

Role of Sprinkler Irrigation in Water Conservation

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Introduction:

The sprinkler irrigation is one of the pressurised irrigation methods, in which water is sprayed into the air and fall on the ground surface somewhat resembling rainfall. The spray of water is developed by the flow of water under pressure through small orifices or nozzles. The pressure created by the pump, which causes the water to flow out through the sprinkler nozzle. The nozzles are mounted on the pressurized pipe system.

In this system the water is supplied from the water source through network of pipes and sprinkler nozzles located at a fixed height and a velocity which breaks water jet into small droplets that fall on to the soil or crop surface. In compared to surface irrigation methods, high irrigation efficiency is achieved in sprinkler irrigation method of water application. The sprinkler irrigation system requires less labour than surface irrigation. This method is highly suitable on sandy soils where water lost through infiltration is very high. Figure shows application of irrigation water in the form of spray resembling rainfall through sprinkler nozzles using a pump for developing the required pressure.



Critical Appraisal of the Adaptability of Sprinkler Irrigation

Sprinkler irrigation system is adoptable

to following situations:

- ❖ Almost all types of soils and terrains.
- ❖ Successfully irrigate high permeable soils that are difficult to irrigate using surface irrigation methods.
- ❖ Lands with combination of shallow soils and terrain that prevent proper land grading smoothing.
- ❖ Lands having steep slopes and erodible soils and undulating terrain that would be too costly to make smooth for use.
- ❖ Areas prone to frost and fog in Northern India this method can be used to minimise their effect of frost and fog on crop damage.
- ❖ Suppressing dust during to dust storm

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during summer and cooling the local environment.

Advantages and Limitations of Sprinkler Irrigation

➔ Advantages

- (i) In sprinkler method of irrigation the water is moved through the network of pipes from the source to the field, thereby minimising the water losses in the process of conveyance and distribution. The studies conducted in different parts of India showed that this method can save water to the extent of 30 per cent compared to surface irrigation method.
- (ii) Frequent application of water and depths matching with the water requirement of crops. Therefore it is possible to maintain the soil moisture in the root zone of crops within allowable depletion level for a specified type of soil.
- (iii) As there is no overland flow, water is not moved on land surface, this method is suitable for irrigating all types of soils except very heavy clay. This method is particularly suitable for irrigating close growing crops where the plant population per unit area is more.
- (iv) It is suitable for oil seeds and cereal and vegetable crops.
- (v) It is not necessary to overland flow by gravity therefore expenditure of land

levelling and smoothening are not required done in surface irrigation methods.

- (vi) There is no necessity of making bunds, ridges, field channels etc. for ponding or guiding water. The land used for these construction is saved and can be used for crop cultivation.
- (vii) Due to high pressure requirement the nozzles are less susceptible to clogging compared to drip irrigation method.
- (viii) Chemicals and fertilizers can be applied along with water.
- (ix) This method saves the fertilizers and other nutrients there is no deep percolation and leaching.
- (x) The damage on vegetables, citrus, apple, mango, litchi, and other fruit crops to fog, frost and high solar radiations can be protected.
- (xi) Plant protection chemicals can be applied to distant part of plant, which is not possible in other methods of irrigation.

➔ Limitations

Alongside the different benefits offered by this method as explained above, there are certain limitations of this method. These are stated below.

- (i) High initial investment as compared to surface irrigation methods.
- (ii) The fine-textured soils which have a low infiltration rate cannot be irrigated efficiently

- (iii) Sprinkler irrigation is not feasible in hot climate and high wind areas.
- (iv) High operational costs due to higher energy requirements.
- (v) Not suitable for crops that require ponding water. However, research experiments on paddy crops have given promising results.
- (vi) In humid regions, not suitable for crops prone to diseases due to moist environment.
- (vii) Water with impurities and sediments may damage the system components.

Scope and Status of Sprinkler Irrigation in India

Agricultural sector is the largest consumer of water and consuming more than 80% water available. However the demand of water has been consistently increasing from other sectors like municipal, industry, hydropower etc. and each of these sectors is provided water often be at the cost of agriculture. The surface method of irrigation is practiced in large parts of the country. In this method more than 50% of applied water is lost in the process of conveyance, application, runoff and evaporation and less than 50% water is utilized for consumptive use of crop. The drip and sprinkler methods save the water more than 50% of water applied and hence these methods assume high importance. Hence these two methods are to be used for efficient distribution and application of water for crop

production under the circumstances of increasing competition of water from other sectors and need to bring more area under irrigation due to increased demand for food.

In India, the area irrigated by the sprinkler system is about 3.59 million ha, which is less than 2.5 % of the total area under irrigation. Table 35.1 provides the statistics of a area under sprinkler and drip irrigation systems in different states of India. As on March 31, 2012 Rajasthan has the largest area under sprinkler irrigation followed by Haryana. The sprinkler system was first introduced in the mid-1950s by few progressive farmers of the Narmada valley in Madhya Pradesh, Southern region of Haryana and north eastern part of Rajasthan and parts of Punjab to overcome the problem of water scarcity.

Classification Based on Spray Pattern

Sprinkler systems are classified into the following two major types (on the basis of the arrangement for spray of irrigation water).

- i. Rotating head or revolving sprinkler system.
 - ii. Perforated pipe system.
- i) **Rotating Head:** In this type of system small spraying size nozzles are placed on pipes of certain height known as riser pipes. The nozzles mounted on the riser pipes are fixed at uniform intervals along the length of the pipe laid on the ground surface called as lateral pipes. Water is

supplied from the source to laterals through network of pipes consisting of mainline and sub mainline, called as main and sub main.

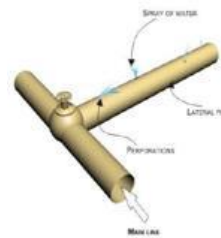
sprayed under pressure. This system is usually designed for relatively low pressure (1 kg cm⁻²). The application rate ranges from 1.25 to 5 cm per hour for



Rotating type sprinkler irrigation systems

Water with pressure is supplied to main; main to sub main and sub main to laterals using a pump. The sprinkler heads mounted on the risers which are above the crop height and rotated through 90o to 360o, to irrigate a rectangular strip. In rotating type sprinklers, the most common device to rotate the sprinkler nozzle is a small hammer activated by the thrust of water striking against a vane connected to it. The pressure requirement varies from 2.0 to 4.0 kg/cm² with application rate from 4.0 to 20.0 mm/hr depending on the nozzle size, spacing etc. Figure shows different type of rotating type sprinkler irrigation systems.

various pressure and spacing. The example shown in the following figure.



Perforated pipe type of sprinkler system

- ii) **Perforated Pipe System:** This system consists of pipes having holes or nozzles along its length through which water is