



Drip fertigation for coconut

Fertigation, which is a widely adopted practice in Israel and other advanced countries, is an efficient method of fertilizer application through drip system. Drip fertigation increases the fertilizer use efficiency, saves fertilizer costs, reduce labour requirement, supply nutrients uniformly and precise dose directly to the root zone.



Drip irrigation is an efficient method of providing irrigation water directly into the root zone of plants and it permits the irrigation to limit the watering closely to the crop water requirements of crops. 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 to wastage of water and energy. This can be applied on surface or sub surface of the soil. The system has overall application efficiency around 90% as compared to 25-30% for surface irrigation.

Potential advantages in the drip irrigation system

- i) More land area can be brought under irrigation as 30-40% of water can be saved in drip irrigation over other general method of irrigation.
- ii) Better plant growth and yield as soil water is maintained at field capacity everyday and due to the reduced effects of variation in texture and water holding capacity in heterogenous soils.
- iii) Better fertilizer and other chemical application.
- iv) Limited weed growth as there is partial soil wetting only.
- v) Decreased energy requirements both in terms of electricity and human labour.

Components of drip irrigation in the field

Tank/Pump:

For homestead gardens i.e., gardens with 20 to 30 palms overhead

tank in the houses can be used for drip irrigation. Based on the number of palms we can fix tank size. A tank size or 1x1x1 m will hold 1000 litre. Depending on the area, the water requirement of palms changes.

Main line :

For main lines either PVC or HDPE pipes can be used. It is better to burry the main pipes at a depth of 1½ to 2 feet below the soil surface. So that, the operations like ploughing, fertilizer application etc. can be done without any hindrance during rainy season. Further the life of the pipes will be longer if we bury. PVC pipes ranging from 2 to 4 inches size can be conveniently used or HDPE pipes of 2 to 3 inch can be used.

Laterals :

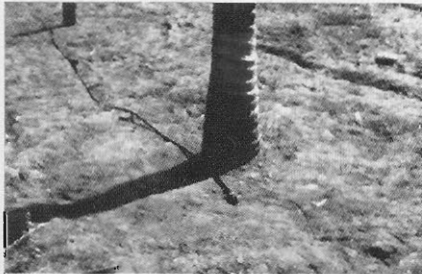
These are the pipes which runs along the rows of the palm. The size of the lateral will vary from 12 to 16 mm depending upon the pressure requirement. Care should be taken to avoid the use of recycled laterals as the life period may not come more than one year. Use only original good company pipes as laterals. The life of which may come up to 7-10 years. These laterals also can be buried in the soil at 20 cm depth when in use and can be coiled and tied on the trunk of the palms during off-season.

Emitter/Micro tube placement in the coconut basin

Coconut basins generally means 1.8 to 2 m radius from the centre of the bole all around the palm. Isotopic study on the coconut root indicates



that 0.75 m to 1.25 m away from the bole is the active absorption zone and hence it is recommended to place the emitter/micro tubes in the centre of that area (1m away from bole). Suppose if the water is allowed 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 cm³. A conduit pipe of 40 cm is placed diagonally and the water is allowed to drip in that pipe at 30 cm depth. The pit should be filled with locally available mulch preferably coir pith.



Micro tube placement in sandy loam soil

Water spread

In trickle irrigation the soil water distribution for different soil is an important factor to be understood before initiation of irrigation as the volume of roots wetted has relationship with the quantities of water and nutrient uptake. Soil water distribution is determined by the soil properties and the way the water is added and withdrawn from the profile. A minimum of 15 to 20 percent of the active root zone should be wet 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 to wet adequate volume of active root zone.

Quantity of water

Under Kasaragod conditions 32-40 liters (66% of open pan evaporation) of water/palm/day can be applied through drip irrigation based on the open pan evaporation. Actual irrigation should be started in the month of November when the soil moisture depletes to 50% of available soil moisture (ASM).

Cost of Drip System

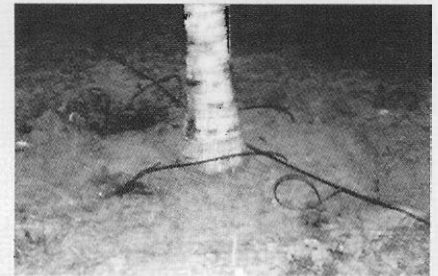
The cost of drip system including installation will be Rs. 130 to 150 per palm (exclusive of pump) which works out to Rs. 23000 to 26000 approximately of coconut garden with 4 emitters per palm.

Fertigation

Fertigation, which is a widely adopted practice in Israel and other advanced countries, is an efficient method of fertilizer application through drip system. Drip fertigation increases the fertilizer use efficiency, saves fertilizer costs, reduce labour requirement, supply nutrients uniformly and precise dose directly to the root zone. Correction of micronutrient deficiencies is also possible. Soluble fertilizers viz., urea, di ammonium phosphate (DAP) and potassium chloride can be combined and supplied through drip irrigation. The other possibility is to use liquid fertilizers which are highly soluble, hence no interference and no clogging except for the high cost. Potassium plays a specific role in the mechanism of opening and closing the stomata and thus adequate potassium helps in reducing the water loss by transpiration.

Fertilizer solubility

An essential pre-requisite for the solid fertilizer use in fertigation is its complete dissolution in the irrigation water. Examples of highly soluble fertilizers appropriate for the fertigation are ammonium nitrate, potassium chloride, potassium nitrate, urea, ammonium monophosphate and potassium monophosphate. The solubility of fertilizers depends on the temperatures. DAP also has good solubility which is mainly used for supplying phosphorous and nitrogen.



Micro tube placement in sandy soil

Practices of fertigation

To capitalize on fertigation benefits, special care should be taken in selecting fertilizers and injection equipments and maintenance of the system,

Fertilizer injection methods

The three methods of injection are:

I. Pressure differential (by-pass tank)

A pressure differential tank system is based on the principle of a pressure differential created by a valve, pressure regulation, elbows or pipe friction in the mainline. The pressure difference forces the water to enter through a by-pass pipe into a pressure tank that contain fertilizer and to go out again, carrying a varying amount of dissolved fertilizer. The application of nutrients is quantitative, therefore is adapted for perennial crops like



citrus, fruit trees and/or crops grown on heavy soil. Its cost is around Rs. 8000 for 120 lit capacity tank.

II. Vacuum injection (Venturi)

This method uses a venturi device to cause a reduced pressure (vacuum) that sucks the fertilizer solution into the line. It is very simple to operate, no moving parts, easy to install and maintain and suitable for both proportional and quantitative fertilization.

In this system, it requires pressure loss in main irrigation line or a booster pump, quantitative fertigation is difficult and automation is difficult.

III. Pump injection

Pumps are used to inject the fertilizer solution from a supply tank into the line. Injection energy is provided by electric motors, hydraulic

motors (diaphragm and piston). It has advantages like very accurate, for proportional fertigation, no pressure loss in the line and easily adapted for automation. Expensive and complicated design including a number of moving parts, so wear and breakdown are more likely.

Fertigation time and frequency

In a year, six times or more, fertilizers can be applied in equal splits depending on the rainfall period. However, fertilizers should not be applied during heavy rainfall season. Findings of CPCRI indicated that 50% of the recommended dose of fertilizer (NPK) when applied through drip fertigation is sufficient to produce an yield equivalent to 100% of the recommended dose of fertilizer (NPK) applied through conventional method. The fertilizers were applied through a

by pass tank to the palms. Fertilizers viz., 70 g Urea, 60 g DAP and 170 g muriate of potash are recommended for single dose per palm (Like this six doses are to be given to the palms which are to be applied from December to May at monthly intervals for Kerala conditions). For Phosphorus application, commercial phosphoric acid can also be used.

Facts about drip irrigation for fertigation purpose

Though Fertigation is possible by drip, sprinkler and other irrigation methods, for plantation crops like coconut, arecanut etc. fertigation is most suitable/economical by drip irrigation as these crops are widely spaced. If fertigation is adopted by sprinkler irrigation, more water and nutrient will be lost.

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