Wireless sensor network for Field Monitoring and Controlling

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Abstract— **On account of changing climate scenario, Agriculturists are also demanding advanced instrumentation to monitor various parameters of farm. Out of various parameters, humidity, temperature and soil moisture are having very high importance at the time of cultivation. Considering the demand an embedded system is designed with the help of LPC 2148 which has ARM 7 as core.LPC family has very high speed of operation with less power consumption. The system has the ability to wirelessly acquire data from the field, and record it. It will also control water pump according to field conditions. Due to monitored controlling efficient use of available resources can be implemented. System will reduce load on farmers, and will ensure no losses due to excess water will occur.**

***Index Terms*— XBEE (Zigbee), Microcontroller, sensor network, humidity sensor, soil moisture sensor, temperature sensor**

I. INTRODUCTION

India is an agriculturist's country. Here major occupation is farming, ultimately gross annual income is also dependent on the yield in the farm .So why not the farmers of India, get the privilege of using hi-tech equipment during their farm work .If they use the technologies such as greenhouse, automated data acquisition and analyzer, and many other the yield would be definitely increase than conventional farming. And as we consider about their profit or income it will definitely increase by using wireless technology and apparently their lifestyle will improve.[1]

This paper prototypes system in which field data i.e. temperature, humidity &soil moisture will be acquired by one part and will be sent over to other part where it will be processes and displayed on some display . This acquired data will also be used to run few regulatory instruments such as drip irrigation, water pump, vents in case of green house, in case for this prototype implementation of water pump and water level sensor.

Whenever the soil moisture drops below certain levels the system will automatically switch on the water pump after checking the water levels in tank**.**

II. SYSTEM ARCHITECHTURE

System has basically two major hardware parts i.e. field device and base station, field device which is remotely located at long distance in field has function to collect readings from various sensors like temperature, soil moisture, and humidity convert it into digital format generate packets and transmit it to base station using XBEE[2] trans-receiver. Base station device on the other hand receives packet transmitted by the field device decodes it and displays readings on both computer as well as LCD. Following figure gives brief information on system plan.

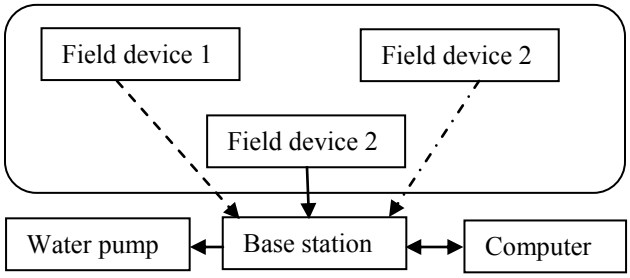

Fig 1Architecture Block Diagram

Base station also has been given control of water pump and is also interfaced with water level sensor, on the basis of the readings from the field it checks for soil moisture if the soil moisture is below threshold it checks for the water level from the tank and according regulates the water pump [3].

Wireless sensor network (WSN) can form a useful part of the modern agricultural fields. Wireless communication such as Zigbee can be used to collect the measurements and to communicate between the centralized control and the actuators located to the different parts of the Farm. Compared to the cabled systems, the installation of WSN is fast, cheap and easy. Moreover, it is easy to relocate the measurement points when needed by just moving sensor

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nodes from one location to another within a communication range of the coordinator device.

WSN maintenance is also relatively cheap and easy. The only additional costs occur when the sensor nodes run out of batteries and the batteries need to be charged or replaced, but the lifespan of the battery can be extended if an efficient power saving algorithm is applied.

III. FUNCTIONAL BLOCK DIAGRAM

Following figure fig 2 shows block representation of field transmitting device, it basically consists of lpc2148 controller interfaced with humidity sensor, soil moisture sensor, temperature sensor and XBEE for wireless transmission. Sensors are interfaced using ADC channels of LPC2148 thus converting analog readings to digital format. The controller then makes packets and gives it to XBEE.

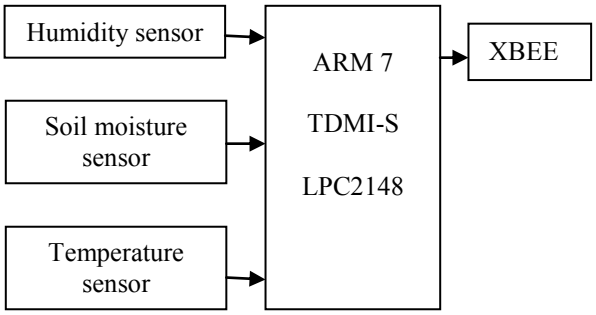

Fig 2 Block Diagram of Transmitter

Following fig represents structure of receiver XBEE for wireless communication and lpc2148 for processing received data. The received readings are then separated as temperature, humidity and soil moisture. These are then displayed on 16x2 LCD and computer screen

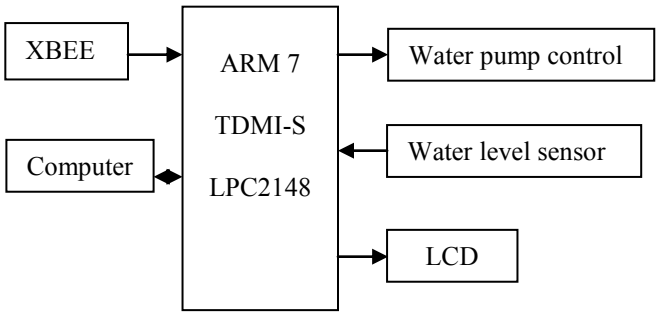

Fig 3 Block Diagram of Receiver

IV. HARDWARE IMPLEMENTATION

Temperature sensor used is LM 35 it is a precision centigrade temperature sensor. It has linear relation between output voltage and temperature. It has range from -55 to 150˚C.

Humidity sensor used is SY-SH 230, it can detect relative humidity from 10 to 90 %Rh. The graph of output voltage and relative humidity is nearly linear. It can operate at 95%Rh.

Soil moisture sensor is a simple but effective custom built three wired sensor (VCC, Ground, Vout)

XBEE used is of series 2 PRO, which gives a range of 1.5 miles in line of sight, for outdoor space. Its operating voltage is 3.3V.

Fig 4 Receiver

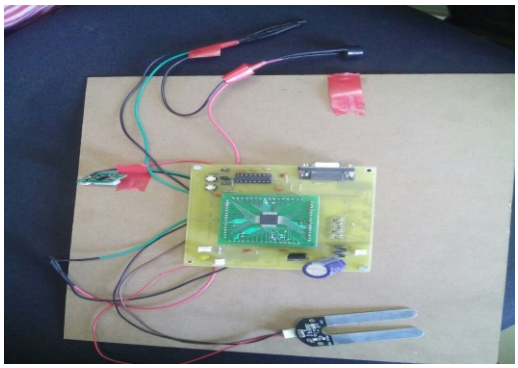

Fig 5 Transmitter

V.RESULT

The project was implemented in farm for general testing; out the numerous readings a few have been sampled in the following table I

Temperature (degree Celsius)	Humidity (RH %)	Soil moisture (% calibration)	Water level status	Water pump status
27	75%	56%	-	Off
33	55%	47%	-	Off
29	62%	43%	ok	On
23	69%	53%	ok	Off

Table I

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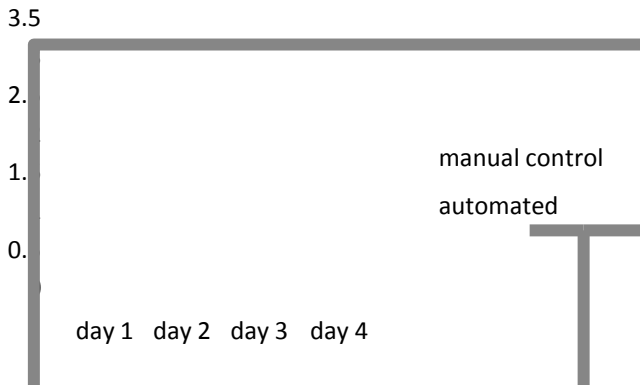

Graph of working period of water pump in both system

VI. CONCLUSION

After the prototype implementation of this work we could conclude that, this system can efficiently optimize use of water and can considerably reduce burden on Indian farmers.

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