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Impact of Smart Irrigation Systems in the Agriculture to Improve the Production

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ABSTRACT: ***Irrigation is the most important need of agriculture as plants need water for irrigation. Plants need water from time to time which they absorb from the soil, so it is necessary to maintain the moisture of the soil. The focus of the study is to know the impact of smart irrigation systems on agriculture to improve production. There are different types of irrigations method utilized with different technology. Different studies are done on the impact of smart irrigation and the technology related to it. Thus it is observed that there are many developments in irrigation systems with the use of the Internet of Things and artificial intelligence which makes the farmers' life sophisticated. This study provides an overview of the smart irrigation system in the field of agriculture to improve production. Thus, many systems can still implement the technology which can be able to fulfill the need for crops to increase production as food is the need of living beings for their survival.***

KEYWORDS: ***Agriculture, Irrigation, Crops, Farming, Sprinkler, Spraying.***

1. INTRODUCTION

Watering, as it is often called, is the agricultural practice of administering a controlled amount of water to fields to help with crop production as well as the development of green plants and grass. Agriculture that depends only on direct rainfall and forgoes irrigation is referred to as rain-fed agriculture. For about 5,000 years, watering has been a crucial component of agriculture, and different civilizations all over the globe have independently developed it. Various methods of irrigation exist. In comparison to overhead irrigation, micro-irrigation needs less water pressure and flow. The root zone receives drip watering [1]–[3]. Archaeological studies have shown evidence of irrigation in areas where there is insufficient natural rainfall to sustain crops for rain-fed agriculture. In Khuzistan, which is situated in the southwest of contemporary Iran, the method was first used in the sixth millennium BC. The earliest known example of canal irrigation is believed to have been at the site of Choga Mami in Iraq, close to the Iranian border, circa 6000 BCE [4]–[6].

It is believed that irrigation was used to control water on the floodplains of an Indus Valley civilization starting about 4500 BC, dramatically expanding the size and prosperity of their agricultural villages. Advanced irrigation and drainage systems were built by the Indus Valley Civilization, including canal irrigation systems and man-made dams at Girnar that date back to roughly 2600 BCE and 3000 BCE, respectively. A massive network of canals used only for irrigation was built, enabling large-scale agriculture to flourish [7]–[9]. The spontaneous application providing water to the land by direct rainfall is known as rain-fed farming. Relying on rainwater is less probable to occur in food poisoning, but it exposes you to a water crisis when rainfall is low. Manufactured applications of water, on the other hand, raise the danger of contamination [10].

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The act of intentionally supplying water to a plant via the use of tubes, motors, and sprays is known as irrigation. In areas where rainfall is unpredictable, dry spells are expected, or drought is anticipated, irrigation is often used. Numerous forms of irrigation evenly distribute water throughout a whole field. For irrigation, you may utilize groundwater from springs or water sources, surface water from streams, lakes, or reservoirs, recycled wastewater, or desalinated water. To lower the danger of contamination, farmers must safeguard their agricultural water supply. Users of irrigation water must use caution, as with any groundwater extraction, to prevent pumping fresh water out of a reservoir more quickly than it is replenished.

There are many different irrigation techniques. How they provide water to the plants varies among them. The strategy is to supply moisture to the plants as equally as possible, ensuring that each plant gets the appropriate amount of water, whether that be too much or not enough. Alternately, irrigation may be thought of as an addition to rainfall, as it is in many areas of the globe, or as "full irrigation," in which crops almost never get any input from rainfall. Full irrigation is uncommon and only used when crops are grown in semi-arid regions outside of rainy seasons or in desert settings with very little rainfall.

Surface irrigation, often known as simply gravity-irrigated agriculture, is the most ancient method of irrigation, having been used for countless generations. Water travels over the edge of agricultural fields in surface irrigation systems (furrow, flooding, or level basin) to moisten it and penetrate the soil. Water travels as a result of gravity or even the slope of something like the terrain. Furrow, border strip, and basin irrigation are all types of surface irrigation. When irrigation causes flooding or near-flooding of cultivated land, it is sometimes referred to as flood irrigation. Surface irrigation has historically been the most frequent way of irrigation purposes for agricultural land for most countries of the globe.

Surface irrigation has a poorer water application efficiency than other types of irrigation, owing in part to a lack of control over applied depths. Surface irrigation requires substantially less money and energy than pressurized watering systems. As a result, it is frequently used for irrigation in underdeveloped countries, on low-value crops, and in huge fields. Groundwater from the irrigation source is regulated by dikes, which are generally filled by the earth. This is common in sloping paddy fields (rice paddies), in which the technology is used to flood or manage the amount of water in each area separately. In certain occurrences, the water is pumped or hoisted to the land's surface using human or animal force.

Micro-irrigation, sometimes referred to as localized irrigation, small volume irrigation, and trickle irrigation, is a technique for supplying water as a very small output to each plant or close to each plant using a piped network and dispersing it under decreased pressure in a specified pattern. This group of irrigation systems includes multiple transmitters, subsurface drip irrigation (SDI), micro-sprinkler irrigation, and mini-bubbler irrigation. Trickle irrigation, sometimes referred to as drip (or micro) watering, accomplishes precisely what it says. This method involves supplying water to the plant roots one drop at a time.

This method, if properly managed, maybe the most liquid kind of irrigation since evaporation and overflow are decreased. The field typically uses around 90% of the irrigation water when it is managed appropriately. To further minimize evaporation in contemporary farming, drip irrigation is usually combined with plastic mulch. It is also used to deliver fertilizer. The process is known as fertigation. When a drip system is kept on for a lengthy period or if the arrival rate is too high,

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deep percolation, in which water runs under the root system, may take place. Technologies for drip irrigation vary from extremely advanced and automated to basic and labor-intensive.

2. DISCUSSION

When sprinkling or overhead irrigation is used, water is sent to one or more central locations within the field and distributed there by high-pressure showers or guns. A solid-set drip irrigation system makes use of sprinklers, sprays, or guns that are fixed above on risers that are always in place. A ball motor, gearing start driving, or impact mechanism is used to propel rotors, which are high-pressure sprinklers. Both a full and a half circle may be created for rotor rotation. Guns are used in a range of industrial processes, such as logging and dust suppression.

2.1.Advantages:

A sprinkler irrigation process utilizes a pump to apply high-pressure water. It emits rainwater through a small diameter nozzle inserted in the pipes. Water is disseminated throughout a pipe system, blasted into the air, and irradiates most soil types due to the variety of discharge coefficients. Smart irrigation technology is classified into two types: weather-based and soil moisture-based. Both can assist in water management, however, there are some key distinctions. Here's the skinny on the two so the user can pick the system that's right for the user.

1. Removes water conveyance channels, minimizing conveyance loss.
2. Suitable for all soil types except thick clay.
3. Water savings of up to 30% to 50%
4. Suitable for irrigation in areas with a high plant density per unit area.
5. Aids in increasing yield.
6. Lessons on soil compaction.
7. System mobility facilitates system functioning.
8. Suitable for uneven terrain.
9. Saves land because no bunds are required.
10. The use of soluble fertilizers and chemicals is possible.
11. Offers frost protection and aids with microclimate modification.
12. Lowers labor costs.

A weather-based irrigation system also recognized as ET-based technology, would include either one mini on-site monitoring station or climate sensor continuously monitoring conditions like temperature, snowfall, and radiation from the sun on your estate, or the very same information is telecast to the irrigated agriculture controller from the weather monitoring site. Depending on the model, the sensor's hardware needs that current controllers be changed with a climate controller that has the technology, or that an add-on receiver be added to your current controller. Sensors are often relatively tiny and may be discreetly put on a structure, fence post, or another item in your yard. The sensors and the processor are usually connected wirelessly.

The weather-based sensors are suited for the majority of home applications. They are reasonably priced around $300-600 installed, especially since they often reduce irrigation water use by 20-50 percent more than when installed properly and calibrated on the well system. The return on investment for a system varied, however, it is not unusual for a sophisticated panel to compensate for itself in reduced water costs within two years. The controllers with integrated climate technology are comparable to append sensors, but since they can utilize the controller's

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computational capacity, they can store more precise information about the plant kind, rich soil, gradient, exposed, and sprayer type than an add-on sensor can.

Because of the extra site information they employ, embedded climate controllers were typically more accurate than add-on controllers. When correctly configured that is used on an effective irrigation canal, the savings will grow proportionately. Water usage savings of up to 40% as compared to conventional irrigation systems are not uncommon. They are reasonably priced, ranging between $500 to $2000 built. Aside from water management, the improvement in plant development, which can reduce the amount of money spent on addressing plant health complications, can be large enough to justify the expenditure.

The second kind of intelligent irrigation system is dependent on moisture. In this method, sensors are utilized to assess the actual soil moisture. This data is used to adjust the irrigation watering time. Both integrated controllers and add-on technologies are offered for sale for moisture-based systems, much as weather-based systems. These devices may cost anything from a few hundred to thousands of dollars. Two different water systems are available, as the user should be informed. The first technique uses a planned and regulated watering schedule and is referred to as suspended-cycle irrigation. The only distinction is that it prevents watering if the moisture in the soil threshold is exceeded. Nevertheless, if the soil is excessively dry, the pre-programmed timetable will not be adjusted to allow additional watering. Most of these sensors may be added to a standard controller that already exists. A water-on-demand system is the second category of a humidity smart irrigation system. This one monitors two soil moisture thresholds, high and low, and calls for water as needed to keep moisture levels between the two. This kind necessitates the replacement of the old controller with a controller that has its sensor.

When calibrated properly, this may be a very efficient setup since it enables more location data to be inputted. Sensors and processors are only a small portion of the equation. Other elements, such as water-efficient transmitters such as turbines, and sprayer heads, must be in place to effectively maximize their benefits. Zoning, like every other feature of an irrigation system, is critical for overall effectiveness and growing conditions. A correctly planned and maintained smart irrigation system may save considerable amounts of water and money while also enhancing plant health by maintaining ideal soil moisture levels. However, keep in mind that the most sophisticated intelligent irrigation technology is not assured to save you money. This is especially the case though a sophisticated controller is implemented and nothing is done to address the inefficient system. Its efficiency is dependent on proper setup and supervision by an experienced person. Many variables must be considered before installing an automated irrigation system. Some of these are as follows:

1. Separate zones for landscape beds and grass
2. Separate zones for landscape beds and grass
3. Sprinkler pressure
4. Sprinkler location
5. Sprinkler nozzle selection
6. Component condition
7. Soil type, conditions, and slope
8. Plant needs

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The device must be set up, configured, and calibrated correctly. It must also be checked over a period and will need to be re-calibrated regularly as conditions change. The majority of homeowners opt to contact a landscape expert as the simplest and most effective approach to maximize the value of the technology. Investing in a combination of sensors is a genuinely "smart" approach to reap the advantages of a lovely lawn and landscape.

3. CONCLUSION

In dry climates as well as during times of below-average rainfall, irrigation promotes the development of crops, the preservation of landscapes, and the re-vegetation of damaged soils. In addition to these extra uses in crop production, irrigation also prevents soil compaction, controls weeds in grain fields, and protects crops from frost. Water sources are also used to cool animals, to control dust, to dispose of wastewater, and to mine. Irrigation is frequently studied with draining, which would be the disposal of surface and groundwater from a specific region. Intelligent irrigation technologies are a blend of innovative sprinkler technology with nozzles that enhance coverage and irrigation as well as water management systems that monitor moisture-related circumstances on the land and automatically change watering to appropriate levels.

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