T1.20 IRRIGATION

What is this?

Irrigation is the process of applying water to the soil through various systems of pipes, pumps, and sprays. Irrigation is used in areas where the quantity of water coming from rainfall is insufficient or irregular for the normal vegetation of the crops.

Precision irrigation means having water brought right to the roots of the plants, at just the right time and quantity.

Some additional information …

Farmers' options for adding water to the soil boil down to two basic approaches:

Natural irrigation - through rains

Artificial irrigation

Rainfed agriculture is the natural application of water to the soil through rainfall. Relying on rainfall is less likely to lead to food contamination but carries the risk of water shortages when rainfall decreases. On the other hand, artificial water application increases the risk of pollution. The term irrigation usually refers to artificial water application to the soil. Irrigation is generally used in areas with irregular rainfall or when dry weather or drought is expected. There are many types of *irrigation systems* where water is supplied evenly to the entire field. *Water for farm irrigation* can be provided by using rivers, lakes, reservoirs, other *surface water*, springs, wells, groundwater, or even treated sewage or desalinated water. Regardless of the type of water source used, farmers have two primary responsibilities when using water. First of all - to minimize the *risk of water pollution. Secondly, it is crucial that water* use be balanced, as the pumped amount should not exceed the aquifer's recharge rate.

A full-fledged agricultural activity cannot be carried out without irrigation in areas where rainfall is scarce or irregular. The water needed for the crops is brought to the field through pipes, canals, *sprinklers*, or other man-made means. Artificial irrigation makes it possible to stabilize food production quantitatively and qualitatively.

Irrigation is an activity that has been known to mankind since ancient times. In the past, irrigation was primarily manual, with people carrying water from wells or rivers and watering their crops. In ancient Egypt and China, there was a significant development of irrigation, with irrigation canals, dams, dikes, and water storage facilities being built. The ancient Romans

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA).
Neither the European Union nor EACEA can be held responsible for them.

Co-funded by the European Union

introduced the construction and use of viaducts to supply water for domestic needs and irrigation.

The primary approach to water supply in modern *irrigation systems* uses tanks, reservoirs, and wells. The group of reservoirs includes aquifers, basins that collect melted snow, lakes, and basins created by dams. Water is carried from the reservoirs to the fields through made channels or special pipelines. The water transfer process itself can be based on the force of gravitation or the use of pumps.

One of the risks associated with irrigation is that the increasing application of irrigation may lead to the depletion of aquifers, thereby reducing the freshwater used for drinking and hygiene. The Aral Sea in Central Asia is a real-life example in this regard. As a result of the unbalanced use of *irrigation water*, the sea has been almost completely emptied, and its ecosystem has been almost destroyed.

The development of agricultural activities through irrigation requires, in the first place, to do an irrigation project, which includes an analysis of water consumption and sources of water supply and the possibilities of balancing them.

Water supply is the more problematic area on either side of the design process. By its nature, it is divided into *surface* and underground. Despite the difficulties in predicting precipitation, it is much more challenging to determine the amount and origin of *subsurface water*.

The water quality must also be subject to control, and in this respect, the two most important indicators are the amount of silt carried and the type and amount of salts dissolved in the water. The project should be planned to use *less water* than is recharged. This is an essential condition for using water resources sustainably.

Dew and wastewater are two additional sources of water that are often overlooked as water harvesting opportunities. With increasing attention to clean water sources and their scarcity, interest in these alternatives is rising.

The amount of water needed to irrigate the farm is closely related to the irrigation system used. Once it reaches the farm, water can be applied to crops by three main methods - surface, subsurface, or *sprinkler irrigation*. Surface *irrigation systems* are generally classified as flood systems, where the entire field is flooded; row *irrigation systems*, where the water is directed between the rows of plants; and pipe hole *irrigation systems*, where the water drips onto the plant.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA).
Neither the European Union nor EACEA can be held responsible for them.

Co-funded by the European Union

Sub-irrigation is a method that is applied relatively rarely. With it, an impermeable layer is placed near the crop's root zone but below it. In this way, water is captured and retained in the root zone.

Sprinklers are a widely used method of irrigating agricultural land. The reasons for their popularity are that little, or no preparation is required, application rates can be controlled, and the system itself can be used for freeze protection and applying pesticides, herbicides, and fertilizers. *Sprinkler* capacities vary from applying water as a mist to *sprinklers* that apply an inch or more of water per hour.

Flooding and row irrigation methods use up a lot of water as it soaks into the ground where there are no plants. The spraying method also results in water losses, mainly due to evaporation into the air. Irrigation through holes in the pipes, called drip irrigation, is considered one of the most efficient irrigation methods because the water drips onto the plant itself and is not wasted.

Considering water as the scarcest yet priceless farming resource, *precision irrigation* aims at the prudent usage of water throughout farming.

Source: https://eos.com/blog/precision-irrigation/

Precision irrigation follows the general ideology of precision agriculture. Farmers can produce larger quantities with higher quality products and fewer resources through this approach. Water productivity and fertilizer efficiency are increased, and farmers can generate higher profits as a result of applying *precision irrigation* methods.

Precision irrigation is believed to have the following *benefits*:

- Water is applied only in the zone of adequate consumption by the plant, where a higher yield is achieved with the economical use of water resources;
- When water and nutrients are applied to the plant's root system in measured doses, there is no surface runoff. Therefore, nutrients are not extracted from the soil, and the risk of groundwater pollution is reduced, in addition to saving resources;
- *Precision irrigation* limits the loss of water to evaporation, and with drip irrigation, this loss is practically zero;
- *Precision irrigation* methods allow the use of contaminated water, turning it from useless to valuable. In practice, the contaminated water is delivered directly to the plant's roots and never comes into contact with the crop itself. This allows such water to be used even in the cultivation of edible crops without creating a risk to consumers' health.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA).
Neither the European Union nor EACEA can be held responsible for them.

Co-funded by the European Union

Precision irrigation contributes to solving society's three main agrarian problems - achieving higher yield, higher quality, and more economical use of water and other precious resources.

Links

https://www.cdc.gov/healthywater/other/agricultural/types.html

https://education.nationalgeographic.org/resource/irrigation

https://www.britannica.com/technology/irrigation/Evaporation-and-seepage-control

https://www.netafimindia.com/Sustainable-agriculture/

https://www.netafimindia.com/precision-Irrigation/water-use-efficiency/

Video

https://www.youtube.com/watch?v=amrCMakolKA

Keywords

Rainfed agriculture

Irrigation water

Irrigation systems

Surface water

Subsurface water

Sprinklers irrigation

Precision irrigation

Benefits

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA).
Neither the European Union nor EACEA can be held responsible for them.

Co-funded by the European Union