Water management in agriculture

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DESCRIPTION

In the agricultural sector, water plays a crucial role in food production and animal husbandry. Given current trends in world population growth, agriculture must counter this increase against decreasing availability and competition for land and water from other uses, be it non-food crops, urbanization or industrial development.

According to the comprehensive evaluation of water management in agriculture (2007), an improvement in the management of rainfed farming could double or quadruple the yield. One of the main reasons for yield gaps is that farmers do not have sufficient financial incentives to use seeds or cultivation techniques that improve yield. Other reasons include lack of access to information, advisory services, and technical skills. Poor infrastructure, weak institutions, and discouraging agricultural policies can also seriously hamper the adoption of improved technology on farms. Other factors could be that the available technologies were not adapted to local conditions. Recently, innovative technologies have improved the management and monitoring of water in agriculture.

Challenges related to water management in agriculture

Water reuse and water pollution monitoring: Human and industrial activities can introduce pollutants into the natural environment which, due to the release of improperly treated wastewater, lead to the deterioration of the aquatic ecosystem.

Water pipeline monitoring: A water leak in the irrigation network can cause a decrease in the productivity of agricultural yields due to the lack of water for plants to grow. Real-time monitoring and control mechanisms help overcome these water distribution problems. The water pipeline monitoring system is one of the most successful solutions that requires technology to cover the problem of a water leak and provides an effective method of inspecting the pipeline infrastructure.

Water irrigation: This challenge is known by various denominations in the agricultural sector, such as irrigation, irrigation, sprinkling, or fumigation. Its main objective is that the water supply of exploitable land for agricultural use based on the methodological and calculated form, the climatic conditions, the surface topography and the nature of the soil (acidity, grading, etc.).

Drinking water for livestock: Livestock in agriculture deals with the breeding and conservation of livestock, especially for the production of meat, milk and eggs. Understanding the role of animal feed in agriculture is a necessary prelude to effective water use in this area.

Measures to improve land and water productivity may include:

• Provide more rainwater for crops when it is most needed (rainwater harvesting, soil and water protection, and use of deficit irrigation; additional irrigation, etc.);

• On-farm water management to minimize water loss through evaporation;

• Use of improved plant varieties;

• Use of improved cropping systems and agronomy, such as conservation tillage;

• Develop financial frameworks to encourage the adoption of best practices and new technologies;

• Use of poor quality water in unconventional applications (not for direct human consumption) such as forestry;

• Assessment of rainfall patterns to determine the quantity and quality available for agricultural use and rethink harvest planning.

There are several methods that can help conserve and protect water sources, such as building dams to store rainwater, desalination of seawater, treatment of sewage, and monitoring of water pipes to detect any damage or leak. Cyber Physical Systems (CPS), Wireless Sensor Networks (WSN), Internet of Things (IoT) and cloud technologies are the most important research paradigms to improve these methods and make them smarter. These paradigms have invaded agriculture industry as a means of creating an automated and integrated system. They rely on sensors that can take quantitative measurements of soil conditions, plant growth, weather patterns, and other useful data. These sensors form a network of devices that can send and receive data, streamlining data storage and processing.

Environmental sensors (eg., humidity, pressure and temperature sensors) are used in WSN and CPS infrastructures. These sensors generate massive and heterogeneous spatio-temporal data that is stored and processed on a large scale. This data processing naturally involves the real-time function required for transmission, analysis and decision making.

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