

Functional linkages and stakeholder interface for improved performance and sustained use of drip irrigation technology in coconut farming

Thamban, C., Mathew, A. C., Subramanian, P. and Jayasekhar, S.
ICAR- Central Plantation Crops Research Institute, Kasaragod

Introduction

The scientific approach for efficient crop production and higher yield emphasise optimum utilization of the available water. It is all the more important under the present day context wherein water supply situation is worsening due to a growing demand for water for domestic, industrial and agricultural sectors. Hence, the approach should be 'more crop per drop'. Drip irrigation, also known as "trickle" irrigation, is the method of water management that can be employed to put into practice 'more crop per drop' approach.

Under drip irrigation system, water is carried to the plant under low pressure, through small diameter plastic pipes and delivered at the root zone, drop by drop through drippers. Drip irrigation is widely practiced and established method of irrigation in developed countries and is slowly gaining popularity in India. It is most suited for horticulture crops including coconut. The system has its advantages and limitations. Its advantages are in terms of savings of water (50-60%) of that required for flow irrigation, effective use of fertilizers, less labour and energy cost. The limitation for adopting of this method is its high initial cost which is beyond the purchasing capacity of small and marginal farmers and thus mainly adopted by large farmers. As a policy to encourage adoption of drip irrigation systems, the Govt. of India under Centrally sponsored Scheme for small and marginal farmers to increase irrigation, provides subsidy to the extent of 50% of the cost of the equipment, the balance is made available by institutional credit.

Designs of drip irrigation system

The design of a drip Irrigation system involves estimation of the following parameters.

1. Area to be irrigated, type of plants, their spacing and numbers per hectare.
2. Peak water requirement of a plant per day. For estimation of total water requirement for a given area, the number of emitters required per plant, amount of water discharged per hour through each emitter and the total number of hours water is available should be known/estimated.
3. Design of Main and Lateral Drip Lines. This depends upon friction head loss which in turn is governed by the type of plantation/crop and field configuration.
4. Water required to be pumped from the well. This depends upon hydrogeological conditions in the area and water requirement of plants/crop
5. Horse Power of Pump set. This depends upon discharge and total head including friction losses over which water is to be lifted/pumped.

The design, number of emitters required for plant and their discharge are important factors in designing a drip irrigation system. Various emitters are designed for controlled release of water to the plants. It is necessary for manufactures of drip system to state optimum operating pressure and discharge and the emitter is so selected that application rate equals to the absorption rate of



soil so that no water stagnation takes place on the surface of the soil. In some systems a short length of flexible plastic tubing of small diameter is used as emitter. This tubing is generally of 0.96mm diameter and is inserted through holes in walls of the laterals. This is commonly known as micro tube system.

Layout of drip system

The main line in a drip system should follow land contour as closely as possible. If there is a slope, compensation should be made for pressure differences due to change in elevation. A fall of 1 m in elevation is equivalent to an increase in pressure of about 0.1 atmosphere. Where main lines are laid down on a slope, the increase in pressure due to elevation change may partly compensate the friction head loss. To provide nearly uniform pressure at each emitter, the tubing should be of sufficient diameter to avoid excess friction losses. The water delivered in the supply line is released through emitters spaced along the supply line.

The allowable pressure drop in mainline and laterals depend upon the operating pressure required at emitters. The pressure difference between the proximate and distant point along the supply line should not exceed 20% which will keep the variation of discharge within 10 of its value at the first emitter.

Drip irrigation in coconut gardens

Lack of irrigation is one of the major reasons attributed to the low level of productivity of coconut in states like Kerala. Scarcity of irrigation water is also considered as one of the major constraints

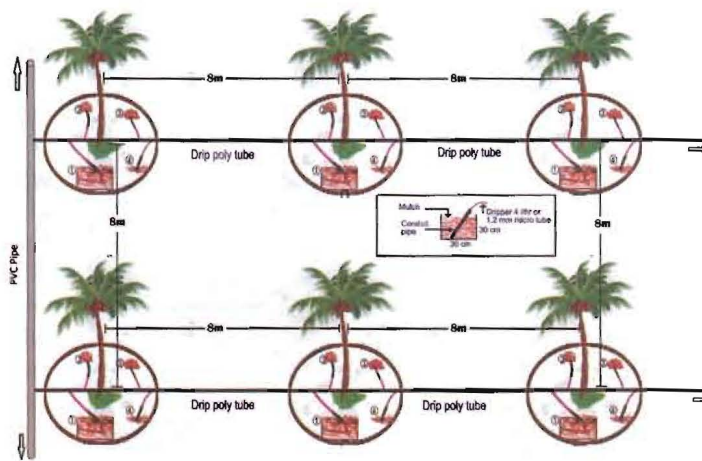
in resource use management in coconut farming. Experiments conducted in research stations have proved that productivity of coconut can be enhanced even up to one hundred per cent if irrigation is ensured. Drip irrigation is a micro irrigation system in which the water is applied to the root zone at the rate at which the palm can take up. It is ideal considering the advantage of water saving. Four pits with a size of 30 x 30x 30 cm have to be dug one meter away from the bole of the palm at equidistance and the pits filled with raw coir pith. The water has to be delivered to the pit through conduit tube placed in slanting position. Based on a study conducted at ICAR- CPCRI, it was concluded that yield of coconut with drip irrigation daily @ 66% of the open pan evaporation from December to May was adequate (32liters/ palm/day when the evaporation rate is 4 mm day) and comparable to basin irrigation @ 200 litres per palm once in four days. Thus, there is 34 per cent saving of water in drip irrigation. This is applicable to varieties and hybrids and also in different soil types. The number of dripping points should be six for sandy soils and four for other soil types. The rate of water application should be 2-4 litres per hour per emitter.

Fertigation

Fertigation is an efficient method of fertilizer application through drip or any other system of irrigation. Drip fertigation helps to increase the fertilizer use efficiency, make savings in fertilizer costs, reduce labour requirement, enables uniform, precise and direct application to root zone and correction of micronutrient deficiencies etc. If there is drip irrigation facility, then the water soluble fertilizers like urea, DAP, phosphoric acid (commercial grade) and muriate of potash can be applied along with drip irrigation in six equal splits. Through fertigation, it is recommended to provide 91 g urea, 33 ml phosphoric acid and 170 g muriate of potash per palm per application. When DAP is used it is recommended to provide 70 g urea, 60 g DAP and 170 g muriate of potash for a single dose per palm. Fertigation can be done using a fertigation tank or venturi system. Compared to conventional method, we can save fertilizers up to 50 per cent because of the higher fertilizer use efficiency.

Improved performance and sustained use of drip irrigation technology

Many farmers have adopted drip irrigation system in their coconut gardens. However, it is seen



that a considerable proportion of the adopters of microirrigation technology did not possess the required level of know-why and know-how aspects, resulting in less effective field implementation of the technology. Results of a study conducted earlier by ICAR-CPCRI among coconut growers in Kannur and Kasaragod districts of Kerala state showed that a substantial number of farmers discontinued the drip irrigation technology. Lack of awareness and knowledge among farmers about the drip irrigation technology was an important factor that lead to discontinuance. Problems such as clogging, leakages and breakages of pipes as well as lack of expertise in repairing and maintenance of the system were all grave concerns. Farmers also did not get adequate technical support and after sales service which lead to discontinuance of the technology in some cases. Besides, lack of profitability in farming especially price fall of coconut, also resulted in inadequate attention paid by the farmers in the proper care and maintenance of the drip system.

The involvement and commitment of the farmer in the proper maintenance of the drip irrigation system is a major factor for the successful and continued use of the drip irrigation technology. The agricultural officers were to certify the proper lay out and installation of drip irrigation system in farmers' field to disburse eligible amount of subsidy. However, it was revealed that majority of the officers did not attend any specific training programme on drip irrigation technology and many of the officers opined that lack of effective training on the drip irrigation technology was a constraint in the proper monitoring and follow up of the field installation and maintenance of drip irrigation system in farmers'

gardens. Krishibhavan staff working at the grass root level are perceived to be overburdened with more of routine office work, which in turn affected the quality of field extension services. The important suggestions of extension personnel for avoiding discontinuance of drip irrigation technology by farmers were to improve after sale service by the dealers/agencies installing the drip irrigation system, to conduct training and demonstration programmes on maintenance of drip irrigation system for farmers and extension personnel and to streamline extension programmes on drip irrigation technology to give emphasis on ways of avoiding clogging.

Improved performance and sustained use of drip irrigation essentially requires not only knowledge of drip by farmers, but also an interactive network of different agencies for its application in the field on a continued basis. Hence, the main point of intervention should be to create a platform of these different agencies to analyse and monitor the application of drip irrigation technology in the field and organise continued interface and knowledge upgradation among the key actors, namely research, manufacturers, dealers, extension, training and farmers. Linkages between all the actors at different levels are to be established through some formal procedures. The coordination can be brought about by linking various actors with the implementation of schemes at grass root level with specific roles related to evolving specific technology recommendations, and capacity building of various actors including farmers, extension personnel, dealers, field staff etc. Department of Agriculture with a separate wing of agricultural engineering can take the crucial role of coordinating the stakeholders. ■