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STUDY ON THE WIRELESS SENSOR MULTIMETER USED FOR AGRICULTURAL

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ABSTRACT

India's economy relies heavily on agriculture. There are around 600 million people who work in this sector, and it accounts for almost 30% of the GDP of the countries in which it operates.The main aim of the study is Study on The Wireless Sensor Multi-meter Used forAgricultural**.** The development and deployment of the Wireless sensor Multi-meter is essential for environmental monitoring.The sensor has been successfully developed and implemented. The development and deployment of the wireless sensor multi-meter have been fruitful.

Keywords: Economy, Wireless, Environmental, Development, Deployment, Agricultural.

1. INTRODUCTION

India's economy relies heavily on agriculture. There are around 600 million people who work in this sector, and it accounts for almost 30% of the GDP of the countries in which it operates. Increasing the amount of farmland in use is a crucial part of agricultural growth. Farmers must have access to new tools and financial aid. The agricultural impact will contribute to India's economic growth. Today's farmers cultivate land to provide food for the population. Farmers continue to provide for the needs of the public via their products. In 2011, 67% of India's 1.21 billion people lived in rural areas, with the vast majority working in agriculture. Farmers grow a wide variety of crops for various purposes, including food, fibre, fuel, and industrial inputs. So, they provide the means by which our country survives. To innovate is to come up with and implement novel concepts. To innovate is to labour; it is a source of growth and development. The economy and society as a whole feel the effects of innovations. The modernization of farming in India and the adoption of cutting-edge agricultural technologies are urgently required in light of the significance of innovation to India's economy. One of the biggest issues today is a general lack of information about soils themselves, including information about the nutrients they contain, the types of fertilisers that should be used, and the irrigation frequency and duration that should be applied based on the soil's porosity and ability to retain water. These issues are ignored. Vast swaths of once-productive farmland have become unusable as a result of water lodging, which leads to excessive salinity and inhibits the correct application of fertilisers. This is why studying the soil and its components is essential. Soil analysis to improve agricultural yields is not widely employed in the contemporary Indian context, mainly owing to the high cost and limited availability of laboratories providing such testing services. Also, owing to the tiny amount of property holdings, the process of transporting soil samples to a faraway lab and then making a choice does not appear economically feasible.

2. LITERATURE REVIEW

Rahu, Mushtaque Ahmed &Karim(2022) Because to advances in sensing technology and Wireless Sensor Networks (WSN), work in the agricultural sector may now be completed rapidly, effectively, and accurately. Smart agriculture refers to these methods. In this study, we explore the many sensing technologies that pave the way for intelligent farming practises. Thereafter, a WSN-based system was developed to track key agricultural indicators. A Wheat field has already been used to test the new method. By reducing the number of times farmers have to go out into the field, we hope to improve Wheat crop quality and yields. This method allows for precision agriculture by continuously monitoring the three most important factors (temperature, light, and water level) that contribute to a significant improvement in the quality, production, and growth of Wheat crops. This method allows farmers, landowners, and researchers to keep an eye on these metrics without ever having to leave the comfort of the station's control room. We also created a graphical user interface (GUI) to show you all the numbers we clocked in. This system is built around the IRIS motes, MDA100 data collection board, and MIB520 USB interface board. For creating codes for wireless nodes, we utilise TinyOS, and for the GUI tool, we rely on Microsoft Visual Studio. The nodes communicate with the base station using the ZigBee IEEE 802.15.4 protocol and the direct topology. Finally, we conclude with some thoughts on where the field may go from here.

Rahaman, Md&Azharuddin, Md. (2022) This article provides a comprehensive overview of the state of the art in wireless sensor networks (WSNs), machine learning (ML), and its applications in the growing subject of smart agriculture. We begin by defining the various kinds of WSNs and discussing their effects on smart farming. Data sets acquired by sensor nodes in an agricultural area are used in the ML procedures. Issues with sensors networks and machine learning methods are also covered. In this paper, we concentrate on the difficulties of WSN implementation in agriculture and how ML approaches might help. To classify the items in question, ML methods work best with certain kinds (i.e., labelled/structured) of data. We also take into account the idea of using Deep Learning on any kind of data set, no matter how large. Lastly, we talk about the many different issues in agriculture and the many different methods that have been employed for smart or precision agriculture in the past. Our ultimate goal is for the agricultural system to make use of a number of advanced technologies all working together to improve its efficiency and effectiveness. Lastly, this survey research suggests using IoT and deep learning in agricultural WSNs.

Ping, Wong &MohdSalleh, MohdFadzli (2022) Today's agriculture must become "smart" in order to meet the increasing demand for food from the world's rising population. The use of wireless sensor networks (WSNs) in agriculture, particularly hydroponics, aeroponics, aquaponics, etc., is not only a futuristic concept, but a reality. The state-of-the-art IoT-based method is used to the presentation of a wireless sensor network hydroponic system. Hydroponic plant parameters may be tracked in real time and analysed online through computer or mobile device. We want to create a working model of a small hydroponic network comprised of numerous sensor nodes. The prototype will be set up in the same manner as a wireless sensor network, with a central controller linked to individual sensor nodes by wifi and able to relay data to the cloud. Using a technique called TDMA (Time Division Multiple Access), the sensor nodes will send the data they've gathered to the gateway node (controller) and then store it in the cloud. The sensors measure things like water temperature, humidity, light intensity, and pH. Prior to starting to monitor hydroponic plants, we will do research on the modifications needed to gather data from sensors. As a result, this initiative may take the place of the manual monitoring system, allowing farmers to keep an eye on crucial environmental elements even if they have to be out of town.

Thakur, Divyansh & Kumar(2019) Wireless sensor networks (WSN) are being used in many different areas, from engineering and research to agriculture and even surveillance and military applications and even smart automobiles. One industry where WSNs have found widespread use is precision agriculture (PA). By monitoring environmental factors like humidity, temperature, soil moisture, PH value of soil, etc., WSNs in PA hope to increase agricultural yields while simultaneously improving crop quality. The WSNs also aid in the conservation of natural resources for agricultural purposes. In order to realise the potential of smart agriculture, this study will seek to catalogue the many different wireless sensor network (WSN) technologies now in use for precision farming. The importance of environmental factors including irrigation, monitoring, soil qualities, and temperature in the pursuit of precision agriculture is also explored. Also, a comprehensive assessment of the various crops monitored by WSNs is conducted. The various forms of communication technology and sensors now in use for PA are also highlighted in this overview. A number of research questions are formulated to examine the effect of WSNs in the agricultural industry, and the purpose of this review is to attempt to discover answers to these concerns. "2019 Springer Science+Business Media, LLC," a division of Springer Nature.

Chaudhary, Dilip&Nayse, Sham &Waghmare, L.M. (2011) Improvements in Wireless Sensor Network technology have allowed for their use in precision agriculture's monitoring and control of greenhouse parameters. The agricultural sector has seen significant technological developments in recent decades, leading to a rise in ultimate output. Since rain falls in different places at different times, farmers must carefully manage how much water each crop receives over the whole farm, or as needed. There is currently no one-size-fits-all technique of irrigation that can be relied on in every climate, with any kind of soil, and for any number of crop varieties. One such answer is greenhouse technology. It is essential to carefully consider all greenhouse factors while deciding on a solution. It has been noticed that farmers lose a significant amount of money due to poor weather forecasting and improper irrigation. Wireless sensor networks and miniaturised sensor devices have advanced to the point where they may be used for autonomous monitoring and control of greenhouse parameters in Precision Agriculture (PA) applications. In this study, we propose and analyse using Wireless Sensor Networks (WSN) with Programmable System on Chip Technology (PSoC) for greenhouse monitoring and control.

3. METHODOLOGY

The development and deployment of the Wireless sensor Multimeter is essential for environmental monitoring. Temperature, soil moisture, humidity, wind speed, rain, soil pH, and solar radiation duration sensors must be developed and linked to a wireless Sensor multimeter. System employing ZigBee module to monitor soil moisture and temperature and regulate irrigation motor.

3.1 Wireless Sensor Multimeter on Farm:

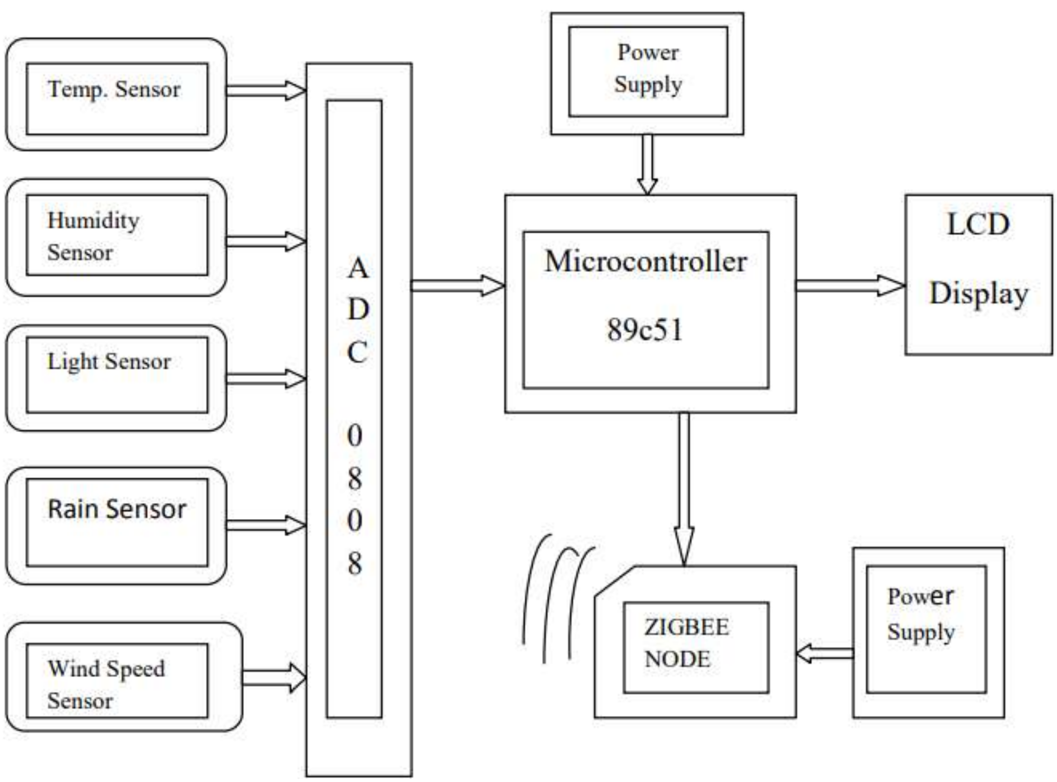

Fig. 3.1 Wireless Sensor Multimeter on Farm

4. RESULTS

4.1 WIRELESS SENSOR MULTIMETER

Table 4.1 Reading taken for 1-1-20 to 11-3-20:

Sr. No.	Period	Temp.^{0}c		Humidity		Wind Speed Km/h	Burst Shun shine
		Max.	Min.	Morn.	Even.		
1	1-1-20to7-1-20	32.02	16.91	87.14	38.28	2.77	8.16
2	8-1-20to14-1-20	31.22	17.14	84.85	35.57	3.12	8.68
3	15-1-20to21-1-20	30.11	11.97	87.00	37.57	3.64	9.02
4	22-1-20to28-1-20	30.80	12.48	85.57	37.14	3.78	9.12
5	29-1-20to4-2-20	30.60	14.08	78.42	31.42	4.02	8.48
6	5-2-20to11-2-20	32.94	15.45	75.85	38.14	4.36	9.16
7	12-2-20to18-2-20	32.05	14.37	87.85	38.28	3.78	9.36
8	19-2-20to25-2-20	33.77	17.02	82.00	37.57	2.98	8.68
9	26-2-20to4-3-20	36.54	17.14	74.71	33.42	4.25	8.06
10	5-3-20to11-3-20	34.85	15.62	77.57	24.71	3.96	9.45

Table 4.2 Reading taken for 12-3-20 to 20-5-20:

Sr. No.	Period	Temp.^{0}c		Humidity		Wind Speed Km/h	Rain Fall Mm	Burst Shun shine
		Max.	Min.	Morn.	Even.			
1	12-3-20to18-3-20	35.85	15.20	81.71	31.28	4.05	-	9.56
2	19-3-20to25-3-20	38.05	19.14	81.00	27.85	3.98	-	8.54
3	26-3-20to1-4-20	36.40	21.77	91.71	45.42	4.02	-	8.12
4	2-4-20to8-4-20	38.31	22.88	90.42	38.28	4.15	-	8.64
5	9-4-20to15-4-20	38.97	22.85	86.72	40.57	3.95	-	7.98
6	16-4-20to22-4-20	37.45	21.51	91.85	36.28	7.65	24.4	6.78
7	23-4-20to29-4-20	37.97	23.14	91.55	44.28	8.12	34	7.02
8	30-4-20to6-5-20	38.42	24.40	86.28	47.71	5.46	-	7.98
9	7-5-20to13-5-20	37.65	23.55	91.28	46.85	5.02	-	7.65
10	14-5-20to20-5-20	38.25	22.17	92.71	40.70	5.64	18	8.02

Table 4.3 Reading taken for 21-5-20 to 29-7-20

Sr. No.	Period	Temp.^{0}c		Humidity		Wind Speed Km/h	Rain Fall Mm	Burst Shun shine
		Max.	Min.	Morn.	Even.			
1	21-5-20to27-5-20	38.82	22.97	90.10	48.85	6.78	-	8.12
2	28-5-20to3-6-20	38.48	22.05	91.00	63.28	7.98	-	7.05
3	4-6-20to10-6-20	36.05	23.54	92.56	70.15	8.65	3.8	6.95
4	11-6-20to17-6-20	33.60	22.82	89.85	61.14	8.90	-	6.24
5	18-6-20to24-6-20	32.50	23.80	93.75	60.54	9.15	15.8	5.98
6	25-6-20to1-7-1221.08	32.21	23.45	92.54	58.90	9.65	-	5.02
7	2-7-20to8-7-20	31.11	21.08	93.42	75.57	10.55	7.2	2.48
8	7-7-20to15-7-20	30.42	21.02	93.57	62.14	9.55	-	2.72
9	16-7-20to22-7-20	28.85	21.00	90.14	66.89	8.86	2.2	2.79
10	23-7-20to29-7-20	28.15	21.16	91.00	60.56	8.98	7.6	2.98

Table 4.4 Reading taken for 30-7-20 to 5-8-20:

Sr. No.	Period	Temp.^{0}c		Humidity		Wind Speed Km/h	Rain Fall Mm	BurstShunshine
		Max.	Min.	Morn.	Even.			
1	30-7-20to5-8-20	29.00	21.34	92.85	77.85	6.98	13.6	3.20
2	6-8-20to12-8-20	31.62	21.57	93.71	73.42	8.56	5.2	2.98
3	13-8-20to19-8-20	29.85	21.74	95.57	71.42	7.12	-	3.12
4	20-8-20to26-8-20	29.54	22.17	96.58	63.71	6.05	-	3.16
5	27-8-20to2-9-20	28.75	21.64	94.75	80.42	7.98	18.4	4.98
6	3-9-20to9-9-20	31.95	21.98	92.71	69.14	6.42	-	4.38
7	10-9-20to16-9-20	32.18	22.02	93.65	71.68	6.88	-	3.92
8	17-9-20to23-9-20	32.65	22.88	94.00	67.71	6.94	-	4.12
9	24-9-20to30-9-20	32.95	22.92	93.55	65.54	7.02	-	4.28

Table 4.5 Rainy Days Information:

Sr. No.	Period	Temp.^{0}c		Humidity		Wind Speed Km/h	Rain Fall Mm	Burst Shun shine
		Max.	Min.	Morn.	Even.			
1	16-4-20	37.45	21.51	91.85	36.28	7.65	24.4	6.78
2	20-4-20	37.45	22.54	93.80	32.20	6.63	21.6	7.11
3	29-4-20	37.97	23.14	91.55	44.28	8.12	34	7.02
4	17-5-20	38.25	22.17	92.71	40.70	5.64	18	8.02
5	9-6-20	36.05	23.54	92.56	70.15	8.65	3.8	6.95
6	23-6-20	32.50	23.80	93.75	60.54	9.15	15.8	5.98
7	1-7-20	28.07	20.34	89.85	79.85	5.93	9.21	2.29
8	5-7-20	31.11	21.08	93.42	75.57	10.55	7.2	2.48
9	21-7-20	28.85	21.00	90.14	66.89	8.86	2.2	2.79
10	27-7-20	28.15	21.16	91.00	60.56	8.98	7.6	2.98
11	2-8-20	37.45	22.51	90.53	69.85	7.20	4.5	4.91
12	5-8-20	29.00	21.34	92.85	77.85	6.98	13.6	3.20
13	9-8-20	31.62	21.57	93.71	73.42	8.56	5.2	2.98
14	17-8-20	27.85	20.00	89.15	67.89	8.36	2.9	5.22
15	2-9-20	28.75	21.64	94.75	80.42	7.98	18.4	4.98
16	3-9-20	25.9	21.07	94.96	81.09	7.73	15.2	3.97

4.2 SOIL PH SENSOR

Table 4.6 Soil pH Sensor Measurement:

Sr.No.	V_{out}(V)	pH
1	54.55mV	3.01
2	168.8mV	4.00
3	100mV	5.18
4	4.06V	7.01

4.3 SOIL MOISTURE

Table 4.7 Soil Moisture Sensor Measurement:

Sr.No.	V_{out}	Soil
1	0V	Soil is dry
2	2.5	Soilmoistureatdeep2inch
3	2.7	Soilmoistureatdeep3inch
4	3.3	Soilmoistureatdeep5inch
5	3.7	Soilmoistureatdeep7inch
6	4.0V	Soilmoistureatdeep9inch
7	>4 V	Slurrysoil

4.4 MOTOR

Table 4.8 Motor Valve and Partition Conditions:

Valve/Partition	Partition1	Partition2	Partition3
Valve1	ON	OFF	OFF
Valve2	OFF	ON	OFF
Valve3	OFF	OFF	ON

5. CONCLUSION

The sensor has been successfully developed and implemented. The development and deployment of the wireless sensor multimeter have been fruitful. The ZigBee module is used in the development of a wireless sensor network to regulate agricultural parameters. The experimental data comes from short-term harvests. As no chemical fertilisers were used in the collection of these data, the negative impacts of these substances on people, animals, plants, and water were avoided. The findings are compared to those obtained using the conventional, non-chemical fertiliser approach. Sensors are tested by direct gustatory experience in the wild. The soil is irrigated depending on data from a moisture sensor. Secondary research is used to investigate ecological concerns. Case studies and in-depth interviews are used to learn more about farmers' issues. Managers of farms have their input taken into account. Even the farmers see the benefits. Farmers are encouraged to forego the use of artificial fertilisers, test the acidity of their soil, evaluate the quality of their crops, and make use of cutting-edge agricultural technology.

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