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Popular Article

Sprinkler Irrigation System

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Introduction

Sprinkler irrigation involves spraying water into the air and allowing it to fall on the ground like rain. The spray is created by passing water under pressure via tiny orifices or nozzles. Typically, pressure is obtained via pumping. By carefully selecting nozzle diameters, operating pressure, and sprinkler spacing, irrigation water may be sprayed uniformly and at a pace that matches soil infiltration rates. Sprinkler irrigation is a method of applying irrigation water which is similar to natural rainfall. Water is distributed through a system of pipes usually by pumping. It is then sprayed into the air through sprinklers so that it breaks up into small water drops which fall to the ground. The pump supply system, sprinklers and operating conditions must be designed to enable a uniform application of water. Sprinkler irrigation is suited for most row, field and tree crops and water can be sprayed over or under the crop canopy. However, large sprinklers are not recommended for irrigation of delicate crops such as lettuce because the large water drops produced by the sprinklers may damage the crop.

Classification of Sprinkler systems:

Sprinkler systems can be classified broadly into two types on the basis of arrangement for spraying irrigation water:

1. **Rotating head or revolving sprinkler system.**
2. **Perforated pipe system.**

1. **Rotating head or revolving sprinkler system:**

Small nozzles are put on riser pipes at regular intervals throughout the length of lateral pipes,

which are typically located on the ground surface. They may be installed on stakes above crop height and turned 90° to irrigate a rectangular area. Rotating sprinklers typically use a tiny hammer operated by water striking a vane to spin the heads.

2. **Perforated pipe system:**

This technology uses drilled holes or nozzles to spray water under pressure. This system is typically built

for low **p**ressure (1kg/cm^2). The application rate ranges from 1.25 to



5 cm per hour according on pressure and spacing.

Sprinkler systems are grouped into the following kinds according to their portability:

1. **Portable system:** A portable system includes portable main lines, laterals, and a pumping plant.
2. **Semi-portable system: These** are comparable to portable systems, but have a fixed site for their water source and pumping plant.
3. **Semi-permanent system**: A semi-permanent system includes portable lateral lines, permanent main lines and sub-mains, and a stationary water supply and pumping facility.
4. **Solid set system:** A solid set system has adequate laterals to prevent movement. Laterals are planted in the field at the beginning of the crop season and remain there throughout the season.
5. **Permanent system**: A completely permanent system includes permanently laid mains, sub-mains, laterals, a stationary water supply, and a pumping plant.

Components of Sprinkler irrigation system:

A sprinkler system typically includes

i. **A pump unit**
ii. **Tubing (main/submains and laterals)**
iii. **Couplers**
iv. **Sprinkler head**
v. **Accessories including valves, bends, plugs, and risers.**

A pump unit: Sprinkler irrigation systems use pumps to spray water on fields. The water is poured under pressure into the fields. Water is forced through sprinklers, perforations, or nozzles in pipes, resulting in a spray. Sprinkler irrigation for specific fields can be operated using a high-speed centrifugal or turbine pump. Centrifugal pumps are employed when the distance between the pump inlet and the water surface is less than 8 metres. Turbine pumps are recommended for pumping water from wells deeper than eight metres. The driving unit might be an electric motor or an internal combustion engine.

Tubing: Tubings include mainline,submains, and laterals. The main line transports water from the source and distributes it to submains. The submains carry water to the laterals, which then give water to the sprinklers. Portable systems often employ aluminium or PVC pipes, whereas center-pivot laterals commonly use steel pipes. Common materials for subterranean laterals and main lines include asbestos, cement, PVC, and wrapped steel.

Couplers: Couplers connect and disconnect two pipes fast and conveniently. A coupler should meet the following criteria:

(a) reuse and flexibility,
(b) no leaks at the junction,
(c) ease of use,

(d) light, non-corrosive, and durable.

Sprinkler head: Sprinkler heads evenly distribute water throughout the field, preventing runoff and excessive loss due to deep percolation. Various sprinklers are available. They are either revolving or fixed in nature. The revolving type can accommodate various application rates and spacings. Sprinklers are effective at pressures ranging from 10 to 70 m/head. Farmers often like pressures between 16 and 40 m head. Fixed-head sprinklers are widely used to water small lawns and gardens. Perforated lateral lines can be utilised as sprinklers. They require lower pressure than spinning sprinklers. They distribute more water per unit area than revolving sprinklers. Fixed head sprinklers are suitable for soils with high input rates.

Accessories: The sprinkler system requires various fittings and accessories.

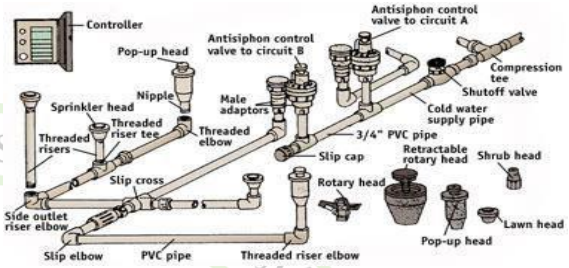
a) Water meters: These are used to measure the amount of water provided. This is vital to run the system and provide the requisite amount of water.

b) Flanges, couplings, and nipples utilised for pump connection, suction, and delivery.

c) Pressure gauge: Monitor sprinkler system pressure to ensure consistent application.

d) Bend, tee, reducer, elbow, hydrant, butterfly valve, and stopper.

e) Soluble chemical fertilisers may be administered to crops using a sprinkler system. Fertiliser application equipment is inexpensive, simple, and easily made locally. The fertiliser applicator contains. A sealed fertiliser tank with the appropriate tubing and connectors. A venturi injector installed in the main line provides differential pressure suction, allowing fertiliser solution to flow into the water line.



Response of different crops to sprinkler irrigation

The studies done in different sections of the nation demonstrated water conservation owing to sprinkler system varies from 16 to 70 % over the old approach with yield increase from 3 to 57 % in different crops and agro climatic conditions.

S.N.	Name of crop	Increase in Yield (%)	Saving in Water (%)
1.	Okra	23	28
2.	Cabbage	3	40
3.	Cauliflower	12	35
4.	Chillies	24	33
5.	Garlic	6	28
6.	Onion	23	33
7.	Potato	4	46
8.	Fenugreek	35	29
9.	Cowpea	3	19
10.	Cotton	50	36
11.	Sunflower	20	33
12.	Groundnut	40	20
13.	Lucerne	27	16
14.	Wheat	24	35
15.	Maize	36	41
16.	Jowar	34	55
17.	Bajra	19	56
18.	Barley	16	56
19.	Gram	57	69

Choosing the most suitable sprinkler systems:

When choosing a sprinkler system, consider the following physical parameters:

1. Crop(s) to be farmed.
2. The field's shape and size (in acres).
3. The geography of the field.
4. The time and labour necessary to run the system.

Benefits of sprinkler irrigation:

1. Elimination of conveyance channels results in no conveyance loss.
2. Suitable for all types of soils.
3. Suitable for irrigation in crops with a high plant density per unit area.
4. It is best suited for oil seeds, cereal, and vegetable crops.
5. Water saving.
6. Improved water application management allows for more frequent and effective irrigation, while also increasing efficiency.
7. Increase in yield.
8. System mobility can also be used to undulating areas.
9. Saves land by eliminating the need for bunds and other structures.
10. Influences more favourable microclimate.
11. Areas at a higher elevation than the source can be watered.
12. Possibility of employing soluble fertilisers and chemicals.
13. Less clogging of sprinkler nozzles owing to sediment-laden water.

Constraints in use of sprinkler irrigation:

1. Uneven water distribution owing to high winds.
2. Evaporation loss while operating under high temperatures.
3. Unsuitable for very impermeable soils.
4. High initial cost.
5. Need for proper design.
6. Inadequate package of practices.
7. Low awareness.
8. Lack of social concern for preserving natural resources.
9. Sprinklers demand high water pressure (above 2.5kg/cm^2).
10. Difficulty in irrigation during wind in sprinklers