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A Review on Monitoring and Controlling System for the Operation of Greenhouse Environment

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Abstract— Agriculture is one of the important occupations of India on which whole economic conditions are dependent. So, the paper is just focusing on the new automation technology which will make it more efficient all the way. Detailed survey of agriculture industry is done with the conclusion that it is lagging with new innovative, efficient and cost effective techniques. The problem is going to overcome by the use of proposed automated system for the Monitoring and Controlling Operations of Greenhouse Environment and other agricultural sectors also. This will lead to decrease in the cost and increase in the production of agricultural goods.

Keywords— Agriculture, yield, microcontroller, sensors, relays.

I. INTRODUCTION

The current generation is surviving in the world of automation where everything can be controlled and operated automatically, but there are still a few important sectors in our country where automation has not been adopted or not been put to a full-fledged use, perhaps because of several reasons one such reason is cost. Agriculture is one of the fields where automation is yet to be implemented completely. It has been one of the primary occupations of society since earlier civilizations and even today it is a primary occupation. Furthermorein the 13th century, the concept of Green house has been introduced in the agricultural industry to full fill the market requirements.It was originally called as*giardini botanici* (botanical gardens). Green house forms an important part of an agriculture sector in our country as it can be used to grow the crops under controlled climate conditions for optimum and efficient production.

So, the paper is introducing the automation in the greenhouse environment. This is one such sophisticated and reliable system which is well designed to react with the climate changes occouring in the environment. It works on the concept of feedback control system, which helps it to respond to the external changes efficiently. Although this system overcomes the problems caused due to human errors, with less expense and fast operations.

II. LITERATURE SURVEY

A. Previous scenario of Indian agriculture

If the flash back of Indian agricultural history is seen, the agenda of production was totally different. The overall agricultural processes were totally manually dependent. No automation was introduced in the historic years of agriculture. All the crops and productions in the agricultural industry were dependent on manual efforts. So, because of the human errors and other default problems, the production was affected somewhere. After 13th century Greenhouse concept had come to existence. And the journey of progress in the field of agriculture started.

B. Current scenario with market expectations

Further, after the introduction of Greenhouse, the production of crops increased to some better level. Also, some new innovative techniques had been implemented to grow up the environment and production of crops. Gradually with the increase in global population, the expectations and requirements of the market have increased to greater level. So, in order to overcome this problem, different machineries have arrived in the industry with various advanced techniques. Even though, the sector was not totally automatedthat time and now also it is not automated totally. So, this paper trying to introduce automation in the agricultural sector, specially focusing towards automation in Greenhouses.

C. Why to use Automation

The pie chart in the Fig. 1 below is representing the use of different irrigation methods with approximate figures. Larger area of chart is covered by drip irrigation followed by sprinkler, water pump irrigation and canal irrigation methods. Remaining portion is covered with other small irrigation method used situation-wise.In all, the conclusion can be done that, if all the above methods of irrigation are made automated, the result of automation will be leading over the market expectations.

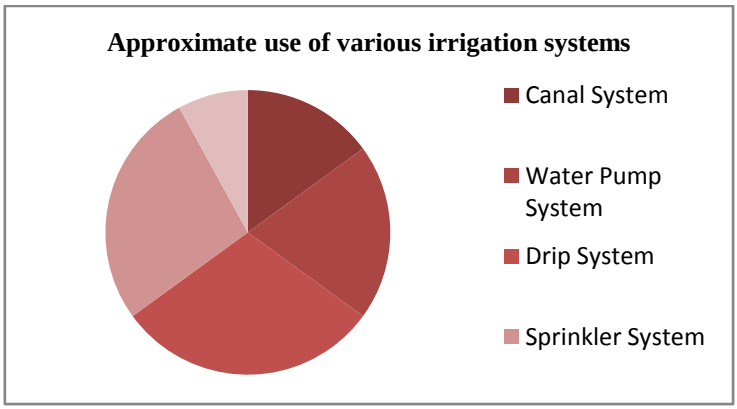

Fig. 1 Approximate use of various irrigation systems

Leaving to some small portion of chart, all the methods of irrigation can be automated. So, implementing the automation in above will reflect the positive effects on various aspects of irrigation.

D. Effect on the cost of production due to use of Automation technology

The following Fig. 2 is approximately showing the effect on the cost of production due to use of automation. Before some sort of years, cost of production was too low with manual operations and vice a versa. i.e. cost of production was too high for automation in the past years due to lack of technology, knowledge and skilled hands.

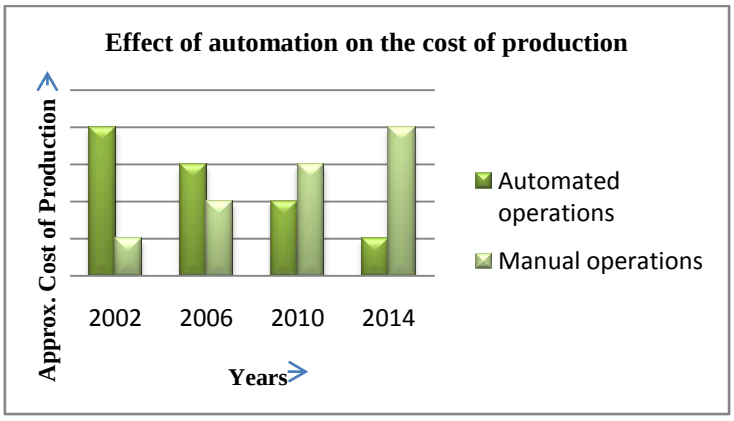

Fig. 2 Effect of automation on the cost of production

Now dealing with the current scenario, the condition is completely inverted. The market requirement is too more which can be achieved only by the use of automation technologies. The situation is also in favour of automation with availability of all the required things for it. And manual labour costs are also becoming too much day by day. So, with all the suitable conditions implementation of automation technology will be the better option for the era of agriculture.

E. Rise in the Yielding percentage

With the use of automation, gradually increasing changes in the yielding percentage of crops are observed. The graphical representations of the year wise gradual changes in the production are shown in the line diagram below in Fig. 3 with approximate changes in the figures. Increase in the production is inversely proportional to the cost of production. All these expectations are getting full filled only due to use of new automation technology in the agricultural industry as well as in the greenhouses.i.e. the cost effective production has made possible by the use of automation systems.

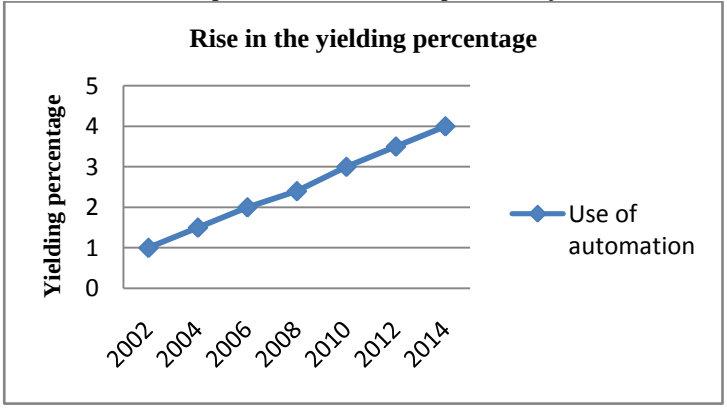

Fig. 3 Rise in the yielding percentage

F. Advantages

1) Market oriented results.
2) Greater saving in the natural resources.
3) Low cost setup with maximum automation.
4) Less expenditure and low labour cost.
5) System can be easily modified for adding the new features.
6) Single defective part will not affect the whole system.
7) Sensorsusedhavehighsensitivity.
8) Complete setup is easy to operate.
9) Income flow is increased.

G. Disadvantages

1) Requires uninterrupted power supply.
2) Proper installation of setup is required.

III. PROPOSED SYSTEM HARDWARE

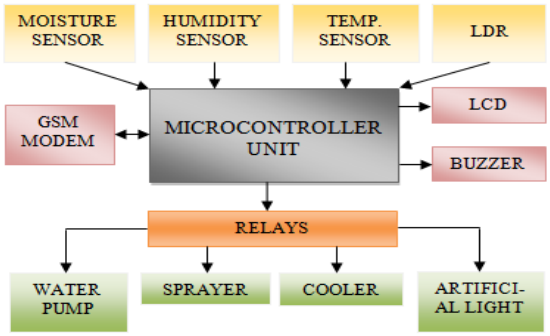

Fig. 4 Block diagram of proposed system hardware

IV. HARDWARE DESCRIPTION

The above block schematic in Fig. 4 is representing the highlighting blocks of the proposed Monitoring and Controlling System for the operation of Greenhouse Environment. This part of the system consists of various sensors, named as soil moisture sensor, humidity sensor, temperature and light detection sensors, etc. These sensors sense various parameters such as temperature, humidity, soil moisture and light intensity in the changing environment.

The analog parameters measured by the sensors are then converted to corresponding digital values by the inbuilt ADC of microcontroller. It constantly monitors the parameters of the various sensors.And if the inputs from the sensors exceeds the predefined values of itthen in order to maintain the proper enviornmental conditions in the green house, the actuators or relays are activated to drive the respective output devices such as cooler to maintain the temperature if it exceeds the predefined value of temperature, similarly sprayer, water pump, artificial light, etc. are driven depending on the input conditions of various sensors. An LCD is used to display different parameters of the sensors. Also the GSM module is connected with microcontroller which is used for the purpose of remote control operations and for the purpose of sending the different sensor parameters information to the owner. Such that, owner will become aware about the updated enviornmental condition in the greenhouse to proceed for further actions, if necessary.The complete system can be realised and utilised by replacing the conventional methods with this modern proposed system.

V. SOFTWARE DESCRIPTION

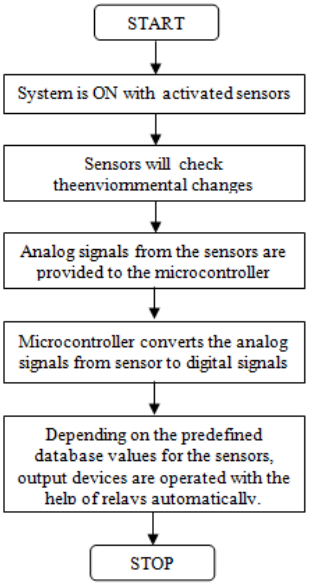

Fig. 5 Flow chart of the execution steps for the proposed system

The flow chart in the Fig. 5 above is representing the software flow of execution for the automated monitoring and controlling of greenhouse environment by our designed system. The system is designed in such a way to execute in the following steps that, it will first check for sensor inputs continuously and provide it to microcontroller as well. Microcontroller will convert the analog signals from the sensor to digital form and compare the signal values with the predefined values by the programmer or the user, for the respective sensors. If the signal values from the sensor are exceeding thepredefined database values, the controller will take respective actions on the present situation to control the environment in the green house. It will monitor and control the environment by activating the respective output devices such as water pump, cooler, sprayer, artificial light, etc. with the help of relays. The above complete process is performed automatically once the system is made ON.

VI. CONCLUSION

The brief evaluation of agricultural industry, especially Greenhouse concept is done. Observing to the previous and current scenario of green house, yet it is not totally automated. So, this paper suggested one of the new systems for greenhouse to make it automated and to enhance the current situation. Implementation of this system will lead to more yields in the production as well as low labour cost comparing with the present condition.

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