D1: SPECIES PROFILES

PEPPER (*Piper nigrum*), DURIAN (*Durio zibethinus*), AND AVOCADO (*Persea americana*) IN COFFEE AGROFORESTRY SYSTEMS

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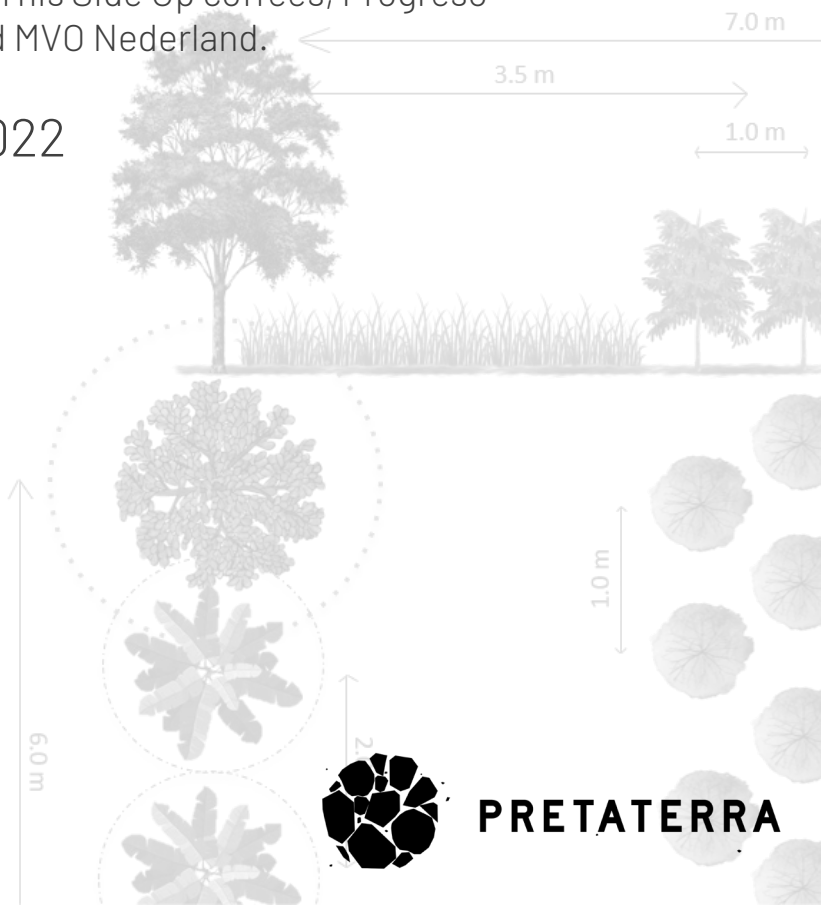


PRETATERRA

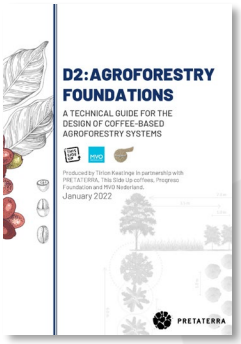
INTRODUCTION

This document presents a species profile of three species - avocado, durian and pepper - for application in coffee agroforestry systems. Examples and discussions focus on intercropping situations where coffee is the main crop.

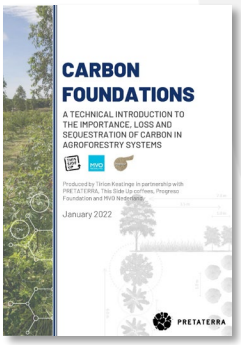
The profiles are supplemented with generic year-by-year advice for the establishment and management of each species. The content is designed for use by field staff working with farmers to implement agroforestry systems.

This document is a companion to two other documents:

D2: Agroforestry Foundations.
A technical guide for the design of coffee-based agroforestry systems.



D3: Carbon Foundations.
A technical introduction to the importance, loss and sequestration of carbon in agroforestry systems.



INTRODUCTION

PEPPER

DURIAN

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APPENDICES

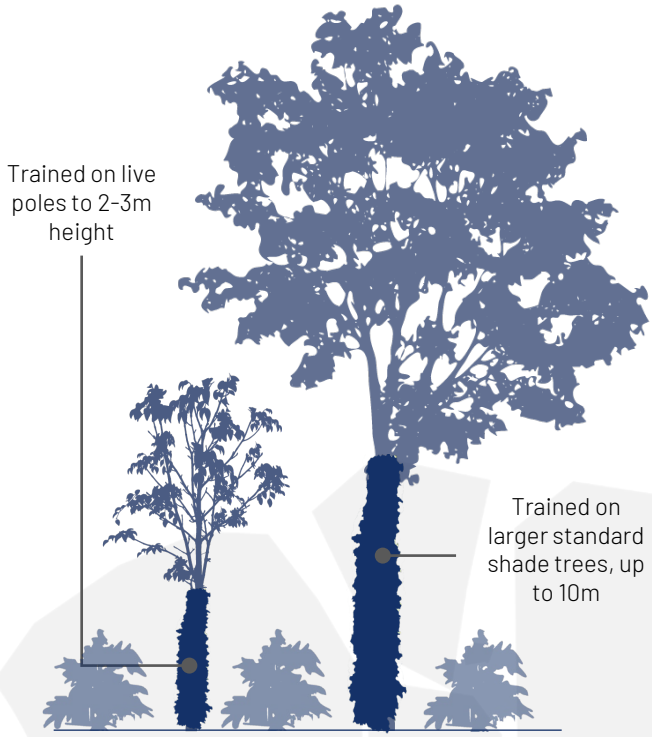
PEPPER IN COFFEE AGROFORESTRY SYSTEMS

PEPPER

Piper nigrum (Piperaceae)

Piper nigrum L. ('pepper') is a *tropical vine crop* cultivated for its fruit, which is used as a spice and medicinal product. It is a high-value cash crop with well-established markets worldwide. It is mostly sold dried, although fresh uses do exist in some locations. It is an ecologically versatile species, produced in systems ranging from intensive monocultures to highly diverse home garden-style agroforestry systems. Post-harvest processing and care influence the type of product derived (e.g. 'black pepper' versus 'white pepper'), as well as sales value.

Plant summary	
Plant type	Climber / vine
Height & spread	To 10+m in length if left unmanaged. 2-3m in managed systems. Bushy, spreading to 0.75-1m.
Ecology	Natural community: tropical montane forest. Function: Understory species, growing with support of trees.
Growth rate	Medium
Main uses	Cash crop, food/spice, medicine
Main services	Productive diversification
Time to first harvest	Year 3 after planting
Time to maturity	Year 5-7 after planting
Productive lifespan	Typically 10-15 years. Potentially 25+ years.
Common intercrops	Gliricidia (*Gliricidia sepium*), areca nut *Areca catechu*, coconut (*Cocos nucifera*) coffee (*Coffea spp.*), cacao (*Theobroma cacao*), diverse native forest species (depending on location).



KEY SUCCESS FACTORS

1. Good shape: pruned to produce 3 main stems. Shoots over 2 metres cut back & excessive shoots thinned out
2. Good soil: open structure, reasonably fertile, mulched regularly with manure, compost or organic matter
3. Appropriate live support tree: live pole needs to have rough bark for the pepper to climb, should be strong enough to support the vine when the pepper is planted, and should not cast heavy shade
4. Light shade: shade is most important in the first 1-2 years and during hot, dry periods - especially when the plant is flowering and fruiting. Productivity is reduced in heavy shade.

PEPPER IN COFFEE SYSTEMS

The main value of pepper in coffee systems is provision of diverse crops either for sale or own consumption. This is especially beneficial in relatively low-density coffee plantations where suitable support trees (e.g. *Gliricidia sepium*, *Erythrina subumbrans*, *Grevillea robusta*, native tree species) are already present. In this case, pepper can make more efficient use of space. If integrated into high-density systems where nutrient, water or light management are inappropriate, addition of pepper may increase competition for nutrients and water, and negatively impact microclimate e.g. by increasing humidity around coffee, increasing risk of fungal disease.

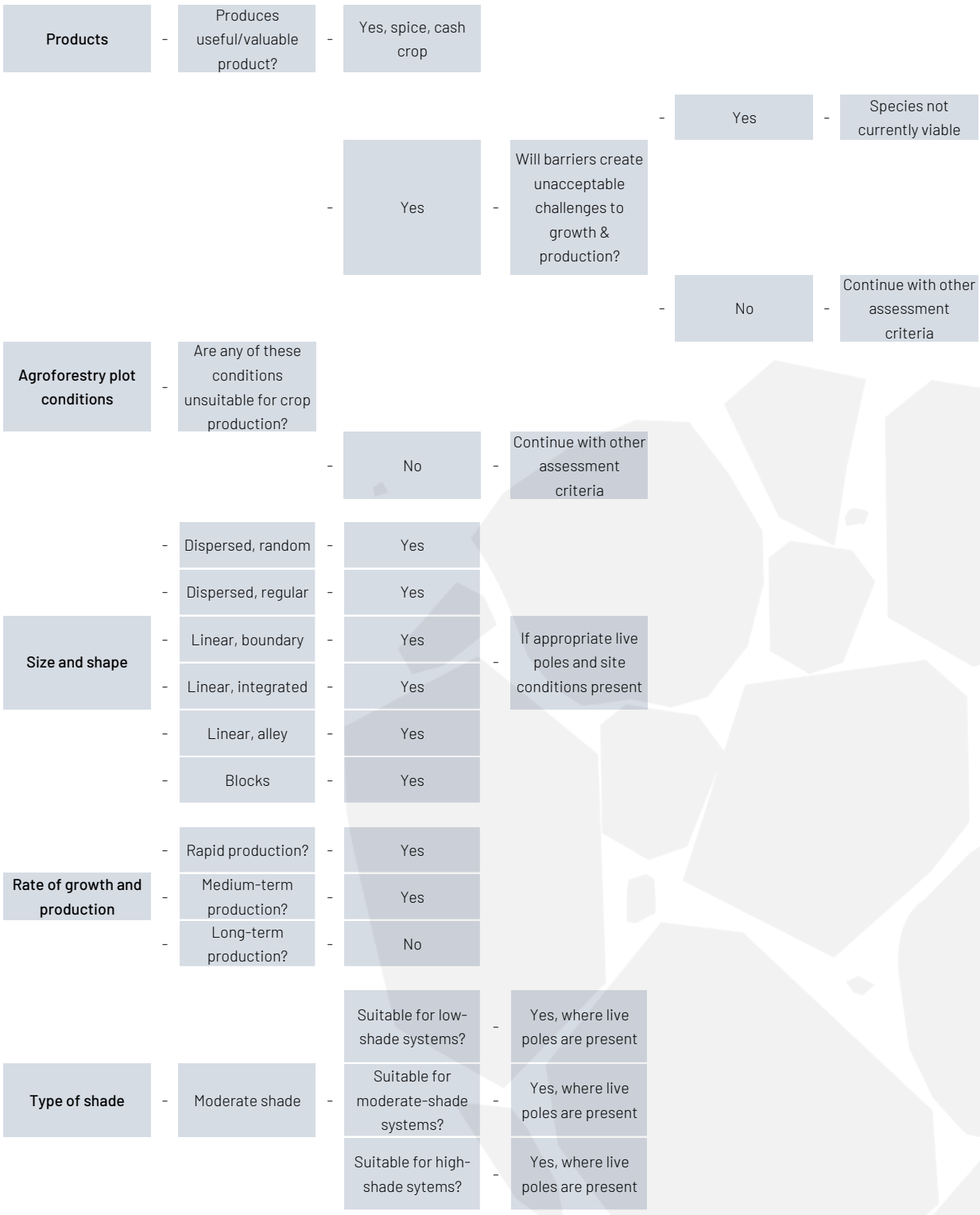
Climate	
Classification	Tropical
Temperature, optimum	23-32°C
Temperature, tolerance	10-40°C
Rainfall, optimum	2000-3000mm/year
Rainfall, tolerance	1500-4000mm/year
Notes	Tolerates extended dry season (3+ months) if well-managed. Sufficient and consistent rainfall during wet season most important for productivity.

Landform	
Altitude, range	0-1500masl
Topography	Flat to moderate slopes

Soil	
Summary	Reasonably fertile sites with good moisture-retention and high organic matter content.
Texture & composition	Light, sandy clay to clay.
Moisture	Well-drained but moisture retentive.
Soil organic matter, optimal	>1.9%
pH range (optimum)	5.6-6
pH range (tolerance)	4.8-7.5 (variety-dependent)
Depth	>100cm

SPECIES ASSESSMENT: PEPPER

This species assessment example links to exercises 7 & 8 in the Agroforestry Foundations Technical Guide (Deliverable 2). It is an example of some key considerations for analysing a species' suitability for application in coffee agroforestry systems based on known characteristics. Broadly, the decision on whether or not to use a specific species will follow this logical pattern: Define the key parameter & goal (e.g. what products are desired) – understand the species' characteristics – list advantages – list disadvantages or barriers – decide on suitability. The diagram below illustrates this process for pepper. Actual suitability is different according to context. Please refer to that guide for further detail on species selection.



			Short-term soil nutrient and organic matter input?	-	No
Leaf litter characteristics	-	Moderate leaf size and decomposition rate	Long-term soil nutrient and organic matter input?	-	Some, limited to plant area (1m2)
			Lasting soil cover?	-	No
	-	Nitrogen fixation?	-	No	
Provision of other services	-	Soil stabilisation?	-	Limited	
	-	Increased biodiversity?	-	Yes, moderate	
Host of organisms or pathogens	-	Not known			
			-	Suitable for poor quality or heavily degraded soils?	-	No
Nutrient and water demand	-	Moderate, sharing same root zone as coffee	-	Suitable for moderately quality soils?	-	Yes, if fertilised sufficiently
			-	Suitable for high-quality soils?	-	Yes
	-	Pruning and training needed?	-	Yes	
Management required or tolerated	-	High maintenance once established?	-	Moderate	
	-	Coppicing or pollarding possible?	-	No	
	-	Requires machine access?	-	No	
Methods of harvest	-	Likely to damage coffee crop?	-	No	
	-	Other complicating factors?	-	No	
			-	Establishment	-	Yes, where pepper and coffee are planted
Timing of key activities	-	Coinciding with coffee activities?	-	Maintenance	-	Yes, possible
			-	Harvest	-	Yes, possible
Access to market or end use	-	Useful for own consumption?	-	Yes, moderate	
	-	Can be marketed in the local area?	-	Context-dependent	

PEPPER MANAGEMENT

Yr.0: Plant

- Establish live pole: if not already present, plant the live pole before planting the pepper. If planting with large stake, this can be done just before planting the pepper. If growing from seed/seedling, this must be done 1-3 years before planting pepper (depending on species)
- Plant pepper: at the beginning of the wet season
- Manure: Apply 10kg of manure and 1kg ash or dolomite at planting
- Mulch: Mulch: 8-10cm deep at to 50cm radius around the seedlings - maintain especially just before the beginning of the dry season
- Train: lead the vine to the support tree with a stick if needed

Yr1: Prune & fertilise

- Prune pepper: at the end of the wet season, cut the pepper vine to 30cm above the ground, cutting directly above a bud
- Manure & ash: apply 10kg manure and 1kg ash or other agent (e.g. dolomite to raise soil pH)
- Remove any pepper flowers or fruit to promote vegetative growth

Yr2: Prune & fertilise

- Prune pepper: when the pepper plant reaches about 1.25-1.5m tall remove excess main shoots (i.e. more than 3), and cut 6-7 nodes from the top of each remaining stem.
- Prune shade trees: thin the shade tree canopy if possible (e.g. with small species like leucaena - lamtoro or gliricidia - gamal) at the beginning of the rainy season.
- Remove any pepper flowers or fruit to promote vegetative growth
- Manure: Apply 10kg of manure and 1kg ash or dolomite at the beginning of the wet season

Yr.3: Prune, fertilise and harvest

- Final formative pruning: Cut 6-7 nodes from the top of each main stem once they reach the top of the pole (2-2.5m).
- Maintenance pruning: Remove unwanted branches and shoots: i.e. side branches on or close to the ground, hanging branches from the top of the vine, vigorous side branches and water shoots growing from the main three stems
- Harvest first pepper
- Manure: Apply 10kg of manure and 1kg ash or dolomite at the beginning of the wet season

Yr.4+: Prune, fertilise and harvest

- Maintenance pruning: Remove unwanted branches and shoots: i.e. side branches on or close to the ground, hanging branches from the top of the vine, vigorous side branches and water shoots growing from the main three stems
- Manure: Apply 10kg of manure and 1kg ash or dolomite at the beginning of the wet season
- Harvest pepper

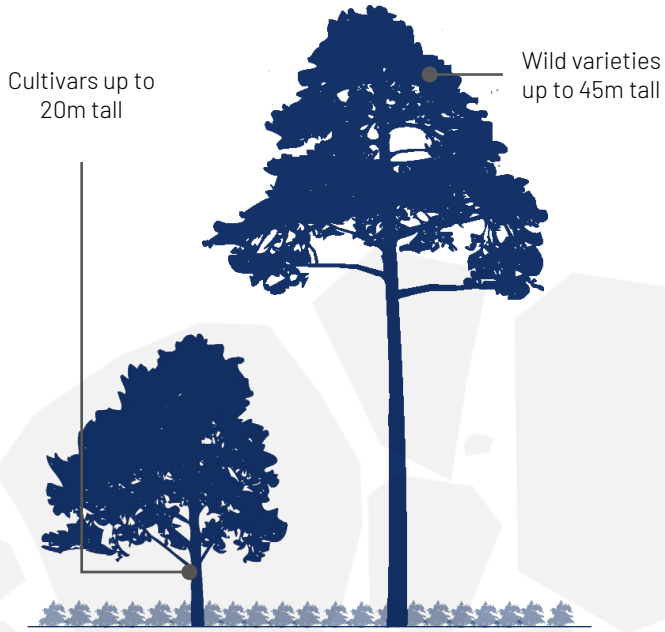
DURIAN IN COFFEE AGROFORESTRY SYSTEMS

DURIAN

Durio zibethinus (Malvaceae)

Durian (various species in the genus *Durio*, here *Durio zibethinus*) is a medium to large tropical tree cultivated for its high-value fruit, mainly in the southeast Asia and Pacific region. Some cultivars are grown in orchard settings, typically growing to 10-15m height, while others are grown as overstory forest trees to 45m according to their natural habit. Modern commercial production is orchard-based, whereas more traditional (e.g. homegardens) systems included durian as a high-stratum overstory. It is primarily valued for its fruit, which may be sold fresh or processed for a range of products. It is also of some value for wood, especially for interior construction, and for honey production. The relatively slow time to maturity and wide commercial spacing of durian makes it a good candidate for intercropping.

Plant summary	
Plant type	Medium to large tree.
Height & spread	To 45m tall in forest conditions, 10-20m in orchard conditions, depending on cultivar.
Ecology	Emergent canopy species in humid tropical forests.
Growth rate	Moderate.
Main uses	Fruit for cash crop or own use, moderate quality timber for interior construction and furniture
Main services	Shade for coffee, soil conservation & organic matter addition, pollen & nectar source.
Time to first harvest	Year 7-8 after establishment
Time to maturity	Years 15+ after establishment
Productive lifespan	50+ years
Common intercrops	Diverse native emergents, lower canopy e.g. *Areca catechu,* shade-tolerant shrubs (*Coffea spp.* , *Theobroma cacao*) and annuals/short-term crops in early years of orchard establishment.



KEY SUCCESS FACTORS

1. Good, well-drained soil: light, open structure, reasonably fertile, mulched regularly with manure, compost or organic matter. Should not become waterlogged as durian is susceptible to root rot.
2. Good shape: pruned to have open, even branch structure and mainly horizontal branches, which bear most fruit.
3. Multiple varieties: required for good pollination and fruiting.
4. Full sun: when mature, durian need full sun for good production.

DURIAN IN COFFEE SYSTEMS

The main value of pepper in coffee systems is provision of diverse crops either for sale or own consumption. This is especially beneficial in relatively low-density coffee plantations where suitable support trees (e.g. *Gliricidia sepium*, *Erythrina subumbrans*, *Grevillea robusta*, native tree species) are already present. In this case, pepper can make more efficient use of space. If integrated into high-density systems where nutrient, water or light management are inappropriate, addition of pepper may increase competition for nutrients and water, and negatively impact microclimate e.g. by increasing humidity around coffee, increasing risk of fungal disease.

Climate	
Classification	Humid/seasonally dry tropical
Temperature, optimum	22-32°C mean daily
Rainfall, optimum	2000-3000mm/year
Rainfall, tolerance	1500-5000mm/year
Notes	Rainfall preferably distributed over 6-8 months. Requires dry season of at least 2-4 weeks for good flowering.

Landform	
Altitude, range	0-1000masl
Topography	Flat to moderately sloped.

Soil	
Summary	Rich, well-drained, sand to clay with high organic matter.
Texture & composition	Light, sandy clay to clay.
Moisture	Well-drained but moisture-retentive. Does not tolerate waterlogging.
pH range (optimum)	5-6.5
pH range (tolerance)	4.0-6.5
Depth	Preferably deep.

SPECIES ASSESSMENT: DURIAN

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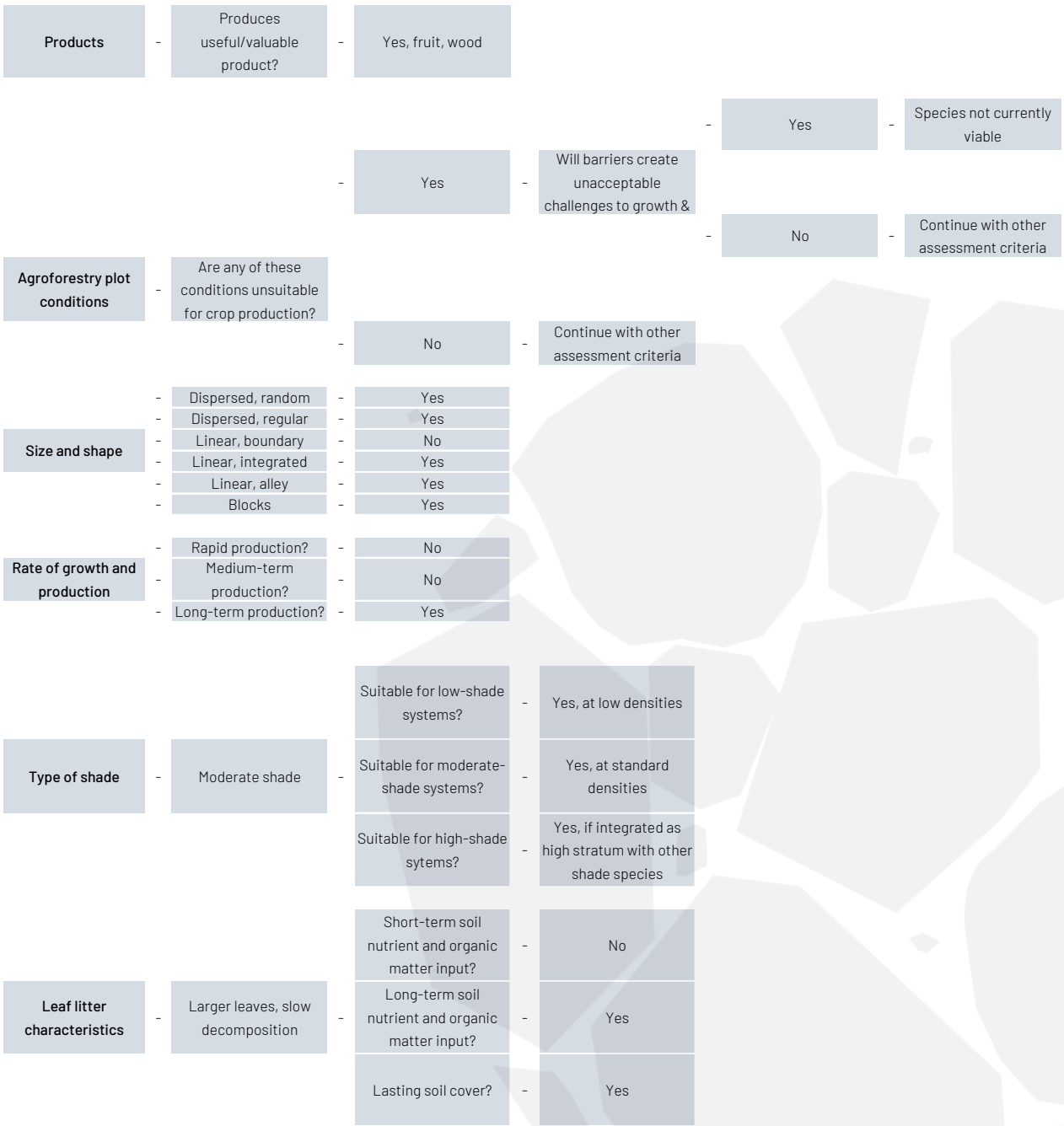


Products	Produces useful/valuable product?	Yes, fruit, wood					
Agroforestry plot conditions	Are any of these conditions unsuitable for crop production?	Yes	Will barriers create unacceptable challenges to growth & production?	Yes	Species not currently viable		
				No	Continue with other assessment criteria		
		No	Continue with other assessment criteria				
Size and shape	Dispersed, random	Yes					
	Dispersed, regular	Yes					
	Linear, boundary	No					
	Linear, integrated	Yes					
	Linear, alley	Yes					
	Blocks	Yes					
Rate of growth and production	Rapid production?	No					
	Medium-term production?	No					
	Long-term production?	Yes					
Type of shade	Moderate shade	Suitable for low-shade systems?	Yes, at low densities				
		Suitable for moderate-shade systems?	Yes, at standard densities				
		Suitable for high-shade sytems?	Yes, if integrated as high stratum with other shade species				
Leaf litter characteristics	Larger leaves, slow decomposition	Short-term soil nutrient and organic matter input?	No				
		Long-term soil nutrient and organic matter input?	Yes				
		Lasting soil cover?	Yes				
Provision of other services	Nitrogen fixation?	No					
	Soil stabilisation?	Yes, limited					
	Increased biodiversity?	Yes, moderate					
Host of organisms or pathogens	Not known						
Nutrient and water demand	Moderate, sharing similar root zone with coffee	Suitable for poor quality or heavily degraded soils?	No				
		Suitable for moderately quality soils?	Yes, if fertilised sufficiently				
		Suitable for high-quality soils?	Yes				
Management required or tolerated	Pruning and training needed?	Yes, if optimal production is desired					
	High maintenance once established?	No					
	Coppicing or pollarding possible?	No					
Methods of harvest	Requires machine access?	No					
	Likely to damage coffee crop?	No, if harvest does not coincide with coffee berry ripening or harvest.					
	Other complicating factors?	Fruit on high branches difficult to reach.					
Timing of key activities	Coinciding with coffee activities?	Establishment	Yes, where durian and coffee are planted simultaneously				
		Maintenance	Not significant				
		Harvest	Possible, context-dependent				
Access to market or end use	Useful for own consumption?	Yes					
	Can be marketed in the local area?	Context-dependent					

DURIAN MANAGEMENT

Yr.0: Plant, fertilise, protect

- When: Beginning of the rainy season
- Spacing: 12-20m apart
- Hole size: 70x70x70cm
- Manure: apply 5-10kg manure
- Other inputs: apply other input such as dolomite or ash where pH is very low (<5.0)
- Mulch: 8-10cm deep at to 50cm radius around the seedlings - maintain especially just before the beginning of the dry season
- Stake: Loosely tie tree to a small stake (e.g. bamboo) for support

Yr.1: Prune and fertilise

- Prune: when tree is 0.7-1m tall, remove all branches on the lowest one third of the stem. If there are multiple vertical stems (leaders), choose one and remove the rest. Tie remaining branches into the desired shape.
- Manure: apply 3-5kg per tree at end of rainy season
- Mulch: mulch base of the tree as in yr.0 - especially just before the beginning of the dry season

Yr.2: Prune and fertilise

- Prune: select 5-8 well-placed, horizontal branches to form the main scaffold. Prune off poorly-place branches. Remove competing leaders.
- Manure: apply 6-10kg per tree at end of rainy season
- Mulch: mulch base of the tree as in yr.0 - especially just before the beginning of the dry season

Yr.3-9: Prune & fertilise

- Prune: in approximately year 5 top main leader to the highest vigorous side shoot, encouraging lateral growth.
- Manure: apply at end of rainy season
- Harvest (yr.7-9)

Yr.10+: Prune, fertilise & thin fruit

- Prune annually
    - Remove branches growing at less than 2-2.5m height
    - Remove dead, diseased or damaged branches
    - Remove excessive small branches within canopy to maintain air circulation and light penetration
    - Remove vertical shoots & trim branch tips
- Manure: apply 10-30kg manure per tree at end of rainy season
- Thin fruit: remove fruit at end of branches, remove small and irregularly-shaped fruit
- Harvest

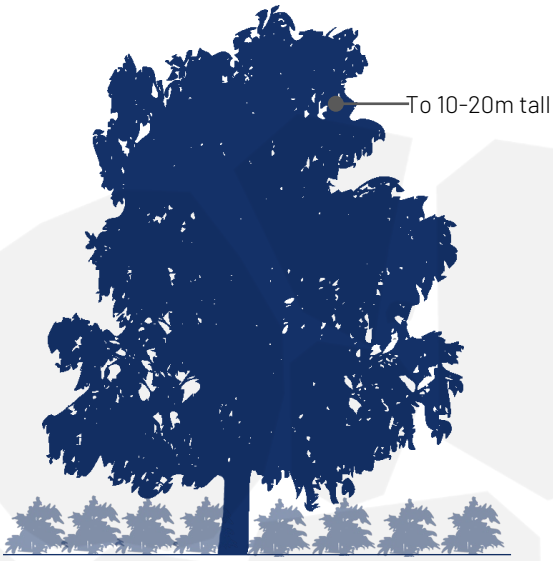
AVOCADO IN COFFEE AGROFORESTRY SYSTEMS

AVOCADO

Persea americana (Lauraceae)

Avocado - *Persea americana*, is a small to large tree from 3-20m in height with a shallow root system - growing in a range of conditions, from semi-arid and Mediterranean to humid subtropical and tropical climates. Both form and appropriate growing conditions depend significantly on the variety of avocado (there are three broad categories, with different origins and different climatic tolerances, as shown in the table below). In coffee-growing contexts, the types of avocado grown are most typically 10-20m in height with a rounded crown and dense canopy. Avocado cultivation is global in reach, in systems ranging from large commercial monoculture orchards, to smallholder farms (including complex agroforestry home gardens) where they are highly valued both for own consumption and as a cash crop. This high value makes avocado a popular component of agroforestry systems, but given its heavy shading capacity, inclusion in coffee systems should be considered with care if coffee productivity is to be maintained.

Plant summary	
Varieties	Three distinct varieties impact characteristics and conditions: 'West Indian' (*P. americana* var. *americana*), 'Guatemalan' (*P. americana* var. *guatemalensis)*, and 'Mexican' (*P. americana* var. *drymifolia*).
Plant type	Medium to large evergreen tree.
Form	10-20m height; shallow roots (30-40cm; max 1m)
Ecology	Emergent canopy species in humid tropical forests.
Growth rate	Fast.
Main uses	Food, cash crop, medicine, cosmetics
Main services	Soil protection, biodiversity
Time to first harvest	Years 4-5 after establishment.
Time to maturity	10-20 years
Productive lifespan	20-40 years
Common intercrops	Various, includes coffee, pepper, durian, horticultural crops, maize



KEY SUCCESS FACTORS

1. Good soil: open structure, well-drained with good water-holding capacity, reasonably fertile, mulched regularly with manure, compost or organic matter.
2. Soil water status: sufficient soil water vital for flowering and fruit set. Also sensitive to waterlogging, which should be avoided.
3. Good shape: pruned lightly to maintain an open, even, uncrowded branch structure.
4. Good root care: sensitive roots must not be damaged during planting.
5. Full sun: prefers full sun for good production.

AVOCADO IN COFFEE SYSTEMS

Avocado is a popular agroforestry species in many areas of the world - from central and south America, to sub-saharan Africa and to the Asia-Pacific regions. It is commonly intercropped with a wide range of species, from annual crops such as maize (*Zea mays*) to perennial shrubs (e.g. coffee - *Coffea* spp., and cacao - *Theobroma cacao*), fruit trees and perennials (e.g. enset - *Ensete ventricosum*, banana - *Musa* sp. and durian - *Durio zibethinus*), multipurpose and timber species such as (e.g. Dama - *Shorea javanica* and bitter bean - *Parkia speciosa*) and service species (e.g. Gliricidia - *Gliricidia sepium* and Leucaena - *Leucaena leucocephala*).

Intercropping with rapidly-establishing crops such as banana (*Musa* sp.) can provide shade to young avocado plants, protecting them from sun scorch in high-sunlight areas. Dense shade from avocado will reduce intercop yields at high densities. Spacing of at least 12+ metres in coffee plantations is preferred to maintain coffee yields (up to 20-25m when combined with other shade species). Low light conditions (e.g. from heavy cloud) and poor soil nutrient status generally indicates a need for wider spacing in coffee production systems. Avocado can be appropriate in diversified systems as an upper canopy species where some yield reduction is acceptable. It provides a valuable product either for own consumption or as a cash crop. Large leaves provide lasting soil cover and gradual addition of organic matter. With brittle branches, avocado is not suitable as a sole windbreak, even requiring wind protection on exposed sites.

OBS. Condition preferences of avocado vary significantly depending on their place of origin & variety. Here West Indian varieties (sub-tropical to tropical) are prioritised.

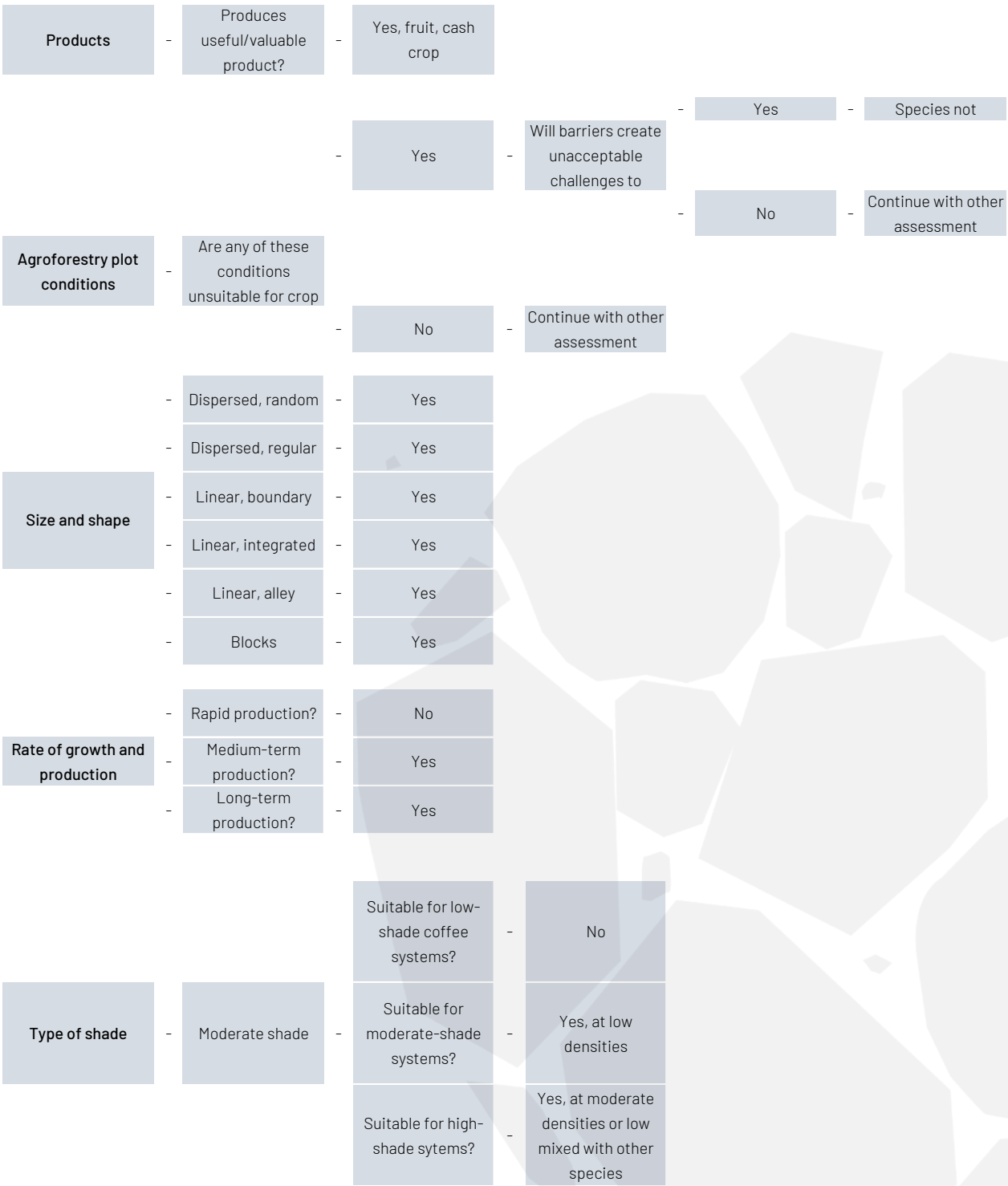
Climate	
Classification	Tropical to sub-tropical, semi-arid and Mediterranean
Temperature, optimum	Variety-dependent. West Indian varieties: mean annual temp 18-21°C.
Temperature, tolerance	West Indian varieties: 10-33°C. Mexican and guatemalan varieties, areas with winter frosts lower than -4-6°C unsuitable.
Rainfall, optimum	Variety-dependent. 1200-1600mm/year in subtropical-tropical areas, well-distributed.
Rainfall, tolerance	Variety-dependent. Minimum 1000mm/year, well-distributed except for during winter dormancy (where appicable).

Landform	
Altitude, range	Variety-dependent. West Indian varieties typically 0-800masl.
Topography	Flat to moderately sloped.

Soil	
Summary	Wide range of soil types. Well-drained soils with good structure minimising root stress are optimal: roots are sensitive to waterlogging, salinity, poor aeration and poor water-holding capacity.
Texture & composition	Sandy to clay, preferring high organic matter.
Moisture	Well-drained but moisture-retentive. Does not tolerate waterlogging.
pH range (optimum)	5.0-7.0
pH range (tolerance)	3.5-8.2
Depth	Medium, 0.5-1m except where water is excessive and Phytophthera root root is a problem (needs to be >1m).

SPECIES ASSESSMENT: AVOCADO

This species assessment example links to exercises 7 & 8 in the Agroforestry Foundations Technical Guide (Deliverable 2). It is an example of some key considerations for analysing a species' suitability for application in coffee agroforestry systems based on known characteristics. Broadly, the decision on whether or not to use a specific species will follow this logical pattern: Define the key parameter & goal (e.g. what products are desired) – understand the species' characteristics – list advantages – list disadvantages or barriers – decide on suitability. The diagram below illustrates this process for avocado. Actual suitability is different according to context. Please refer to that guide for further detail on species selection.



SPECIES ASSESSMENT, AVOCADO

Leaf litter characteristics	Moderate leaf size and decomposition rate	Short-term soil nutrient and organic matter input?	No		
		Long-term soil nutrient and organic matter input?	Yes, moderate		
		Lasting soil cover?	Yes, moderate		
Provision of other services	Nitrogen fixation?	No			
	Soil stabilisation?	Yes, moderate			
	Increased biodiversity?	Yes, moderate			
Host of organisms or pathogens	Yes	*Colletotrichum gloeosporioides*	Avoid intercropping with coffee where *C. Gloiosporiodes* is a significant challenge.		
Nutrient and water demand	Moderate, sharing same root zone as coffee	Suitable for poor quality or heavily degraded soils?	No		
		Suitable for moderately quality soils?	Yes, if fertilised sufficiently		
		Suitable for high-quality soils?	Yes		
Management required or tolerated	Pruning and training needed?	Yes, moderate			
	High maintenance once established?	Yes, minor			
	Coppicing or pollarding possible?	No			
Methods of harvest	Requires machine access?	Yes, in some systems			
	Likely to damage coffee crop?	No			
	Other complicating factors?	No			
Timing of key activities	Coinciding with coffee activities?	Establishment	Yes, where avocado and coffee are planted simultaneously		
		Maintenance	Yes, possible		
		Harvest	Yes, possible		
Access to market or end use	Useful for own consumption?	Yes, moderate			
	Can be marketed in the local area?	Context-dependent			

AVOCADO MANAGEMENT

Yr.0: Plant

- When: beginning of rainy season
- Spacing: 15-20m apart to avoid excessive shading to coffee plants
- Hole size: 50x50x50m or large enough to spread the roots out well
- Manure: apply 5-10kg manure
- Other inputs: apply lime, dolomite or other suitable input to raise pH if it is below 5.0
- Mulch: 8-10cm deep at to 50cm radius around the seedlings - maintain especially just before the beginning of the dry season
- Stake: Loosely tie tree to a small stake (e.g. bamboo) for support

Yr. 1-4: Fertilise, mulch and prune

- Prune: in year 2 or 3 remove poorly-placed branches to produce a balanced tree form with 8-12 branches
- Maintain layer of mulch approx. 8-10cm thick around the base of the tree, especially just before the beginning of the dry season
- Apply manure: 10kg/tree

Yr. 5-7: Fertilise, harvest

- Harvest available fruit
- Apply manure: 30-50kg per tree

Yr.8/9: Thin branches, harvest & fertilise

- Thin branches: Reduce the number of main branches to 6-8
- Manure: apply 50-70kg manure per tree

Yr.10+: Prune, harvest & fertilise

- Manure: apply 75kg manure per tree
- Prune: remove dead, damaged or diseased wood. Thin the centre of the canopy as needed.

APPENDICES

APPENDIX A: DURIAN HARVEST CALENDAR

Durian harvest season

Country/region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Thailand				●	●	●	●	●	●			
Myanmar						●	●					
Cambodia					●	●	●					
Lao PDR					●	●	●					
Singapore	●				●	●	●					● ●
Eastern Malaysia						●	●	●				
Western Malaysia					●	●	●	●				
Sabah	●	●	●								●	● ● ●
Sarawak	●	●	●								●	● ● ●
Indonesia (general)	●	●	●			●	●	●	●	●	●	● ● ●
Kalimantan / Borneo												
Sulawesi												
Java	●	●	●								●	● ● ●
The Philippines								●	●	●	●	●
Brunei							●	●				
N. Queensland		●	●	●	●	●	●					
N. Territory	●	●	●								●	● ● ●

APPENDIX B: TREE PLANTING BASICS

TREE PLANTING PROCESS

The basic process for planting a tree includes:

- Source good quality seedlings
- Care for seedlings if storing before planting, including sufficient watering and avoiding stressful conditions (e.g. direct sunlight)
- Prepare the ground (e.g. weed control)
- Water the tree well before planting
- Plant the tree, making sure the roots are not crowded in the hole
- Add surface amendments and organic mulch
- Water the tree well directly after planting
- Feed & protect the tree (e.g. tree guards may be necessary where grazing animals are a major threat, and staking may be necessary where there is significant risk of wind)
- Prune and form the tree as appropriate for the species

GENERAL PLANTING ADVICE

- Clear approximately 1m of weeds around the planting area, especially aggressive weeds such as grasses
- Dig a hole that is large enough to spread out the roots of the seedling
- Gently loosen seedling roots before planting to ensure roots are not wrapped tightly together
- Mix inputs with soil as needed before filling the hole (e.g. dolomite)
- Plant the tree with the soil at approximately the same height on the stem as in the soil level used in the planting bag
- Make sure the roots are fully covered by the soil
- Apply nutrients around the tree in the root zone (approx. 50cm radius)
- Add an 8-10cm layer of mulch around the tree in an approximately 50cm radius
- Make sure that a 3-5cm gap is left between the tree stem and the mulch. If the mulch is touching the bark, there is a chance that the stem will rot

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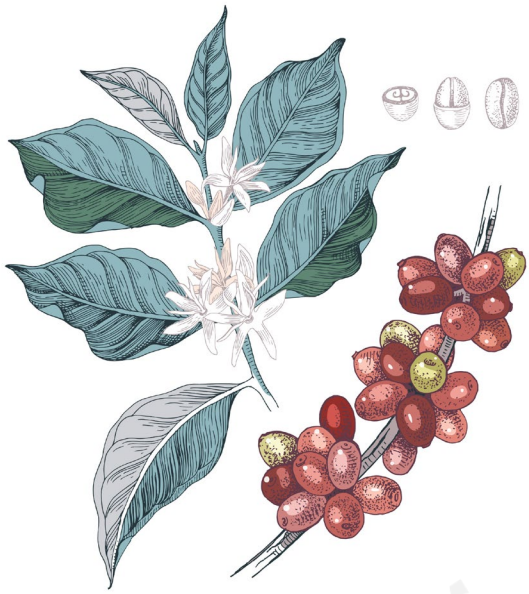

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