# Trickle Irrigation for Homestead Gardens and Small Holdings Under Coconut

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The concept of surface trickle, often called drip irrigation, has spread from Israel to Australia, North America and South Africa by late 1960 and eventually throughout the world. Drip irrigation experience proved beyond doubt that this suits better for the wide spaced crops. Thus, coconut being a wide spaced crop enjoys the advantages of this system. Any user of drip irrigation should recognize that this method has both advantages and disadvantages and the success of this method depends on the maintenance of this system.

In major coconut growing states particularly in Kerala the crop is grown in small holdings and homestead gardens. There are about 5 million coconut holdings in the country with 98 percent of such holdings having size of less than 2 ha. In Kerala state alone there are about 2.5 million holdings with 90 percent of the holding falling within the category of one hectare and less (P.K. Thampan, 1989). Consequent of this uneconomic size of the holdings the farmers necessarily have to explore maximum benefit from the available land under coconut in addition to the extra income in terms of intercrop and a job outside.

## When to Introduce Drip

This system can be introduced at any time but earlier the better because the total effect of better management from the beginning of planting can never be obtained when this is introduced at later stage. However a common doubt exists among the farmers especially Tamil Nadu farmers, that introducing drip irrigation at planting, the root development will get affected thus in the later stage the anchorage gets weakened. As the coconut seedlings are planted deep, due to rains in the rainy season and as there is chances of changing the position of

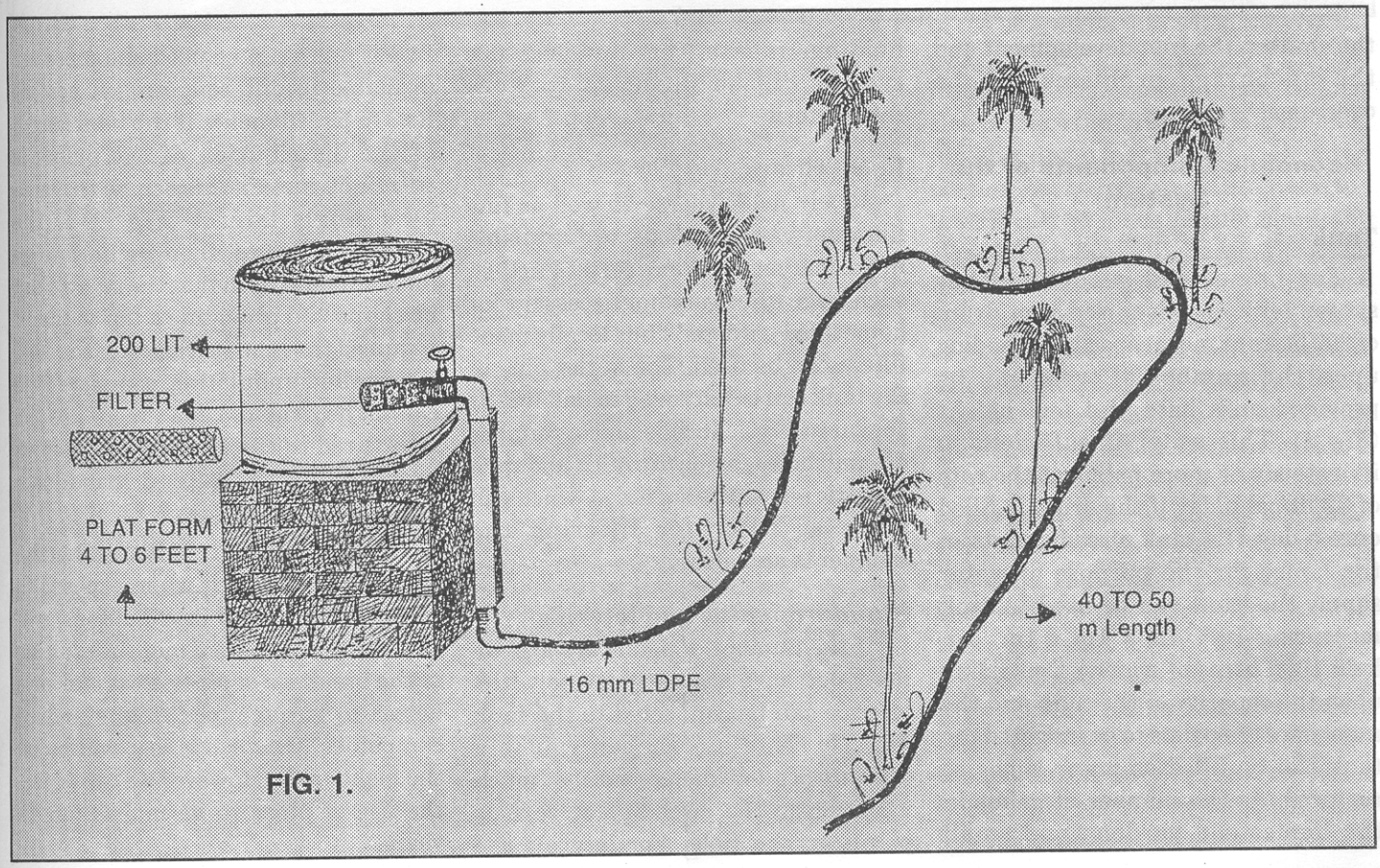


FIG. 1.

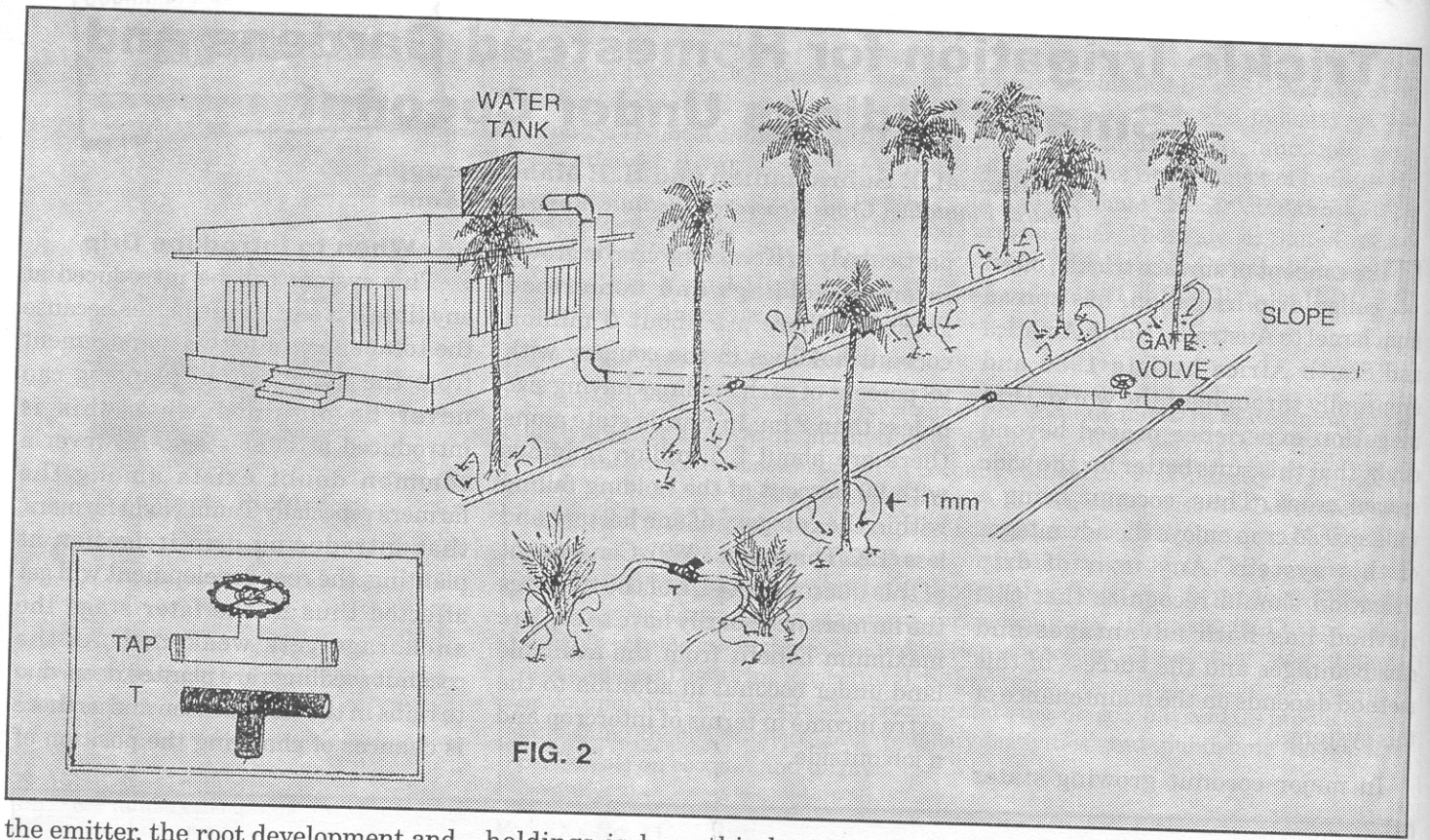


FIG. 2

the emitter, the root development and the anchorage problems can be overcome.

## Economic Components of the System

### Tank

For homestead gardens either syntex tank or galvanized iron drum of 200 litres or more capacity depending upon the number of trees can be provided on a base of 4 feet height (*Fig 1*). This water is sufficient to irrigate six or more palms at the rate of 32 lit/palm/day if the drum is filled once a day. If a tank already exists in the house for the purpose of water supply the same can be used {a tank measuring $1m^3$ (1m x 1m x 1m) can hold 1000 litres of water.} Depending upon the capacity of the tank and the number of the palms to be irrigated the tank can be filled as many times as required. As the number of palms in the homestead gardens and small holdings is less, this low pressure system will be sufficient to work satisfactorily.

### Local filters

Ready made coarse as well as fine filters of various makes are available in the market which are costly. Further, such huge filters are not necessary for homestead gardens. Thus locally made filters can be used. The outlet pipe in the tank can be extended to half feet as shown in *Fig 1*. In this pipe a number of small holes can be provided and then a plastic net can be encircled which will serve as filter for filtering the sediments and algae.

### Standard mains and laterals

If the number of palms are less we need not have mains separately, the laterals can be connected to the tank directly. The laterals can run to a distance of 40-50 meters without much variation in the discharge at various points in the field. For laterals the LDPE pipes can be used and pipes are available in different ranges, costing Rs 3 to Rs. 10/meter. If the total length of the distribution of the palms is within 50 meters this can be irrigated by a single lateral (*Fig 1*). If the distance is more, then we have to go for mains and from that the laterals can be connected providing a tap so that if required that can be closed. If the field is large and undulating, complete field cannot be irrigated at a time. Thus the taps fitted to the laterals will help us in controlling the water distribution.

### Quality of materials

The low cost materials are often the recycled ones which when exposed to sun and field weather conditions, will get damaged within a month resulting in the breakage of pipes. So it is always better to go for pipes from standard companies, where the cost will be on the higher side. However we can expect the life of pipes to be more than 12 years.

**Zero pressure flow / Laminar flow**

Either emitter or micro tube is used for water to drip or flow to the palms (laminar) depending on the design and operating pressure. Since the main purpose of drip irrigation is allowing the water to flow at a rate in which the trees can take up, the emitter should be designed to allow the water to flow at a rate of 2 to 4 litres/hour for coconut palms. However the emitter clogging is a universal problem and the emitters clog inspite of using filters. Thus if there are very few trees where we can give personal attention daily then we can go for emitters. If there are more than 10 palms where enough attention cannot be given daily, then we can use microtubes (1 mm OD) instead of emitters where the clogging will be less because of the laminar flow.

**Emitter clogging**

It is directly related to the quality of the irrigation water, *i.e.*, suspended load, chemical composition and microbial activity. Consequently all these factors are responsible for clogging. Clogging problems are often site specific and the solutions are not always available. Clogging of emitters often discourages the operators and consequently causes the abandonment of the system. Thus we should be ready to use this system which has more advantages than the problem of clogging.

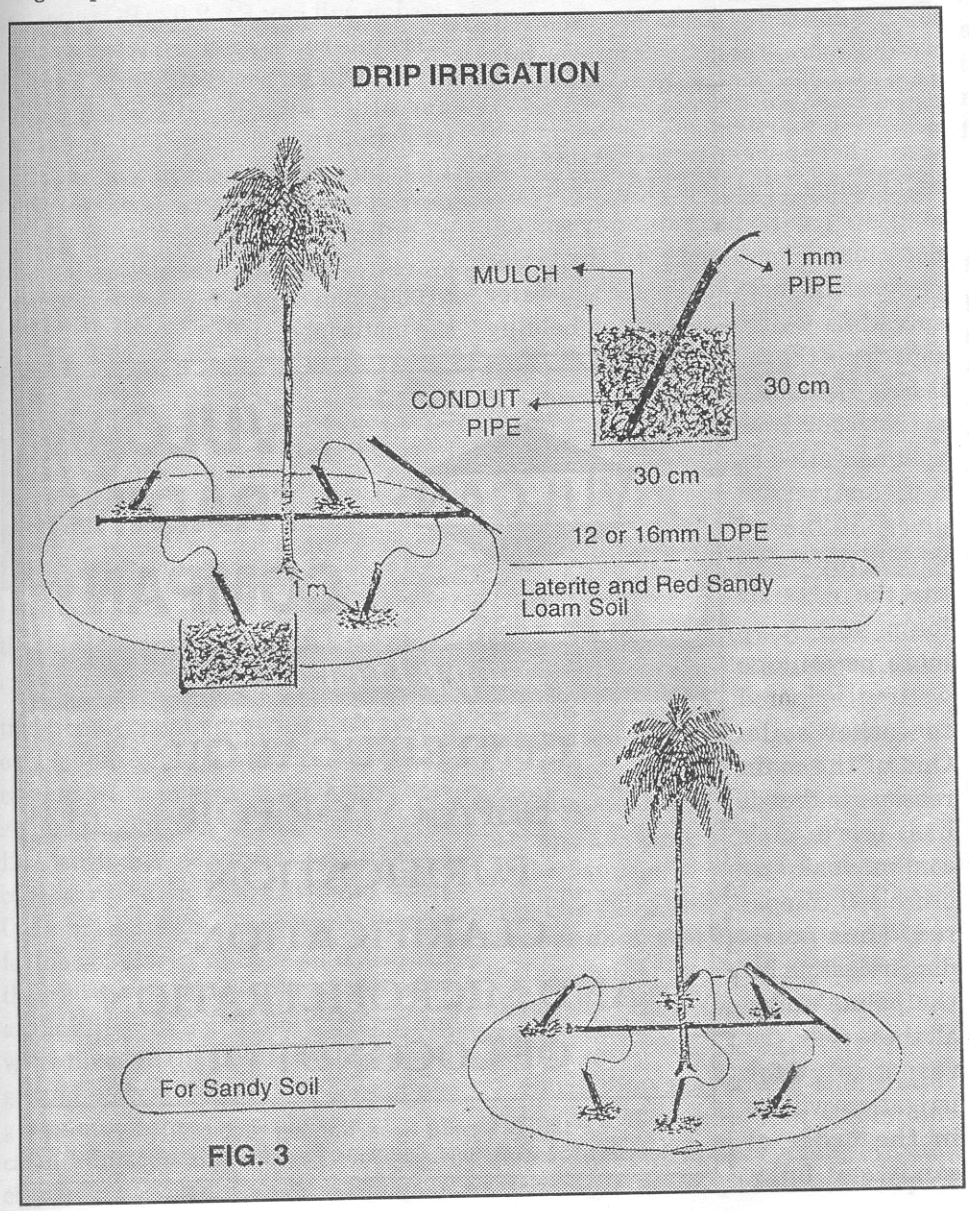

FIG. 3

**Layout of drip system**

If there are more number of palms (more than 8) in a line with 7.5m spacing between the palms then it is better to install the tank in the centre of the field. If the house tank is used then there is no alternative and water regulation can be made by adjusting the flow in the laterals by cutting the supply in some laterals (*Fig 2*). If the area is sloppy then we can provide a gate valve in the main and the half of the garden can be irrigated at a time. This can be done by putting taps even in the laterals so that when the portion away from the tank is irrigated the taps in the laterals near to it can be kept closed. Once the irrigation is completed for the down portion the elevated portion can be irrigated. Otherwise the lateral can be made to run across the slope for uniform discharge. For small holdings the same thing can be followed by increasing the capacity of the tank or filling the same tank more than once. The advantage of this system is that, it can be operated even in the night time once the tank is full. Drip irrigation is no doubt a labour saving method but at the same time we should not forget this also needs some labour for checking the clogging. Some of the problems are site specific, for example there is chance for the damage of the laterals by animals such as dogs, fox, or squirrels. In that case the laterals can be buried at 1 to 1.5 feet deep inside the soil. Before burying the laterals, the microtubes of sufficient length should be attached to the laterals.

**Table1 : Moisture distribution pattern in coconut basin under drip irrigation**

| *Soil Type* | *Water Spread* | | *% Active Root Zone Wetted** |
|---|---|---|---|
| | *Horizontal* | *Vertical* | |
| Laterite Soil | 60 | 100 | 28.8 |
| Red Sandy Loam | 61 | 115 | 31.0 |
| Sandy Soil | 34 | 110 | 10.2 |

**For four emitters*

### Emitter/Microtube placement in the coconut basin

Coconut basin generally means 2 m radius from the centre of the bole all around the palm. Studies on the coconut root absorption indicate that 0.75m to 1.25 m away from the bole is the active absorption zone and hence it is recommended to place the emitter/ mircrotubes in the centre of that area (1m away from bole). Suppose if you are allowing the water to drip on the surface it leads to evaporation losses where a good amount of water is lost, Therefore it is advisable to allow the water to drip at 30 cm depth. This is achieved by making a pit of 30 $cm^3$. A conduit pipe of 40 cm is placed diagonally and the water is allowed to drip in that pipe. The pit should be filled with locally available mulch. The pit can be filled with coir pith also, if available nearby.

### Water spread

It is important to know before hand how much per cent of the root zone is wetted by one dripper. Because, all the water required by the palms cannot be absorbed by wetting a few roots. Studies have indicated that a minimum of 15 to 20 percent of the active root zone should be wetted to absorb the water required by the palms. Results of the experiment conducted at CPCRI has shown (water spread from a single point source) that at least four emitters are required for the laterite and red sandy loam soil, whereas for the sandy soil six emitters are required (*Fig 3*).

The reason for increasing the number of emitters for the sandy soil was the horizontal spread which was only about 50 percent of that of the laterite and red sandy loam soil and the wetted volume of active root was only 10.2 percent for four emitters (*Table*). The wetted volume with six emitters was 15.1 percent. Experimental experience revealed that having 4 emitters for the littoral sandy soil did not cause much impact on the better performance of the palms as the water spread as well as the water holding capacity of the soil is less. Estimated active root zone volume wetted by four emitters is given in *Table I* which indicates that the red sandy loam soil have more percentage wetting compared to other soils. One of the main reasons is that it has more clay content than any other soil compared. Thus providing irrigation for the palms under all these soils, the response for irrigation will be in the order of sandy soil followed by laterite and red sandy loam soil.

### Economics

Under the present socio economic condition in which the labour is not only costly but also scarce, it is always advisable to adopt less labour intensive technologies. Adoption of drip irrigation is one among them through which about 80 mandays of labour per hectare (worth about Rs. 8000) could be saved, compared to the conventional basin irrigation system.

Laying out drip irrigation in littoral sandy soil under stabilized coconut garden will pay Rs. 2.02 (BC ratio) for every one rupee spent and the pay back period will be between 2 and 5 years. For other soils by introducing drip irrigation from the time of planting the BC ratio will be 1.15 to 1.6 and pay back period is about 6 to 8 years. The installation cost for the drip irrigation system will be approximately Rs. 100 to 200/palm depending on the area and the material cost.