous volume of information created by the system of remote sensors.

3. Methodology
In our proposed system we are using five sensors such as temperature, humidity, moisture, ph and ultrasonic. All sensors are connected to the microcontroller. The temperature sensor senses the temperature, humidity and moisture sensor senses the humidity and moisture of soil. Ph sensor senses the ph of water that we are using for irrigation. We are also using ultrasonic sensor to sense the illegal entry of animals and humans into our field. The entire unit is given by the help of solar panel. Power produced by the solar panel is stored in the battery. All the sensor values are updated n cloud through WIFI module.

Advantages:
- Low water consumption
- Proper updation to farmers about field current status
- No Wastage of electricity
- No man power required
- Usage of solar panel reduces EB bill

4. Proposed Method
In this proposed system we utilize the sun light to solar panels to subsequently siphon water from drill well direct into a ground level amassing tank dependent upon the power of light. While conventional methods join directing of water from drill well into a well and from this well onto field using another siphon, our structure uses so to speak a lone stage imperativeness usage wherein the water is guided into a ground level tank from which a clear valve framework controls the movement of water into the field. This extracts impressive proportion of imperativeness and capable usage of maintainable force source. A valve is controlled using astute figuring in which it coordinates the movement of water into the field dependent upon the moisture need of the land. In this system we use a moisture sensor that perceives the proportion of moisture present in the soil and relying on the essential of level of sodden content required for the gather the water stream is controlled subsequently, safeguarding the water by keeping up a vital good ways from over flooding of harvests. Figure 1 and figure 2 shown the working flow and the block diagram of the proposed system.

Figure 1. Flow chart of the proposed system
4.1. Hardware used:
- The Arduino UNO R3
- Ph sensor
- DHT11 sensor to sense humidity
- LM35 sensor to measure temperature
- Sensor to measure the soil moisture
- Ultrasonic sensor
- ESP8266 WiFi module

4.2. Temperature sensor
This means that the LM35 has a favoured role over Kelvin-adjusted straight temperature sensors since the consumer does not need an immense constant voltage from its output to acquire a useful centigrade scaling. No outer modification or cutting is required for the LM35 to provide regular correction of $\pm 1/4^\circ C$ at room temperature and $\pm 3/4^\circ C$ over a complete $-55-150^\circ C$ run. Figure 3 shows the temperature sensor.

4.3. PH Sensor
In soils, water and shower tank arrangements the pH levels are important. Soil and water pH are the most critical factors in determining if crops can be supplemented. The viability of pesticides relies on

![Figure 2. Block diagram of the system](image)

![Figure 3. Temperature sensor](image)
pH levels in splash tanks. This multifunctional metre allows all plants to grow soundly. It explores soil alkalinity, soil humidity and sunshine. The PH sensor is shown in figure 4.

![PH Sensor](image)

**Figure 4. PH Sensor**

5. Result
The expected outcome is achieved by the working model. The solar panel collect the energy from the sun and that energy can be stored in the battery. This energy is given to the aurdino instead of electrical power from EB. With this all sensors are activated. Ultrasonic sensor is used to detect any animals and bird entered into the field. If it can detect the buzzer will be on automatically to intimate farmers. ph sensor is used to detect the soil moisture. All the outputs of temperature, humidity, soil moisture can be displayed in LCD. Tested output values are displayed in table 1.

| Temperature (deg cel) | Soil Moisture (%) | Humidity (%) | Ultrasonic Sensor | Buzzer |
|-----------------------|-------------------|--------------|-------------------|-------|
| 28.2                  | 13.6              | 64.3         | Not Detected      | Off   |
| 29.4                  | 18.5              | 64.6         | Detected          | On    |
| 34.1                  | 19.22             | 65.5         | Detected          | On    |

6. Conclusion
In the field of irrigation, environmental parameters tracking and detecting pests, this proposed method is very successful. The estimation of crops is also very precise because of the use of the PH sensor. The productivity of the crop is higher because of the forecast for the crop to be harvested. This is very convenient for agriculturists to track the condition without going to the field. This method is particularly good for rice cultivations as it needs a significant amount of water relative to other crops. The machine built is cheap and less efficient due to IOT and microcontroller applications.

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