Cocoa Agroforestry
at ECOM

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Cocoa agroforestry is a versatile land-use system offering agronomic, ecological, and socio-economic benefits, enhancing resilience and contributing to the long-term sustainability of cocoa farming (Niether et al., 2020). Cocoa agroforestry is one element of regenerative agriculture and involves practices such as inter-planting within cocoa farms, border planting around farm edges, and strategic planting near water sources for erosion protection and watershed health (Dagar & Tewari, 2017). As cocoa remains a vital global commodity, embracing agroforestry practices offers one of the solutions to meeting the demands of today while ensuring a resilient and sustainable future for cocoa production.

Cocoa is often grown in the variable system of agroforestry whereby forests are selectively thinned and cocoa along with other fruit or timber trees are planted beneath the remaining canopy (Franzen & Borgerhoff Mulder, 2007). These systems often replace natural forest and thus contribute to environmental degradation, both directly within farms and indirectly beyond the farms.

While the integration of shade trees in agroforestry supports the growth of young cacao, shade becomes less critical in older cacao plantations, necessitating a dynamic approach to shade tree management. The changing response to shade regimes of cocoa plantation age highlights the importance of identifying the optimal combination and density of species to maintain high cocoa production within an agroforestry system over time.

Meta-analyses reveal the potential range of outcomes, both positive and negative in agroforestry systems, emphasising the need for a careful balance to achieve desirable ecosystem services without compromising profits, livelihoods, or ecological integrity (De Beenhouwer et al., 2013).

Agroforestry leverages the interactions between different species within the system and has the potential to contribute to functional biodiversity, carbon sequestration, nutrient recycling, soil fertility, drought resistance, and provide natural pest control (Somarriba et al 2021; Asar 2006). For example, selected non-cocoa species create habitats for insects that can control pests or increase pollination while increasing the canopy cover contributes to more shade, reducing evaporation and controlling temperature and soil moisture.

Additionally, agroforestry has the potential to promote social and economic benefits like food security and income diversification through the planting of food or commercial crops, addressing the multifaceted challenges faced by cocoa farmers globally. However, the implementation of cocoa agroforestry systems comes with risks if not well planned or managed, particularly in the face of unusual weather patterns driven by changing climate. All the potential benefits of agroforestry can become suboptimal outcomes that may compromise profits, farming livelihoods, and ecological integrity. To mitigate these risks, careful consideration of the optimal combination and density of species, as well as a comprehensive understanding of local ecological and social conditions, is crucial in ensuring the success and resilience of cocoa agroforestry systems for ECOM and the farmer.

Cocoa Agroforestry at ECOM continued

Scaling-up cocoa agroforestry requires a collaborative effort involving co-learning, co-adapting, and co-managing between ECOM and cocoa farmers. The ultimate goal for ECOM is to improve the sustainability of cocoa production while addressing environmental, economic and social issues. Cocoa farmers, facing climate change impacts and increasing productivity demands, must adopt sustainable management practices that integrate multidisciplinary approaches. While we see our role to support in the sustainable transition, ultimately cocoa farmers need to decide if agroforestry can be a tool to meet their priorities and if so how to adapt it to best meet those needs.

There is a diverse portfolio of agroforestry frameworks available, and these are further specified when adapted to farmer needs and the local environment. This introduces challenges in global monitoring as our aim is to set targets and confidently report on progress against the scale of agroforestry adoption in our supply chain. Therefore, we aimed to establish a definition for agroforestry across our origin-sourced supply chains by the end of 2023. Going forward we hope to focus on understanding the various intensity levels across systems and the associated outcomes from those different levels.

Below we standardise a definition for a minimum intensity or converting system (Seedling Level) through the highest intensity (Mature Level) of agroforestry.

ECOM Agroforestry **Intensity levels:**

Indicators	Seedling Level *Low intensity or converting system*	Sapling Level	Mature level
Land coverage	1 ha		
Tree Density (trees per ha) [1] **and basal area (m2 per ha)** [2]	≥12 trees per ha **OR** basal area of ≥ 3m^2 per ha	≥16 trees per ha **OR** basal area of ≥5m^2 per ha	≥20 trees per ha **OR** ≥ or basal area of 8m^2 per ha
Number of species (non-cocoa) [3]	Not specified	≥3	≥5
Recommended species [4]	Any combination of forest, legume and fruit trees determined through a discussion with the farmer	Multipurpose trees are deliberately selected through a discussion with the farmer to have more than one function, such as native shade, economic shade, and/or trees for intercropping, selected based on climate suitability and incremental revenue estimates.	Multipurpose trees are deliberately selected through a discussion with the farmer to have more than two functions, native shade, economic shade, and/or trees for intercropping, selected based on climate suitability and incremental revenue estimates.
Additional requirements	• Individual farmer goals drive agroforestry system purpose • Engage with all local specifications shared through local agriculture bodies. For example in Côte d'Ivoire, agroforestry as described in the African Regional Standard (ARS 1000) (25 - 40 trees/ha). • Adapt to local physical and environmental contexts for example generally more shade in sites with poor soils and less shade in fertile soils. • Preferably all native species except for when intention is linked to food security and/or livelihood diversification which often require non-native tree species. Research suggests the ratio of native vs exotic species is rarely specified and up to local discretion. • Farmer technical training is of key importance to ensure well implemented farm management practices for successful agroforestry. This includes timely pruning, weeding, IPM and introducing other regenerative agriculture practices such as composting or vermiculture. • Slow rollout to show short-term benefits and reduce risk to farmer livelihoods is recommended or scaled cash payments for agroforestry adoption • Additional planting around farm boundaries or near water systems to create buffers. • Added benefit of short cycle food crops like legumes, chilli etc. dependent on the age of the cocoa plantation • Vertical stratification of the shade canopy is recommended • Regular monitoring of farms to assess outcomes and iterative improvement		

[1] Number of non-cocoa trees per hectare (ha). ECOM programs have a large range, with some models aiming for more than 300 non-cocoa trees per ha

[2] Basal area is a measure of stand density. It indicates how much of the growing space in a defined area is being utilised (average amount of an area occupied by tree stems) and is often well correlated with stand stem volume. It can be measured using the total cross-sectional area of all stems in a stand measured at breast height, and expressed as per unit of land area.

[3] Depending on the micro-climate, farmer priorities etc

[4] Varies considerably between origin operations as expected, and prioritises farmer choice and implementation intentions. Research suggests functional or ecological guilds should be a key consideration with species selection.

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