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Precise Use of Irrigation Water in Agriculture

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Precision Irrigation: When needed, precision irrigation precisely supports crop demands by applying tiny amounts of moisture straight to crops. When fertilisation (fertigation) and irrigation are coupled, this method also supplies nutrients to the plants. Precision irrigation allows farming operations to use less water and chemicals, which is good for business and good for the environment. Precise moisture supply, being a sparing strategy, also plays a role in sustainable farming.

Precision Irrigation's Advantages

- As the primary method and objective of precision irrigation, precise water distribution makes the technology a vital component of precision agriculture.
- By adopting this approach, farmers can reap the following financial and agronomic rewards
- Simpler farm management with precision irrigation software; reduced agricultural water use and its precision distribution; flexible deployment options for mobile sprinklers and drip lines; improved field productivity and increased yields; easier installation of precision irrigation systems and the possibility of automated control; more effective weed management because the soil is watered only around the plant, and unwanted vegetation doesn't get enough moisture.

Methods of Precision Irrigation

While irrigation the soil is recommended by all methods to promote plant growth, the specifics of each method's implementation vary. Surface, sprinkler, and trickle/drip moisture supply are the basic method options. The benefits and features that they offer are covered in detail below.

Precision Surface Irrigation: Water follows the rule of gravity and spreads organically throughout the area. While it uses a lot of water and doesn't use any sophisticated agricultural technologies, it makes sense in situations where soil infiltration is minimal. It will be challenging to apply this precise irrigation technique in sandy soils, but it works well in clay soils.

The following procedures are used while using the surface method:

- Using bunds, the basin technique floods and confines the area. For a very long period, the water remains there. This method works well for cultivating wheat as well as rice. The technique is used on level terrain, with more levelling provided as necessary.

- Using the furrow technique, long, water-filled trenches are built. Water flows naturally through syphon tubes or gates, or via furrows that are positioned higher than crop rows.
- The border approach provides water between the lines of property. It makes use of syphons or gates just like the kind before it.

Precision Sprinkler Irrigation: Water is sprayed through manually operated equipment or machines that may be rotated or moved ahead, and they can be installed temporarily or permanently. Sprinklers' guns and nozzles determine the pressure and size of its droplets.

Not every crop can benefit from this precision irrigation technique because large drops and high pressure can harm them. Pollination would be eliminated and flowering plants' blooms destroyed. Furthermore, if any insoluble particles become lodged in the system, the equipment will become non-operational. Another problem is that winds have a big impact on how moisture is distributed.

Precision Irrigation System with Trickle (Drip): Precision drip irrigation is often referred to as drip tape or drip line irrigation because it uses tiny pipes arranged in lines to provide moisture. Low pressure droplets are guided towards the crop proper, and the absence of water adjacent prevents weed growth. Therefore, one of the main advantages of drip irrigation systems is that it not only keeps plants from starving because of weeds, but it also drastically lowers the amount of water required.

Drip tapes, however, are quickly damaged or obstructed by insoluble particles, and they are susceptible to mechanical failure. Conversely, soluble materials enable the blending of fertilisation and water supply.

Precision Underground (Subterranean) Drip Irrigation: The low water consumption of this precision irrigation method is comparable to that of the drip system. Drippers and pipelines are used to hydrate plant roots that are buried in the soil. Furthermore, soil moisture does not evaporate since it is fed underground. However, the subsurface drip line is extremely susceptible to machinery, tilling, root hairs and insoluble particles.

EOSDA Crop Monitoring Combined With Precision Irrigation Management: A precipitation forecast that demonstrates the requirement for additional soil moisture supply and precise and trustworthy information about the existing field condition are necessary for the rational and justifiable planning of precision irrigation events. It's best to practise precise irrigation, or irrigation crops only when necessary, as this reduces costs associated with irrigation and can benefit crops more than it can.

Precision Irrigation Technologies and the NDMI Vegetation Index: Several vegetation indices produced by satellite imagery analytics are available on the GIS platform EOSDA Crop Monitoring. For precise irrigation control, the Normalised Difference Moisture Index (NDMI) is quite helpful. If there is not enough moisture in the crops, NDMI can identify it. To prevent yield loss, the index assists in promptly identifying issues related to moisture deficit and taking appropriate action before water stress becomes unmanageable. Furthermore, NDMI enables the identification of waterlogging to prevent crop deterioration or under-irrigated areas to boost field productivity. By irrigation just the plants that are dry, precision variable rate irrigation—which conserves resources—can also be implemented with NDMI.

Our platform's index-based vegetation maps allow you to segment the field into zones according to the water requirements of different crops and plan additional precision irrigation events where necessary. In order to apply water and other resources linked to irrigation VRT,

users may also download the resulting vegetation map and send it to irrigation equipment dashboards.

Data on Soil Moisture for Precision Irrigation Management: There are various methods to gather data on soil moisture, including using satellite imagery or field sensors. Sensor deployment means ongoing maintenance expenses and ongoing equipment control. However, regardless of cloud cover, satellite photography is a trustworthy source of data on soil moisture.

Satellite spectral sensors are used in EOSDA Crop Monitoring to provide data on root zone and surface soil moisture. Simply add the field to your account to view both history and current soil moisture data on any field in the world. Tracking the relationship between rainfall and moisture levels in the field will be made possible by NDVI index graphs and precipitation data.

Precision Irrigation Management Using Past Weather Analytics: Many problems with precision irrigation are resolved by satellite technologies, such as the absence of field data on water availability and appropriate planning. In addition, agri-holdings, agricultural cooperatives, and agri-consultants frequently possess several fields that could be dispersed throughout a sizable area. Large agribusinesses must examine a multitude of sources in order to obtain meteorological data for their farmlands.

EOSDA Crop Monitoring includes weather and precipitation graphs among its features. By examining past cumulative precipitation data, the user can assess seasonal weather and precipitation trends and develop irrigation plans for precision agriculture based on past seasons' patterns. This technique facilitates the creation and application of precision irrigation maps for your fields, helping to prevent overirrigation or vice versa.

Weather Prediction and Precision Irrigation Scheduling: In addition to temperature and precipitation data from the past, EOSDA Crop Monitoring offers a 14-day weather forecast for every field. In agriculture, precision weather forecasts aid in determining when irrigation is necessary to maintain the right level of soil moisture for crops. Farmers may delay irrigation activities in order to conserve resources because they are aware of the impending downpours. You can track changes at your convenience by using the desktop and mobile apps, which both provide access to weather forecast data.

Utilising Precision Irrigation Technology to Make Sensible Decisions: Together with sunlight, readily available nutrients, and the right temperature of the soil, water availability is essential for plant development. Rainfall in fields is sufficient in locations where it rains frequently. In other regions, the primary means of promoting crop growth and optimising yields is through extra irrigation. The best and most economical way to provide plants the water they need is through precision irrigation, and satellite technology greatly ease the decision-making process.

Modify your water consumption: Aiming to use water wisely throughout the farming process, precision irrigation views water as the most valuable, yet scarcest, resource. The farmer benefits from it in the ways listed below.

Continues to run off and undergo deep percolation at Bay: Water is used carefully, reaching the roots of the plants directly and in the exact amounts needed. By doing this, important problems like run-offs and deep percolation are avoided. Furthermore, precision irrigation systems are tailored to the water-absorbing capacities of both the soil and the plant, guaranteeing that the water remains in the active root zone and is utilised by the crop. This ultimately leads to the utilisation of fewer resources while attaining a greater return.

Reclaimed Waste Aquum

Waste water can be turned into a valuable resource. Current methods waste a significant amount of water. Precision irrigation, on the other hand, delivers water directly to the crops,

avoiding contamination and, as a result, the waste of water. Additionally, you can recycle the water that was previously thrown away and turn it into a useful resource for farming.

Evaporation

Water evaporation could be greatly increased by huge sprinklers (between 15 and 30 percent).This is not a possibility with precision irrigation because water is sent straight to the roots. This also applies to farming a comparably bigger area of land.

Amplify Soil Succulency

When too much water is applied through irrigation systems like pivot or flood, the soil may get saturated, which will worsen the aeration and cause stress to plant roots that don't get enough air and water. However, precision irrigation maintains the air-water ratio precisely, enabling the ideal crop growth, because only the necessary amounts of water are utilised in line with the dominant type and in the suitable quantities.

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