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E-Agricultural for Better Yield

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Abstract: ***The advent of newer technologies had led scientists and researchers to monitor and control agricultural activities remotely by the incorporation of information and communication technology (ICT). Modern information technologies have the impact to potentially increase the agricultural productivity by transferring knowledge and information to agricultural practitioners from the rural communities. Since the present generation have knowledge and easy access to smart mobile phones so the setup of control system installed in field can be monitored and controlled by new generation giving new dimensions to agriculture also known as smart agriculture. The agriculture is playing a major role in the economy of nation developing; therefore the need for upliftment in Agriculture is very important. Smart agriculture or e-Agriculture is a one of such concepts that is playing an important role in the enhancement of processes involved in Agriculture. The major role of ICT in Agriculture is its potentiality to aid a wide access to information that will support knowledge sharing and decision making. The usage of Information and Communication Technology (ICT) in Agriculture is growing day by day and more youth are attracted towards e-agriculture for their better earnings.***

Keywords: e-Agriculture, Information and Communications Technology, Agricultural Production, Smart Farming.

I. INTRODUCTION

The application and use of Information and Communication Technologies in day-to-day life has become common and its importance for innovation and Economic growth has been recognized widely [1]. In recent years a rapid emergence of internet and mobile based technologies has boosted the knowledge base and more advancement in research and development [2]. As the result an easy and fast mode has emerged to reach the urban as well as rural communities. The traditional methods used in Agriculture practices by farmers for a long period have been replaced with mechanized practices by the emergence of new technologies and its widespread use and will probably create a positive effect on the growth and development of Agriculture. There are many ways to incorporate the emerging trends in ICT with Agriculture that will aid on the enhancement of rural development [3-4]. E-Agriculture has an emerging field in the intersection of agricultural informatics, agricultural development and entrepreneurship, agricultural services, technology dissemination, and information discrimination through the Internet and related technologies [5]. The e-Agriculture concept, however, moves even beyond technology to the combination of knowledge and culture which is primarily focusing on the improvement of communication and the process of learning [6]. Since in rural communities, people are still following the traditional ways in their production processes so the best strategies to overcome this challenge may be educating and introducing the deployment of Information and Communication Technology for the development of agricultural productivity. A Geographical Information System (GIS) makes visual comparisons between different types of data possible. It helps to establish relationships between different data sets and is important in the production of maps, and charts and additional information associated with coordinates and time. It helps in the analysis of post-harvest variation in crop yield measures, and provides a holistic view of the production system. GIS is a computerized data storage and retrieval system, which can be used to manage and analyse spatial data relating crop productivity and agronomic factors. It can integrate all types of information and interface with other decision support tools. GIS can display analysed information in maps that allow (a) better understanding of interactions among yield, fertility, pests, weeds and other factors and (b) decision-making based on such spatial relationships [2]. Handheld Personal Computers are small, light, and robust and have been used for providing access to information, mobile mapping and other data gathering activities [7]. Mobile (Cellular) Phone Applications The cellular phone has provided market links for farmers and entrepreneurs. Growth in mobile phones has been explosive and now reaches more than a third of the population. This has reduced transaction costs, broadened trade networks and facilitated searches for employment [8]. Radio is an important mechanism for disseminating knowledge and information in different languages and formats [9], especially to poor people [10]. Internet and Web-Based Applications, the Internet, e-mail, web sites and web-based applications are becoming increasingly popular in sharing and in disseminating agricultural information and there are many ongoing web-based application initiatives in worldwide.

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The Food and Agricultural Organisation (FAO) and partners are implementing e-Agriculture – aimed at the intersection of agricultural informatics, agricultural development and entrepreneurship, focusing on agricultural services, technology dissemination and information delivered through the internet. E-Agriculture is intended to promote the integration of agricultural stakeholders and technology with multimedia, knowledge and culture, and aims to improve communication and learning processes [11].

II. AUTOMATION AND CONTROL FOR HIGH YIELD

The end product of agricultural produce depends upon many parameters of which soil moisture, temperature, and humidity are vital parameters in protected cultivation whereas the open field mostly require adequate soil moisture content for better yield. The hardware circuit for automation control is shown in Figure1. Transistor T_1 is NPN and is used for ideal switch triggering and is a low current operating transistor whereas T_2 is NPN power transistor used for main triggering of relay and can withstand high current flow. The relay operates motor which eventually operates flow of water as per requirement. The sensor installed in field signals the circuit for switching ON or OFF of the motor for watering or not watering the filed as per desired set moisture content corresponding to the crop. For protected cultivation (polyhouse or green house) the temperature increases during day time so during hot summer days the temperature is to be reduced to adequate level. A digital temperature controller is installed to control electric mains supply connected to exhaust fans. As the set temperature is reached the sensor installed in polyhouse signals the controller to operate exhaust fans which pushes fresh air across the polyhouse till inside temperature is reached to the already set temperature, the minimum temperature can be up to ambient temperature. The size of fans should be enough to push ambient air across the hot house. Regarding the humidity control the foggers installed/ hanged on height by stretched wires are connected to an electric operated water pump which operates by a digital humidity controller set alongside of temperature controller, usually the two are combined in one gadget.

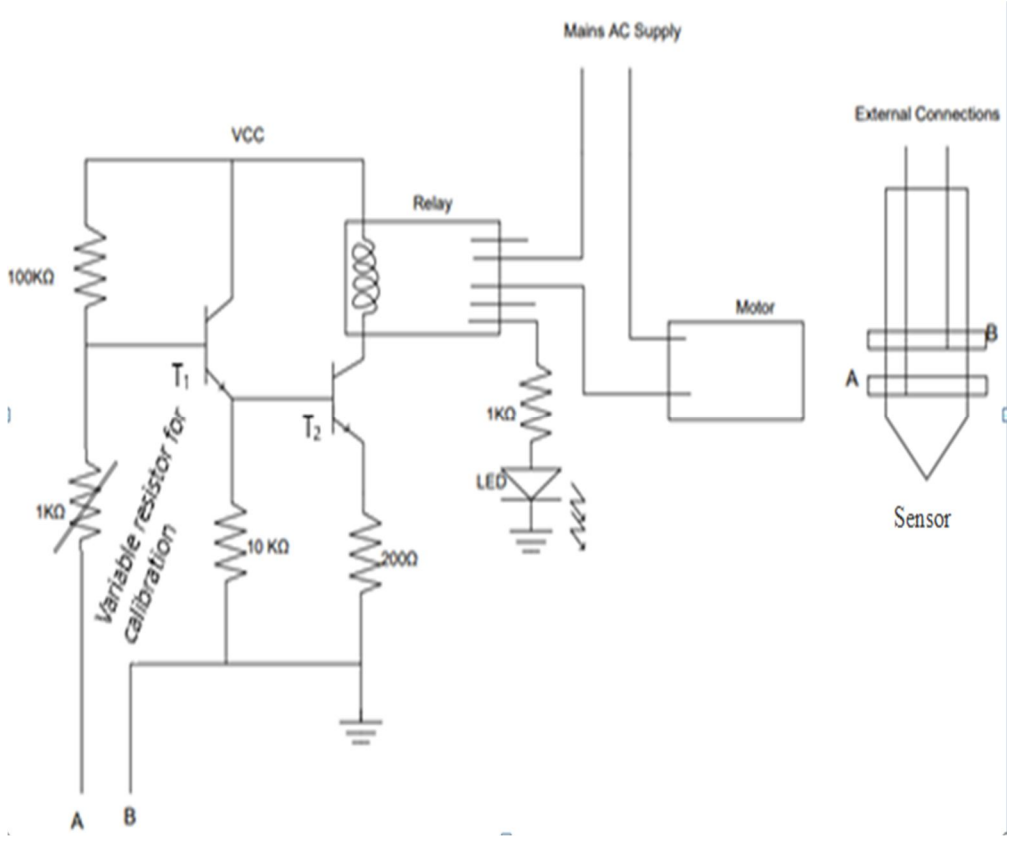


Figure1. Schematic of circuit diagram for automation of drip irrigation

Automation enhances water use efficiency in irrigation by 10% - 50% with increased yield by 20% - 100% and improved produce quality. Automation triggers the adoption of volumetric approach in water application and achieves increased food production and higher profits for farmers [12].

III. RESULTS AND DISCUSSION

The fabricated circuit was installed in polyhouse and the observations recorded are given in table1.

Amount of water given for irrigation (Litre)			
Day	Date	Automated drip irrigation system (Litres/day)	Manually regulated drip irrigation system (Litres/day)
1	01-06-2022	250	330
2	02-06-2022	250	330
3	03-06-2022	255	325
4	04-06-2022	250	330
5	05-06-2022	255	330
6	06-06-2022	255	330
7	07-06-2022	255	330
8	08-06-2022	250	330
9	09-06-2022	250	335
10	10-06-2022	250	335
11	11-06-2022	250	330
12	12-06-2022	250	330
13	13-06-2022	250	330
14	14-06-2022	250	330
15	15-06-2022	250	330
16	16-06-2022	255	330
17	17-06-2022	255	325
18	18-06-2022	255	325
19	19-06-2022	255	325
20	20-06-2022	255	330
21	21-06-2022	255	335
22	22-06-2022	250	335
23	23-06-2022	250	335
24	24-06-2022	250	330
25	25-06-2022	250	330
26	26-06-2022	250	330
27	27-06-2022	250	330
28	28-06-2022	250	330
29	29-06-2022	250	330
30	30-06-2022	255	330
31	01-07-2022	255	330
33	02-07-2022	255	330
33	03-07-2022	255	330
34	04-07-2022	255	330
35	05-07-2022	255	325
36	06-07-2022	250	330
37	07-07-2022	250	335
38	08-07-2022	250	330
39	09-07-2022	250	330
40	10-07-2022	250	330
41	11-07-2022	250	330
42	13-07-2022	250	330
43	14-07-2022	255	330
44	15-07-2022	255	330
45	16-07-2022	255	335
46	17-07-2022	255	335
47	18-07-2022	255	330
48	19-07-2022	255	330
Total		12110	15855

Table 1. Amount of water given for irrigation in automated and manually regulated irrigation system Table depicts actual data of water given in manual mode and automatic mode, it is revealed that in automatic mode of water application the number of time water applied to field is significantly low as compared to water given in manual mode, which paves a way for adoption of this cost-effective technology in the future.

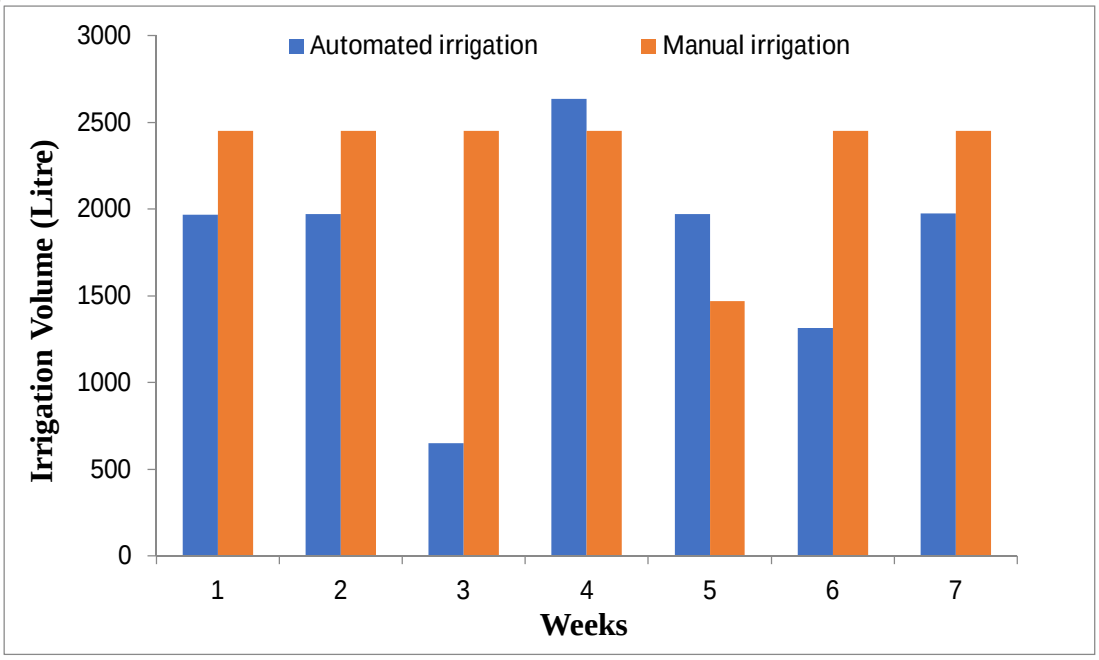


Figure2. Bar graph for relationship between automated and manual irrigation

It is evident from the Figure 2 that not only the amount of water given per irrigation reduces but also number of scheduling during the experiment was reduced to half of scheduling given in comparison to manual mode.

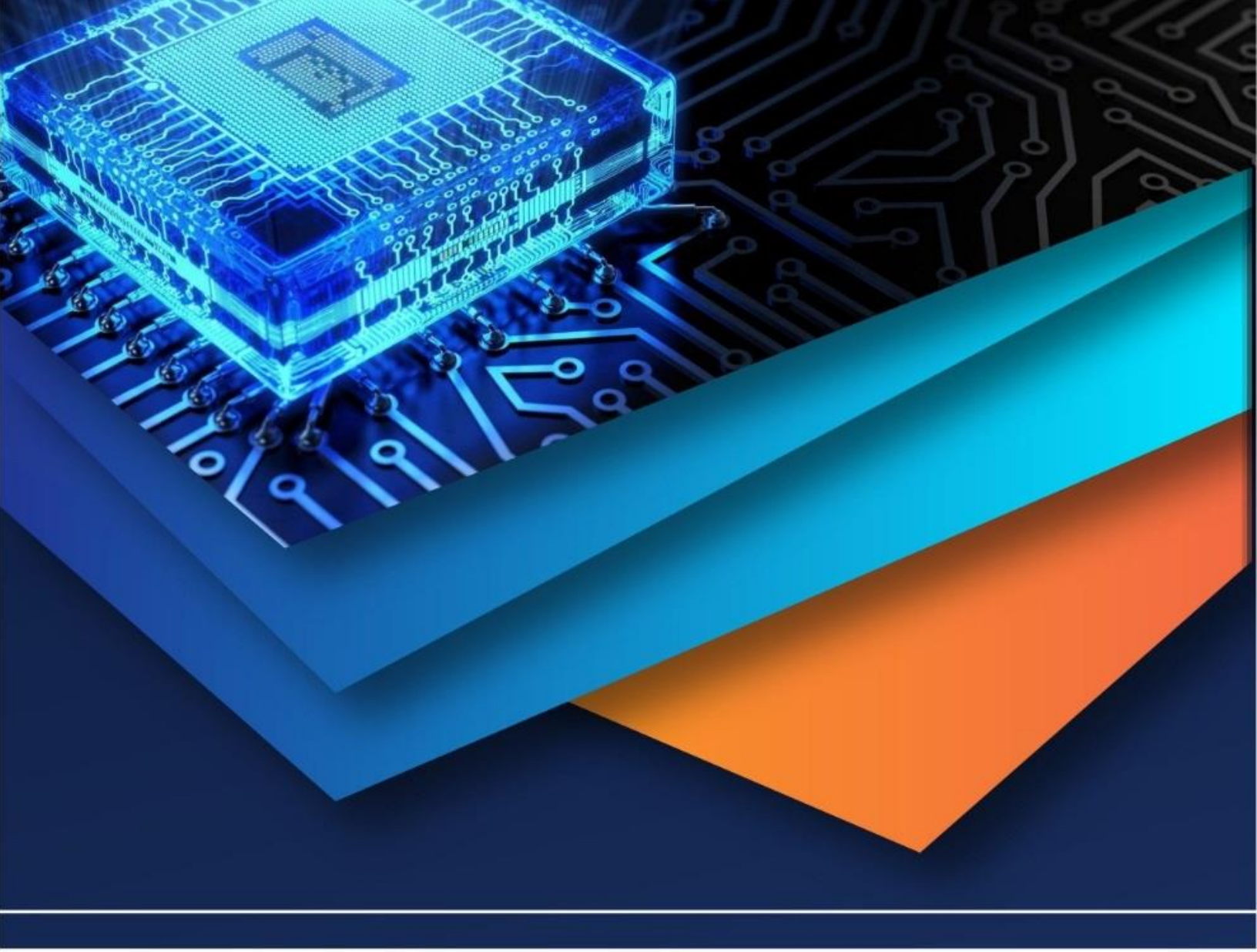
The cost of the final product is very low which paves the system a good acceptance even at the margin of farmer level. The total cost incurred for the design and development of the automatic drip irrigation circuit along with motor accessories is ₹1020, thus, the developed system is a low-cost system.

IV. CONCLUSION

With the implementation of proposed low cost ICT driven system the quantity of water per irrigation is proportionally reduced and the number of scheduling during entire cropping season is nearly reduced to half of the manual scheduling. The novelty of the developed product is that it is even affordable by the marginal farmer.

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