International Journal in Management and Social Science
Volume 09 Issue 11, November 2021 ISSN: 2321-1784 Impact Factor: 7.088
Journal Homepage: http://ijmr.net.in, Email: irjmss@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal

ANALYTICAL STUDY ON THE CROPS USED WIRELESS SENSOR NETWORKS

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ABSTRACT

Water content in the soil is ignored. Irrigation infrastructure is rapidly evolving. The most cutting-edge methods of irrigation in India are drip and sprinkler systems. **T**he main aim of the study is Analytical Study on The Crops Used Wireless Sensor Networks**.** Provide a toolkit with an innovative interface to wireless sensors as well as recommendations for system design, development, and deployment of the technology.Parameters including air temperature, humidity, wind velocity, sunshine hours, and precipitation rates were among those picked up by the wireless sensor multimeter.

Keywords: Innovative, Wireless, Sensors, Humidity, Technology, Irrigation

1. INTRODUCTION

Water content in the soil is ignored. Irrigation infrastructure is rapidly evolving. The most cutting-edge methods of watering crops in India include drip and sprinkler irrigation. Drip irrigation is one method, while sprinkler irrigation comes in a variety of forms. Drip irrigation systems are subsidised by the government. Nonetheless, many farmers still do not use such methods. In India, wells, rivers, canals, and boar-wells are only some of the sources of water used in the country's 30% surface irrigation system, which irrigates just 40% of the country's irrigated area. Drip irrigation is the basis for 8% of all irrigation systems, however wells and boar-wells are also used to provide water for drip irrigation. Sprinkler irrigation systems are only used to water 2% of the land, with the other 98% using other water sources such as wells and boar-wells. Farmers are concerned about the high price of these devices and their potential misuse. Thus, a more efficient and cost-effective method of irrigation is required. The yield profit is smaller than the waste on fertilisers and harvesting because farmers do not have sufficient understanding of agricultural parameters, use chemical fertilisers, and bear the cost of fertilisers. Due to the rising cost of inputs and stagnant prices for crops, several young farmers have taken their own lives in recent years. Farmers' crop insurance premiums are not being paid. More and more farmers are opting out of the industry and instead going into service. Although farmers may expect to make about Rs 5,000 per acre while cultivating crops, a 5-acre farm won't bring in enough money to pay for itself via crop growth and harvests alone if they do so at the current rate. Large subsidies on fertilisers mean that certain crops may earn as much as Rs 1,000 per acre. Climate, input shortages, markets, and disease are all seen by farmers as major risks in the agricultural industry.

The information technology (IT) industry is very appealing to today's youth. Young people nowadays are less likely to get their clothes filthy than previous generations. They believe higher status and pay may be attained via obtaining an engineering degree or other kind of advanced education. The position of farm manager does not pay well enough, and there is little respect for the person in such a position. With future generations in mind, farming must become mechanised and international. The farming community deserves better treatment. The current agricultural system needs to be updated. They need a system that helps farmers deal with and solve the many challenges they encounter. Innovations in electronic technology have far-reaching consequences. The gift to all sectors is the advancement of electronics in communication and wireless communication. Wireless sensor networks have advanced to the point that they may be used to keep tabs on and adjust various agricultural factors in remote locations. There have been enormous technological improvements in agriculture in the previous several decades. 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. To solve this problem, greenhouse technology may be the greatest option; nevertheless, it comes at a high price. It has been noticed that farmers lose a significant amount of money due to poor weather forecasting and improper irrigation. According to the author's thesis, advances in wireless sensor technologies and smaller sensor devices have made it feasible to employ them for autonomous monitoring of the environment and control of agricultural parameters. The goal of the proposed study is to use WSNs for the purpose of tracking and adjusting agricultural variables.

2. LITERATURE REVIEW

Hamami, Loubna&Bouchaib, Nassereddine (2020) As a number of concerns have come to light in recent years—including a worldwide water crisis, drought, and a dearth of freshwater resources—researchers are looking for answers by analysing agriculture's high water usage. Wireless sensor networks (WSN) are a promising and useful technology that has advanced rapidly in recent years and may be put to use in a variety of contexts; one such context is agriculture, where WSN have been extensively adopted and effectively deployed. This study aims to provide a comprehensive overview of wireless sensor networks and their role in the irrigation industry. Controlling and managing irrigation systems using WSN technology is a great way to guarantee the effective and sensible use of water and so help to lessening the severity of the worldwide water problem.

Ramson, Jino (2017) Independent sensors placed in different locations form Wireless Sensor Networks (WSNs), which are used to monitor physical items or the environment and relay that information back to a central location. WSNs are used for a wide variety of purposes, including animal tracking, precision agriculture, environmental monitoring, security and surveillance, smart buildings, healthcare, and more. The goal of this study is to help the research community better understand WSN and its many potential applications so that it may be used in even more cutting-edge contexts.

Hussain, Rashid (2012) When it comes to farming, India is second only to China. Several families may keep their jobs thanks to it. Given the size of the sector, it is crucial that productivity gains be made across the board. India is now experiencing a number of issues, one of the most pressing of which is a lack of irrigation water. Because of a lack of irrigation infrastructure, farmers rely significantly on rainy seasons. Because to extreme fluctuations in both rainfall totals and patterns, their agricultural yields are exceedingly unpredictable. In addition, these farmers rely largely on the forecasted values of a wide range of variables, including the weather, the water supply, the quality of the soil, and so on. Here, we detail how sensor networks may be used to better manage water resources and regulate other variables. Poor farmers in rural India's semi-arid regions are the intended audience. The Internet and other forms of electronic communication are put to extensive use (ITC). Their ability to collect and use rainwater, to raise crop yields while decreasing cultivation costs and making use of real-time values, rather than relying only on forecasts, may be greatly improved by the use of sensor networks and other agricultural approaches.

Sahota, Herman & Kumar(2011) For information and control technologies to be effectively used in precision agriculture, wireless sensor networks must be used. Here, we share our approach to designing a network stack for this kind of application, in which sensor nodes gather data at regular intervals from predetermined points in a field. Our plan for the physical layer includes a variety of power modes for both receiving and sending data in an effort to cut down on power consumption. To further enhance the energy efficiency of the wake-up synchronisation phase, we also build our MAC layer to make advantage of these numerous power modes. Also, our MAC protocol schedules data transmissions to ensure that all sending nodes are in perfect phase with each other and the receiving node at all times. Next, we schedule the nodes for transmission in line with the routing tree's structure, which both reduces the amount of wake-up synchronisation overheads and brings energy consumption throughout the field into a more even distribution. We create analytical models and run simulations to determine how much power our MAC protocol uses in comparison to the widely-used S-MAC protocol when both are deployed in the same network architecture and with the same routing strategy. In a periodic data collecting application, we demonstrate that our MAC protocol is more efficient in terms of both energy consumption and latency. In addition, we utilise simulations to demonstrate the gains achieved by using our routing technique as opposed to the scenario in which the next hop is arbitrarily selected from the collection of neighbours that are closer to the sink node.

Chen, Yu &Peng, Xiaodong& Zhang, Tiemin (2011) The field of wireless sensor networks (WSN) has advanced greatly in recent years. WSN's widespread adoption may be attributed to its inexpensive cost, low power requirements, and self-organization. This study provides a review of current uses of WSN in agriculture and examines the technical benefits of their use. Hydrology and water resource monitoring, greenhouse microclimate monitoring, monitoring the health and behaviour of poultry, and environmental monitoring are all promising areas for WSN deployment. The study concludes by addressing the basic problems of WSN in agricultural production and management and proposing some novel approaches to implementing WSN in this sector.

3. METHODOLOGY

Provide a set of rules for the system's design, development, and deployment, and showcase a toolkit that includes a novel interface for wireless sensors. Focus on developing a wireless sensor network-based agricultural decision-support tool via teamwork. Several of the agricultural characteristics, including soil, water, crops, irrigation, chemical, and fertiliser difficulties, are discussed, along with a formal presentation of the possibility afforded by WSNs.

3.1 CROPS CHOSEN FOR READINGS:

SPICE CROP:

- Cilantro (Kothimbir, Dhania)

LEAFY VEGETABLES:

- Fenugreek(Methi)
- Spinach (Palak)

VEGETABLE CROPS:

- Tomato
- Lady finger(Bhendi)

COMERTIAL CROP:

- Marigold(Zhedu)

4. RESULTS

4.1 Cilantro (Kothimbir):

Table 4.1 Cilantro Readings:

Sr. No.	Day	Height(NormalMethod-usingchemicalfertilizers) cm	Height (NormalMethod - withoutusingchemical fertilizers)cm	Height(WSNmethod-withoutusingchemical fertilizers) cm
1	1st	0	0	0
2	3rd	0	0	0
3	5th	0.3	0	0.5
4	7th	2.2	0.2	2.8
5	9th	6	1	5.7
6	11th	10	4	11.6
7	13th	14	6	15.3
8	15th	19.3	10	21.4
9	17th	22	12	22.5
10	19th	24	13	24.5
11	21th	26	15	27

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4.2 Fenugreek or Methi:

Table 4.2 Fenugreek Readings:

Sr. No.	Day	Height(NormalMethod-usingchemicalfertilizers) cm	Height (NormalMethod - withoutusingchemical fertilizers)cm	Height(WSNmethod-withoutusingchemical fertilizers) cm
1	1st	0	0	0
2	3rd	0.2	0.2	0.54
3	5th	0.9	0.8	1.3
4	7th	2.5	0.9	3
5	9th	3	1.6	4.7
6	11th	5	2.2	7.1
7	13th	7.8	3.5	10.3
8	15th	9.6	5.2	13.5
9	17th	12.3	7.4	15.3
10	19th	14.7	8.2	17.4
11	21th	16.4	8.7	19.1

4.3 Spinach (Palak):

Table 4.3Palak Readings:

Sr. No.	Day	Height(NormalMethod-usingchemicalfertilizers) cm	Height (NormalMethod - withoutusingchemical fertilizers)cm	Height(WSNmethod-withoutusingchemical fertilizers) cm
1	1st	0	0	0
2	3rd	0.7	0.5	0.9
3	5th	2.7	1.5	2.3
4	7th	4.7	3.5	4.3
5	9th	6.8	4.7	6.3
6	11th	9.6	6.2	9.1
7	13th	11.2	7.6	13.4
8	15th	12.9	8.2	15.4
9	17th	15.1	9.0	17.8

4.4 Tomato:

Table 4.4 Tomato Readings:

Points	Normal Method-usingchemical fertilizers	NormalMethod-withoutusing chemicalfertilizers	WSN method-withoutusing chemicalfertilizers
PlantAverage Height	3meter	2meter	2.5meter
FirstPickingFruits			
FruitShapein Diameter	3.5cm	1.8cm	3cm

Fruitlength	6.5cm	4cm	6.3cm
Averagenooffruit oneachplant	6	3	5
SecondPickingFruits			
FruitShape	4cm	2cm	3.5cm
Fruitlength	5cm	4.5cm	6.5cm
Averagenooffruit oneachplant	20	15	25
ThirdPickingFruits			
FruitShape	4.5cm	2.2cm	3.5cm
Fruitlength	6.5cm	5cm	6.5cm
Averagenooffruit oneachplant	35	18	30
FourthPickingFruits			
FruitShape	3.5cm	1.8cm	3cm
Fruitlength	7cm	5cm	6.5cm
Averagenooffruit oneachplant	35	18	30

4.5 Lady Finger (Bhendi):

Table 4.5 Lady Finger Readings:

Points	Normal Method-usingchemical fertilizers	NormalMethod-withoutusing chemicalfertilizers	WSN method-withoutusingchemical fertilizers
Plant Average Height	4feet	4feet	4feet
Fruitlength	9cm	7cm	11cm

AverageNo ofFruitsin everyPlant	3	2	4
SevenTimespluckedaftereverythreedays			

4.6 Merigold (Zhendu):

Table 4.6 Marigold Readings:

Points	NormalMethod-usingchemical fertilizers	NormalMethod-withoutusing chemicalfertilizers	WSN method-withoutusingchemical fertilizers
Plant Average Height	30cm	20cm	24cm
Average Flower diameter	3cm	2cm	4.5cm
Average noofflowerso n eachplant	18	12	25
FiveTimespluckedaftereverythreedays			

5. CONCLUSION

The Temperature, Humidity, Wind Speed, Duration of Direct Sunlight, and Rain Data were all measured using the Wireless Sensor Multimeter. After receiving a signal from a soil moisture sensor, a motor activates or deactivates the valve. The three kinds of comparisons were made across six distinct crops, all of which had shallow root systems and short harvest seasons. The WSN approach without chemical fertiliser performed well in the experiments, and since I didn't use any, the total cost of my crops was lower than if I had. Use of chemical fertilisers and WSN without fertilisers both result in almost equivalent Cilantro growth. Normal Cilantro cultivation, without the use of chemical fertilisers, lagged behind both of the other approaches. Coriander is a common spice and decorative accent in any kind of home, hotel, restaurant, food court, hostel, and mess. They are put to immediate use, In spite of the fact that it has been washed, the chemical fertilisers that have been employed on this crop have had a direct impact on human health. Coriander in food contains chemical fertilisers that humans ingest. Aaurveda also places value on the Kothimbhir. The seeds are a good source of several minerals, including those already mentioned plus iron, copper, calcium, potassium, manganese, zinc, and magnesium. The seeds of the coriander plant are a good source of vitamin anti-oxidants. This harvest may occur at any time of the year. While the seeds only matured in 85–100 days, the leaves may be eaten in meals as early as two weeks after planting. The market has a daily need for this produce. This needs soil with a pH of about 6.8 to 7. When roots don't penetrate deeper than a metre into the ground, less water is needed to sustain plant growth.

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