MOISTURE CONSERVATION AND EFFICIENT WATER - USE IN DROUGHT - PRONE AREAS

R.C.MANDAL
Central Plantation Crops Research Institute, Kasaragod.

SUMMARY

Either soil moisture deficiency or 'atmospheric drought' occurs due to irregularities in the rainfall distribution, low humidity accompanied by hot dry winds which severly affect crop stands and yield of vegetation. Various agro-techniques have been developed for dry zones and drought-prone areas for the field crops; but little attention is given to tackle drought situation in plantation crops, eventhough these crops pass through unfavourable dry weather spells for over 5 months from December to May in the tropics.

Out of nearly 4000 mm precipitation received during the season, 1000 to 1200 mm of rainfall is used by plantation crops and the remaining precipitation received during monsoon is lost through runoff, percolation and evaporation. Hence, the strategy would be:

(i) to conserve the rainwater, as much as possible, to meet the water deficit during the dry period of over 5 months;

(ii) to develop a suitable system for runoff collection in a community water-shed for re-utilization; and

(iii) also to utilize the ground water to the fullest extent.

The techniques to conserve rainwater will include:

(a) adoption of ridge-furrow system to implement intra-plot and intra-row water harvesting system;

(b) practising of deep-tillage in certain situations to encourage penetration of moisture and its safe storage, allowing deep-root penetration; and also to follow 'no-tillage' or minimum tillage system in tropical belt, particularly with undulating topography, so as to give good protection against water and soil erosion.

(c) mulching with ofganic residues and other similar mulches to maintain infiltration rate, to control sufface water run-off and evaporation loss, and to ratain enough soil moisture forra longer period;

(d) cover-cropping with Mimosa invisa, Calapogonium, etc. to reduce evaporarion loss, and temperature of the surface soil, conserve enough moisture and thus create a good micro-climate for the standing crop.

Green manuring around the basin of plantation crop and incorporating in situ, and addition of organic manure to increase the water-holding capacity, particularly of light sandy soils;

(e) timely weed control to increase the water-use effeciency and save enough soil moisture for crop use.

2. Extensive well-branched deep-root system of the perennial crops will explore more moist soil in deeper layer and the crop may not suffer when surface becomes dry.

In an increased root: shoot ratio, roots will extract water from a large volume of soil when transpiring surface is reduced. This technique may be applicable in cardamom and similar other plantation crops.

However, selection for superior root system and drought tolerant cultivars must be emphasized which will ratain more water under high stress or desiccation.

3. Water-use efficiency can be increased by adoption of improved micro-irrigation techniques like drip-irrigation or sprinkler irrigation system in water-scarce areas. Drip irrigation system can save 40 to 60% water easily without reducing the yield or quality of the produce.

4. Physiological adaptation of plants to water stress needs considerable attention; particularly, to conserve water by restricting transpiration and accelerating water uptake. To conserve water, the mechanisms would be: early stomatal closure, increased photosynthetic efficiency and reducing the surface area of the leaf. The uptake of water can be accelerated by efficient root system and increased leaf-water potential.

Methods of decreasing transpiration are:

(i) use of antitranspirants that tend to close stomata and increase leaf resistance to transpirational losses,

(ii) increase leaf reflectance by spraying kaolinite, and

(iii) use of growth retardants like CCC.

Most of these techniques could be suitably adopted for plantation crops to save them from adverse soil and weather conditions.