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Review Paper on Smart Irrigation and Farming Techniques

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ABSTRACT

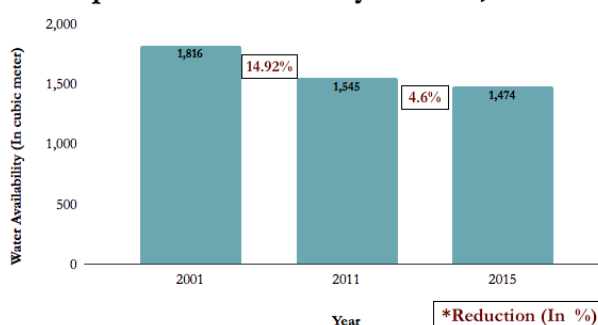
India is an agricultural country. The economy of India is dependent on the same. Agriculture in India is still carried out in conventional methods and lags behind in integrating modern technologies. To meet increasing population we need to increase our agricultural production and also we have to adopt automation techniques. Water scarcity in the agriculture sector is one of the savior crises in front of India. This paper gives an idea of existing irrigation techniques used in farming. The traditional water irrigation techniques such as channel system are causes over irrigation. The over-irrigation results in a decrease in quality of soil which affects the growth of the plant. The paper focuses on the modern irrigation techniques such as soil moisture sensor-based irrigation. Soil moisture controlled irrigation senses the moisture content in soil and according to that output in control pump or valve used for irrigation. This paper also focuses on measuring and maintaining soil temperature within permissible values. The paper gives a general picture of soil moisture controlled irrigation circuitry and its components. This paper consists of different methodologies used in farming techniques which help to overcome the water crisis in India.

Keywords: Agriculture, Smart Irrigation System, Farming Techniques.

1. INTRODUCTION

India is more focused on the agriculture. With the reference to census 2011, there are 118.9 million farmers across the country or 24.6% of the total manpower of over 481 million. Also, there are 144 million people working as agricultural laborers. The total workforce related to the agricultural sector is around 263 million or 22% of the population. Agriculture plays a very important role in India's economy. The population of the country is increasing day by day for which more production of food grains is required for feeding the huge population. For fulfilling those needs our agricultural sector is unable due to use of traditional farming methods, lack of automation, land degradation, lack of knowledge and unavailability of sufficient water.

Per Capita Water Availability In India, 2001-15



Source: Ministry of statistics and program implementation

In India near about 25% of the land area is affected by the problem of water erosion. The Traditional channel type irrigation causes wastage of water and land degradation. The per capita water availability in India dropped almost 15% over a decade to 2011, from 1,816 cubic meters to 1,545 cubic meters in 2011.

In India, 80% of the total rainfall in a year occurs in four months, i.e. from mid-June to mid-October. With the years coming by, the total rainfall is decreasing year by year as compared to Long Period Average (LPA). So it is very necessary to irrigate the farm field during the rest of the eight months. The availability of water for agricultural use has decreased day by day due to the increased demand of the industrial and domestic sectors particularly in developing countries. In India, the agriculture sector is the main consumer of water in which it is used mostly for irrigation purpose. Improving the water use efficiency without increasing cost of production will be quite beneficial for crop production system. Unfortunately, many farmers still use the traditional methods of farming which results in low yielding of crops and fruits. The sustained yield of the crop is achieved by the conservation of soil, water and adopting conservation farming. The agriculture sector in India is facing several challenges. It now depends on the heavy use of fertilizer, pesticides, irrigation and several agricultural inputs, which are constantly degrading and polluting the quality of soil, water, and our environment. Science and technology have been implemented in many areas including the industries daily practices, but the use of it has still not been done much in agricultural areas. Hence there is need to implement modern science and technology in the agriculture sector for increasing the yield.

2. LITERATURE REVIEW

A. "Design and development of Precision Agriculture System Using Wireless Sensor Network." S. R. Nandurkar, V. R. Thool, R. C. Thool

The irrigation system is one of the serious issues in the agriculture sector in developing countries. This paper proposes a low cost and efficient wireless sensor network technique which is used to monitor the soil moisture and temperature from various locations of the farm. According to the need of crop, the microcontroller takes the decision to make valve ON or OFF. The aim of this system is to develop a wireless sensor network based low-cost soil temperature and moisture monitoring system that can detect the soil temperature and moisture of the field in real time and by using drip irrigation system water is fed to the soil near the roots depending on the nature of crop grown in the soil. The two major components used in their system are

i. Temperature Sensor (LM-35DZ)

The soil temperature is continuously monitored by temperature sensors. The soil temperature is one of the important environmental factors for the proper vegetation of the crops. The change in soil temperature directly affects soil nutrients and moisture content. The physical processes of soil are dependent on soil temperature. Therefore, the real-time monitoring of soil temperature helps in the large production of crops and also helps in proper maintenance of soil nutrients.

ii. Moisture Sensor

To measure the moisture content in the soil a resistive sensor is designed. The moisture sensor consists of two probes which are deeply inserted into the soil. It works on the principal of electrical conductivity of the soil. If the moisture content in the soil increases, then the resistance of the soil decreases and vice versa. If the water content in soil increases then the conductivity of soil increases and the effective resistance of soil decreases. Proper irrigation of water will improve crop quality and save natural resources.

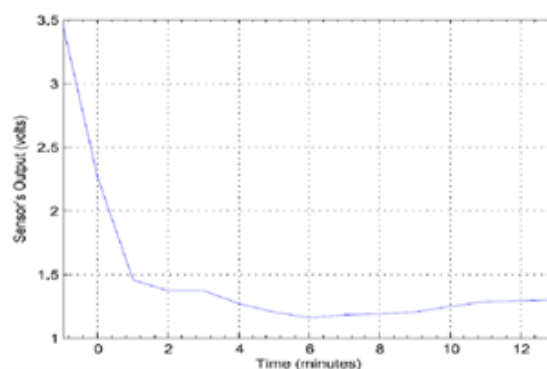


Fig. 1: Relation between Voltage and Time

The above figure shows the result analysis of the moisture sensor output in terms of voltage with respect to the time taken for the same. If the valve is ON, then the moisture content in the soil changes depending on the output of the sensor in voltage change in time.

With reference from above paper, the proper management of irrigation is to reduce water stress on roots of the crops, that of over-irrigation and under irrigation. The soil temperature is very important in the determination of crop planting time, tiller growth and wintering safety etc. The change of soil temperature directly affects the number of soil nutrients.

Automation in agriculture sector helps in saving of natural resources and also helps in proper utilization of it. In agriculture, irrigation plays an important role that influences crop production. Conventionally, farmers use normal irrigation process. But nowadays, farmers are ensuring that they use automation technique for their purposes. Farmers need to use simple and cheap methods for their farming techniques. Modern techniques help the farmers to know the current status of farm fields watering direction.

Methodology

There are different types of method for irrigating farm field for different types of crop field. Basically Indian farmer use three methods for irrigation. These are sprinkle irrigation, channel system and drip irrigation. Channel system is used for irrigation of large areas. This system requires a large number of laborers and high amount of water wastage. Sprinkler and drip irrigation are costlier than channel but they are water, time and laborers saving. But a smart irrigation system was a new technology to irrigate farm technology.

Out of the other methods used, smart irrigation systems were more useful. Drip and sprinkle systems are generally operated by a user, but a smart irrigation system tells that the total system is controlled by automation. The irrigation is done whether or not the farmer is present in the field. Soil moisture sensor includes a comparator. The soil between two probes acts as variable resistance whose value depends on moisture content in the soil. Soil moisture sensors are used to sense the moisture level in soil and then the irrigation is done accordingly. The output sensor value is compared with the fixed value in the comparator LM 393 and signal is transmitted for further processing in microcontroller or microprocessor.

The paper had a model showing the automation in the field of the irrigation system in the agriculture sector. The moisture content of the soil is a major factor determining plant growth. This system was used in a remote area and there are various benefits for the farmers. By using automatic irrigation system it optimizes the usage of water by reducing the water wastage and also a reduction in human efforts. The power consumption of the electronic devices is also less and the system life extends. The water was used as per the required by crops. [2]

3. CONCLUSION

With the reference of from the above two papers, we get the information using a temperature sensor, moisture sensor and smart irrigation system for proper management of available resources. So by having a proper idea of different technology we can develop a much simple and smarter system which will be affordable as well as easy to use for the farmers. The sensors can be used with proper values which will lead to the good vegetation of crops. We can develop our own system of growing plants with the help of LED lights and using automation techniques for proper management of natural resources.

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