



Sprinkler irrigation

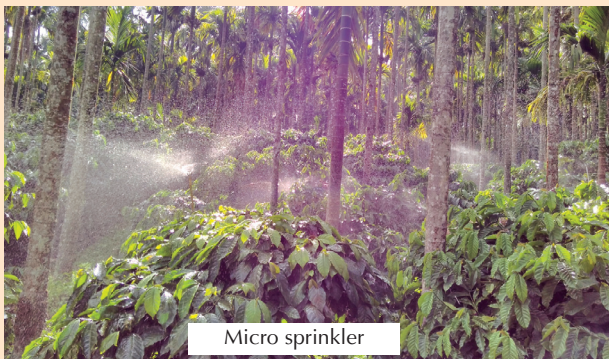
If the planter is having sufficient source of irrigation water, it is advisable for irrigation during winter, blossom and backing. If the water source is limited for irrigation, it is better to go for blossom and backing irrigation. However, in some case a planter is able to give only one time irrigation it is always advised to irrigate during blossom with 38 to 50 mm; wherever backing irrigation is not possible give foliar application of nutrient mixture along with plant growth regulator 15 to 20 days after blossom irrigation (Urea -1 Kg, Super Phosphate - 1 Kg, Muriate of Potash - 0.75 Kg, Zinc Sulphate - 1 Kg and 0.5 Kg Magnesium Sulphate + 75 ml Planofix (NAA) dissolved in 200 liter of water) during the dry period to reduce the drought stress of the plant. Spray solution required is 1 liter per bush. Spraying of this nutrition solution with mist blower is economical.

Beneficial effect of Sprinkler Irrigation:

Sprinkler irrigation resulted in a two-fold increase in length of laterals due to increase in number of nodes and internodal length. Providing blossom and backing irrigation alone improved yields by 48-57% and continuous irrigation throughout dry period gave a yield increase of 85 – 95% over un-irrigated robusta.

II) Micro sprinkler irrigation:

Micro-sprinkler proved good for inducing blossom and getting yield equal to sprinkler irrigation by consuming only 50-60% of overhead sprinkler irrigation water in Robusta. However, these methods can be adopted only in small areas but not on large areas due to some drawbacks like clogging of nozzles, non-shifting irrigation etc.



Micro sprinkler

III) Drip Irrigation:

The drip or trickle irrigation has assumed considerable importance in recent years in view of the greater need for economy in water use. In drip method, water is distributed by a network of tubing which brings water directly to each plant near the root system. Water is provided daily or on alternate days based on the water requirement of crops. Thus, the water losses during conveyance and due to seepage, evaporation etc., are avoided. Besides, the water is not applied to the unwanted areas like inter-spaces between the rows of plants. Thus, drip irrigation system offers greater savings in water. The other advantages of drip irrigation system include saving in labour, increased yields, better quality of produce, less weed growth, increased fertilizer efficiency, possibility of fertilizer application through irrigation water and reduced incidence of foliar pests.

IV) Irrigation for establishment of young coffee:

For successful establishment of young plantations, coffee should be irrigated during dry months to a depth well below the root



Drip fertigation unit

Drip laterals

zone and the intervals between two irrigations should be long enough without causing serious wilting to young coffee. This encourages deep rooting and also improves the anchorage of trees. If adequate water is available, young coffee can be irrigated at every 15-20 days interval during dry months with one inch irrigation. However, sprinkler irrigation encourages



Hose irrigation

excessive weed growth. Suitable measures like cover crops etc., can be adopted to suppress weed growth. In areas of limited water supply, it is advisable to go for sub-soil injection or hose irrigation once in 15 days with about 4-5 litres of water per plant.

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WATER HARVESTING AND IRRIGATION MANAGEMENT IN COFFEE



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Indian coffee plantations are located on slopes of hills as coffee cannot tolerate waterlogged conditions. But the inherent truth is that coffee plants love water and the geographical regions where plantations are located receive from a modest 1400 mm of rainfall to almost 3400 mm of average annual rainfall from 80-127 rainy days. Nearly 69-80% of rainfall is received only during the South-West monsoon period, from June to mid September. Most of the rainfall flows out of grower's field as runoff after fulfilling the surface retention, infiltration and saturation capacity of the soil. Nearly 50% of rainfall received during the monsoon flows as runoff accounting to 14 to 40 lakh liters of water from one acre in a year. The Coffee tracts of South India usually experience drought period of four to five months from November onwards. The prolonged drought period limits the production of coffee even in well managed estate and also affects the successful establishment of young coffee.

Among the two major species, Arabica coffee can withstand the dry conditions to a greater extent but Robusta is highly susceptible to prolonged dry weather. Besides this, insufficient or delayed blossom showers or failure of backing showers would adversely affect the yields of both Arabica and Robusta during any year. If blossom rains are delayed beyond March in case of Robusta and beyond April in case of Arabica, then the production receives a major setback. Thus, creation of the structures for harvesting the water for irrigation is mainly necessary for inducing normal blossom and to provide backing showers in mature coffee and also for successful establishment of young coffee. Hence, under the present drought scenario, all coffee growers must acquire sufficient knowledge about rainwater harvesting and harvest this valuable runoff water for critical operations like winter, blossom and backing irrigation and spraying for pest and diseases management to be carried out during the pre and post monsoon period. Besides this, rainwater harvesting helps not only to increase the water resources but also helps to recharge and improve ground water table.

The principle of rainwater harvesting is to conserve rainwater where it falls according to local needs and geographical conditions. Nevertheless, there are limits beyond which in-situ rainwater conservation cannot be stretched. Therefore, surface runoff capturing and its recycling as irrigation, hold key to stable and sustainable coffee production in India.

WATER HARVESTING OPTIONS:

A. In -situ water harvesting structures:

1. Contour bunding: It consists of building earthen embankments across the slope of the land, following the contour as closely as possible. A series of such bunds divide the area into strips and act as barriers to the flow of water, thus reducing the amount and velocity of the runoff. Contour bunds can save soils from erosion to the extent of 25 to 162 tones/hectare annually. It maintains soil fertility and increases water infiltration into the soil considerably.

2. Contour ridges: Contour ridges are ridges of soil that run along the contour. It slows down water flow and catch sediment before it is washed away. Planters should make small ridges (called "cross-ties") at right angles to the contour to make the contour ridges more effective at trapping water. These cross-ties prevent the water from flowing along behind the contour ridge and collecting at the lowest point – where it may break through the ridge and start a gully.

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Space the cross-ties 10 m apart (closer on steeper slopes and in areas with heavy rainfall).

3. Cradle Pit: On undulating lands, trenches or cradle pits should be opened across the slope during post- monsoon period. These are dug in a staggered manner in between the rows of coffee all along the contour. Trenches are dug 30 cm wide, 45 cm deep and of any convenient length. The cradle pits are short trenches measuring about 1 to 1.5 m long. Trenches and cradle pits act as mini compost pits for fallen leaves, weed biomass and dadap lopping besides conserving soil moisture and preventing soil erosion. The trenches/pits are to be renovated once in 2 to 3 years by removing the deposits and spreading them near by the surrounding plants.

4. Half moon micro catchments: Half moon micro catchments are small, semicircular earth bunds. The half moons catch water flowing down a slope. Coffee plants can be planted in the lower portion of the half moons, using conservation agriculture techniques. Other in situ water harvesting practices like cover digging, scuffling, mulching need to be adopted.

B. Ex-situ water harvesting structures:

1. Check dams: By constructing small check dams against streams, coffee growers can impound water for sprinkler irrigation during February/March as also prevent streams from carrying the silt to the rivers. It is also reported that check dams help in rejuvenating failed wells. Check dams, therefore, will be a boon to the coffee grower irrespective of whether he is a small or a big grower. There is tremendous potential to boost the coffee production and productivity through check dams.

2. Water tanks/farm ponds: A farm pond is a large opening dug out in the earth, usually square or rectangular in shape, which harvests rainwater and stores it for future use. It has an inlet to regulate inflow and an outlet to discharge excess water. The pond is surrounded by a small bund, which prevents erosion on the banks of the pond. The size and depth depend on the amount of land available, the type of soil, water requirements, the cost of excavation, and the possible uses of the excavated earth. Water from the farm pond is conveyed to the fields manually, by pumping, or by both methods. A tank must be located always at lower elevation of the field so as to enable diversion of all the water generated from runoff water on estates. Provide water channels along the coffee estate and connect them to tank. All water channels must be provided with grass lining or grass barriers and catch pits at regular intervals to avoid silting of tank and also to prevent soil loss from estate. The suggested size of the water tank / farm pond is presented below.

Size of Holding (Ha.)	Recommended inner Dimension (LxBxH)	Capacity of the water tank (cft)
1.00 ha	30 x 30 x 10 ft	9000
2.00 ha	43 x 43 x10 ft	18490
5.00 ha	68 x 68 x 10 ft	46240
10.00 ha	100 x 100 x10 ft	100000
20.00 ha	126 x 126 x 12 ft	190512

(Coffee Board 12th Plan DSS guideline)

IRRIGATION MANAGEMENT IN COFFEE:

Coffee is predominantly cultivated as a rainfed crop worldwide. In equatorial regions such as South and Central America rainfall is received almost every month. Under such conditions, coffee generally does not require irrigation. But the coffee growing regions in India and other Asian countries experience pronounce wet and dry conditions in a year in these areas, the coffee berries develop during rainy season and mature in dry season, when the

conditions are ideal for harvesting and sun drying of crop. After harvest, the coffee flower buds are usually semi-dormant for a period of three months coinciding with the cool, dry winter season. Rain or irrigation at this stage, induces anthesis of buds which open usually within 8 to 10 days. Prolonged drought and inadequate showers provoke retardation of growth and production of star and snake mouthed flowers. An analysis made on rainfall and potential evapotranspiration at CCRI & CRSS has indicated that even though the rainfall is surplus during monsoon, the water deficit accounts during winter and summer months. The coefficient of variation of summer rainfall is about 300%. Thus, irrigation is mainly required for inducing normal blossom and to provide backing showers in mature coffee and also for successful establishment of young coffee.

Critical Periods in Coffee for Irrigation

The critical periods of coffee growth and development falls usually towards the dry seasons of any year. The most critical periods of coffee are

- Blossom and Backing period
- Berry expansion stage
- Dry matter development and bean filling stage

Preparation of coffee for irrigation:

- This is essential for getting proper response to irrigation.
- Over crowded and old coffee under thick shade should be avoided.
- Preference should be given to younger and more responsive coffee.
- Shade should be well regulated and coffee pruned every year after harvest.
- Short-hole borer affected, dead twigs and whippy wood are to be removed.
- Weed growth has to be checked.

Types of Irrigation:

I) Sprinkler irrigation for blossom and backing:

Sprinkler irrigation is the most versatile method of irrigation to supplement the natural rain fall for the growth and blossoming of coffee. In sprinkler irrigation the water application resembles natural rainfall. Water is sprayed under pressure through small orifices or nozzles and is uniformly applied all over the plant and land surface.

- a. First winter irrigation needs to be commenced during 20-25 days after the cessation of monsoon. Irrigation is to be given at the rate of 25 mm once in 20-25 days till the end of December.
- b. Later blossom irrigation @ 25-40 mm is to be given during the second fortnight of February followed by backing irrigation of 25 mm water within a gap of 15-20 days after blossom.

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