

# Tea and Coconut Intercropping

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## Introduction

Tea cultivation is traditionally considered as a monocropping system, however, it is the only plantation crop integrated with shade trees (Ekanayake, 2003). Tea is a light and humid loving shade tolerant tree species (Kulasegaram, 1980). The growth of tea is negatively affected by strong light, high temperature and low humidity (Yu Shanqing, *et al.* 2001). Therefore, tea is usually grown under shade of other trees and there is a high potential of supplementing the necessary shade by interplanting with tree species of economical importance. From the inception, tea smallholders in the Mid country have been cultivating various crops in their tea lands in an unplanned manner. Since mixed cropping is gaining economic importance during last two decades, there was greater attention for planned mix cropping not only in smallholdings but also among larger plantations (Ekanayake, 1994). Prior to 1990, intercropping with tea was confined to Export Agriculture Crops (previously known as Minor Export Crops) such as pepper, coffee and cloves. During last decade the intercropping with tea extended to other plantation crops such as rubber and coconut.

## Intercropping

The term intercropping refers to cultivation of a mixture of crops planted in a defined pattern of spatial arrangement (Bavappa and Jacob, 1982). There are several objectives of intercropping, such as enhancing land use efficiency, productivity and net returns, achieving favourable cost benefit ratio, reducing risk of dependence on a single crop and to ensure year round income, to generate additional employment opportunities and to maintain eco-friendly environment.

## Advantages of Intercropping

- Improves soil properties, soil structure and nutrient status (Mapa, 1995, Vidanachchi and Liyanage, 1998)
- Suppresses weed growth (Bulson *et al.*, 1997)
- Increases eco-friendly soil microorganisms (De Zoysa, 1993)
- Decreases incidence of pests and diseases (Deadman and Cook, 1997)
- Mitigates adverse effects of prolonged drought conditions (Karunaratna *et al.*, 1999)

## **Intercropping of Tea and Coconut**

Intercropping of tea and coconut is considered feasible in the mid and low elevations in the Agro Ecological Regions, WM1, WM2, WM3, WL1 and WL2, where climatic and soil conditions are conducive for the cultivation of these crops. Accordingly, Galle, Matara Districts and Katuwana AGA division of Hambantota District in the southern province, Kalutara District in the western province, Kegalle and Ratnapura Districts in the Sabaragamuwa province and Kandy, Matale Districts and Kotmale AGA division of Nuwara Eliya District in the Central province are suitable for this cropping system (Gunatilake *et al.*, 2000).

## **Intercropping Procedure**

It is necessary that soil conditions are favourable for successful cultivation of both crops, particularly tea requires a soil depth of not less than 90 cm (3 ft), not more than 20% gravel content and an organic carbon content not less than 2%. For lands with degraded soil conditions where the organic carbon content is low, it is necessary to rehabilitate the soil by planting mana grass for a period of 18-24 months prior to planting of tea (Anon, 2000).

## **Tea and Coconut Intercropping Systems**

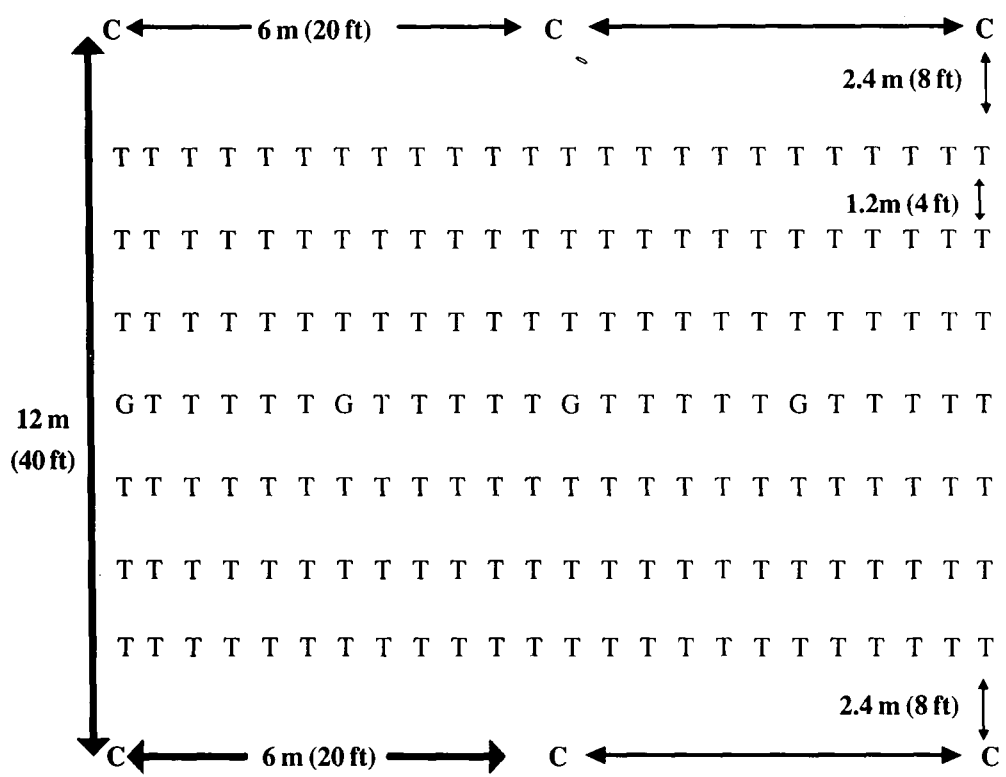
It is possible to adopt following systems of intercropping depending on the existing land use pattern.

- New planting of both tea and coconut
- Replanting tea and new planting of coconut in existing tea lands
- Replanting of coconut and new planting of tea in existing coconut lands
- New planting of tea in lands presently under coconut
- New planting of coconut in lands presently under tea

The same procedure could be adopted for first three systems *i.e.* new planting of both tea and coconut, replanting tea and new planting of coconut in existing tea lands and replanting of coconut and new planting of tea in existing coconut lands.

## **New Planting / Replanting of Both Tea and Coconut**

Coconut should be planted in an avenue (row) system (Figure 1). The spacing between avenues (rows) can vary from 9.75 - 12.0 m (32 - 40 ft). However, the spacing within the avenue (row) should not be less than 6.0 m (20 ft). According to this system of planting, density of coconut (plant population) varies from 135 to 170 palms per ha (54 – 68 palms per acre). The tea should be intercropped in the avenues of coconut leaving at least 2.0 m (6.0 ft) for the manure circle of coconut. The spacing of tea can vary from 1.0 m x 0.6 m (3.5 ft x 2.0 ft) to 1.2 m x 0.6 m (4.0 ft x 2.0 ft) depending on the growth habits of tea cultivars. It is advisable that the coconut rows should be arranged in the East-West direction to avoid excessive shade on tea.



C - Coconut      T - Tea      G - Gliricidia  
 Tea - 75%      Coconut - 84%

Note: 1. Tea – 12,500 plants per ha (5000 per acre)  
 2. Coconut – 160 plants per ha (64 plants per acre)  
 at recommended spacing for monocropping

**Figure 1. Spatial arrangement of tea and coconut intercropping system**

**Cultivars**

- **Tea**  
 TRI 2025, TRI 2026, TRI 2027  
 TRI 3014, TRI 3019, TRI 3025  
 TRI 4006, TRI 4048, TRI 4088  
 S 106, DG 7, DG 39
- **Coconut**  
 Dwarf x Tall (DT or CRIC 65) hybrid/cultivar is suitable for areas where soil is deep (>2 m)  
 Tall x Tall (TT or CRIC 60) cultivar is suitable for areas where soil depth is average and recommended for all commercial plantations.

## Land Preparation and Soil Conservation

It is necessary to ameliorate soil conditions in avenues where coconut are to be planted by thatching with coconut fronds and husks and also establish recommended cover crops such as *Calapagonium mucunoides* and *Arachis pintoii*. In addition, contour drains and earth bunds are recommended for soil conservation.

## Tea

Recommended agronomic practices should be adopted prior to establishment of tea. These practices include soil conservation, land preparation, holing/trenching, establishment of shade *etc.* Soil rehabilitation with mana grass for a period of 18-24 months prior to planting tea is essential for lands with less than 2% organic carbon content. A shallow trench of 30 cm depth (1.0 ft), 2.0 m (6 ft) away on either side of coconut rows should be cut to minimize any adverse effect of mana grass on the productivity of coconut as shown in Figure 2.

## Spacing

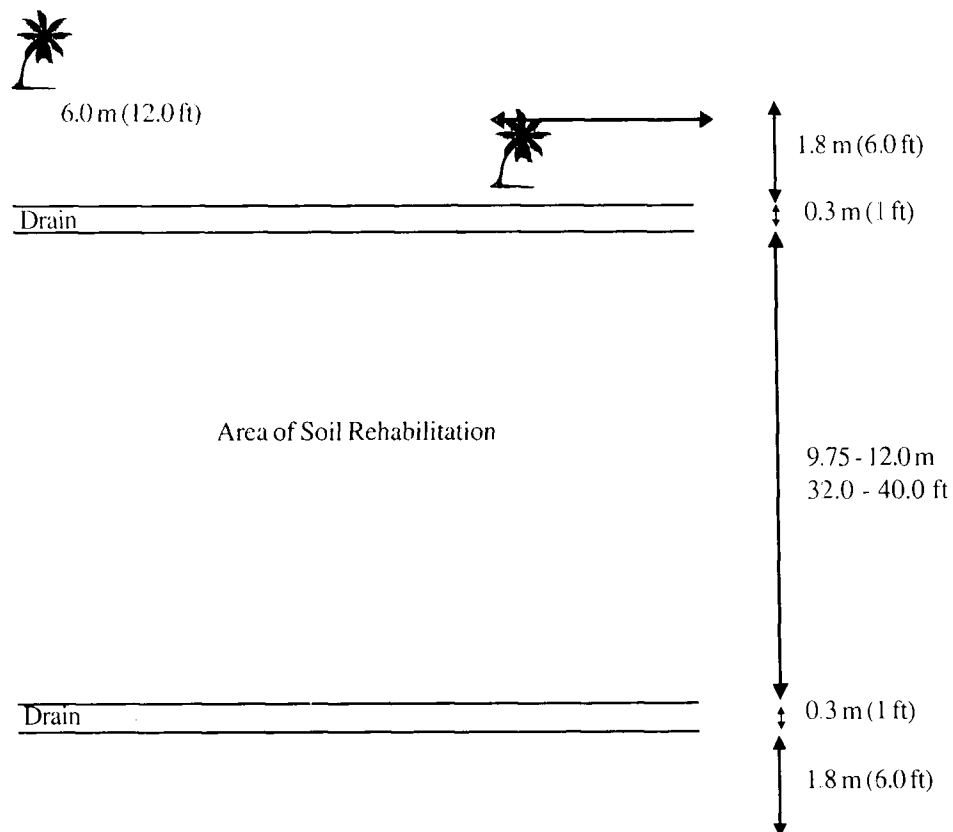


Figure 2. Area demarcated for soil rehabilitation in coconut avenue

- **Tea**

1.0 m x 0.6 m (3.5 ft x 2.0 ft) – For cultivars with erect growth habits

eg.S 106, DG 7 and 39

1.2 m x 0.6 m (4.0 ft x 2.0 ft) – For cultivars with spreading growth habits

TRI 2000, 3000 and 4000 series cultivars)

**Coconut**

9.75 m to 12.0 m (32 ft – 40 ft) between rows in avenue system 6.0 m (20 ft) within the row

**Planting Holes / Trenches**

- **Tea**

Holes : 45 cm (18 inches) deep with a top diameter of 30 cm (12 inches) and a bottom diameter of 12.5 cm (9 in)

Trenches : 45 cm (18 inches) deep and 45 cm (18 in) wide

- **Coconut**

Holes

For loamy/clay loam soil - 0.9 m x 0.9 m x 0.9 m (3 ft x 3 ft x 3 ft)

For shallow & gravelly soil - 1.2 m x 1.2 m x 1.2 m (4 ft x 4 ft x 4 ft)

**Time of Planting**

Planting of both tea and coconut should be done with the onset of South West monsoon rains (May/June) or North East monsoon rains (October / November). Precautionary measures recommended such as incorporation of pesticides should be adopted to control pests such as nematodes and white grubs prior to planting.

**Aftercare Operations**

Aftercare operations such as weed management, fertilizer application *etc.* common to both crops and thatching and bringing into bearing operations for tea should be adopted according to the recommendations of the TRI and CRI.

**Intercropping Tea in Existing Coconut Lands**

Lands presently under coconut may be intercropped with tea, provided that the soil and climatic conditions are conducive for tea. The coconut palms should be over 35 years to allow sufficient sunlight adequate to sustain satisfactory growth of tea. Soil rehabilitation is essential for lands with degraded soil conditions. Further, planting tea in trenches of 45 cm (1.5 ft) wide and 45 cm (1.5 ft) deep is preferable. A shallow

trench of 30 cm depth (1.0 ft), 2.0 m (6.0 ft) away on either side of coconut rows is advocated to minimize any adverse effect of mana grass on the growth of coconut.

To avoid competition, tea should be planted at least 2.0 m (6.0 ft) away from the coconut palm. Two systems of planting can be adopted for planting tea in existing coconut lands.

- Planting tea in the avenues of coconut;  
In this system, tea is established only in the inter-rows of coconut. The spacing can vary from 1.0 m – 1.2 m (3.5 ft. – 4.0 ft) between rows and 0.6 m (2.0 ft) within the row depending on growth habits of tea.
- Planting tea in the entire space between coconut palms;  
In this system, tea should be planted at a spacing of 1.0 m x 0.6 (3.5 ft x 2.0 ft) or 1.2 m x 0.6 m (4.0 ft x 2.0 ft.) to cover the entire space in the coconut square leaving a radius of 2.0 m (6.0 ft) from the coconut palm

### **Intercropping Coconut in Existing Tea Lands**

Tea lands in the low and mid elevations with an average bush stand of not more than 60% are better suited for mixed cropping provided that soil and climatic conditions are conducive for cultivation of coconut. It is possible to enhance the productivity of such lands by adopting mix cropping system (Gunatilaka and Ekanayake, 2000). The coconut spacing should be not less than 8 m x 8 m (26 ft x 26 ft) and a row of coconut could be planted for every 6 – 7 rows of tea. In addition, a radius of 2.4 m (8 ft) around coconut palms should be left as manure circles. Cultivation practices and aftercare operations may be adopted as similar to other systems. Further, it may be necessary to remove high shade species such as Albizzia and Gravillea to provide adequate light for coconut prior to planting.

### **Other Considerations**

- In order to allow movement of carts and tractors, it is advisable to leave one coconut avenue for every 5 to 6 avenues without planting tea.
- In coconut plantations with irregular spacing (where coconut is planted on the contour), it may not be possible to plant tea in a systematic manner. In such lands, tea should be planted in the spaces available after leaving 2.4 m (8.0 ft) from the coconut palm.

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