

# Study of Different Positions of Sprinklers for Irrigation System

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## ABSTRACT

The use of sprinkler is becoming prevalent day by day. A sprinkler system should be designed to apply water homogeneously without erosion or runoff. The sprinkler application rate of the system should be harmonized to the infiltration rate of the most restrictive soil in the field. If the application rate exceeds the soil intake rate, the water will run off the field or relocate within the field resulting in over and under watered areas. Three different sprinkler systems for irrigation purpose are proposed in this paper. The three different systems are stating the configuration of the sprinklers as at between 2 rows but on height with 2 sprinklers, on plants at topmost position and on plants at topmost position but 2 sprinklers at position. The comparison based on the eleven points amongst the three configurations along with the traditional sprinkling system is made and further the most suitable configuration of sprinkler system is predicted.

**Keywords:** Sprinklers, Irrigation system, Sprinkler head

## 1 Introduction

There are different methods of watering in irrigation. Sprinkling is one of the most preferred methods in many irrigations system based on the crops. In the sprinkler method of irrigation, water is sprayed into air and then permitted to drop on the surface of the ground analogous to the rainfall. By passing the water flow under pressure throughout small nozzles or orifices, the spray is developed. Pumping is employed for obtaining the pressure. With careful assortment of operating pressure, nozzle sizes, and sprinkler spacing the quantity of irrigation water necessary for refilling the crop root zone can be applied nearly consistent at the rate to suit the infiltration rate of soil. The trials conducted in different parts of the country revealed water saving due to sprinkler system varies from 16 to 70 % over the traditional method with yield increase from 3 to 57 % in different crops and agro climatic conditions. So, this method means adjust the positions of sprinklers we can reduce human efforts & we can use very effectively [1-7].

The significant parts of the Sprinkler system are the rotating head and the necessary fittings and accessories.

**Rotating Head:** - In rotating type of sprinklers, the sprinklers heads are rotated by means of a tiny hammer activated with the thrust force of the water hitting against a vane connected to it. The few rotating type of sprinklers are presented in Figure 1.





**Figure 1:** *Rotating type sprinklers*

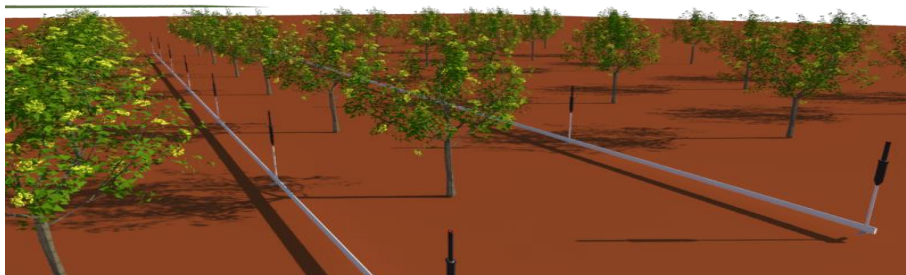
**Fittings and accessories:** - The fittings and accessories required in sprinkling system for irrigation purpose is shown in Figure 2.



**Figure 2:** *Fittings & accessories*

## 2 Traditional Method for Sprinklers

The sprinklers are used from many years. The traditional method of sprinklers is depicted in Figure 3.



**Figure 3:** *Traditional method for sprinklers*

The details of the traditional method of sprinklers are given below:

- 1] Position between Two Rows: At centre between Two Rows
- 2] Height of Sprinklers: Greater Than Plant
- 3] Distance From Plant Of Sprinklers: Equal From Both Sides Of Plants
- 4] No. Of Sprinklers At Position: 1
- 5] Pipes Height From Ground: As Suitable
- 6] Gravity Effects on Water Flow: Yes, Effect is pressure loss takes place.
- 7] Pressure Loss on Position: Yes, Because of gravity
- 8] Areas Covered of Plant: Only Top surface is covered
- 9] Mode or Distance Covering Range: Less
- 10] No. of Plants in range: 2
- 11] Direction of Sprinkler: Upward

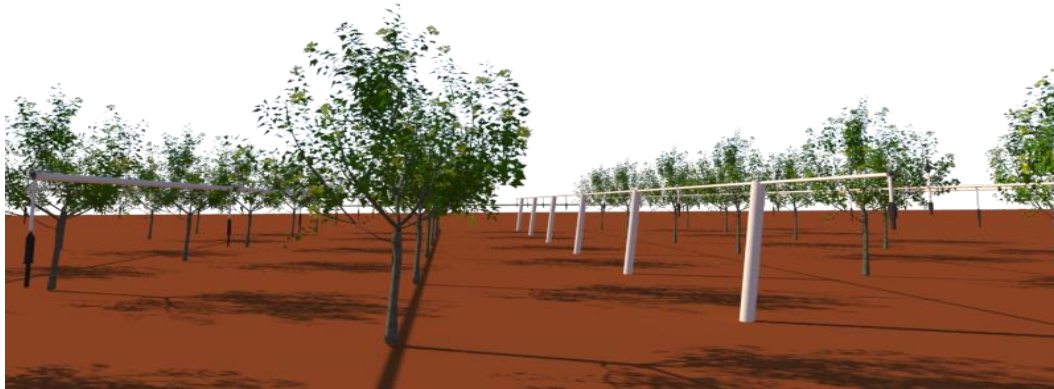
### **3 Other Configurations of Sprinklers**

In other configurations, the sprinklers are arranged as per the required positions where water and pesticides cover much more areas than traditional method. The three different configuration systems proposed are given below:

- 1} At between 2 rows but on height with 2 sprinklers
- 2} On Plants at Topmost Position
- 3} On Plants at Topmost Position But 2 Sprinklers at Position

#### **3.1 At between 2 rows but on height with 2 Sprinklers**

The sprinklers configuration at between 2 rows but on height with 2 sprinklers is presented in Figure 4.



**Figure 4:** *At between 2 rows but on height with 2 sprinklers*

The details of the sprinklers configuration at between 2 rows but on height with 2 sprinklers is mentioned below:

- 1] Position Between Two Rows: At Center Between Two Rows as well as columns
- 2] Height of Sprinklers: Equal to Plant
- 3] Distance From Plant Of Sprinklers: Equal From Both Sides Of Plants
- 4] No. Of Sprinklers at Position: 1
- 5] Pipes Height from Ground: With Respect to plant
- 6] Gravity Effects on Water Flow: Yes, But it advantage

- 7] Pressure Loss on Position: Less
- 8] Areas Covered of Plant: Top & Middle area is covered
- 9] Mode or Distance Covering Range: Grater than traditional
- 10] No. of Plants in range: 4
- 11] Direction of Sprinkler: Downward

### 3.2 On Plants at Topmost Position

The sprinklers configuration on plants at topmost position is presented in Figure 5.



**Figure 5:** *On plants at topmost position*

The détails of the sprinklers configuration on plants at topmost position is mentioned below:

- 1] Position Between Two Rows: On the plants at its topmost position
- 2] Height of Sprinklers: Depend on Plant
- 3] Distance from Plant of Sprinklers
- 4] No. of Sprinklers at Position: 2
- 5] Pipes Height from Ground: With Respect to plant
- 6] Gravity Effects on Water Flow: Yes, But as advantage
- 7] Pressure Loss on Position: Less
- 8] Areas Covered of Plant: Lower & Middle area is covered
- 9] Mode or Distance Covering Range: Less or Equal to traditional
- 10] No. of Plants in range: 1 & 2
- 11] Direction of Sprinkler: Downward

### 3.3 On Plants at Topmost Position with 2 Sprinklers at Position

The sprinklers configuration on plants at topmost position with 2 sprinklers at position is presented in Figure 6.



**Figure 6:** On plants at topmost position with 2 sprinklers at position

The details of the sprinklers configuration on plants at topmost position with 2 sprinklers at position is mentioned below:

- 1] Position Between Two Rows: On the plants at its topmost position
- 2] Height of Sprinklers: Depend on Plant
- 3] Distance from Plant of Sprinklers
- 4] No. Of Sprinklers at Position: 2
- 5] Pipes Height from Ground: With Respect to plant
- 6] Gravity Effects on Water Flow: Yes, But as advantage
- 7] Pressure Loss on Position: Less
- 8] Areas Covered of Plant: All area is covered
- 9] Mode or Distance Covering Range: Less or Equal to traditional
- 10] No. of Plants in range: 1&2
- 11] Direction of Sprinkler: Both

#### **4 Conclusions**

The study of three different sprinkler configuration systems is carried out in this paper. The three sprinkler configuration systems are compared amongst themselves and with traditional sprinkler. Based on the study, the utilization prediction of the sprinkler systems is given below:

- First Sprinkler Configuration System: Between 2 rows but on height, it can be used but the cost is more.
- Second Sprinkler Configuration System: On plants at topmost position- it can be only used for water.
- Third Sprinkler Configuration System: On plants at topmost position with 2 sprinklers at position- it can be used for water as well as pesticides.
- Hence the most suitable Sprinkler Configuration System is of 3rd type i.e. On plants at topmost position with 2 sprinklers at position

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