

# Methods of Irrigation in Coconut Gardens

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Coconut is mainly grown as a rainfed crop in Kerala. Though the state comes under high rainfall zone, palms suffer for want of water during summer. There are plenty of water resources in Kerala. In spite of this, only less than 12 per cent of area is under irrigation. Development of irrigation infrastructure is less in the state. As the palms are perennial in nature, unless there is severe drought due to failure of monsoon, the palms do not die. But the stress symptoms like immature nut fall, leaf petiole breakage etc., are seen very commonly in Kerala. The poor water holding capacity of the major coconut growing soils (laterite followed by sandy) aggravates the situation. Thus as the period progresses, the palms instead of getting stabilized, starts declining in production. To overcome this, the palms should be irrigated. Though there are many methods of irrigation available, all the methods due to one or other reason do not suit well to coconut as coconut is being grown in different kinds of soils. Here in this paper the different methods of irrigation, the problem associated with each system and the

best-suited method are discussed.

## **Flood irrigation**

This is the kind of irrigation, which was predominantly in use in earlier days before the micro systems of irrigation were introduced. However this practice of irrigation is still in use in some of the coconut growing areas of Tamil Nadu, Andhra Pradesh and Karnataka. If there is enough water, then we can go in for flooding but there are many problems associated with this type of irrigation

i) Large quantity of water is required for meeting the water requirement of the palm.

ii) If the soil is too porous then the possibility of deep percolation of irrigation water and leaching of the nutrients from the root zone exists.

iii) In clay soil flooding results in difficulty in carrying out the various cultural operations immediately after the irrigation.

iv) The energy cost in terms of electricity increases.

v) No uniform wetting of the soil.

vi) Critical land preparation is required for this kind of irrigation.

If some inter crops are grown, the water wastage will be less, provided the inter crops do not interfere in the flow. The quantity of water required will be around 50,000 to 75,000 liters per ha per

day (However flood irrigation is not a daily irrigation practice and it will be applied once in a week or so depending upon the quantity of water available in the source, soil type and climatic factors.)

## **Sprinkler or perfo irrigation**

Perfo irrigation is a kind of sprinkler irrigation, where small holes of fixed number and size are found throughout the pipe length through which water is forced out in small sprinkles that wets the garden (*Fig.1*). To irrigate one hectare garden we require approximately 200 to 300 meters of aluminum pipe. Since the system works on the high pressure the motor should run continuously till the completion of irrigation. The over head sprinkler will be of much use when grass or any other inter crops are grown in coconut garden whose height is less than the sprinkler. If the sprinkler head is lower than the inter crops the water distribution is blocked or affected.

Experiments conducted at Central Plantation Crops Research Institute at Kasaragod in red sandy loam soil revealed that irrigation is required from December to May and the water applied at the rate of 20mm at  $IW/CPE=1$  is sufficient to produce viable yield (*Table 1*). This 20mm of cumulative pan evaporation will reach once in 4 to 5 days during the irrigation period December to May under north Kerala conditions.



Fig. 1. Perfo irrigation

### Favourable features of perfo irrigation

- i) Ideal microclimate is maintained in the garden.
- ii) Uniform wetting of the soil.
- iii) The inter crops grown can be irrigated without any hindrance to the system of irrigation.
- iv) Best suited for the high density multi-species cropping system where no other system performs better.

### Drawbacks

- i) Initial investment is more.
- ii) Sediment in the irrigation water will affect the irrigation by clogging the small pores.

iii) It is impossible to create the required stress for some crops, which are grown along with coconut as mixed crop.

iv) If the area is open and the wind velocity is more, the water applied will be easily carried away in drift form.

v) More weed growth is found since the entire land area in the garden is irrigated.

### Basin irrigation (hose irrigation)

This is also a type of flood irrigation but applied through hose in the coconut basin area of 1.8m radius, where only limited area of the coconut field is wetted (Fig.2).

However the water speed is not controlled and the speed with which water comes in the hose is applied as such. This is the general practice of irrigation in Kerala (wherever irrigated). By this method, application of 200 liters of water once in 4 days in the coconut basin, is sufficient to bring about significant yield in coconut.

This system has a few a good features.

i) There is water saving in this method compared to flood and perfo method of irrigation as only limited area is irrigated.

ii) Uniform quantity of water can be applied.

The characteristic problems associated with this method are

1) More water is consumed compared to drip irrigation.

ii) Costly as main and hose pipes are required.

iii) A large amount of irrigation water will be wasted if hose irrigation is practiced in sandy soil.

iv) More weed growth is seen in the basin area.

### Drip irrigation

It is a micro irrigation in which water is applied at a rate at which the trees can take up (Fig.3). It is suited to any type of soil either very porous or less porous but is a boon for the very porous soils and for the undulated topography where any other type of irrigation will lead into lot of wastage of water and energy. This can be applied on above or beneath the soil.

The drip or trickle irrigation has some characteristic features:

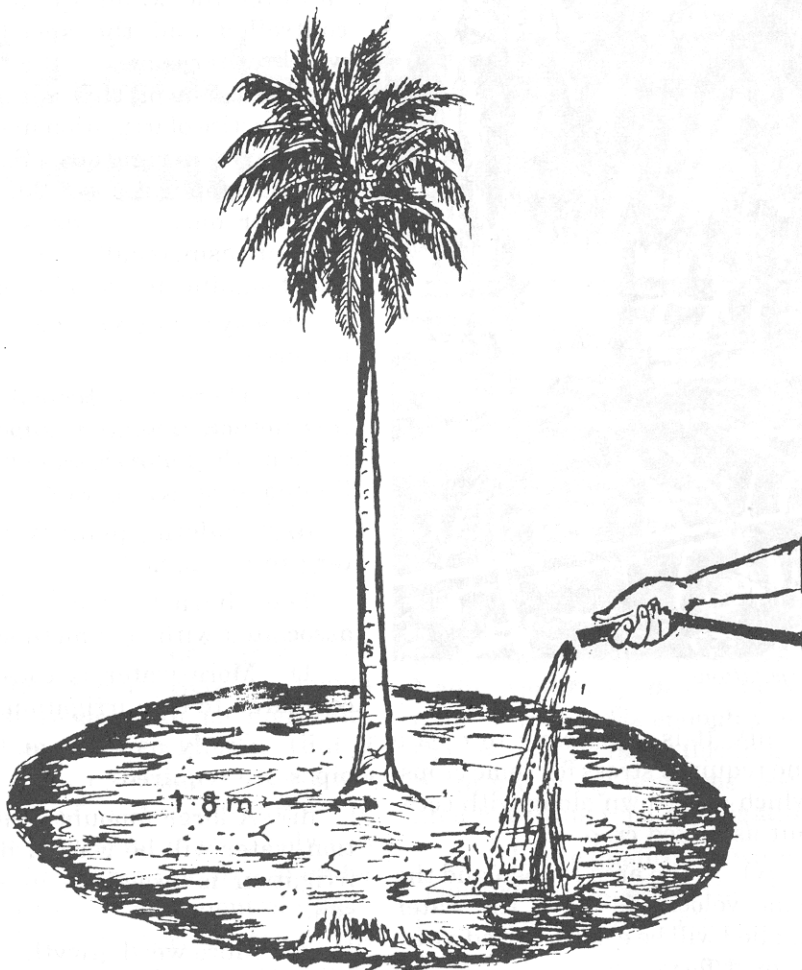
i) Application rate is low (2 to 4 litres per hour per emitter)

ii) Water is applied over a long period to meet the water requirement

iii) To avoid wastage and to

**Table 1. Cumulative nut yield upto 16 years in relation to depth and interval of irrigation**

IRRIGATION DEPTH (mm)	IW/CPE RATIO			MEAN
	1.00	0.75	0.5	
20	918	872	637	809
40	834	783	776	798
60	769	698	741	736
Mean	841	784	718	-



**BASIN IRRIGATION**

Fig. 11

**Table II. Irrigation requirement and their comparison in different methods (irrigation requirement for six months period from December to May for one hectare)**

Sl. No.	Irrigation method	Irrigation Requirement (lakh liters)	% Saving compared to	
			Flood/Perfo	Basin
1.	Flood irrigation*	89.00	-	-
2.	Perfo irrigation	89.00	-	-
3.	Basin irrigation	15.75	76	-
4.	Drip irrigation	10.08	85	36

\* To accomplish flood irrigation 30-40% more water is required

suit the infiltration rate the water is applied at frequent intervals

vi) Water is applied near or into the plant root zone

There are many potential ad-

vantages in the drip irrigation system

i) More land area can be brought under irrigation as 30-40percent of water can be saved

in drip irrigation over other general methods of irrigation.

ii) Better growth and yield of the palm as soil water is maintained at field capacity everyday and due to the reduced effects of variation in texture and water holding capacity in heterogeneous soils.

iii) Better method of fertilizer and other chemical application.

iv) Limited weed growth as there is partial soil wetting.

v) Decreased energy requirements both in terms of electricity and human labour.

iv) Minimum tillage practice can be easily adopted along with trickle irrigation as dry areas are available.

Experimental evidences indicate that drip irrigation with 4 emitters in laterite and 6 emitters in sandy soil applied at the rate of 66 percent of open pan evaporation is sufficient to produce an yield equivalent to irrigating at 100percent of Ec through drip and basin irrigation under Kasaragod conditions which comes to 32 litre per palm per day.

Out of various methods of irrigation for coconut, considering the prevailing situation, the drip irrigation is found to suit well with minimum disadvantages. Under drip irrigation 36percent of water saving compared to basin irrigation and 85percent saving compared perfo/flood irrigation can be accomplished (Table II) ensuring same yield or a better yield compared to other methods. Though basin irrigation is also a method where in limited area is wetted but the rate of application does not fit well to all kinds of soils. Thus the quantity of water application has to be changed according to the kind of soil.



Fig. III

annuals and biennials in tolerance capacity i.e., their life cycle extends over a long period and thus we cannot critically pin point which stage is affected more and even if affected in one season, it can recover in the ensuing wet season. Thus the coconuts which are predominately grown along the coasts of Kerala, Andhra Pradesh, West Bengal, Orissa etc, can be irrigated with sea water for its sustainable productivity.

The availability of fresh water in the islands for irrigation purpose is very limited but nature has blessed with two favourable situations i.e., abundance rainfall and porous soils which enables sea water irrigation in the Islands like Andaman and Nicobar group of Islands and Lakshadweep in India and in other countries like Maldives and Sri Lanka. The response for irrigation in coastal sandy soils is tremendous. Coconuts can tolerate a pH of 8.5. Since the coasts are fed with high rainfall the accumulated salt due to seawater irrigation during summer months can be easily washed away from the root zone during the wet season.

Results of the experiment conducted at CPCRI, Kasaragod has explained that soil Ec build up due to summer irrigation with sea water (Table III) comes down to a level equal to that of no irrigation (Control) during December. Thus the experimental result has proved beyond doubt that the sea water can be used for irrigation in the sandy soil without any deleterious effect on the palms and soil. The yield can also be increased from 12 to 27 nuts per palm per year.

**Table III. Effect of sea water irrigation on Ec ( $\mu$  mhos/cm) in sandy soils**

Sl. No	Treatment	Ec of soil (Mean for 0-100 cm depth)	
		May	December
1	No irrigation	338	122
2	100% Sea water	1432	138
3	75% Sea water	1276	158
4	50% Sea water	1132	105
5	25% sea water	785	152
6	100% Well water	112	269

### Sea water irrigation

The use of quality water for irrigation is of paramount importance for agricultural crop pro-

duction. However crops differ in their tolerance to poor quality irrigation water. The perennial crops have advantages over the