MEASURES TO MINIMIZE DROUGHT EFFECTS ON PERENNIAL INTERCROPS

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Unlike annual intercrops such as ginger, manioc, vegetables which can be selectively grown only during wet season, the perennial intercrops like pineapple, banana, pepper require moisture during the whole year as these crops remain with coconut, and are both subjected to climatic changes alike. The more important of these are the low rainfall and drought effects caused due to the ineffective rainfall.

Significant changes in rainfall patterns have been experienced during the recent past in major coconut growing areas such as Colombo. Gampaha, Kurunegala, Kegalle, Kalutara, Galle and Matara districts. Very often low rainfall and distribution from January to April in each year are recorded. Accordingly between 1983 and 1992 recurring droughts have been significant which had adversely affected the intercrops and also coconut.

Measures to minimize drought effects on perennial intercrops are two fold:

i Consideration of the coconut land and its management practices.

ii Consideration of the intercrops and their management practices.

The basic requirement would be an effectively managed coconut land so as to minimize the adverse effects of drought on both the intercrop and coconut.Therefore, planting of drought resistant CRIC 60 coconut seedlings, preparation of coconut planting holes as recommended by CRI, use of organaic and green manure, and adoption of the recommended soil and moisture conservation practices such as husk burying, establishment of suitable cover crops become extremely important.

Management of perennial intercrops to overcome drought effects.

There are various parameters under this purview. Selection of intercrops has to be made only after taking into consideration the rainfall and its pattern of distribution in the area.

Accordingly the following is presented:

Wet and the wet intermediate zones (annual rainfall over 1500 mm).

- Coffee, Cocoa, Pepper, Clove, Cinnamon, Rambutan,Pineapple, Passion fruit and Banana.

Dry and the dry intermediate zone (annual rainfall less than 1500 mm).

- Cashew, Mango, Citrus and seasonal crops.

Growing of perennial intercrops may not be suitable on every site even on the same land. Most coconut lands in the wet zone are sloping. The upper side of the sloping areas are usually subjected to moisture deficiency especially during periods of drought. Also the lower side of these slopes are subjected to poor drainage hence unsuitable. Therefore only the middle land area of these sloping lands could be used for growing perennial intercrops.

On the other hand soils along the coastal areas of the coconut belt are more sandy while in the interior wet areas the soils are gravelly. As the water holding capacity in sandy soils is much less; these soils are not suitable for intercropping. Also if the soil is shallow in stable gravelly soils, root formation will be retarded. Therefore when selecting lands for intercropping it is important to give due consideration to the following:

Loamy soil, high content of organic matter, and a considerable soil depth if the land is very gravelly.

The land should also have a shallow water table during the period of drought.

Age of the Coconut Plantation and Density

Lands where the avenue systems of planting have not been adopted are not suitable for perennial intercropping, between 5 - 20 year old,well managed coconut. Likewise if the age of the coconut plantation is over 50, it is also unsuitable for planting intercrops, as the land has to be replanted and the decrease in shade after replanting would cause higher rates of evaporation. Lands with a 25 - 50 year old coconut plantations are ideal for intercropping.

It has been observed that most small holders plant coconut in excess of the recommended density. This is due to either non removal of the old stand after under planting or non conformity to the recommended planting distance. Under these conditions there is certainly a heavy competition for moisture especially during dry spells, exposing the intercrops to the adverse effects of drought. It is therefore very important to maintain only the recommended density of coconut palms in a given area and is also equally important to plant the intercrop at least six feet (2 m) away from the base of the coconut palm.

Soil and Moisture Conservation Practices

When intercropping with perennials (excepting pineapple) is contemplated, the first exercise should be only the removal of the bush type weeds and to mark the planting points. It is not necessary to plough or to do mammoty weeding or to destroy cover crops.

In addition in a perennial intercropping system, agricultural practices that enhance the soil and moisture conservation such as contour draining, bunding and husk burying could be carried out continuously. While the cover crops too can be established, the only requirement in this process would be the removal the creepers surrounding the base of the coconut palms during fertilizer application.

Selection of Drought Resistant Varieties

The following varieites have been tested for drought tolaran and have shown much promise:

Coffee	-	C C R, Q 11, catimor
Cocoa	-	Millewana, Amerzon
Pepper	-	Local varieites recommended by the Department of Export Agriculture
Passion fruit	-	Yellow variety
Banana	-	Kolikuttu

Planting Material

Mortality, after transplanting could be reduced if the plants have attained significant growth, suitable for field planting:

Coffee	- with 6 - 7 leaves (pairs)
Cocoa	- with 4 - 5 leaves (pairs)
Pepper	- with 4 - 5 leaves
Clove	- Two year old plants about 0.6 m in height

Polybagged seedlings that have remained in the nursery for too longer periods have a tendency to thrust out roots piercing the polybag. Such seedlings planted even after trimming will be subjected to drought effects as their main root systems fail to grow satisfactorily. It is therefore advisable to select only the suitable plants.

Time of Planting

In coconut growing areas the rainfall pattern during the last 30 years have shown low average in the first quarter (January - March) in most years. This has indicated the suitability of planting perennial intercrops in the Yala (May/June) season, as intercrops planted in the Maha (Oct/November) season are exposed to severe drought periods which commence 2 - 3 months afterwards. But for intercrops planted during Yala (May/June) seson, the advent of the drought period would be often 7 - 8 months in January/February of the proceeding year.

Planting

Although the recommended dimensions of planting holes for pepper, coffee and cocoa are 1 1/2 ft x 1 1/2 ft x 1/2 ft (0.5 x 0.5 x 0.5 m), these may be made larger depending on the growers resources, as roots develop faster in such pits. In clove plantings it has been shown that pit sizes presently recommended do not suffice. Use of pits of size 3 x 3 x 3 ft (1 x 1 x 1 m) in our trial plots have shown much promising results. Addition of organic matter into the planting hole increases it water holding capacity.

Before planting, the polybag containing soil and the plant must necessarily be removed. Care has to be taken not to damage the main root. Plants with damaged roots have been found growing unsatisfactorily and plants with a poor root system suffer drought effects more often. Larger planting holes filled with organic matter, and correct planting of the intercrop would be ideal.

Mulching

Coconut husks, coir dust, coconut fronds, straw etc could be effectively used as mulching material. The first two mentioned are available in plenty on coconut lands. During the first year of planting there is no need to maintain the mulch right round the whole year. Provision of a mulch throughout will entail the plant's root formation only on the surface soil. Such plants suffer the ravages of drought. Also in a plant like clove if the mulch is allowed to remain unnecessarily, the coconut roots could invade the clove root zone causing competition for moisture especially during dry months.

Therefore it is advisable to provide mulch using coconut husks etc to clove and other similar intercrops only after fertilizer application in Maha (Oct./Nov.) season. This will conserve moisture during the first quarter of the year. The mulch should be removed during fertilizer application in Yala (May/June) season.

Coirdust is used liberally as a soil cover in pineapple cultivation with coconut. This practice has ensured better performance in pineapples yielding large fruits. Coconuts too benefit as drought damage is reduced. However care is needed to prevent beetle damage on coconut seedlings.

Fertilizer Application:

It is important to apply only the recommended fertilizer mixture and also the appropriate quantities for intercrops. Balanced fertilizer mixtures should be applied for uniform growth and performance of intercrops. For example a fertilizer mixture containing less amounts of phosphorus and potassium but nitrogen in excess will enhance leaf production but later exposing the plant to early drought damage. While phosphorus induces better root formation potassium hardens, the plant tissues saving moisture.

Time of fertilizer application is also important in intercropping. The most appropriate being after reflush of leaves which preceded the drought during the first quarter of the year. Therefore it is advisable to apply fertilizer after 3 - 4 showers in Yala (May/June) season.

Fertilizer application during the Yala (May/June) season should not be delayed. Early application of the appropriate fertilizer mixtures help to regenerate the drought affected crop. This will also help flowering and fruit formation for December harvest.

Again fertilizer application for the Maha (Oct/Nov) season should commence during September as the efficiency of fertilizer applied during November - December would be retarded due to the incoming dry period in the first quarter of the preceding year. Further late fertilizer application in Maha(Oct/Nov) season could be detrimental to the intercrop due to its production of the tender leaves.

In addition to chemical fertilizers incorporation of organic matter such as cattle dung, compost, green manure should be done whenever possible due to their nutritive status, and the moisture holding capacity.

Pruning and Control of Pests and Diseases

Coffee and Cocoa plants that are not well managed produce large numbers of stems and branches, resulting in loss of water through transpiration and hence are exposed to drought damage. It is therefore very essential that the intercrop is appropriately pruned.

Damage to Coffee, Cocoa, Clove and Cashew by stem borers affect the plant's water conducting functions and are subjected to drought damage. Further, failure to control the leaf pests also weaken the food resources. Such plants suffer mostly during dry periods. Intercrop plantations where pests and diseases are kept well under control could obviate drought damage considerably.

Mixed Cropping Models

It has been accepted that when a single intercrop is grown the plants' root system will also grow into equal depth in soil, and become more susceptible to drought. In a mixed cropping model where are a variety of intercrops are gorwn, the situation of the root systems in the soil will be at variable depths, increasing the water use efficiency.

The CRI has introduced a number of mixed cropping models with the recommended varieties of Coffee, Cocoa and Pepper and these have been documented in CRI publications.

It has been observed that clove plants subjected to drought damage in the first quarter of the year is not attributable to moisture deficiency only. There are also adverse effects from dry winds with excessive heat blowing across plantations which increase the rate of water loss from leaves. If banana could also be planted along with the other intercrops it will be possible to reduce the drought effects easily.

Irrigation

As the financial outlay for an irrigation system is heavy, installation of such a system depends mainly upon the growers financial capacity, and the profits he derives from such a venture. In small holdings it is more beneficial to pour water using pots.

Market prices are attractive for intercrops such as Pepper and Rambutan, and for such crops the pitcher irrigtion system (Pots filled with water buried in soil) could be practised. Here the side of the pot that does not face the seedling will have to be painted so that the water will seep only towards the seedling.

It will be far more helpful to conserve the soil moisture, and develop a pattern for its efficient use. If such soil and moisture conservation measures are practised continuously, and efficiently, the maintenance costs, could be substantially reduced, and the drought damages minimised.