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A Study On Quality Assurance Service Of Waste Water Management In Real-Time Automation Of Agricultural Environment

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Abstract **- Agriculture is one of the greatest sectors that contributes a lot towards the upliftment of the country's economy. This field yields abundant result in spite of the slow rate of advancement in its development. Traditional practices are still followed across most places in our country which results in low 'yield potential'. The Gross returns obtained from the field seems low compared to the time and money invested because of lack of proper planning and inadequate technology. More over the most prominent problem prevailing in agronomic field is the irrigation management. Hence it becomes need of the hour to arrive at a solution for this. The main aim of this project is to automate the measurement of field parameters and control using GSM module. This provides complete automation in the determination of type of irrigation based on the availability of water supply. This involves the presence of various sensors within the field environment and transmission of these field parameters to the control. This can facilitate the reduction in labour in agriculture and water conservation both of which can have a long and productive impact on the economy and environment.**

Key terms: yield potential, agronomic field, irrigation, field parameters.

I. INTRODUCTION

Wireless sensor networks are a leading advancement which has an upper hand in all the sectors among which one recent application lies in agriculture. Utilizing WSN in the data transmission of field parameters has the potential to benefit the labours by reducing the tedious work involved. Agricultural Research Service(ARS) ,an agency of USDA published a report which implies that 40% of water is wasted through irrigation .Our country is monsoon dependent. Hence this project focuses on dynamically determining the type of irrigation based on the water availability. So by this we are reducing the 23% of water wastage by irrigation. Various sensors are placed on the field environment to determine pH, temperature, water level in field and well. This data from the field are converted to digital form and sent to the person concerned to finalise the decision on the irrigation. The ATMEL microcontroller is used to control the actions of the various sensors. The motor operation is monitored and controlled by using GSM. Reduction in work load and water saving is done effectively ,thereby achieving the high productivity and quality of crops.

II. EXISTING SYSTEM

The pH level of soil in not investigated. Farmers simply start seeding the crops. Each and every operation will be done manually. The farmer has to irrigate the land. So he has to come for a visit . He has to do the regular inspection in his land. Moreover they will not use the proper irrigation or water management system to save the water. Since the farming is done manually the amount of work done is very high.

III. PROPOSED SYSTEM

This project aims at Real-Time Automation of Agricultural Environment for Social Modernization of Indian Agricultural System. Efficient water management is a major concern in many cropping systems in semiarid and arid areas. Temperature sensor, level sensor, pH sensor connected with ATMEL inspects the field aspects . Microcontroller transmits the data using Global system for mobile communications Modem, this project offered stable remote access to field conditions and real-time control and monitoring of the variable-rate irrigation

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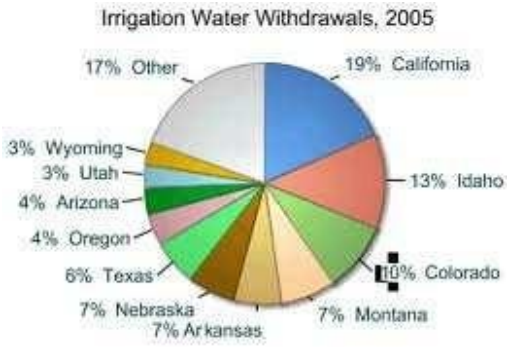
controller. Through this a sophisticated farming is done and ensures the agricultural benefits.

IV. IRRIGATION

Irrigation means the application of water , artificially to the land or soil. Additionally, irrigation also has a few other uses in crop production, which include protecting plants against frost, suppressing weed growing in grain fields and helping in that relies only on direct rainfall is referred to as rain-fed are also used. Irrigation is often studied together with drainage, which is the natural or artificial removal of surface and sub-surface water from a given area.



The above charts shows the consumption of water for irrigation in US. During 2005 without any automization the usage of water is drastic. Here we are contolling the water consumption but producing the high yield through automization.

A. Types of irrigation

- Surface irrigation
- Sprinkle irrigation
- Drip irrigation
- Subsurface irrigation

Surface Irrigation*:* Just flooding water. About 90% of the irrigated areas in the world are by this method. Water is applied to the field in either the controlled or uncontrolled manner.

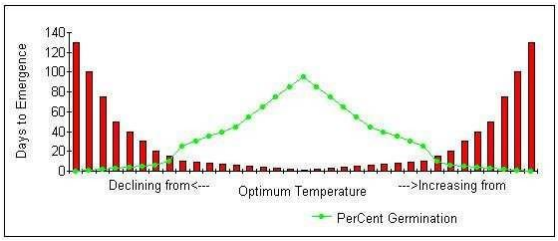
Sprinkler Irrigation*:* Applying water under pressure. About 5 % of the irrigated areas are by this method. The sprinkler system is ideal in areas where water is scarce. A Sprinkler system conveys water through pipes and applies it with a minimum amount of losses. Water is applied in form of sprays sometimes simulating natural rainfall.

Drip or Trickle Irrigation*:* Applying water slowly to the soil ideally at the same rate with crop consumption.

Sub-Surface Irrigation*:* Flooding water underground and allowing it to come up by capillary to crop roots. In this paper we are majorly concentrating on the surface and sprinkle irrigation. Because this irrigation is mostly suitable for all kind of crops. Drip irrigation requires pre planned water pipeline setup, is we have this setup then we can prefer this type irrigation also.

V. IMPORTANCE OF TEMPERATURE.

Temperature is important to agriculture because it influences plant growth through photosynthesis and respiration, affects soil temperature, and controls available water in the soil. Farmers use soil temperatures and soil moisture to decide when to plant what varieties of crops to choose, and to determine the likely development of key plant characteristics like flowering as well as emergence of insect pests and plant diseases. The occurrence of freezing temperatures in fall generally heralds the end of the growing season for most plants.



Most plants have a range of temperature at which growth occurs. Some plants are more adaptable and can grow throughout the range, while other plants have more specific temperature requirements. When the temperature reaches the upper end of the spectrum, in general, plant photosynthesis declines. Optimal temperatures are different from plant to plant, and can even be different within one species.

Air temperature can also affect the availability of some nutrients (phosphate is less available in the chloroplast of the plant at low

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temperatures), which in turn reduces the level of photosynthesis. Low air temperatures can also

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negatively affect plant growth. Sometimes they irrigate the crop so that a thin layer of ice forms on the crop. Sometimes the farmers can cover the crop with plastic or cloth to protect the crop, and other times the farmer might run fans or propane heaters to try and raise the air temperature slightly around the crop. Low air temperatures also affect soil temperatures and freezing soil temperatures can cause “frost heaving” of plants that overwinter in the soil.

Moreover land should not be irrigated during hot temperature. If the land is irrigated during very high temperature then the water gets heated up. Now the roots start sucking the hot water. When the roots sucks the hot water then plant cell are destroyed if the cells are destroyed then the growth of the plant is afftected. so the temperature should be noted before we are going for the irrigation.

VI. PH VERSUS TEMPERATURE

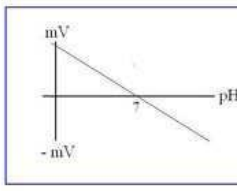
Nernst equation gives the pH and temperature relation

$$E = E_o + 2.3\frac{RT}{F} \cdot (\log a_{H+})$$

$$pH = -\log a_{H+}$$

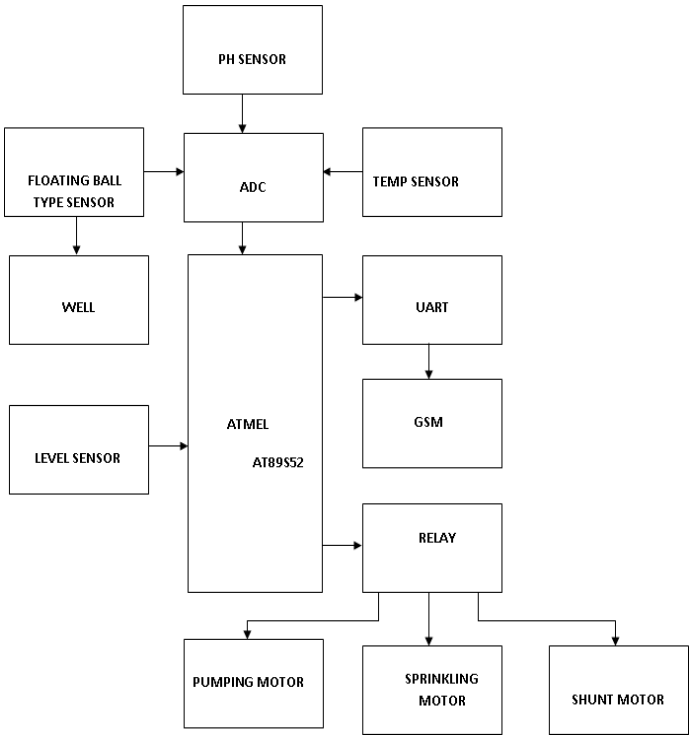
$$2.3\frac{RT}{F} = k \cdot T \quad \text{(is called the Nernst factor, or slope factor)}$$

$$E = E_o - k \cdot T \cdot pH$$



The equation E = E0 - kT·pH is the potential or voltage (millivolt; mV) relation of a pH electrode. It is the equation of a straight line. The slope factor is the term "kT" and it provides the amount of change in total potential (mV) for every change in pH unit. The equation E = E0 - kT· pH may be stated for any temperature. However, the slope or Nernst factor (kT) will change when temperature changes .

VII. BLOCK DIAGRAM



VIII. COMPONENTS USED

A.AT89S52 microcontroller:The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel’s high-density non volatile memory technology and is compatible with the Indus-try-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non volatile memory programmer.

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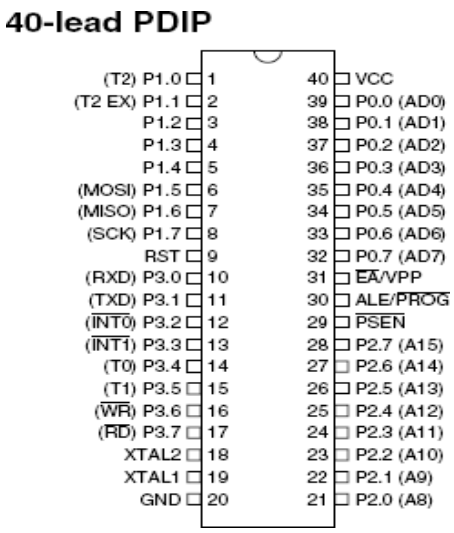

B.ADC:The ADC0808, ADC0809 data acquisition component monolithic CMOS device is 8-bit analog-to-digital converter. It provides 8-channel multiplexer. It is a Microprocessor compatible control logic based on Successive approximation method. The design of the ADC0808, ADC0809 has been optimized by incorporating the most desirable aspects of several A/D conversion techniques. The ADC0808, ADC0809 offers high speed, high accuracy, minimal temperature dependence, excellent long-term accuracy and repeatability, and consumes minimal power. These features make this device ideally suited to applications from process and machine control to consumer and automotive application.

***C.UART*:** UART(RS 232) -Universal Asynchornous Receiver Transmitter. It converts parallel information to serial data.Single bits is transferred at a time.At receiving side converts bits into bytes. The only extra devices attached are line driver chips capable of transforming the TTL level signals to line voltages and vice versa.

D.GSM :Global System for Mobile communication GSM cellular technology uses 200 kHz RF channels.Used to send data over the network.The product has SIM Card holder to which activated SIM card is inserted for normal use.Powered by UPS

E.pH sensor :The most common pH sensor is the glass electrode. It's used in many industry applications and in a wide variety of fields. The glass-electrode method has high reproducibility, and it can measure pH of various solutions A pH

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electrode is a potentiometric or electrochemical sensor that has a voltage output. A potentiometric sensor consists of two electrochemical cells or electrodes:

1. glass electrode

2. reference electrode

The electric potential created between the glass electrode, and the reference electrode is a function of the pH value of the measured solution. So once the potential difference has been measured we will be ale to calculate the pH value.pH electrode life is dependent on the temperature.

- Typical pH Electrode Life is 12 - 18 Months
- Life is Reduced Approximately 50% for Every 25°C Increase in Operating Temperature

F. Level sensor: Level sensors detect the level of substances that flow, including liquids, slurries, granular materials, and powders. All such substances flow to become essentially level in their containers (or other physical boundaries) because of gravity. The substance to be measured can be inside a container or can be in its natural form. The level measurement can be either continuous or point values. Continuous level sensors measure level within a specified range and determine the exact amount of substance in a certain place, while point-level sensors only indicate whether the substance is above or below the sensing point. Generally the latter detect levels that are excessively high or low. There are many physical and application variables that affect the selection of the optimal level monitoring method for industrial and commercial processes. The selection criteria include the physical: temperature , pressure or vacuum ,chemistry, dielectric constant of medium, density (specific gravity) of medium, agitation(action), acoustical or electrical noise
,vibration, mechanical shock, tank or bin size and shape.

G. Temperature sensor :LM35 is a precision IC temperature sensor with its output proportional to the temperature (in °C). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possess low self heating and does not cause more than 0.1 °C temperature rise in still air. The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every

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°C rise/fall in ambient temperature, *i.e.,* its scale fActor is 0.01V/°C.

H.RELAY

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches.

IX. WORKING:

The pH level and temperature of the field environment are measured by the respective sensors. It is essential to maintain the pH and temperature of the field within limits. Otherwise the productivity of the soil may be lost in due course and the nutrient balance will also be deteriorated in the long run. pH has to be slight acidic and the temperature must not exceed limits since India is a tropical country with prominent environmental conditions. This value obtained by the sensor is converted into digital signal by ADC and is sent through GSM. The next important task of the microcontroller is to check the water level of the field using level sensor to determine if it requires the water supply. If the condition is satisfied, it checks for the level of water in the well to be sufficient to supply the field . This is performed using floating ball sensor. The entire control lies with the ATMEL microcontroller. Based on the availability of water in the well, the type of irrigation is determined by the microcontroller. The most advantageous feature of this method is that irrigation of crops is ensured even in the conditions of drought which is not possible in the manual system of operation. When the water level in the field exceeds the required level of water , it is notified to the microcontroller which prevents the logging of water thereby ensuring the prevention of stagnation.

Advantages:

- No manual intervention
- Increased quality of product
- Increased in productivity
- Automated irrigation
- No logging of water
- Reduce man power
- Wireless control of plant growth.

X. CONCLUSION

Now a days it is not possible to obtain labour for agriculture since a large mass of people have started moving towards the urban areas due to industrialization. In such a scenario at present, automation of agriculture would fetch a very promising result. Moreover this automatic measurement of field parameters would maintain the field stability improving the agronomic economy and yields good returns to the investors. This maintains the physical environment of the farm land ensuring quality of products and sustainability in production which is otherwise not be possible through conventional methods

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