

TEA RESEARCH INSTITUTE OF SRI LANKA

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GUIDELINE ON IRRIGATION OF TEA FIELDS

Introduction

Tea is cultivated predominantly as a rain-fed plantation crop. Lack of water bodies, geographical limitations and inability to use conventional irrigation techniques such as flood and furrow irrigation have hindered the application of irrigation in tea plantations. Introduction of micro irrigation techniques viz. drip and sprinkler irrigation, frequent drought occurrences and productivity improvements *etc.* have prompted stakeholders to seek alternative techniques to manage soil moisture levels. Also, high impact droughts, impacts of climate change and poor replanting rates have created renewed interests in adopting suitable irrigation techniques. It is evident that rudimentary to modern irrigation techniques have been practiced in tea fields although adoption of such techniques is not feasible in the entire plantation. However, there are tea fields, where irrigation could be applied with the development of in-situ water bodies. Since management of soil moisture levels plays a pivotal role in sustainable crop production, it is necessary to advise stakeholders to take correct decisions on adoption of suitable irrigation techniques. This guideline serves as a basis for decision making on irrigation as a potential drought mitigation strategy in tea plantation.

Selection of irrigation as an option for drought mitigation

There are many other drought mitigation techniques recommended by the TRI (Please refer Advisory Circular No. PA 2 on Drought Mitigation in Tea Plantations, Issued in January 2011). However, unlike those strategies, irrigation involves critical technical inputs and financial commitments. Therefore, decision making should be economically viable. Hence, it is necessary to carefully analyze the drought effects in a particular location or estate and decide whether such damage can be prevented by other less costly drought mitigation techniques.

Fields to be irrigated

1. Newly planted tea fields are more vulnerable to drought, as their root system has not fully developed. Returns in investments for irrigation would be higher in the long term when new clearings (immature fields) are irrigated.
2. Low elevation tea plantations are more vulnerable to drought because of high ambient temperature during dry periods.
3. Within estates too, there could be fields, frequently subjected to drought damage due to the geographic location, poor soil and presence of drought susceptible cultivars. High yielding cultivars usually gives higher returns to irrigation.

4. Irrigation of tea fields earmarked for pruning is usually not economical, unless they are threatened with death of plants due to drought.

Requirements for irrigation

Before making the final decision on irrigation, following factors need to be carefully considered.

1. Availability of water source: Availability of a permanent and a reliable water source is essential for successful irrigation during the drought. In view of this, potential maximum duration of drought according to the estate location needs to be found. Many water sources in tea estates are dry during severe drought periods. It is also necessary to ascertain whether the use of water source for irrigation affects estate community and down streams users to avoid potential social conflicts.
2. If such a reliable water source is not available, it should either be developed (e.g. Irrigation well) or water should be transported from the bowzers, as and when necessary. However, it should be remembered that transportation would increase operational cost depending on the distance to the water source.
3. Selection of irrigation system depends on the level of investment, type of water source and technical expertise available to maintain the system *etc.*,

Selection of irrigation method/system

Irrigation can be done manually or by using permanent or portable irrigation system. The permanent irrigation system can be either drip or sprinkler irrigation.

Manual irrigation

Manual watering is the most popular irrigation method in tea plantations, where water is applied to plants by workers manually. Normally, water is transported by a bowser or rarely using a nearby water source. Advantage of this method is that there is no investment cost for an irrigation system. However, operational cost would be high as workers have to be employed for irrigation. The chances for under irrigation that could result in a poor response, is also one of the main disadvantages.

Drip irrigation

Drip irrigation is the application of irrigation water through emitters fixed to an irrigation tube. The most economical drip irrigation system for tea is the in-line drip tubes. It is the most efficient irrigation water application system which ensures uniform water application throughout the field. Pressure requirements to operate a drip system are low. Also, application of irrigation water through drips prevent, unnecessary wetting of plant stems.

However, drip system usually requires higher investment cost than sprinkler system. Also, water quality should be at a higher level to prevent possible blocking of drippers. Certain technical knowledge is necessary for operating a drip system and intervention of irrigation specialist may be required for trouble free operation.

Sprinkler irrigation

Sprinkler irrigation can be done by a permanent set of sprinklers or a mobile sprinkler head. Alternatively, gun-type mobile sprinkler heads, capable of covering a radius usually more than 15 m, could also be used. Investment cost for such gun-type sprinkler is lower. However, additional man power is necessary to operate such systems in the field.

The operation and maintenance of the system is user friendly. Also, it gives a cooling effect to the plant micro environment, which is important during drought periods. In addition to drought mitigation, sprinklers can be used to minimize frost damage in tea at high elevation. Some disadvantages of the sprinkler irrigation system are high energy use, low application efficiency and potential theft and vandalism of the permanent irrigation equipment.

Economics of irrigation

Return on investment for irrigation depends mainly on investment/operational cost and plant response to irrigation (yield increment and plant survival). The investment and operational cost vary according to the irrigation system. Estimation of system cost needs to be obtained through a service provider or vendor. Based on the potential drought damage, return on investment for irrigation could also be worked out. In general, investment cost for drip irrigation system for a unit area is higher than the permanent sprinkler irrigation systems. However, water application efficiency for drip irrigation system is higher than that of sprinkler irrigation systems. Hence drip irrigation system is best suited for water limited locations. Mobile gun-type sprinkler irrigator could be used as a low investment strategy depending on the exigencies of the situation.

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