Low Cost Water Saving Irrigation Technology and Its Adaptability for Coconut

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India ranks first in coconut production with 13968 million nuts from an area of 17.96 lakh ha and contributing 26.06 per cent to the total share of coconut production in the world. Still there is lot of scope to improve the coconut production in our country. Out of the various constraints identified in coconut production, the stress that the coconut palms undergoes during summer months, in high rainfall zones and 6-9 months period in other coconut growing areas brings about a severe impact on the coconut production. The response for irrigation irrespective of the quantum of rainfall received is high. This response in terms of reduced button shedding, immature nut fall, leaf petioles breakage etc. is remarkable which directly or indirectly contributes to the total yield of the nuts.

Though there are many micro irrigation techniques which have proved beyond doubt their best fit for plantation crops, still the cost involvement and the characteristics problems attached to each system makes the farmers to think twice before investing money on these systems. The new method called surge irrigation will suit to perennial crops especially in the water scarce areas where the wetting depth will be approximately ranging from 75 to 120 cm. This method will be more beneficial during summer season when there is scarcity of water even in the high rainfall zones.

This surge irrigation, has advantage over other micro systems as the cost involvement in this system is meager and water saving to the tune of 25-30 per cent is expected without involving much of the materials cost for this system except for the inlet pipes and the stopper made of PVC. This system has been proved good for maize and sun flower at Tamil Nadu Agricultural University Coimbatore, where 30-40 per cent water saving was recorded. Thus the possibility of introducing this system of irrigation to coconut is discussed here.

Mechanism of Surge Irrigation

1. Redistribution of infiltered water in the soil profile
2. Surface soil consolidation as negative gradients develop in the soil water during flow interruption
3. Surface sealing caused by practice migration and reorientation
4. Air entrapment and
5. Expansion of the soil particles

Wetting Pattern by Surge Effect

Since the water is let in the channel intermittently say with ON=OFF=10 minutes, the water will not advance more than 30-40 m distance which depends upon the flow rate, slope, roughness of the furrow, weeds etc. The next time when we allow the water after a lapse of 10 minutes the water will run faster in the already wetted area due to the various surge mechanism. Thus the water percolation to the deeper layer is avoided and when the same effect continues there will be uniform wetting from the head to the tail end of the furrows. Thus in the wetting pattern as shown in *Fig.1* ie., the deep percolation in the furrow head by continuous flow is avoided. So there is chance for considerable saving of the applied water. Generally for surge irrigation we should have a mild slope so that the water let in from the main channel will run smoothly from the head to the tail end of the furrows. Introducing this low coast water saving method (the surge irrigation) to coconut is suggested under two situations.

Situation I

Surge Irrigation During Water Scarce Period

In many parts of Tamil Nadu coconuts are grown on the bunds of the irrigation channels. The main idea behind this is whenever water is let to the crops in the main field, these coconuts on one side of the irrigation channel (bunds) also gets water. So the total quantity of water that the palm gets at a time, may be adequate or more than the requirement but

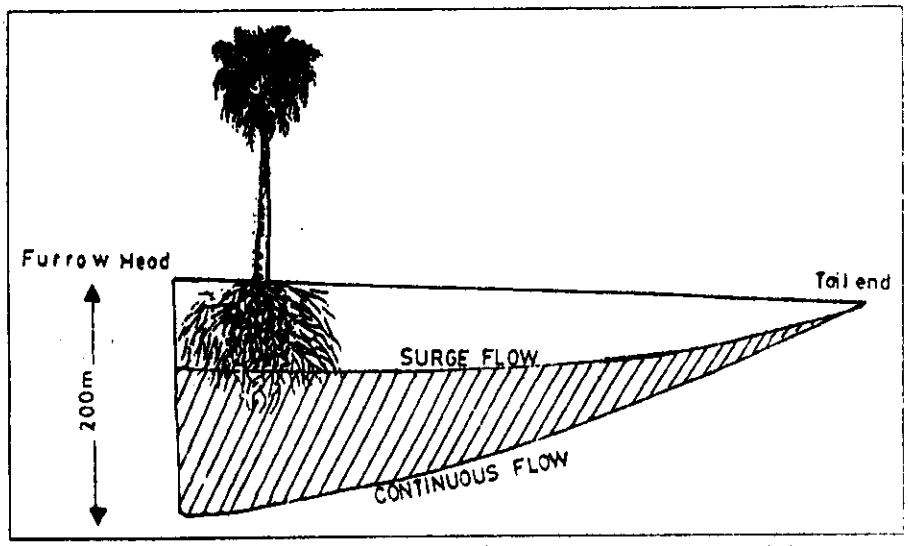

Fig.1. Surge irrigation/continuous flow (the shaded portion indicates the deep percolation losses)

still there is all the chance that lot of water goes waste as deep percolation. However this cannot be avoided as the purpose is to irrigate the main crop. But in the same garden when there is water scarcity during summer, the farmers keep the main field fallow. In that situation the farmers fail to irrigate the coconut palm which are on the bunds of the irrigation channels due to one or the other reasons.

1) As the main crop is not irrigated
2) Having the idea that it is for short period and as the palms are perennial in nature, they would not suffer by the temporary stoppage.
3) Their ignorance about the impact of stress
4) As the coconut palms are not the main crop/source of income.

But since coconut is perennial in nature and produces flower primordia throughout the year, demands continuous and adequate supply of water. Therefore if the palms are not irrigated during that period when the evaporative demand is maximum, there is all the chance for more button shedding, immature nut fall and under severe stress the leaf petiole breakage. These palms will recover only after another two years if congenial environment exists. This is where the surge irrigation becomes handy because if you start irrigating the palms by continuous flow in the already existing channels only for the coconuts there will be lot of wastage as deep percolation and also due to over flow at the tail end of the channels.

Thus by adopting surge irrigation there will be uniform wetting for all the palms existing in the channel bund. Before going in for irrigation by surge method the existing channel is to be dressed properly and the weeds and other obstruction should be removed for the best surge effect. Since there will be only one channel in one direction water may be permitted to flow in that channel for 10 or 15 minutes as the case may be depending upon the flow rate and length of the channel. After completion of the 10 or 15 minutes on time the flow can be diverted to the other channel in different direction *(Fig.2)*. Likewise the irrigation can be continued till the water reaches the end of the furrow or channel by which we say the irrigation is complete. Still if the, farmer feels that the quantity of water supplied is too less post stage irrigation can be given at a reduced rate (half of the original

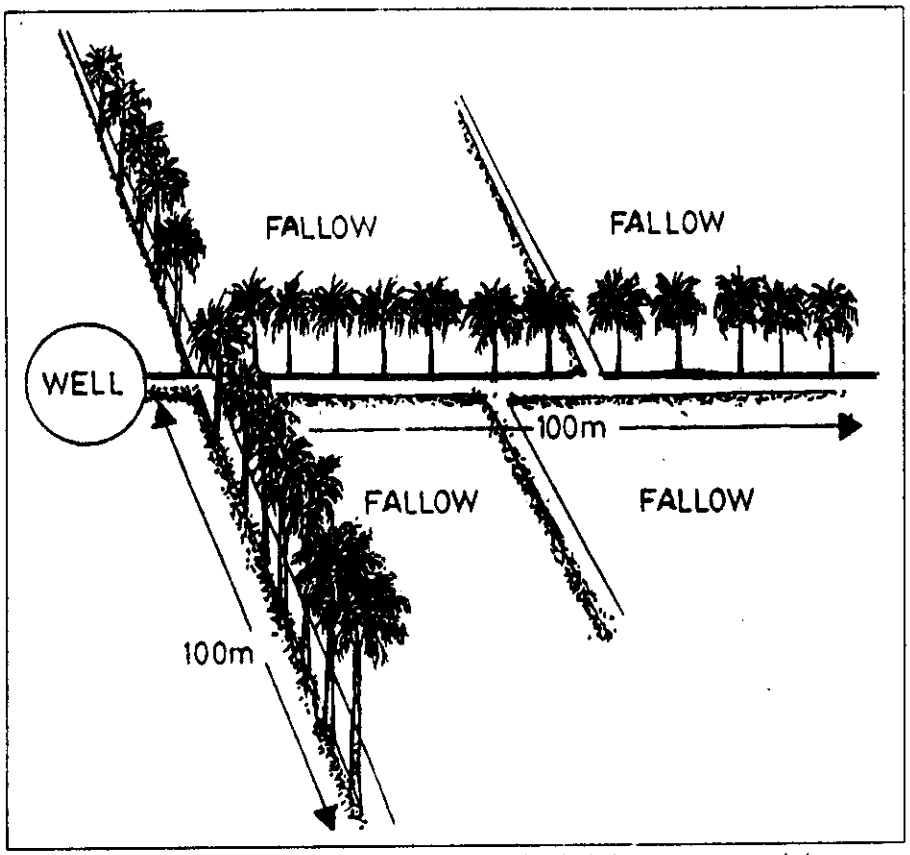

Fig.2.Surge irrigation for palms in the channel bunds during water scare period

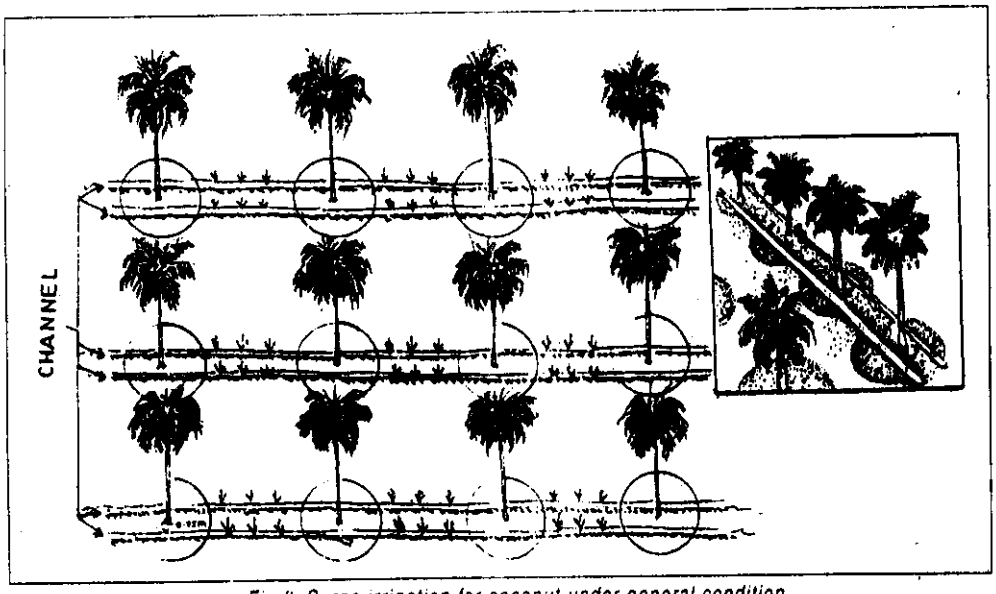

Fig.3. Surge irrigation for coconut under general condition

flow rate) i.e., whatever the quantity of water that is flowing out can be diverted to both the channels simultaneously till the water reaches the end of the furrows (channels). By this the irrigation requirement can be met with water saving of 25-30 per cent. Leaving the 2 m radius from the bole on both side of the each palm, all along the channel summer season vegetables can be grown for which extra quantity of water need not be supplied which will fetch the farmer his vegetable needs and extra income.

Situation II

Irrigating Coconut by Surge Method:

Make irrigation channels 0.75 m away from the bole running to a minimum length of 75 to 100 M (12 palms in a row) on both sides of the palm as shown in *Fig 3*. Two inch PVC pipes of 2 feet length can be buried in the head of the channel with a PVC stopper for facilitating the easy opening and closing. The channels should have a mild slope, and should be devoid of any weeds so that the water will flow smoothly.

To start with, water can be allowed in 3 or 4 furrows @ 2 to 3 litres per second depending on the soil, roughness, slope and other furrow irregularities. If the pump has the capacity to pump water @ 7.5 to 10 litres, then water can be allowed in 4 to 5 rows at a time. The ON time is selected by trial run. Keep 10 minutes as ON time (The time for which water is allowed at one time). Then after a break of ten minutes (OFF time) again water is let in the same furrow. Now the advance will be faster in the already wetted area due to the various surge mechanisms explained earlier. Thus continuing this intermittent flow allow the water to reach the tail end of the furrow. If the ON time is 4 or more we will have good surge effect. Thus once we know the ON time, then one individual can irrigate even large areas without going into the field. Another advantage of this method is that, if the farmer is engaged for other works during the day time he can operate this system of irrigation during night time as he knows after how many surges the water will reach the tail end with a watch and a torch in hand sitting at the head of the furrow. The OFF time can be less or equal or more than the ON time which does not matter much. Thus we can choose the OFF time conveniently. If the ON time is too short or too long then the flow will behave like continuous mode where there would not be any surge effect leading to deep percolation resulting in wastage of water. The channel in the tree zone ie., basin, can be deepened (5-10 cm.) so that in that area the water flow is interrupted and the palms get adequate water. The inter space along the channel leaving the basin area can be fit in with any annuals depending on the environment and demand of that area which brings about additional income.

Initially when the soil surface is rough there will be maximum infiltration; thus the water advance for each surge will be less i.e., the number of surges to complete irrigation will be more. As the time advances due to the furrow bed sealing and as the channel gets smoothened the advance of the flowing water will be faster thus the time taken for completion of irrigation will be less. As the time advances further weed growth along the channel will interfere in the water advance; this increases the time for completion of irrigation by 10 minutes or by one surge. However these things can be altered by furrow cleaning and rectification if required provided if the number of surges are less than four.

The post stage irrigation mentioned earlier can very well be practiced if the farmer feels the quantity of water supplied to the palms is insufficient. The post stage irrigation can be given either continuously or intermittently at half of the original flow rate, till the water reaches 85 per cent of the full furrow length.