



Coconut Research Institute of Sri Lanka



Advisory Circular No C 1

INTERCROPPING IN COCONUT LANDS

The majority of coconut holdings in the country are maintained as monoculture plantations. Coconut monocropping is an inefficient land management system of low productivity and poor economic returns (Picture 1). Intercropping has proven to be the best option for maximizing land use in coconut plantations. It is an intensive land use system, in which one or more compatible crops are grown together with coconut, providing complementary benefits. It is estimated that about 200,000 ha of coconut lands, mainly in the Wet, and Wet-Intermediate Zones have the potential for intercropping. It is reported that suitable to moderately suitable, and marginal lands for coconut cultivation (S_3 , S_4 , S_5) offer much scope for successful intercropping, as coconut alone on these land classes cannot generate adequate income to maintain plantations on a profitable basis.



Picture 1: Resources available for Intercropping in an adult coconut plantation

1. Benefits of intercropping

- ♦ Increases income and profit
- ♦ Increases sunlight use efficiency
- ♦ Maximizes resource utilization (land, soil-water, sunlight, plant nutrients)
- ♦ Increases coconut production
- ♦ Improves soil fertility
- ♦ Increases crop productivity
- ♦ Suppress weed growth
- ♦ Reduces risk of depending on one crop (coconut) for income
- ♦ Provides food security

2. Selection of suitable land

In planning intercroppings in coconut lands, it is necessary to ensure that there is no decline in coconut production due to competition between coconut and the intercrop. The intercrops would compete with coconut for soil moisture and nutrients while coconut reduces the sun light availability to intercrops. This competition could be reduced considerably by selecting the most suitable coconut lands for intercropping and by adopting good management practices applicable to both coconut and the intercrops.

3. Factors to be considered for successful intercropping programme

3.1. Age of coconut palms and sunlight

Coconut is popularly planted at 8.5 m x 8.5 m or 8.0 m x 8.0 m spacing. Light availability underneath the coconut palm depend on:

- Age of palm
- Coconut planting system and spacing

Age of the palm can be grouped into:

A) Stage 1 - (0-5 years)

Generally light is not limiting in new or re-plantations between the age of 0-5. Hence light loving crops such as Pineapple, Passion fruit, Papaya, Cassava (seasonals and semi perennial crops) could be selected as intercrops(Picture 2). Depending on the type of soil and availability of water, vegetables and annual crops could also be grown.



Picture 2: Abandon sunlight availability in early stage of coconut Planting



Picture 3: Light is one of the limiting Factor in a coconut plantation at the age of 15 years

B) Stage 2 (6-20 years)

Palms of between the age of 6-20 years have over lapping of fronds. Consequently sunlight availability limiting(Picture 3). Therefore intercropping is generally impossible. However, pasture, yam, ginger (either shade tolerant or shade-loving crops could be selected.)

C) Stage 3 (21 - 50 years)

With the age, coconut canopy is getting small, and accordingly light availability the ground is increased. Majority of crops could be grown in this stage (eg. pepper, cinnamon, banana, pineapple, betel, ginger etc.).



Picture 4: A 60 years old coconut plantation required underplanting or replanting

D) Stage 4 (51 - 70 years)

At this age category replanting or under planting is normally carried out in coconut plantations (Picture 4). Selection of crops should be limited to semi-perennial crops (eg. pineapple, banana) (Picture 5) or seasonal (eg. vegetables, cassava). Perennial crops should not be planted at this stage (eg. pepper, coffee).



Picture 5: Pineapple intercropping in an underplantation of coconut

3.2 Soil moisture

The coconut palm needs a continuous supply of soil moisture to give a satisfactory yield. Hence inter-cropping under rain-fed conditions should be restricted to areas with adequate rainfall to provide moisture to both crops, (eg. Wet zone). In the semi-wet intermediate zone, perennial intercrops such as cacao, coffee and pepper would require supplementary irrigation during the dry periods, particularly during the establishment stage.

Note: To avoid competition for soil moisture, all intercrops should be planted 2.0 m away from the palm (Picture 6).

3.3 Plant nutrients

Both coconut and intercrops require nutrient for satisfactory growth and yield. Therefore, it is essential that both coconut and the intercrops are given the recommended fertilizers. Failure to apply fertilizer to intercrops will affect the intercrop as well as coconut because the intercrops will draw on the nutrients applied to coconut.



Picture 6: Banana has been planted leaving 2.0 m radius from the bole of a coconut palm

3.4 Soil characters

Generally fertile soils should be selected for intercropping. Several of those soil characters are texture (sands, clay, loamy etc.), drainage, water holding capacity, soil pH, CEC. Different crops require different soil characters. As an example pineapple grows vigorously in well-drained boralu soils while cinnamon grows well in sandy soils. Land suitability classes S₃, S₄ and S₅ are more suitable for intercropping (See Table 1).

3.5 Choice of crops

The varying climatic and soil conditions under which coconut is grown permit the cultivation of a wide variety of intercrops. However, many of the failures of intercropping as well as the adverse effects on coconut are mainly because of the wrong choice of intercrop. Therefore, selection of a proper intercrop is very important for a successful intercropping system.

Table 1: A guide to select suitable inter-crops

Zone	Wet			Wet-intermediate			Dry-intermediate			Land suitability classes				
	2500-1900			1900-1500			1500-1250							
Rainfall (mm/Year)	0-5	21-50	51-70	0-5	21-50	51-70	0-5	21-50	51-70	S1	S2	S3	S4	S5
Age (yrs) of coconut plantation (26'x 26' square planting)														
Crops														
Black pepper	-	X	-	-	X	-	-	-	-	-	X	X	X	-
Betel	-	X	X	-	X	X	-	-	-	-	-	X	X	-
Banana	X	X	X	X	X	X	X	X	X	-	X	X	X	-
Coffee	-	X	X	-	X	X	-	-	-	-	-	X	X	-
Cocoa	-	X	-	-	X	-	-	-	-	-	-	X	X	-
Cinnamon	-	X	X	-	X	X	-	-	-	-	-	-	X	X
Cashew	-	-	-	-	-	X	-	-	X	-	-	-	X	X
Cassava	X	-	X	X	-	X	X	-	X	-	-	X	X	X
Ginger	X	X	X	X	X	-	-	-	-	-	X	X	X	-
Improved pasture	-	X	X	-	X	X	-	X	X	-	-	X	X	-
Lime/Lemonime	-	-	X	-	X	X	-	X	X	-	X	X	X	-
Papaya	X	-	X	X	X	X	X	X	X	-	X	X	X	-
Passionfruit	X	X	X	X	X	X	-	-	-	-	-	X	X	X
Pineapple	X	X	X	X	X	X	-	-	-	-	-	X	X	-
Rambutan	-	-	X	-	-	X	-	-	-	-	-	X	X	-
Seasonal crops (yams, vegetables, cereals, pulses)	X	X	X	X	X	X	X	X	X	-	-	X	X	X

3.6 Rainfall and climate

Rainfall is the most critical factor in the choice of intercrop. The water requirements at various stages of growth of the selected intercrop should fit into the rainfall regime. As an example pepper should be selected for wet and intermediate zones, while crops like grafted cashew and lime are ideal for



Picture 7: Cocoa (a shade tolerant intercrop) Planted in a 35 years old coconut Plantation within the plantations (Picture 7).

intermediate dry and dry zones.
3.7 Shade

Intercrop rows should be oriented towards East-West direction to get the maximum benefit from the available sunlight. Generally, crops such as yams (eg. Colocasias, Dioscorea yams), coffee, cacao, pepper, cloves, ginger and turmeric need shady conditions and therefore should be restricted to areas receiving relatively less light

3.8 Slope of the land

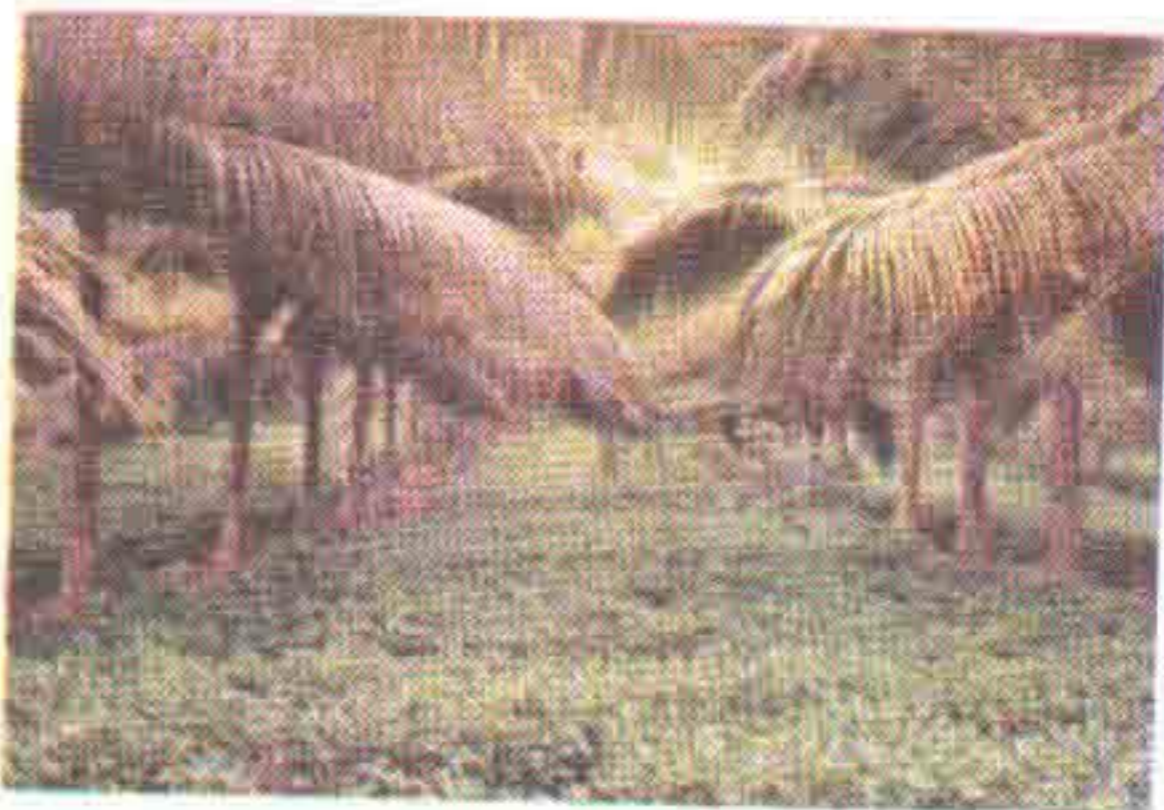
Intercropping programmes should minimize soil erosion. Perennial crops such as cocoa, coffee, pepper are ideal for slopping land while crops require land preparation (eg. ginger, pineapple) should be planted in less slopping or flat lands.

3.9 Marketing and disposal

It is advisable to study the marketing and disposal aspects before establishing intercrops. Only crops, which can be marketed easily, should be established close to a marketing point.

3.10 Labour requirements

Intercropping provides more employment. However, when planting an intercrop in a particular area, the availability of labour should be carefully considered, as certain crops require high labour inputs (eg. pineapple).



Picture 8: Coconut are planted at 10 m x 7 m spacing (avenue planting) for intercropping tea Planted in a 35 years old coconut Plantation

Special note: Avenue planting

With the establishment of new plantations, avenue planting of coconut with wider rows oriented intercrops having large canopy (Picture 8).

eg. Rambutan should be grown in coconut planted at 12 m x 8 m spacing.

4. Selected intercrops for coconut lands

A) Seasonal crops (duration is less than a year)
Ginger, Turmeric, Cassava, Yams, Vegetables

B) Semi-Perennial crops (duration is 2-5 years)
Pineapple, Banana, Passion fruit, Betel, Papaya