

IRRIGATION IN COCONUT

R Mahindapala

Coconut Research Institute, Lunuwila

INTRODUCTION

The coconut palm requires for satisfactory performance a regular supply of water. In the past, the main coconut growing areas of the island had, on an average, a fairly well distributed rainfall. In the wet and wet intermediate zones, the important rains in May/June and October/November provided the required moisture. In other areas, the abundant October/November rains were adequate.

During the last decade or so, the rainfall distribution pattern in Sri Lanka has distinctly changed. Prolonged droughts are now more frequent. Long dry spells are harmful to both vegetative as well as nut production in coconut. The recurrent droughts in the recent past have affected the nut production very adversely; the worst affected being the long neglected lands and the estates where soil has degraded and unable to hold moisture.

Sri Lanka's coconut production has fluctuated very widely during the last decade, primarily because of the droughts. For instance, in 1984, the production was only about 1,950 million nuts compared with the production of nearly 2,500 million nuts in 1982. This loss in production is attributed to the long drought experienced in 1983. The potential of coconut lands in Sri Lanka is demonstrated by the very high production of nearly 3,000 million nuts in 1986, partly due to the good rainfall in 1985. In low-yielding years, the surplus of

coconut for export is extremely low, resulting in uncertainties in the processing and export sectors. The price fluctuations as a result of the low production is damaging to both national and international marketing. Exporters are wary of forward contracting when the production fluctuates so drastically. These phenomena have been common during the last decade and have prompted the authorities to take serious note of irrigating coconut.

Effects of drought

Water is of vital importance to all activities of the palm. It is essential for the proper functioning of the cells. Secondly, it is a basic raw material for the food production. Thirdly, it is the medium in which all mineral nutrients enter and are transported within the plant.

Under prolonged drought conditions, the outer cells in the absorbing region of the roots develop thickened walls through which water will not enter. Roots so affected remain more or less in a resting condition and cease to absorb water.

Droughts slow down or totally arrest the activity of the growing point of the stem. During a drought, plants under two years old may not produce any leaves, whilst those under five years may produce only a single leaf. In older plants, droughts cause early leaf fall. Trees without a minimum of twenty active leaves lack the vitality for satisfactory production. Fewer leaves also mean fewer flowers.

Pollinated flowers are very susceptible to moisture stress. Droughts lead to button nut fall and immature nut fall. A long dry spell will result in a reduction not only in the number of nuts but also in their size.

Water requirements of coconut

The Sri Lanka tall variety requires a rainfall of about 1,500 mm distributed fairly uniformly throughout the year, with a dry season not exceeding three consecutive months, and with at least 130 mm rainfall in each of the remaining months. The dwarf variety and the hybrids (CRIC 65) require essentially similar conditions but the dry spell should not exceed two consecutive months.

The actual water requirement of coconut depends on a number of factors such as climate, soil type and the age of the palms. Data available on the water requirement is very limited. The Coconut Research Institute has carried out a study on the water requirement at the Isolated Seed Garden, Ambakele, Rajakadaluwa (dry zone) prior to the installation of an irrigation system. This study revealed the following:

Irrigation is required for a total period of about 90 days during the year, which is in February/March and July/August period.

The water requirement during the drought period is about 25 to 30 litres per day.

If daily irrigation is not possible, palms could be irrigated when convenient, but the maximum duration between irrigations is 10 days. When irrigated in this manner, the amount of water should be computed on the basis of about 25-30 litres per day.

IRRIGATION

The problems of the fluctuating production in coconut can be overcome to a considerable degree by irrigation. In fact, there has been considerable interest in irrigating coconut lands during the past few years. It is also acknowledged that estates which regularly carry out soil regeneration and water conservation practices continue to obtain high yields in spite of droughts. Irrigation should therefore be attempted with good cultural practices to have the maximum benefit in terms of production.

The Coconut Research Institute of Sri Lanka has carried out several trials, both in young and old coconut plantations, to determine the effects of irrigation. The results available so far clearly demonstrate that irrigation, even at sub-optimal dosage, increase coconut production significantly. In fact, in one trial, irrigation increased copra production by about 50%. Similar experiments in India have also shown the beneficial effects of irrigation.

It has been shown that irrigation could be made profitable with a 30% yield increase. In a 20 ac good plantation, the yield increase due to irrigation can recover the capital cost within 3 to 4 years, even under monoculture. However, the availability of water in a coconut land would also allow intercropping, which can substantially increase the income from the land, and the investment can be made a profitable venture.

Irrigation Systems

The grower should, before attempting to install an irrigation system in his land, give careful consideration to the availability of an adequate amount of water for irrigation during the dry period, which can be reasonably expected to be about 90 days per year. Several

water sources can be considered. They are:

- a) Open wells - these would be useful where ground water is not very deep
- b) Tube wells to exploit deep underground water
- c) Reservoirs to store excess rain water and surface run-off. Unless there is a reservoir in the land, construction of a new reservoir will be very costly.

The land owner should carefully consider the above options together with his water requirements and decide on a suitable water source, taking into due consideration the funds available for the venture.

It is pertinent to mention here that the Coconut Development Authority (CDA) operates a scheme to assist the growers in drilling tube wells. The CDA has a well-equipped well drilling unit for this purpose.

Besides the water requirements and water source, the land owner should consider the soil condition of the land (because the moisture depletion is dependent on the soil type), land layout and the age of the plantation.

Selection of a irrigation system

Traditional methods

- (1) It has been the practice of coconut farmers, particularly in the eastern coast, to irrigate palms manually. They have several small ponds ('pathaha') conveniently located in the land. Water is manually transported in pots and applied. In certain areas of the coast and in certain other areas in the island, this is possible as the water table is fairly high, but in other areas this may be difficult and uneconomical.



The irrigation system installed at the Isolated Seed garden.

(2) Pitcher irrigation - This is a very convenient and an inexpensive method, particularly in seedlings and young palms. Pitcher irrigation has demonstrated that it could effect rapid establishment and vigorous growth of seedlings. In this method, two large (20 litres) earthenware pots are buried about 0.75 m (2½ feet) away on either side of the seedling. The surface of the pot facing away from the seedling should be made impervious by the

application of tar or other suitable paint to prevent unnecessary water loss (Fig.1).

The pots are filled with water, which will seep through the sides. The rate of seepage depends on the porosity of the pot. The water will have to be replenished periodically. In the dry zone sandy soils, water had to be replenished every 6 to 7 days. The advantage of this method is that water use is efficient.

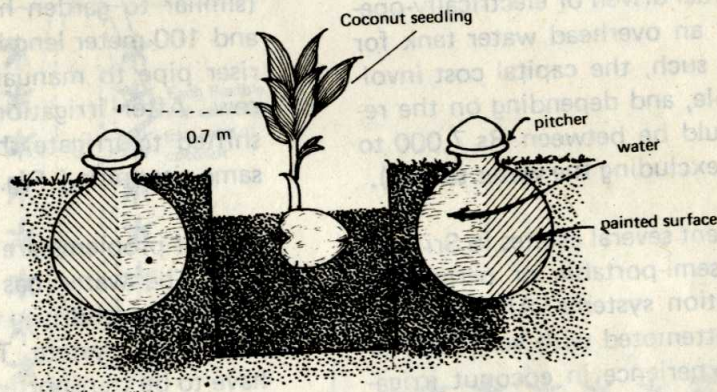
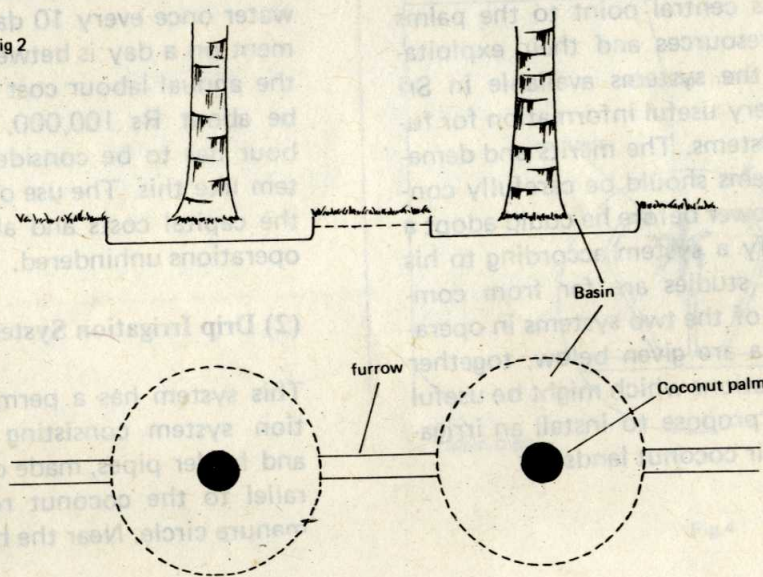


FIG. 1 - PITCHER IRRIGATION

Fig 2



(3) Another common method of irrigation practised in India is the furrow method. In this, a small basin is constructed at the base of the palm, and these basins are interconnected by a furrow (see Fig.2). This method is possible in flat lands only.

Pipe borne irrigation systems

Several pipe borne systems, using both PVC and flexible pipes, are available. These systems would essentially require direct pumping of water (using fuel-driven or electrically-operated pumps) or an overhead water tank for gravity flow. As such, the capital cost involved is considerable, and depending on the requirement, it could be between Rs 7,000 to 20,000 per acre (excluding the water source).

There are at present several estates in Sri Lanka which have semi-portable or permanent pipe borne irrigation systems. All these systems have been attempted with very little or no background experience in coconut irrigation. As a consequence, these systems are far from perfect: indeed some have recurring problems which could have been avoided with some past experience in coconut irrigation. The main problems are (a) method of delivery of water from a central point to the palms and (b) water resources and their exploitation. However, the systems available in Sri Lanka provide very useful information for future irrigation systems. The merits and demerits of these systems should be carefully considered by the grower before he could adopt a system, or modify a system according to his needs. Although studies are far from complete, the details of the two systems in operation in Sri Lanka are given below, together with some observations which might be useful for growers who propose to install an irrigation system in their coconut lands.

(1) Semi-portable flexible pipe system

An irrigation system based on this method is installed at the Isolated Seed Garden at Ambakele, Rajakadalawa belonging to the Coconut Research Institute. The water sources are two irrigation tanks, which impound rain water. The system essentially consists of permanently buried mains and submains, which are 100 mm PVC pipes. Arising from the submains at 16 meter intervals are riser pipes, which are 25 mm PVC pipes. A flexible hose (similar to garden hose) of 25 mm diameter and 100 meter length can be connected to the riser pipe to manually irrigate 12 palms in a row. After irrigation, the same hose can be shifted to irrigate three more rows from the same riser pipe (Fig.3).

Several problems are associated with this system. The water has to be directly pumped, and the diesel-driven water pump causes vibration in the system. The flexible hoses, which have to be transported in the field are relatively heavy. Also, a considerable labour force is required for the operation, as each flexible hose requires a person to handle. Considering the total area in the seed garden (nearly 320 ac) and the fact that each palm has to receive water once every 10 days, the labour requirement on a day is between 30 to 40. Although the annual labour cost has been estimated to be about Rs 100,000, the availability of labour has to be considered carefully in a system like this. The use of flexible hoses reduce the capital costs and allow mechanised field operations unhindered.

(2) Drip Irrigation System

This system has a permanently laid reticulation system consisting of mains, submains and feeder pipes, made of PVC, which run parallel to the coconut rows just outside the manure circle. Near the base of each palm, the

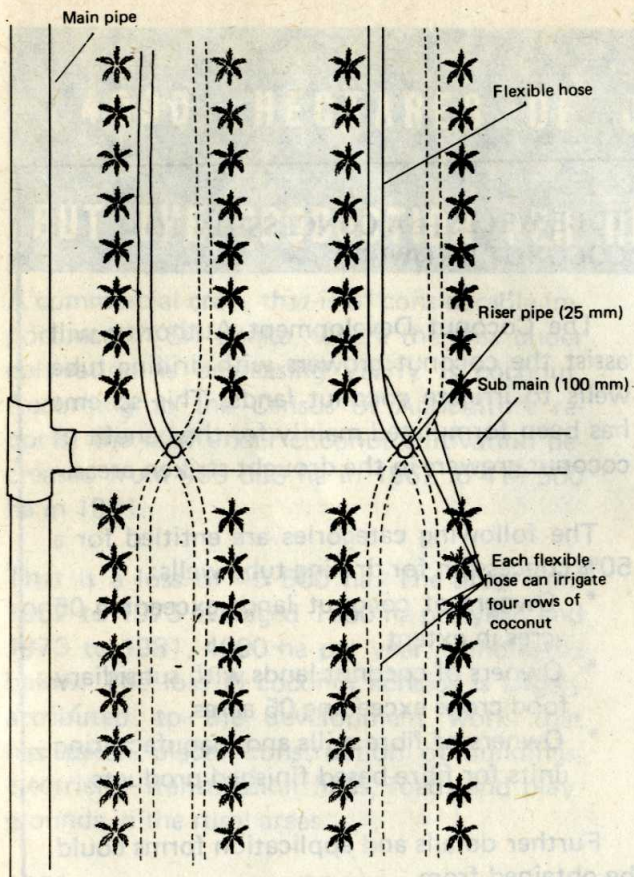


Fig. 3

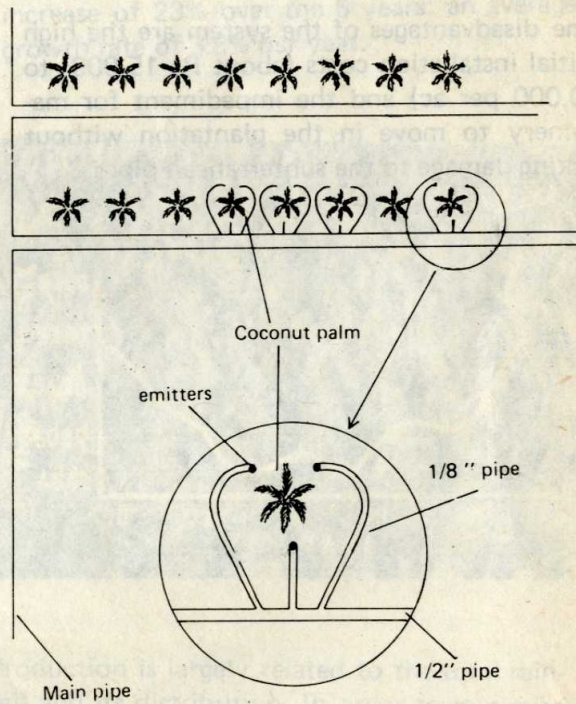


Fig. 4

feeder pipes give off drippers (about 3 drippers per palm) which have emitters at the end, which could be buried about 6" below the surface. Water trickles through the emitters at a pre-determined rate to provide the necessary moisture (Fig.4).

As all pipes are laid in position permanently, the labour requirement minimal. The system is also efficient in water use, as water can be provided regularly in small quantities. The evaporation losses are also minimal. In this system, fertilizer could be incorporated into the irrigation water ('fertigation'), if so desired. However, special soluble fertilizers and filters are required. If fertigation is attempted, perhaps fertilizer could be applied in small doses throughout the year, thereby increasing the fertilizer uptake efficiency and minimizing labour costs for fertilizer application. The cost benefit analysis of using fertigation remains to be studied.

The disadvantages of the system are the high initial installation costs (about Rs 15,000 to 20,000 per ac) and the impediment for machinery to move in the plantation without risking damage to the subterranean pipes.

TUBE WELLS – A CONCESSION TO COCONUT GROWERS

The Coconut Development Authority will assist the coconut growers with drilling tube wells to irrigate coconut lands. This scheme has been formulated mainly for the benefit of coconut growers in the drought-stricken areas.

The following categories are entitled for a 50% concession for drilling tube wells:

- * Owners of coconut lands exceeding 05 acres in extent.
- * Owners of coconut lands with subsidiary food crops exceeding 05 acres.
- * Owners of fibre mills and manufacturing units for fibre-based finished products.

Further details and application forms could be obtained from-

Well Drilling Unit,
Coconut Development Authority,
320, T B Jayah Mawatha,
Colombo 10.

DO NOT MISS THIS OPPORTUNITY

The well Drilling Unit of the Coconut Development Authority at Bandirippuwa Estate, Lunuwila will also provide further details.