THE IMPORTANCE OF A SMART IRRIGATION INTRODUCTION SYSTEM BASED ON DIGITAL TECHNOLOGIES IN AGRICULTURE

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ABSTRACT

The article discusses the introduction of water-saving technologies in irrigation, information on the composition of land and soil, the implementation of optimal agrotechnical measures and other scientific and innovative achievements and best practices. The implementation of irrigation systems based on digital technologies in the use of water resources and their efficiency is demonstrated.

Keywords: drip irrigation, IOT- Internet of Things, ARM microcontroller, Arduino Uno board, Zig-Bee, temperature sensor, humidity sensor, light sensor, rain sensor.

Irrigation systems remain an integral part of crop production in some regions of the world. The reaction of the irrigation system is irrigated in the traditional way, which in turn leads to a lot of water being wasted. Today, the closure of the drip irrigation system plays an important role in eliminating the wastage of water as a result of evaporation and leakage in irrigation. Drip irrigation is a drip of water that flows near the root part of a plant.

Irrigation of arable lands in the country is carried out at the expense of 80% of the country's water resources. Seventy percent of irrigation branches does not have an anti-filtration coating in the Republic, as a result a portion of the water being lost during delivering in the field.

The agricultural land in the country is 20,236.3 thousand hectares, of which irrigated land is 20.7%. At the same time, as a

result of population growth, the transfer of agricultural land to another category and climate change, the amount of irrigated land per capita in the last 10-15 years has decreased by 24% from 0.23 hectares to 0.16 hectares.

"The situation is exacerbated by the continued use of traditional irrigation methods due to the high dependence of agriculture on irrigation and the sharp increase in drought as a result of climate change. According to the forecast of the World Resource Institute, by 2040 Uzbekistan will become one of the 33 countries with the highest water shortages. The decline in productivity has had serious negative consequences for food security and the balance of payments, which has led to a decline in the use of resource-saving technology in the management of water resources and in the cultivation of agricultural crops "[1].

In recent years, special attention has been paid in our country to increase the efficiency of agricultural lands by using water-saving technologies. In 2021, water-saving technologies have been introduced on 433,000 hectares of arable land.

Resolution of the President of the Republic of Uzbekistan No. PP-144 of March 1, 2022 "On measures to further improve the introduction of water-saving technologies in agriculture" was approved. According to this resolution, by the end of 2022, it is planned the adopt drip irrigation at least 230,000 hectares, sprinkler irrigation on 28,000 hectares, discrete irrigation system on 2,000 hectares and laser equipment on 218,000 hectares.

This year, Samarkand region plans to introduce drip irrigation on 18,875 hectares out of 21,328 hectares, including 11,800 hectares of cotton, 3,900 hectares of orchards, 2,900 hectares of vineyards and 275 hectares of other areas. preparation for a discrete irrigation system by laser leveling is planned [2].

"On the implementation of the tasks set in the strategy of agricultural development of the Republic of Uzbekistan for 2020 - 2030 in 2021" February 26, 2021, number PQ-5009 "to improve the use of water resources in the online mode, to equip the hydrological post with automated equipment on the basis of advanced technologies, to close the water-saving technologies in irrigation, Regular provision of fertilizers and protection of the soil protection system, the use of pesticides and fertilizers in the field, and the use of chemicals on a scientific basis "[1]. Based on these tasks, it can be said that the introduction of smart irrigation systems based on digital technologies in agriculture plays an important role in the optimal use of water resources.

The smart irrigation system will facilitate the efficient use of fresh water resources in agricultural areas, while the automated

technology will help to increase its efficiency in the optimal use of water resources.

The modern drip irrigation system does not significantly reduce the water level compared to the traditional method. In the automated drip irrigation system, when the mobile pump is closed, it first takes the image of the plot, calculates its moisture content and transmits the data to the microcontroller. Microcontroller does not start the irrigation system based on the data and sends the field status to fermer's mobile phone.

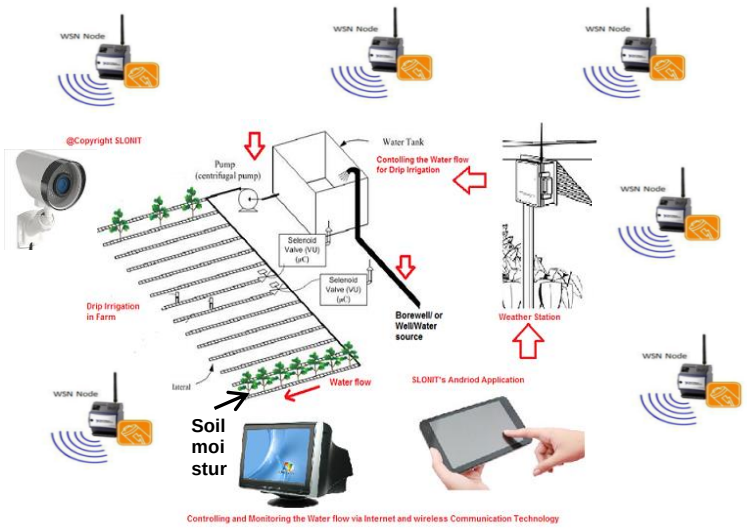

Figure 1. Sensors nodes placed in the field at various points

In the drip irrigation system, water and fertilizer are used efficiently. The concept of this irrigation system is to irrigate only the root zone of the plant. Drip irrigation allows water to slowly seep into the plant roots. Such a system is especially suitable for cold, hot and windy places. Applying water to the root zone of the plant has the potential to reduce the disease and improve the yield.

The data from the sensor is constantly loaded into the cloud technology, which is placed in the drip irrigation system. This system also provides information for administrator and for the user. The irrigation system can be operated automatically in the mobile app or by the user (ON-OFF). By closing the data analysis algorithm, this system optimizes water use and allows for increased product development.

In the horticulture of Uzbekistan, a wireless sensor detection system based on the Internet of Things (IoT) has been designed as follows.

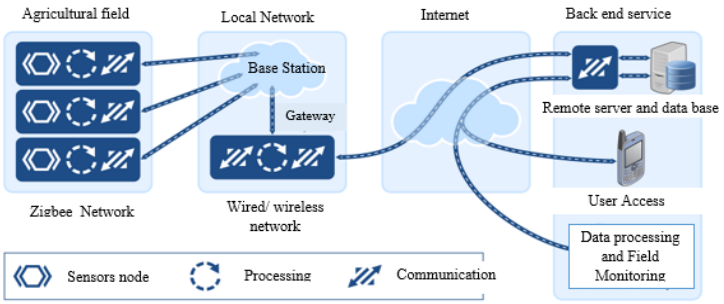

Figure 2 System architecture for IoT based Wireless Sensor network system

In this method, which is proposed for use in horticulture, a knot of different sensory nodes is placed in a bran place. This node collects the data and transmits the wireless module to the base station or sepvep that collects the data. The stored data is processed and transferred to a smartphone, tablet or laptop where the data can be multiplied. During the cultivation of the crop, a weather station is set up to record the environment parameters.

Provision of communication architecture and monitoring system for IoT-based wireless sensing detection system is given in step 2.

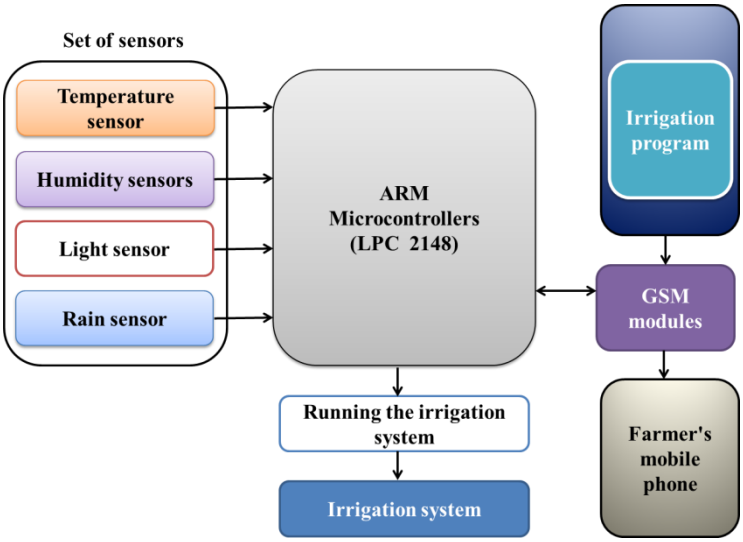

Figure 3 Automated irrigation system

Natural parameters from sensors installed in agricultural areas are measured and the collected data is sent to the ARM microcontroller (Arduino Uno board) and Zig-Bee module via the Internet (IoT) cloud system.

Using a mobile device or computer, the user receives and monitors data remotely. In the final stage, the farmer carries out the work that needs to be done (irrigation, resource management, crop control, etc.) through the data collected.

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The proposed irrigation system consists of a microcontroller, a mobile phone, a GSM module, a set of sensors and a water pump control unit, as shown in step 3. The set of sensors consists of a temperature sensor, a humidity sensor, a light sensor, and a rain sensor, which is used to monitor field conditions, such as air temperature, soil moisture, sunlight, and precipitation. An irrigation program has been developed to determine soil moisture from the image captured by the camera mounted on the smartphone, and a rectangular device with a Transparent Anti-Reactive Glass (TARG) medium on one side of the camera is mounted on the ground and captured from this device by the camera on the smartphone. The software installed on the smartphone analyzes the ground condition using the captured data. The mobile communication (GSM) module in the proposed irrigation system is used to send and receive messages between the microcontroller and the smartphone. The ARM microcontroller receives data from various sensors and the data analyzed by the software installed on the smartphone and controls the irrigation system by adding or removing the water pump based on this information. Through the ARM microcontroller (GSM) module, it sends information about the irrigation status to the farmer and the farmer is aware of the entire irrigation status. The ARM microcontroller receives data from various sensors and the data analyzed by the software installed on the smartphone and controls the irrigation system by adding or removing the water pump based on this information. Through the ARM microcontroller (GSM) module, it sends information about the irrigation status to the farmer and the farmer is aware of the entire irrigation status. The ARM microcontroller receives data from various sensors and the data analyzed by the software installed on the smartphone and controls the irrigation system by adding or removing the water pump based on this information. Through the ARM microcontroller (GSM) module, it sends information about the irrigation status to the farmer and the farmer is aware of the entire irrigation status.

In summary, the use of traditional irrigation systems in agriculture in recent years has required a lot of water consumption. In addition, the level of rainwater and groundwater is declining day by day, thereby increasing the demand for new systems for the efficient use of water resources for agriculture. In order to use water efficiently in agriculture, there must be a system that supports farms. A smart irrigation system not only reduces water consumption, but also saves the time that farmers spend on controlling the irrigation system and increases
efficiency in agriculture.

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