Efficiency Evalution and Comparison of Soil Moisture Sensor and Time-Based Sensor for Radish

Mohammed Thousiff S[1], Subash Chandru L [2], Vijayakumar E[3] , Pavithra K[4] , Pradeepan S[5], D.A. Anila Dani[6] , D. Bhuvaneswari[7], Nivetha John[8], Senthil Naathan[9]

[1] Assistant Professor,Department of Agricultural Engineering,Sri Shakthi Institute of Engineering and Technology

[2] [3] [4] [5] Final Year, Department of Agricultural Engineering,Sri Shakthi Institute of Engineering and Technology

[6] [7] [8] [9] Assistant Professor,Department of Civil Engineering,RVS Technical Campus

Abstract

Water is one of the most valuable things for all living organisms, also crops require water for growth and development. The supplying of water tothe plant is called irrigation method. During theirrigation of crops approximately 28% of water will be wasted in India due to some poor irrigation methods, leakages in the pipeline. Due to lack of poor irrigation, it affects the growth of the crop. The major problem is selection of irrigation methods, many of them are not choosing the right irrigation method for the selected crop. To maximise the usage of water, a system for developing water dialogue is needed. Additionally, to optimise water use, eliminate water waste, and agricultural systems must be automated. So, in this project we compare the soil moisture sensor and timing sensor in the drip irrigation system for the crop radish. The main aim of the project is to reduce the wastage of water and increasing the efficiency of plant growth. By comparing these twotypes of sensors we get the result which one is the best one and which gives more yield in the less amount of water, this will be helpful for the farmers to choose the different irrigation methodfor their fields.

Keywords: Water Wastage, Drip irrigation,Automation, Soil Moisture Sensor, Timing Senso

INTRODUCTION

Radish is one of the most important crops which contains more minerals and antioxidants and is very good for the health. seeds in the early April, early may. The total duration of the plant for harvesting is 2 months. In this project we irrigate the radish crop with the help of both soil moisture and timing sensor. Then we compare the efficiency of both sensors which will give more yield with consuming less amount of water. A timing sensor is one of the useful and helpful sensors for the farmers to irrigate the plants properly without the manual help of the farmers once we set the proper time in the timing sensor it automatically irrigates the plants in the fixed time. Then the soil moisture sensor soil moisture is one of the effective methods of the irrigation because it automatically irrigates the plants by measuring the water content in the soil with the help of sensor and programed board.it irrigate the plants correctly in this project we compare both sensor and the yield given by the sensor with using less amount of water.

I. MATERIALS AND METHODS

A. Experimental Site

The study area was located at Coimbatore in Tamil Nadu. The area has a moderate climatic condition, the total measurement of the plot is 25×26 meter.

Figure 1. Average monthly maximum and minimum temperature at Coimbatore.

And the adopted soil conditions are

Variety	White Radish, Red Radish
Season	Kharif/Rabi/Summer

black soil, it is also called regular soil, it is used for several crops. In figure-1 we show the temperature measurement of the study location.

High temperature	32.73ºC (90.91ºF)
Low temperature	22.25ºC (72.05ºF)

Then Bund formation it is one of the importantmethods to get high yield and reducing pest attack. The height of the bund is 0.8 feet and width of the bund is 2.5 feet, the total number of bunds for each crop is 18.

B. Land Preparation

Before the process of sowing seed land preparation is very important, the study land is cleaned with the tractor with the help of rotavator and the tillage implement for softening the soil and breaking the hard rock, then the Land is tilted using tractor with the help of 9 Tyne Cultivator for mixing the soil and removing the hard rock particles in the agriculture field.

C. Seed Selection and Sowing

In the Agriculture selection of seed is one of the most important and basic process, seeds play a vital role in the farming, so in this project we selectedthe effective and organic seed for the radish crop. We sowed the seed in the depth of 3cm,the space between each crop is 60 cm because of reduction ofpest attacks.

D. Experimental Setup

Comparing efficiency of automated drip irrigation using soil moisture and timing sensor is the main goal of the project "Layout design and automation of drip irrigation." The raw materials are what make up a product in the first place. Selected and filtered materials are those that are needed. Theconceptual design uses a time-based sensor and a soil moisture sensor to describe the automated drip watering procedure. The field is divided into two tracks for radish and fields have soil moisture and time-based sensors. The pump is connected to the mail line, and the two sublines are connected to the main line.

Figure 2. Variety and season for the selected seed

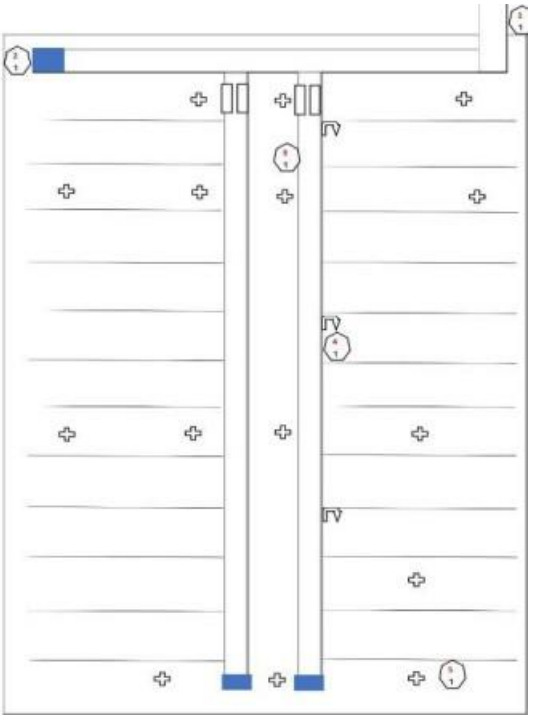
E. Components Involved

The automated drip irrigation system is made up of the following parts to fully meet all irrigation process needs.

a. Pump
b. Drip lines with emitters
c. Solenoid valves
d. PVC pipelines

e. Soil Moisture sensor
f. Time based sensor
g. Valve controller
h. Pressure sensor
I. Flow transmitter

F. Layout of the field



Structures in layout
1)Main line
2)PVC Dummy cap
3)Sub Main Line
4)Soil Moisture sensor
5)Lateral

The conceptual design outlines the automated drip irrigation process with the aid of soil moisture sensor and time-based sensor. The automated irrigation system was developed utilising the ARDUINO board Soil Moisture sensors and Time-based sensor. The field is divided into two tracks for radish, and both fields have soil moisture and time-based sensors. The pump is connected to the mail line, and the two sublines are connected to the main line. From each subline the laterals are connected

G. Time Based sensor

A time-based sensor functions similarly to a physical sensor in that it generates data, but the data is time-based. You must specify a time-based sensor before you can create one for your machine.

H. Soil Moisture Sensor

The volumetric water content of the soil is measured by soil moisture sensors. Soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons as a proxy for the moisture content, because the direct gravimetric measurement of free-soil moisture requires removing, drying, and weighing of a sample.

III. RESULT AND DISCUSSIONS

A. Irrigation Performance

In this study we compared efficiency of both soil moisture and timing sensor for the radish which one give more yield in the less amount of water. We show the weekly growth of the radish in both the sensors in the below

figure 3.

No of Weeks	Crop Growthin Timing Sensor	Crop Growthin Soil Moisture Sensor
Week 1	0.6cm	0.5cm
Week 2	1.1cm	0.9cm
Week 3	2.3cm	2.0cm
Week 4	4.1cm	3.5cm
Week 5	6.4cm	4.6cm
Week 6	8.7cm	6.0cm
Week 7	10.4cm	7.6cm
Week 8	12.1cm	9.8cm

Comparing both sensors, timing sensor much effective in the field because it gives much yield compares to soil moisture, and also Timing sensor consume less water for growth. Daily water required for radish is 200ml per plant, timing sensor irrigate the plant in the daily scheduled time. soil moisture sensor daily irrigates 400ml per plant by sensing the moisture content in the soil. Comparing this timing sensor consumes less water and it also gives better yield than the soil moisture sensor.

B. Cost of the system

Cost is very important in the irrigation system because the main concept of this project is to give proper and cost-effective solution for the farmers.in the agriculture field cost of the process is very important. The whole setup of soil moisture sensor consumes 17000 RS, the timing sensor setup costs up to 12000 Rs. Comparing this timing sensor is much cheaper than the soil moisture sensor and it gives better yield in the field.

C. Water Consumed by the Bothsensors.

Water is one of the basic needs for agriculture. And water plays a vital role in plant growth, in India water scarcity is one of the major problems in the Crop Production. The basic water need of radish is 200ml per day in this project timing sensor consumes 3litre for 15 crops, the soil moisture sensor consumes 6 liters for 15 crops, At the result the timing sensor consumes less water than the soil moisture sensor, but it gives good yield. The water consumed by the sensors ate shown in the figure 4

Water requiresfor radish	Water irrigated by Timing sensor per day	Water irrigated by soil moisturesensor per day
200ml	200ml	400ml
Overall water consumer for 15 crops	3 liters for 15crops per day	6 liters for 15crops per day

Figure-4: Water Consumed by the Both sensors.

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IV. CONCLUSION

In this study we connected the water soil moisture and timing sensor into drip for testing the efficiency of both sensors. The main aim of this project is to give proper solution for farmers. In this study we calculate the sensors efficiency by water irrigated by the sensor, cost of overall structure and the yield of the crop. By comparing these factors timing sensor is much better than the soil moisture sensor because soil moisture sensor consumes more water but the yield is low, also the cost of materials and sensors are high. The study result showed Timing sensor give good yield and consumes less water.

REFERENCES

1. V. Dhawan, Water and agriculture in India. Federal Ministry of Food and Agriculture, (2017) 1-28.
2. FAO Water for Sustainable Food and Agriculture: A report produced for the G20 Presidency of Germany
3. D.L. Bjorn Berg Irrigation Methods, Reference Module in Earth Systems and Environmental Sciences
4. GoI Pocket book of Agricultural Statistics, Government of India, Ministry of Agriculture & Farmers Welfare, Department of Agriculture, Cooperation &Farmers Welfare
5. R.J. Smith, S.R. Raine, J. Minkovich Irrigation application efficiency and deepdrainage potential under surface irrigatedcotton
6. V. Dhawan. Water and agriculture in India, background paper for the South Asia expert panel during the global forum for food and agriculture (GFFA) (2017)
7. R.K. Sivanappan Status, scope and future prospects of micro-irrigation in India

8. S.R. Raine The future of irrigation technologies and practices is here now, keynote address.
9. Gaikwad Apurva A, Kamble Sonali U-2015- Intelligent drip irrigation system- International Journal of Innovative Research in Advanced Engineering- (02,02)
10. Narayana Moorthy A-1997-Economic viability of drip irrigation-Indian Journal of Agricultural Economics-(52.04).
11. Rose grant W. M, Sarah A. Cline-2002- Scope of drip irrigation for vegetable production in India-International Journal of Innovative Research in Advanced Engineering-(26,01).
12. Vishal Patil, Arvind Kadam-2016-Preservation of water sources and minimize the wastage of water-International Research Journal of Engineering and Technology-(03, 11).
13. Vaidiyanathan-1994-Use of drip increasing yield and employment opportunities- Indian Journal of Agricultural economics-(22,06).
14. Mohammad Valipour-2012-Drip irrigation system design using tapered pipes for pressure loss adjusting-Journal of Agriculture Science-(12, 125).
15. Ali Zahraei, Sacid Eslamian-2015-An integrated irrigation system applying uniform deficit irrigation-International Journal of Hydrology Science
16. Prathyusha K. Chaitanya suman M-2012- Design of embedded systes for the automation of drip irrigation-International Journal of Application or Innovationin Engineering and Management- (01.02).
17. Marshall CJ, Dyson J. Huber JA, MJ O'dogherty, Astudy of the physical and mechanical properties of wheat straw, Journal of agricultural engineering research (1995) 133-142 10. Peter Krizan, Soos L, Dorrde Vukelic. A study of impact technological parameters on the briquetting process. Facta universitatis (2009)
18. Porkaveerat Watchara. The performance of biomass chopper and solid fuel compactors from agricultural waste, (2019) 3-76
19. Suresh S. Lokare (2020). Design and Development of Chopper and Compression Machine for Developing Green Briquettes as Domestic Fuel Alternate International Research Journal of Engineering and Technology (IRIET) Volume: 07
20. Tavakoli H. Seyed Sacid Mistassibi, jaferi A, Physical and mechanical properties of wheat straw as influenced by moisture content, international agrophysics (2009) 175-181
21. Teodora Deac. Lucian Fechete-Tutunaru, Ferenc Gaspar, environmental impact of sawdust bi riquettes use experimental approach, Energy procedia (2016) 178-183.