Document Name	Type	Description
Introduction	Report	
1.1 Report/Guidelines: Fit-for-purpose Cocoa Agroforestry in Côte d'Ivoire	Report	
1.2 Report/Guidelines: Company/Cooperative Support Needed by Cocoa Farmers to Transition to Fit-for-purpose Cocoa Agroforestry in Côte d'Ivoire	Report	
2. ECOOKIM Agroforestry Transition Plan	Report	
3. ECOOKIM Agroforestry Business Model	Report	
4. Reflection	Report	
Agroforestry Designs - MASTER	Tool	5 Agroforestry Segment Designs & Yields
CI Agroforestry Species List & Functional Groups - MASTER-12-NOV-2020 GB	List	Species List & Functional Groups
Farmer Agroforestry System Financial Modeling Tool	Tool	Modeling Tool for Agroforestry Systems w/ Modifiable Inputs/Variables

Introduction: Cocoa Agroforestry Business Model

LDN - IDH - ECOOKIM - reNature - Progreso

Ivory Coast is faced with the tremendous challenge to recover large areas of forest that have been lost over the last three decades. This loss is mostly due to land-use change and the expanse of cocoa production areas has played an important role. The Ivorian government has signed commitments to work on avoiding further deforestation and promoting reforestation, which pushes cocoa farmers and their organizations to think about changing their production methods.

The ECOOKIM cocoa union works with 39 primary cooperatives with a total of 29,586 cocoa farmer members and 81,750 hectares of cocoa plantations, scattered over several of Ivory Coast's cocoa-producing regions. Supporting all these farmers in changing their production methods is both a logistical and financial challenge. And as many of these farms are very low in productivity, this is also an opportunity to make changes in the design of the farms to a more productive and sustainable design.

Our team, made up of experts from reNature and Progreso, was asked by IDH to develop an approach to design fit-for-purpose agroforestry systems for ECOOKIM. During the project, we realized that the design of the systems needs to be as flexible as possible, due to the high diversity between and among farms and farmers. The five farmer segments that we present in these documents and the corresponding agroforestry designs are solely used to illustrate how designs change according to specific farm and farmer conditions. **Under no circumstances can these farmer segments be understood as representing all cocoa farmers in Ivory Coast, as they were based only on empirical information and not on a scientific approach.**

In general, we recommend ECOOKIM to first and foremost invest time, money, and effort in making their existing cocoa and cashew production sustainable. European law is quickly turning towards stricter control on mandatory due diligence for imported products from outside of the EU, related to human rights and ecology. So now is the time to invest in a strong member base, compliance with the latest rules and requirements, to be able to continue exporting cocoa and cashew to the EU. We foresee other markets, such as the USA and Japan, following suit with similar regulations. With a strong, sustainable base for cocoa and cashew, ECOOKIM can then strategically expand its product focus to other crops and processing opportunities.

We present the following documents as guidelines and tools to support ECOOKIM and its farmers on their way to environmentally sustainable cocoa production. The package of knowledge and skills that is required to implement a well-designed agroforestry system takes time and effort to transfer to the farmers, and therefore we further recommend starting implementation with the core cooperatives and members to gain experience. Digitizing farms, well defined individual investment plans, and clustered farmers can then be presented to interested financiers such as the LDN fund who are willing to invest in the implementation through farmer input loans.

reNature.

Fit-for-purpose Cocoa Agroforestry in Côte d'Ivoire

Report Deliverables

1.1. Approach to farmer segmentation.

1.2. Overview of the main parameters determining the choice for best agroforestry option.

1.3. Approach on how to determine fit-for-purpose cocoa agroforestry model for the different farmer segments, considering location/farm specific parameters.

1.4. Overview of main fit-for-purpose cocoa agroforestry options proposed for Côte d'Ivoire, including the business case to the farmer.

1.5. Reflection of applicability of approach/guidelines in other West African countries.

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Executive Summary

Transitioning monoculture cocoa plantations to agroforestry systems requires thoughtful designs of agroforestry systems that consider a multitude of criteria. The methods and approaches to consider such criteria must be considerate of variability as well. A truly well-designed system will be adaptable to each farmer's individual social and biophysical context.

Agroforestry systems for ECOOKIM's farmers are designed according to two categories of criteria:

1. **"General criteria"**: Criteria that apply to all farmer groups
2. **"Segment-specific criteria"**: Criteria that apply only to specific farmer groups

These criteria are defined based on the ECOOKIM farmer segmentation exercise completed in September and October 2020. With these approaches in mind, five hypothetical segments and designs have been created. Segments used as examples are not to be construed as the focus for approach to design and segmentation of all farmers. They are merely examples. It is important to understand that the complexities (social, economic, and environmental) for each farmer create innumerable differences between them and that the designs and methodologies applied be used in an adaptable manner by agroforestry trainers.

1.1. Approach to Farmer Segmentation

The segmentation approach is divided into four “tiers”, through which we analyzed variations in farm types according to a range of scales. These parameters provide us with the main segments for ECOOKIM’s fit-for-purpose agroforestry design.

Primary classification: Tiers 1 & 2

Tiers one (1: Biophysical parameters) and two (2: Major farm categories) form the “primary classification” of farmer segments. This provides us with the main segments.

Secondary classification: Tiers 3 & 4

Tiers three (3: Obligatory criteria) and four (4: Fine-scale variations) form the “secondary classification”, providing further detail on farmer variations that are beyond the scope of this report, but which should be considered when applying these designs.

The primary and secondary classifications, and criteria tiers 1-4 are summarised in Table 1.1.

Table 1.1: Farmer segmentation tiers 1-4 assessed in the segmentation exercise.

Tier Category	Tier	Category
Primary Classification	Tier 1: Biophysical parameters	Current climate
		Projected climate changes
		Soil classification
	Tier 2: Major farm categories	Size of plantation
		Gender
		Plantation yield
		Age of farmer

		Income Management
Secondary classification	Tier 3: Obligatory criteria	Existing farmer commitments to certification programs
	Tier 4: Fine-scale variations	Variations between individual farmers

In all cases, segments were created only where parameters significantly influenced critical design criteria. As summarized in this chapter, only tiers two and three are used for the final segmentation.

Focus groups

A total of nine focus groups were conducted in four regions. In four groups there were only male participants and in two groups only female participants.

Region	ABOISSO	SAN PEDRO	SAN PEDRO	SAN PEDRO	VAVOUA	VAVOUA	VAVOUA	DIVO
Gender	mix	male	female	male	male	female	male	mix
Producers or Cooperative leadership	mix	producers	producers	leadership	mix	producers	producers	mix

Tier 1: Biophysical parameters

The first tier of segmentation criteria was an assessment of broad biogeographical differences between ECOOKIM cooperatives. This includes climate classification and basic soil type. The majority of cooperatives have broadly similar climates and soil types, as summarized in Table 1.2 below.

Table 1.2: The biophysical parameters considered for Tier 1 of the segmentation exercise, including current climate, projected climate changes to 2050, and soil classification (source: Schroth *et al* 2016)

Parameter	Sub-category	Data
Current climate	Precipitation	Cooperatives KANWORI (Aboisso) and CAKIB (San-Pédro) have fewer “dry” months (less than 100m rainfall) compared to all other cooperatives.
	Temperature	Some small variation in annual temperature range across regions.
Projected climate changes to 2050	Precipitation (expected change)	In all areas dry seasons are expected to become marginally shorter by 2050, reducing the number of consecutive “dry” months (less than 100mm)
	Temperature (expected change)	In all areas maximum temperatures during the hottest months, in most cases risking excessive.
Soil classification (USDA)	Ultisols	The soils of all cooperatives except KANWORI (Aboisso) and CAKIB (San-Pédro) are classified as "Ultisols". Acidic, highly leached tropical soils. Relatively low natural fertility. Low in base cations Ca, Mg, and K. Likely to have low P and N availability.

	Oxisols	The soils of cooperatives KANWORI (Aboisso) and CAKIB (San-Pédro) are classified as "Oxisols" more heavily-leached acidic soils compared to all other cooperatives. Acidic, highly leached tropical soils. High in Al and Fe. Low in base cations Ca, Mg, and K. Likely to have low P and N availability.

All ECOOKIM cooperatives have climates classified as Tropical, savannah (Köppen: Aw) except for KANWORI (Aboisso) and CAKIB (San-Pédro) which are classified as Tropical, monsoon (Kööpen: Am). There are therefore some differences in average annual precipitation and distribution throughout the year. However, it appears that these differences are not significant enough to justify separate segmentation on this basis.

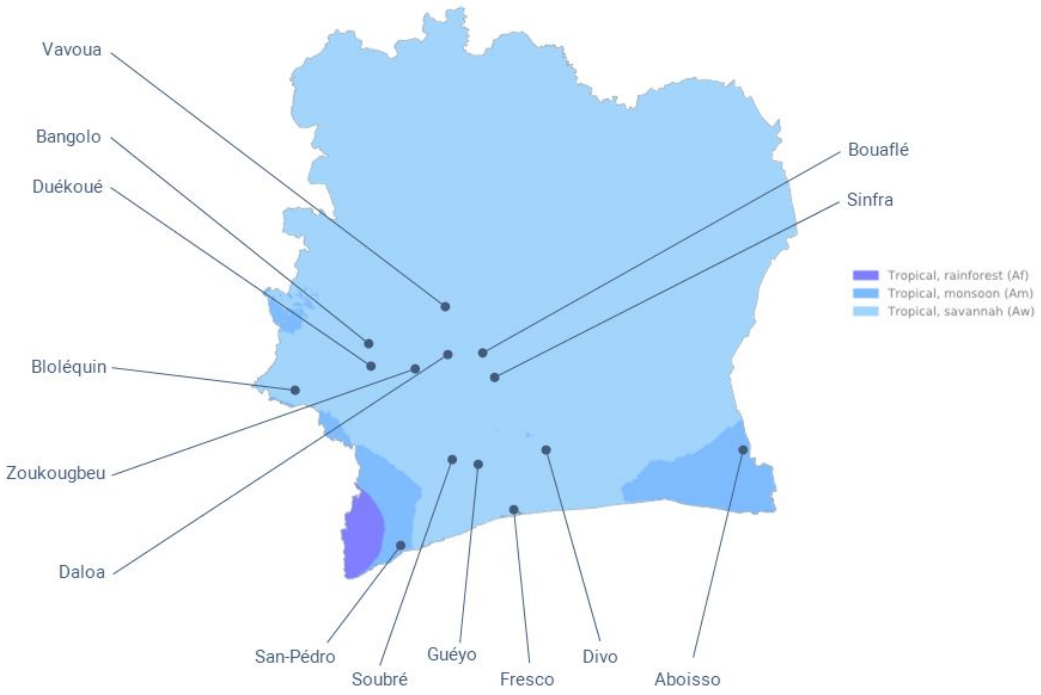

Figure 1.1: Köppen climate classification for the Ivory Coast showing the departments where ECOOKIM's cocoa cooperatives are located, 1980-2016 (Beck *et al* 2018)

Minor regional differences also apply to climate change predictions. Broadly, it is predicted that all areas will experience slightly shorter dry seasons and higher maximum temperatures in the years to 2050. Dry season water stress will remain a broad challenge, and heat stress from excessively high maximum temperatures (33.5C) will marginally increase over the same period. Although dry seasons are projected to become slightly shorter on average, farmers' experience implies that unpredictability and severity in extreme years may increase.

The majority of cooperatives have Ultisols, with the exception of KANWORI (Aboisso) and CAKIB (San-Pédro), which have Oxisols. Both of these soil types are heavily leached and acidic. They are low in natural fertility with sometimes toxic levels of mobile aluminium (Al) and iron

(Fe). Both of these related classes of soil require similar treatment - especially the continued addition and cycling of organic matter and application of lime if possible. Therefore, we do not segment farmers on the basis of soil type.

Tier 2: Major Farm Categories

From the focus group discussions we obtained 5 characteristics that are mentioned by all groups to identify the difference between cocoa farmers to serve as an example to approach. For this example, these are:

- Size of the plantation
- Gender of the plantation owner
- Yield of the plantation
- Age of the plantation owner
- Management of income (planning of income)

From these characteristics we have developed 5 different segments, which form the core of the ECOOKIM farmer segments that we have made designs to serve as examples:

- **Group 1:** Young male plantation owners, with large plantations, high productivity, and good management of income
- **Group 2:** Old female plantation owners, with small plantations, low productivity and no specific management of income strategy
- **Group 3:** Middle aged male plantation owners, with small plantations, low productivity and no specific management of income strategy
- **Group 4:** Young female plantation owners, with small plantations, with high productivity and good management of income
- **Group 5:** Middle aged plantation owners, both female and male, with average size plots, high productivity and good management of income

We are unable to quantify the segments and to conduct a mathematical segmentation analysis due to a lack of individual farmer data. With individual farmer data we would have been able to conduct a cluster analysis which would have provided us an indication of which aspects of the 5 characteristics would have been the most common fits. We would have also been able to identify how many of the farmers fall under which farmer segment.

Tier 3: Certification Criteria

All except one (ECOODA) of ECOOKIM's cooperatives are certified by one or a combination of Fairtrade, Rainforest Alliance, UTZ, European Organic or USDA Organic certification schemes. Any agroforestry designs must comply with the criteria defined by existing certification schemes. We did not find any of these criteria to be conflicting with our proposed approach to agroforestry design. These certification schemes therefore do not affect the final farmer segmentation. Table 1.3. summarises the impact of certification criteria on our agroforestry designs.

Table 1.3: A summary of the main findings from certification reviews, and relevance for the farmer segmentation exercise.

Certification	Criteria	Comments	Significant for farmer segmentation?
Fairtrade	Fairtrade makes no specific requirements for farmers in terms of diversity, arrangement or management of cocoa production systems.	Fairtrade certification does require that cooperatives pay a certain price to their farmers for cocoa. This will impact the sales values of cocoa from Fairtrade farms compared to uncertified farms.	No
Rainforest Alliance	Requires natural vegetation cover on at least 15% of farms cultivating shade-tolerant crops; cocoa farms in CI must have minimum canopy cover of 30% and at least 5 trees of a native species per ha.	General consensus is that optimum shade for balancing short-term yield with long-term plantation health and ecosystem services is between 30-50%.	No

UTZ	At least 12 shade trees per hectare are maintained and distributed evenly on cocoa plots; applies from yr. 2 (plantation age)	The shade tree spacing that this implies (max spacing 28m) will be easily incorporated into all agroforestry designs.	No
European Union Organic	On farm, farmers must practice (where appropriate): crop rotation; cultivation of nitrogen fixing plants and other green manure crops to restore the fertility of the soil prohibition of use of mineral nitrogen fertilisers; to reduce the impact of weeds and pests, organic farmers choose resistant varieties and breeds and techniques encouraging natural pest control; encourage the natural immunological defence of animals; in order to maintain animal health, organic producers need to prevent overstocking	All of our agroforestry designs are created to either eliminate the need for disqualified agricultural inputs (e.g. mineral nitrogen fertilisers) or greatly increase their use efficiency. This will not negatively impact farmers' eligibility for EU Organic certification.	No
USDA organic	USDA production standards require that: land must have had no prohibited substances applied to it for at least 3 years before the harvest of an organic crop; soil fertility and crop nutrients will be managed through tillage and cultivation practices, crop rotations, and cover crops, supplemented with animal and crop waste materials and allowed synthetic materials; crop pests, weeds, and diseases will be controlled primarily through management practices including physical, mechanical, and biological controls; When these practices are not sufficient, a biological, botanical, or synthetic substance approved for use on the National List may be used; Operations must use organic seeds and other planting stock when available; The use of genetic engineering, ionizing radiation and sewage sludge is prohibited.	All of our agroforestry designs are created to either eliminate the need for disqualified agricultural inputs (e.g. mineral nitrogen fertilisers) or greatly increase their use efficiency, to build and conserve soil fertility naturally and use locally-available plant varieties. This will not negatively impact farmers' eligibility for USDA Organic certification.	No

Tier 4: Fine-scale farm variations

Biophysical and socio-economic factors vary on a fine-scale amongst individual farmers, even within the same cooperative or between adjacent plots. Such variations include:

- Site:
    - Aspect
    - Exposure
    - Accessibility (incl. Proximity to homestead)
    - Soil quality
    - Water availability
    - History
    - Position relative to other landscape features (e.g. proximity to waterbodies or forests)
- Farmer:
    - Livelihood portfolio (including other forms of income, non-paid labour such as childcare)
    - Tools & equipment
    - Mobilisable labour
    - Personal/family finances
    - Social capital
    - Knowledge & access to capacity-building resources

Accounting for these differences is beyond the scope of this design exercise. However, our transition approach is designed to address these differences (see chapters 1.2 & 2). The flexibility of agroforestry designs, the model farm approach and the “options by context” method recommended for the transition allow farmers to adapt the core agroforestry designs to their own context, with the support of extension workers.

1.2. Overview: Main Parameters for Determining the Best Agroforestry Option

The main parameters for determining the best agroforestry options are called “critical design criteria”. These critical design factors are divided into two categories:

3. **“General criteria”**: Criteria that apply to all farmer groups
4. **“Segment-specific criteria”**: Criteria that apply to specific farmer groups

General criteria are derived from all Tiers of the segmentation exercise that can be applied to all of ECOOKIM’s farmers. Segment-specific criteria are defined based on the segmentation exercise carried out in September and October of 2020.

Focus Group results

For a fit-for-purpose agroforestry design, it is important to understand most aspects of the general audience. Through the focus group discussions, we obtained the following general impression about the target audience: cocoa farmers within the cooperatives that fall under ECOOKIM. These aspects are also taken into account when designing the agroforestry systems.

Cocoa farming in general

In general, the target audience sees themselves as simple producers who work like civil servants (doing their duty but with limited pay). They work 5-6 days a week on the farm. Agriculture is a crucial aspect of their lives because it provides their only source of food and income and it is their main occupation. If the cocoa-plantations would disappear, all participants in the focus group meetings mention that they would fall into poverty.

The main roles of the women in cocoa production are collecting the harvesting pods, sorting the residue, and collecting the fresh cocoa for fermentation.
The main roles of the men in cocoa production are cleaning the plantation, harvesting the cocoa, and breaking the pods. The men are responsible for selling the cocoa. Selling cocoa is never mentioned as an activity for women.

For the cocoa farmers changes in climate mean a scarcity of rain, irregularity in the seasons, and heatwaves. These cause problems of reduced production of crops, famine, and impact the fields (towards field dying). To avoid these impacts the cocoa farmers plant trees and increase awareness about climate change and its impact. The majority of cocoa farmers do not have any animals.

The most used mode of transport are motorcycles and carrying on the head. Trucks and bicycles are used also. In general cocoa trees are about 4,7 meters high and are 2.6 meters spaced between one another. The soils are mainly seen to be poor. To improve soil fertility most farmers use chemical fertilizers, some compost, and other natural/organic fertilizers.
The majority of the people working on the cocoa plantations are family members or self-help groups. These are groups that are formed to work on each-others lands. This labor does not involve any payments. Contract workers are mentioned to be used in San Pedro and Vavoua. But not by all focus groups. These contract laborers are very difficult to find, however.

Important aspects for the agroforestry design

For the analysis of the focus group information, we counted the most often mentioned items. The results of the most mentioned characteristics for comparing cocoa farmers are used as characteristics for the farmer segmentation as described above. For the agroforestry design, we also incorporated the most mentioned products from the environment, the most important cash- and food- crops, and the most important trees. The results are below in table 1.4.

Table 1.4: The five most mentioned answers for the different categories for all the focus groups.

Characteristics for Comparing Cocoa Farmers	**Most Important Products in the Environment**	**Most Important Cash Crops**	**Most Important Food Crops**	**Most Important Trees**
Size of plantation	Oranges	Cocoa	Manioc	Akpi
Gender	Cassava	Rubber trees	Plantain	Fromagers
Plantation yield	Cocoa	Cashew	Rice	Mango
Age of farmer	Rice	Coffee	Yam	Avocados
Income Management	Avocados	Palm oil	Maize	Cola nut

While comparing regions, the following differences are observed:

Table 1.5

Region (nr groups)	Characteristics for comparing cocoa farmers	Most important products in the environment	Most important cash crops	Most important food crops	Most important trees
Vavoua **(3)**	Household Size also mentioned	Cashew/Mango/Coffee CASH CROPS often mentioned	Coffee	Yam	Oranges

Divo **(2)**	Household Size/ Crop Diversification also mentioned	Akpi/Iroko/Fromagers TREES often mentioned	Palm Oil	x	Iroko/Frake/Samba
San Pedro **(3)**	Marital Status also mentioned	Cola Nut/Papayas/Palm Oil	x	Yam	Oranges/ Coconut
Aboisso **(1)**	Age of the Plantation also mentioned	Yam/ Corn/Eggplant FOOD CROPS also mentioned	Coffee	x	x

For the agroforestry design, the following is noted as a result of the differences in the answers provided when looking at different regions:

- When targeting the region Vavoua it might be important to take into account trees/shrubs which provide food or other non-timber tree items (coffee, mango, oranges, and cashew).
- When targeting the region Divo it might be important to take into account trees (Akpi, Iroko, Frake, Samba, Fromagers, and oil palm)
- When targeting the region of San Pedro it might be important to take into account tropical fruits (Papaya, Oranges, Coconut).

It is important to note that the focus group sessions were conducted in September/October. The important cash crops, food crops, and trees might have been influenced by the most

important crops in that specific season. While comparing men and women, but without distinction in regions, the following results are observed (aspects most often mentioned):

Table 1.6

Gender	Characteristics for comparing cocoa farmers	Most important products in the environment	Most important cash crops	Most important food crops	Most important trees
Men	Plantation yield	Oranges	Cocoa	Rice	Akpi
	Size of plantation	Cocoa	Rubber trees	Manioc	mango
	Income Management	Cashew	Cashew	Plantain	Coconut
	Gender	Avocados			Avocados
	Marital status	Coffee			Fromagers
Women	Age of farmer	Oranges	Cocoa	Yam	Akpi
	Income Management	Avocados	Rubber trees	Manioc	Mango

	Household size	Mangoes	Cashew	Plantain	Cola nut
	Size of plantation	Cola nut			Avocados
	Field Maintenance	Fromager			Oranges

According to some men, marital status is another important characteristic to differentiate cocoa farmers as married men are more focused on their plantation and the production than single men.

According to women, field maintenance is another important factor to differentiate between cocoa farmers as some women have the opportunity to work on the land while others do not have that option.

For the agroforestry design, the following is noted as a result of the differences in the answers provided when looking at male versus female answers:

A. When targeting male-headed households (groups 1,3 and 5) it might be important to take into account coffee.
B. When targeting female-headed households (groups 2,4 and 5) it might be important to take into account oranges, yams, and cola nuts. These products are more mentioned by the female than by the male focus groups

General considerations for agroforestry design

Cocoa production in Côte d'Ivoire is faced with a number of challenges which we have considered in our designs as "background" to the segment-specific challenges identified. These broad challenges have been described extensively in various documents, such as UNDP's "Forest Friendly Cocoa in Côte d'Ivoire" report (UNDP 2017) and Wessel & Quist-Wessel's (2015) review "Cocoa production in West Africa, a review and analysis of recent developments".

Here we translate those challenges and translate them into broad goals that farmers' agroforestry systems must try to meet. In report section 2.1.1., these goals are translated into core agroforestry practices that we recommend all farmers follow.

The tension of diverse land-use needs

Agriculture - especially production of key commodities such as cocoa, rubber, palm oil - is a major driver of deforestation and loss of biodiversity in Côte d'Ivoire. According to the FAO's global forest resource assessment (FAO 2020) reports that over 60% of Côte d'Ivoire's forests were lost between 1990 and 2020. Intensification of cocoa must balance with the need to eliminate deforestation and create biodiverse, functional landscapes for the long-term health of Côte d'Ivoire's communities.

Agroforestry systems must support farmers to conserve and enhance biodiversity, and specifically the presence of trees in the agricultural landscape, especially in areas adjacent to forest fragments. This should be balanced with (or used as a mechanism for) the sustainable intensification of existing cocoa cultivation, and production of other goods that improve the quality and resilience of cocoa farmers' livelihoods.

Sustainable intensification of cocoa production

Cocoa yields in Côte d'Ivoire are generally low, as well as variable from year to year. Access to agricultural inputs is often very limited, especially for women, and low soil fertility and pest & disease pressures strongly limit the volume and consistency of cocoa yields. Both heat and water are also key limiting factors, and the impact of both may increase with projected climate changes.

Agroforestry systems must support farmers to maintain and enhance key on-farm soil resources such as soil and water, and minimise the impacts of pests & diseases. Dependence on agricultural inputs such as fertilisers, herbicides and fungicides is minimised, favouring methods for fertilization and pest control that can be achieved on-farm through best practices of agroforestry system design and management.

Improve the quality and resilience of cocoa farmers' livelihoods

Improving cocoa yield and productivity is important, but so too is ensuring that cocoa farmers' livelihood quality and resilience is improved through the sustainable production of other subsistence or marketable products.

Agroforestry systems must contribute to increasing the quality and resilience of livelihoods in cocoa producer communities. They should produce a manageable diversity of products to improve farmers' income, nutritional security or provide other useful products for household use.

Some of the challenges will require potentially conflicting interventions. For example, Cocoa Swollen Shoot Virus Disease (CSSVD) can be reduced by reducing plantation humidity, while maintenance of humidity will be an important factor especially for increasing resilience to climate change. All on-farm decisions are a trade-off between different goals, practices and outcomes. Our designs and recommendations for the transition program are flexible in order to empower ECOOKIM's farmers to take appropriate actions that meet their goals.

We provide a full list of general challenges facing the Côte d'Ivoire cocoa industry in Appendix A.

Contextual factors for consideration for the transition program

In addition to agroforestry design, we also make recommendations for an effective transition to agroforestry in Reports 1.2 and 2. Consideration must be given to key factors in the enabling/disabling environment, including:

- Lack of financial support for farmers to improve their practices
- Access to genetic materials & other farm inputs (especially for women)
- Limited access to markets for commodities, specialty exports or locally traded goods
- Limited access to key knowledge and capacity-building resources
- Limited access to basic farm equipment

- General parameters - Critical design criteria
- Specific parameters per segment - How these critical design criteria vary/must be adjusted
- Critical design factors determining cocoa agroforestry system financial success
- Critical socio-economic factors determining best agroforestry option

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Table 1.7: Summary of general and segment-specific design criteria defined through the context analysis and segmentation exercise.

Segment	Topic	Design criteria
All segments	Soil	Practices must regenerate soil and facilitate the long-term conservation of soil on farms
	Pests & Diseases	Practices must reduce the potential for serious disease pressure from high-risk diseases

	Water Use & Climate Change Resilience	Practices must balance introduction of shade & other system diversification with minimised inter-specific competition for water during the dry season
	Forests & Biodiversity	Practices must diversify production in a way that effectively increases the short- and long-term biodiversity value of cocoa production landscapes

	Segment summary	Design criteria
Segment 1	Large, male-owned plantations with high yields. The farmers are generally young and have good financial management practices.	Increase cocoa yield stability. Increase diversity of cash crops. Increase biodiversity value without undermining long-term yields. May include timber trees.
Segment 2	Small, female-owned plantations with low yield. The farmers are generally old with varied financial management practices.	Increase cocoa yield. Increase the capacity for production of subsistence/own use crops throughout the system life-cycle. Increase the production of locally-tradable goods throughout the system life-cycle. Do not focus on timber trees.
Segment 3	Small, male-owned plantations with low yield. The farmers are generally middle-aged with varied financial management practices.	Increase cocoa yield. Maintain simple cash cropping system. Encourage the use of service species to maintain cocoa yield. Do not focus on timber trees.
Segment 4	Small, female-owned plantations with high yield. Farmers are generally young and have good income management.	Increase biodiversity value without undermining long-term yields. Increase the capacity for production of subsistence/own use crops throughout the system life-cycle. Increase the production of locally-tradable goods throughout the system life-cycle. Do not focus on timber trees.
Segment 5	Medium-sized, female-owned plantations with high yield. Farmers are generally middle-aged with good income management.	Increase biodiversity value without undermining long-term yields. Increase the capacity for production of subsistence/own use crops throughout the system life-cycle. Increase the production of locally-tradeable goods throughout the system life-cycle. Crop mixes may include other saleable commodity or specialty cash crops.

1.3. How to Determine Fit-for-purpose Cocoa Agroforestry Model for the Different Farmer Segments

We recommend an approach to agroforestry design that:

A. **Delivers an architecture that is functionally diverse** (as opposed to species-rich), replicating key forest ecosystem processes ensuring the desired level of ecosystem complexity. This includes grouping species into specific functional groups.
B. **Without becoming so complex that it is no longer feasible**. Once the basic structure has been understood, the farmer may diversify or simplify the species mix. This facilitates adaptation by farmers in their specific context.
C. **While other aspects of the designs ensure they are easy to understand, adapt to context, and implement.** This includes organising the layout around the logic of the core crop - in this case cocoa. For example, the spacing of cocoa is used as the basis for spacing of all other species in the system. If cacao is spaced at 2,5m x 2,5m, all other plants will be spaced at multiples or divisions of this (e.g. 5m, 7.5m, 15m).

Chapters 1.2 and 2 develop detailed guidelines for how to translate the findings described in this chapter into fit-for-purpose agroforestry systems across the ECOOKIM network.

Agroforestry system

The assumption is that most farmers now cultivate cocoa as a mono-crop. The agroforestry systems are designed to balance cocoa productivity and resilience with increased biodiversity & ecosystem services. The designs also aim to diversify production to improve the quality and

resilience of cocoa farmers' livelihoods, including the production of non-cocoa cash crops, food crops, and other products such as firewood, timber and medicinals.

Not all of the improvements made are quantifiable within the parameters of the economic model, and it is likely that some trade-offs may need to be made between achieving optimum cocoa income and the delivery of other diverse values. This should be used to inform the kinds of support developed during the transition program. For example, agroforestry can increase carbon sequestration and storage compared to monoculture cocoa, but this can reduce gross production of cocoa per hectare per year. In this case, carbon financing may be an appropriate solution to facilitate transition to agroforestry.

These systems are described in detail in chapter 2.

1.4. Business case for the farmer

For the business case, we make a distinction between the general current status of the farmer segment, and the expected results of implementing an agroforestry system. For the current baseline, we used 1480 as the average number of cocoa trees per hectare (which was a result of the focus group discussions), and we multiply that by the low, medium, or high productivity levels per cocoa tree. This calculation leaves out other costs of inputs and/or labor, and assumes a constant productivity level and a constant price per year for the dry cocoa. We know this changes over time but we cannot make predictions on this.

We compare the baseline to the expected income obtained when transforming the field fully into an agroforestry system. Per farmer segment, a specific agroforestry system is designed. We assume that this system will be planted in an empty field. The number of cocoa trees per hectare would be reduced from the current 1480 trees/hectare depending on the agroforestry system designed, to enable planting other crops and trees within the agroforestry system. We have not taken into account the labor costs for establishing a new field, nor have we included

any input and/or labor costs throughout the 30 years. The results of the income analysis are shown over 30 years, and we assume that once the maximum productivity stage of cocoa is reached after 12 years of establishment, that the cocoa production remains the same.

Once an agroforestry system is established, in general, the microclimate becomes more stable, and input requirements in the field reduce. The combination of different products and their functions stabilize the nutrient availability in the soil. The use of fodder and mulch also contribute to the reduced need for inputs. This reduced the external costs to maintain the fields. Labor requirements in the field can change, but assuming that most of the work is done by the family and that labor requirements do not drastically increase, the labor costs are limited.

For each farmer segment, an agroforestry system is designed. Also, for each agroforestry system, a business case is calculated to show the expected returns to investments and the expected net profits over time. The actual plants chosen within the agroforestry system can change, depending on the personal preferences of the farmers. As long as the different crops and trees are chosen which fall within the same functional group, this should not harm the agroforestry design. However, to calculate the business case, we have taken examples of crops to be used. We will provide an excel sheet where more detailed information about expected yield and prices can be integrated and hence the business case can be made more accurate. However, we are unable to calculate the business cases for all possible combinations of crops used in the agroforestry systems.

1.5 Reflection of the Applicability of the Segmentation Approach/Guidelines to Other West African Countries

This segmentation exercise was carried out with limited capacity for field visits. With the exception of the focus groups carried out for Tier 2 of the segmentation exercise, a combination of desk-based exercise and author experience was used to develop this basic farmer segmentation. In this respect, the approach to segmentation can be readily applied to a broad range of contexts across West Africa.

However, as is explained throughout chapters 1.2 and 2, significantly greater in-the-field research and participatory program development with farmers is required in order to create a truly effective transition. This segmentation exercise, while generally applicable as a starting point for analysis in any West African country, could be significantly strengthened by fieldwork. On this basis, a more detailed segmentation exercise is likely to be less transferable between national contexts.

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Appendix A

The broad challenges and goals for cocoa production in Côte d'Ivoire, matched with their relevance to the current program, critical design factors and their priority level (derived from Rivain 2018, Wessel & Quist-Wessel 2015)

	Challenge	Goal	Relevant program element	Critical design factor	Priority level
Farm & land management	Deforestation	To reduce pressure on forest resources	Agroforestry design	Practices should encourage sustainable production & exploitation of timber and non-wood forest products.	Primary
	Degradation of biodiversity	To increase the biodiversity value of cocoa production landscapes	Agroforestry design	Practices must diversify to increase the biodiversity value of cocoa plots so that they contribute to a high-quality "landscape matrix"	Secondary
	High incidence of pest & disease	Reduce incidence of pest & disease	Agroforestry design	Practices must reduce the potential for serious disease pressure from high-risk diseases	Primary
	Soil degradation & infertility	Regenerate soil quality and ensure long-term soil conservation	Agroforestry design	Practices must regenerate soil and facilitate the long-term conservation of soil on farms	Primary
	Increasing water and heat stress	Minimize water and heat stress for cocoa plants.	Agroforestry design	Practices must find a balance between increased in-plot diversity and competition for water resources	Primary

	Long-term tension between food production, forest exploitation and cocoa production	To establish a long-term balance between goals of food production, forest exploitation and cocoa production	Agroforestry design	Practices must combine the production of cocoa with other food and/or forest products.	Secondary
	Lack of land tenure	To establish systems that either increase land tenure rights or can benefit farmers in spite of tenure uncertainty	Agroforestry design	Practices must work with local land and resource access practices to ensure that the target group benefits from changes in the production system. Where possible and appropriate, practices must strengthen the land and resource access of target groups.	Secondary
Enabling/disabling environment	Lack of financial support	Increase financial support for cocoa farmers to improve practices	Transition plan	This is especially important in the early stages of transition (i.e. farmers need help to develop knowledge and techniques, once this is done commercial credit can take a larger role than non-repayable financial support)	Primary
	Poor access to ag inputs	Achieve acceptable soil fertility and pest & disease levels with minimal agricultural inputs	Agroforestry design	Practices must maximize the use efficiency of agricultural inputs and reduce or eliminate the need for these inputs.	Primary
	Poor farm gate cocoa prices	Improve farm gate prices paid to cocoa farmers	Transition plan	E.g. premium schemes	Primary

External Support for Cocoa Farmers' Transition to Fit-for-purpose Cocoa Agroforestry in Côte d'Ivoire

Report Deliverables

1.2.1. Guidelines on How to Develop a Transition Strategy and Action Plan

1.2.2. Overview: Best Practice Activities/Actions for Organizations to Support Transition

1.2.3. Reflection on the Applicability of Approach for West Africa

Table of Contents

Executive Summary

Agroforestry transition can be a powerful tool for generating a wide range of positive impacts for cocoa farmers and the farming landscape across Ecookim's producer network in Côte d'Ivoire. We recommend **an approach that puts farmer decision-making and peer support processes at the center of the transition** strategy and action plan.

Here we recommend three pillars as guidelines for the development of an agroforestry transition strategy and action plant. Each of these contributes to this broader goal of creating a self-sustaining agroforestry transition across Ecookim's cooperatives and beyond.

Pillar 1 is the **"model farm"** approach and **pillar 2** is the **"options-by-context"** method. These two pillars are primarily focused on the technical work of developing and disseminating fit-for-purpose agroforestry practices within farmer communities. **Pillar 3** emphasises the need to develop a transition strategy based on a clear understanding of the **enabling/disabling environment** influencing cocoa farming systems at a village, landscape, or national scale.

This approach is based on techniques that are explicitly designed to understand and work with the variations of local context. The approach is explicitly non-prescriptive and solutions are driven largely by the conditions of the specific communities involved in the program. It is therefore broadly applicable across the West African region.

1.2.1. Guidelines on How to Develop a Transition Strategy and Action Plan

Agroforestry transition can be a powerful tool for generating a wide range of positive impacts for cocoa farmers and the farming landscape across Ecookim's producer network in Côte d'Ivoire. We recommend **an approach that puts farmer decision-making and peer support processes at the center of the transition** strategy and action plan. Results from field work carried out in this project indicate that cocoa farmers are generally in favour of greater integration of trees into their farming landscapes. **This program must focus on creating the appropriate conditions for farmers to act on this motivation.**

If this is done well, the outcomes of an effective agroforestry transition will extend well beyond the final end date of any official program. A transition program & action plan must therefore focus on creating favourable economic, social, political and infrastructural conditions, so that agroforestry becomes a logical choice for cocoa farmers whether or not they are participants in the program itself. **All program elements should contribute to this broader goal of creating a self-sustaining agroforestry transition across Ecookim's cooperatives and beyond.**

External technical knowledge is most likely to be translated into success if Ecookim's farmers are able to:

- Take ownership of the transition process
- Build in-situ knowledge relevant to their own context
- Support each other through the transition
- Access key resources required for agroforestry practice (such as high-quality seedlings)
- Solve key challenges relating to location, infrastructure and marginality, such as access to market

These insights are at the heart of the best practices outlined in section 1.2.2. We propose that IDH & Ecookim's approach to transition should be informed by three main pillars. **Pillar 1** is the **"model farm"** approach and **pillar 2** is the **"options-by-context"** method. These two pillars are primarily focused on the technical work of developing and disseminating fit-for-purpose agroforestry practices within farmer communities.

Pillar 3 emphasises the need to develop a transition strategy based on a clear understanding of the **enabling/disabling environment** influencing cocoa farming systems at a village, landscape, or national scale. This refers to all elements *beyond* the boundaries of cocoa plantation which either support or hinder meaningful adoption of agroforestry practices.
Section 1.2.2 describes these three "pillars" in detail, and highlights the data/information, capacities and resources needed to effectively execute key activities.

1.2.2. Overview: Best Practice Activities/Actions for Organizations to Support Transition

As outlined in section 1.2.1, best practice pillars 1 & 2 are mainly concerned with how to develop, adapt and disseminate knowledge about fit-for-purpose agroforestry practice amongst farmers. Pillar 3 is concerned with creating a context that encourages and supports agroforestry adoption. This section describes the key aspects of each of these pillars.

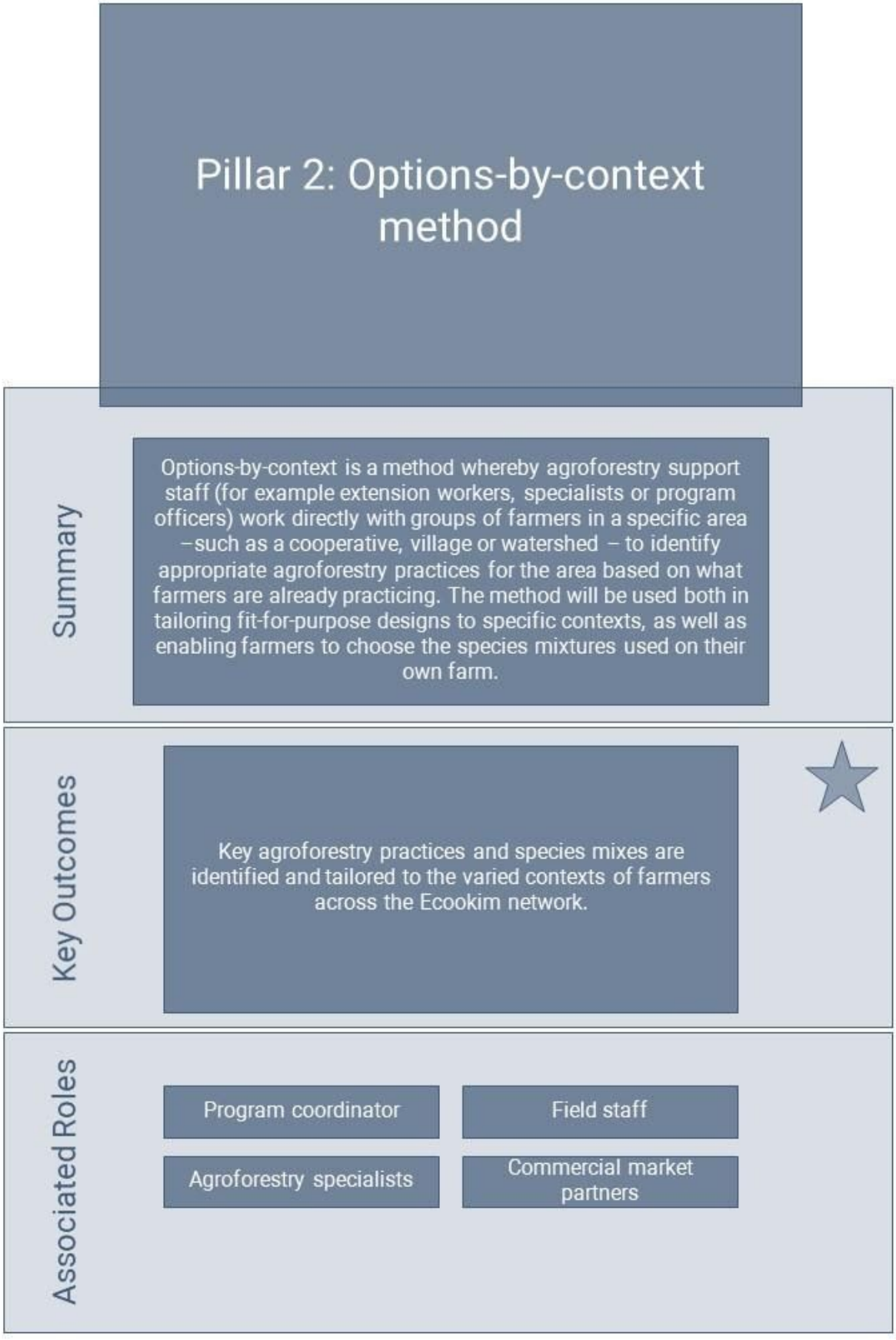
Overall, the three pillars are designed to enable program developers to:

A. Build increasingly detailed knowledge about the varied local contexts throughout the Ecookim network
B. Develop meaningful, fit-for-purpose agroforestry solutions *with* farming communities
C. Establish the knowledge, infrastructure and other contextual factors necessary for a successful large-scale agroforestry program

The three pillars are summarised in Figure 1.2.1, below.

Figure 1.2.1: The three main pillars recommended for IDH and Ecookim's approach to agroforestry transition


Pillar 1: Model Farm Approach
Summary
The model farm is a working example of new or adapted agroforestry practices, strategically located within the farming community for maximum visibility and accessibility. It is a single farm or plot where agroforestry practices are first piloted, which acts as a knowledge hub for the local area.
Key Outcomes
Farmers across the Ecookim network are able to learn about, replicate and adopt essential agroforestry practices based on hands-on and peer-to-peer learning.
Associated Roles
Program coordinator
Monitoring & evaluation partners
Agroforestry specialists
Commercial market partners
Field staff


Pillar 2: Options-by-context method
Summary
Options-by-context is a method whereby agroforestry support staff (for example extension workers, specialists or program officers) work directly with groups of farmers in a specific area –such as a cooperative, village or watershed – to identify appropriate agroforestry practices for the area based on what farmers are already practicing. The method will be used both in tailoring fit-for-purpose designs to specific contexts, as well as enabling farmers to choose the species mixtures used on their own farm.
Key Outcomes
Key agroforestry practices and species mixes are identified and tailored to the varied contexts of farmers across the Ecookim network.
Associated Roles
Program coordinator
Field staff
Agroforestry specialists
Commercial market partners


Pillar 3: Building a strong enabling environment
Summary
The activities carried out through pillars 1 and 2 will provide key data on the contextual factors that either work in favour of agroforestry practices ("enabling factors") or act as barriers to agroforestry practices ("disabling factors"). Addressing these factors is essential to the long-term and large-scale success of the transition program.
Key Outcomes
Key agroforestry practices and species mixes are identified and tailored to the varied contexts of farmers across the Ecookim network.
Associated Roles
Program coordinator
Market development specialists
Policy advisor/specialist(s)
Government/institutional support

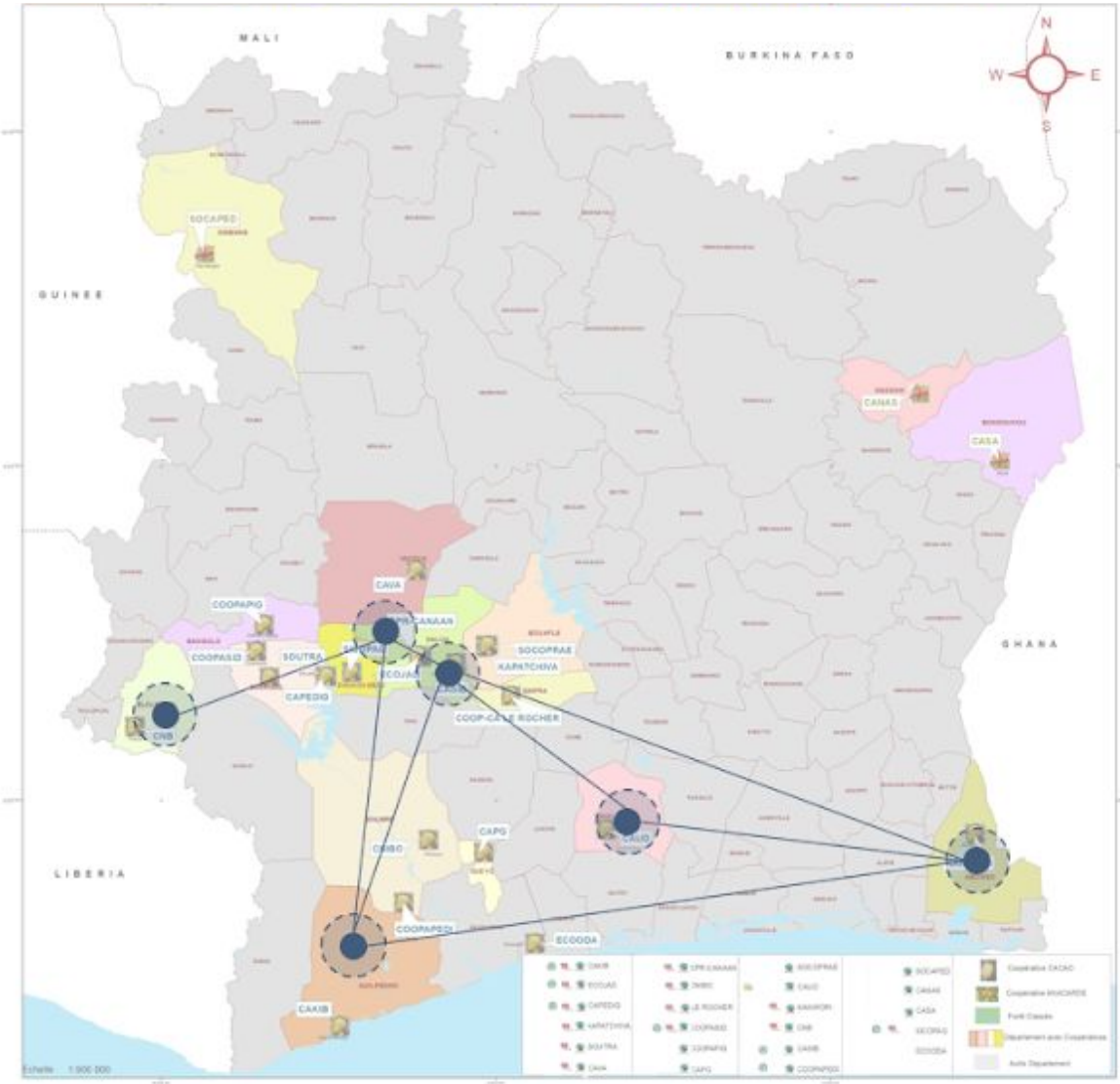
Pillar 1: The Model Farm Approach

Overview

The model farm is a working example of new agroforestry practices, strategically located within the farming community for maximum visibility and accessibility. It is a single farm or plot where new agroforestry practices are first piloted, which acts as a knowledge & educational hub for the local area. The model farm approach emphasises the need to have practical focal points or “nodes” within farming communities to drive a strong transition towards agroforestry. It acts as a space for hands-on learning, knowledge creation and knowledge-sharing amongst farmers.

For Ecookim, we recommend that multiple model farms are established in strategic locations across the 23 cooperatives. Future phases of the transition program will be developed from this network of model farmers.

Figure 1.2.2: A hypothetical example of the distribution of an Ecookim model farm network across Côte d'Ivoire developed in phase 1 (see chapter 2).



As described in section 2.2, we recommend that all of the costs of establishing this farm, running capacity-building and research activities is fully funded. Although this is resource-intensive, it is a worthwhile investment because it can:

- De-risk agroforestry practices for early adopters

- Give program staff (e.g. agroforestry specialists) the opportunity to build direct connection with farming communities & the specific challenges/goals they have, as well as key field staff
- Create an opportunity to assess the state of key enabling/disabling factors and other resources on a fine-grain scale (e.g. within a specific village or cooperative)
- Create an opportunity to collect other key data for effective refinement of agroforestry interventions & transition approach, and to inform the scaling-up processes in later program phases.
- Begin the process of influencing the enabling/disabling environment in favour of long-term transition to agroforestry

Farm clusters around each model farm

Associated with each of these model farms is a “farm cluster”. This farm cluster is a relatively small group of farmers who take part in every stage of capacity-building and implementation of this model farm. This group is therefore meaningfully engaged with the agroforestry transition process and can learn key skills in a practical context, but in a risk-free way.

This approach creates a strong basis for larger scale program development in future years. The result is a core group of engaged, educated farmers who have already been through an agroforestry transition process with their peers. It also establishes connection between these farmers, and can facilitate peer-to-peer learning and support.

The development of model farms is also a key step because it gets “boots on the ground” for program staff. This means that key partners - such as agroforestry specialists, market development specialists and Ecookim staff members - have the opportunity to carry out a range of important field work necessary for developing large-scale transition programs. As outlined in chapter 2, this

We recommend that the full costs of transition, including seedlings, other inputs, capacity-building and farmer opportunity costs are fully funded to de-risk the process for the first adopters. Each model farm therefore requires relatively high up-front investment on the part of program developers (IDH and ECOOKIM). However, this investment generates more than simply a pilot agroforestry plot.

Farmer clusters

Each model farm is the focal point of a "cluster" of farmers. This cluster is a group of farmers who are local farmers who all take part of the same capacity-building program as a single group. While a pilot plot is established on only one farm, all farmers in the cluster benefit from the practical experience of implementing the new agroforestry practices in a risk-free way.

By focusing on the practical development of a single farm per cluster, program resources can be used with maximum efficiency, and minimum risk.

Creating a community of practice

The clusters also act as a peer support network, whereby farmers are able to share ideas and experiences and build a common set of knowledge. This facilitates a culture of shared learning and shared ownership of the transition process. This **"community of practice"** can be facilitated through various exercises during the early stages of program development, such as co-design and trouble-shooting sessions hosted by program field staff or agroforestry specialists.

Ideally, these groups can build on existing social institutions within communities, integrating agroforestry transition within the fabric of community.

Establishing deep knowledge and refining program activities

Finally, the model farm approach also has a key function because it allows program staff to build deep local knowledge, collect essential contextual information, establish meaningful

connections with farming communities, and refine program activities accordingly. This facilitates the development of a program that is closely attuned to the needs and limitations of different farming communities, and is a key step in building solutions that are both fit-for-purpose and strongly supported by farmer communities themselves.

Outcomes of the model farm approach

Key outcomes of developing a model farm include:

- An established, functioning agroforestry cocoa farm plot
- An established group of engaged, educated farmers ready to adopt agroforestry practices in the following phase
- An inventory of the key enabling or disabling factors of importance in that location (see pillar 3, below)
- A well-documented understanding of other the key challenges facing farmers in that location
- A well-documented understanding of all other barriers to agroforestry adoption (e.g. key knowledge gaps within the farmer community, equipment limitations)
- A well-documented understanding of the key species possibilities for use in agroforestry systems
- A well-documented understanding of the commercial opportunities and constraints associated with piloted agroforestry systems
- A draft understanding

Pillar 2: The Options-by-Context Fieldwork Method

Options-by-context is a method whereby agroforestry support staff (for example extension workers, specialists, or program officers) work directly with groups of farmers in a specific area - such as a cooperative, a village, or a watershed - to identify appropriate agroforestry practices for the area based on what farmers are already practicing. The key advantage of the options-by-context approach is that it allows agroforestry practices to be developed and adapted in-situ *with* not *for* farmers. This has two main outcomes:

1. Agroforestry practices are developed in a way that is highly appropriate to the context

2. Farmers themselves play a strong role in the development of these practices, facilitating a strong sense of process ownership

Key steps in the options-by-context method

The original options-by-context approach, described by Sinclair and Coe (2019), follows a process of understanding agroforestry practices used amongst a given group of farmers, systematizing those practices to create a list of "options", and finally working with farmer groups to identify which of those options would be most appropriate for their context. Here we suggest an adaptation of this method to be used during the model farm development activities as well as in later phases of the program.

The method will be used both in tailoring fit-to-purpose designs to specific contexts, as well as enabling farmers to choose the species mixtures used on their own farm.

Step A: Engage farmers and map agroforestry options

In the early stages of the model farm process, program staff will work directly with the farm cluster groups to understand:

- What agroforestry practices they are already familiar with and/or actively using
- What species are available and valuable in their context
- How the fit-for-purpose agroforestry principles & designs developed here might be used or adapted to meet farmers' individual contexts

Step B: Co-design sessions based on agroforestry options

Based on step 1, each farm cluster will have a tailored set of agroforestry options and species available to them. Based on this design work sessions can be facilitated by program staff or agroforestry specialists, whereby farmers are:

- Helped to navigate key agroforestry decision-making processes
- Allowing them to choose from the range of options and species that they themselves have been part of developing
- To suit their needs in a manner that also meets broader program goals

Even at these early stages of the program, farmers are encouraged to take an active role in defining their own agroforestry transition, with the support of program staff.

Steps C & beyond: scaling up agroforestry practices

Steps 1 and 2 occur in the development of model farms & farmer clusters, but can be repeated in later stages of the program as more farmers are engaged. These steps generate a context-specific list of agroforestry options and species that can be tailored further in the following phases of the program. Each model farm in each location throughout the Ecookim network will have developed a “menu” of agroforestry options that are unique to their own context, yet held together by a framework of core guiding principles and practices contributed by the program field staff and agroforestry specialists.

In this way, the options-by-context allows the program to develop and adapt agroforestry practices in a way that is innovative, evidence-based and yet strongly collaborative and local.

Pillar 3: Building a strong enabling environment

The activities carried out through pillars 1 and 2, in addition to further research activities, will provide key data on the contextual factors that either work in favour of agroforestry practices (“enabling factors”) or act as barriers to agroforestry practices (“disabling factors”). Addressing these factors is essential to the long-term and large-scale success of the transition program. A thorough analysis will also highlight what work is already being done, helping identify

opportunities for collaboration, program support, and resource-saving. It will also identify key steps that need to be taken to reduce barriers to agroforestry adoption and increase incentives.

Some of the key contextual elements that contribute to either an enabling or disabling agroforestry environment include:

- National and regional public policy
- Private sector activity, policy, and initiatives (E.g. Companies' commitments to reducing deforestation in cocoa and increasing forest cover through agroforestry and the Cocoa & Forestry Initiative's Joint Action Framework)
- Public-private sector initiatives/partnerships
- Financing initiatives and differential farmer access to that funding
- Farmer access to inputs
- Product pricing and market requirements
- Extension service & farmer technical support
- Socio-cultural and historical drivers

Roles and Capacities Needed for Successful Transition

Table 1.2.1 below describes the key roles and capacities needed to successfully execute the best-proposed transition plan. The roles are divided into the "core" roles that should be fulfilled within the main program team. The "supplementary" roles are those that may be fulfilled via work with external partners on a needs basis.

Table 1.2.1: Overview of the recommended roles & capacities needed for effective execution of the strategy

	Role	Description of capacities	Program element
Core	Program coordinator(s)	This role is focused on coordinating the diverse members of the program team from different organisations. This role requires deep knowledge of the Côte d'Ivoire cocoa industry context, an ability to communicate clearly both remotely and in person	Project management & partnership coordination

		across cultures, and to coordinate multiple partners working on diverse interconnected tasks at large spatial scales and long timescales (e.g. IDH).	
	Agroforestry specialist	This role must be filled by an organisation that has deep knowledge of the technical aspects of agroforestry for cocoa. They must be able to use, communicate and adapt fit-for-purpose agroforestry techniques & designs into effective on-the-ground agroforestry transitions at large scales. This includes organising and conducting research, communicating directly with in-the-field staff, undertaking fieldwork, training farmers, facilitating peer support groups and training the trainer.	Technical agroforestry & farm community activities
	Field staff	This role is likely to require multiple staff distributed throughout the ECOOKIM cooperative network. These staff are a direct and regular link between technical program partners such as agroforestry specialists and farming communities. They need to have a strong connection to the farming communities they are working with, must be communicative and have sufficient skills and local knowledge to facilitate execution of on the ground activities. For example, these staff must coordinate with agroforestry specialists to plan and arrange fieldwork operations, farmer field schools, focus groups/farmer co-design sessions (see section 2.2). Eventually, these staff may become the facilitators of ongoing peer-to-peer learning within farm communities, and the main point of contact between farm communities and national-level program staff.	Technical agroforestry & farm community activities
	Monitoring & evaluation partners	This role requires an organisation that can effectively monitor program Key Performance Indicators, once they have been defined in Phase 0. M&E should be carried out largely remotely wherever possible or with the support of field staff, to maintain program cost efficiency and limit administrative burden placed on farmers. Good ability to present and communicate the M&E results is a further important capacity that this role will fulfill, allowing project results to be delivered to relevant parties (e.g. funders; commercial parties' consumers) in a timely, relevant and inspiring way.	Technical agroforestry & farm community activities
	Market development specialist	This role must have intimate knowledge of national and international cash crop market possibilities and ideally good connections with commercial market partners. They also need to be able to coordinate with local field workers to assess the market potential of specific crops or products within specific regions. During later phases of the transition, these partners will be key in developing large-scale market access for farmers producing key agroforestry products. For example, production of timber from agroforestry plots is likely to be most effective if off-taker companies are already in position to buy the product at a favourable price for the farmers (see commercial partners, below).	Enabling environment
Supplementary	Commercial market partner(s)	During phases 2 & 3 of the project it is likely that commercial partners will be needed as off-takers for the diverse cash products that farmers will start to produce from their agroforestry cocoa plantations.	Enabling environment
	Policy advisor/specialist	The project team will need to include, or have support from, advisors who deeply understand the national or regional policy context and its implications for the future development of agroforestry for cocoa.	Enabling environment
	Government/institutional support	The support of local or national government officials can play a key role in facilitating the success of the transition program. This support can include a link to public funding opportunities, technical support & networking, policymakers, or "softer" forms of capital such as building program credibility and the buy-in of key stakeholders.	Enabling environment

Further detail is provided on the specific capacities, resources and budget required for phase 1 of the transition plan in section 2.

Overview of data/information need

This segmentation and design exercise has highlighted some important challenges facing farmers and key factors influencing farming practices. However, further data collection in the early program stages is essential. This should establish a clear and relevant baseline of data to:

- Test & adapt technical interventions and farm transition approaches in the field
- Facilitate large-scale transition in phases 2 & 3.

A distinction should also be made between the data & information needed to develop the first steps of a program, the data required for later stages, and broader data needed to indicate the impact of the project.

Table 1.2.2 below highlights the most significant data & information needs for developing this program. Chapter 2 offers more detail on the specific information needs & recommendations according to each of the proposed transition program phases (for example, section 2.2.1 gives a list of the main considerations for assessing the state of current farming systems and provides recommendations for supporting resources).

Table 1.2.2: Overview of the data and information needs for agroforestry transition program development

Category	Data/Information need	Scale(s) of analysis
Farming systems & technical interventions	Characterization of existing agroforestry systems	Village or landscape
	Characterization of farming & livelihood systems per model farm location	Village or landscape
	Characterization of the key on-farm resource constraints facing farmers regarding transition to agroforestry (such as tools, labour availability)	Village or landscape; cooperative or department; national
	Mapping of geographical priority areas in relation to cooperatives (such as sensitive water bodies, conservation areas etc.)	Landscape; national
Enabling/disabling environment	Characterization of current extension & technical support capacities in-country and within each region	Cooperative or department; National
	Characterization of digital capacities within farmer communities	Village or landscape; cooperative or department
	Market prices for key crops per model farm area	Cooperative or department; National
	Market access per model farm location	Village or landscape; cooperative or department
	Characterization of key contextual constraints and opportunities for farmer transition	Village or landscape; cooperative or department; national
	Overview of other large-scale commercial parties per model farm location (e.g. off-takers for other products; timber extraction, processing and sales contractors)	Village or landscape; cooperative or department; national
	Overview of all policies and government incentives either enabling or disabling agroforestry adoption	Department; national
	Overview of all ongoing commercial schemes within the Ecookim network that may support or come into conflict with agroforestry activities	Cooperative or department; national
	Overview of key social & cultural factors (e.g. rights to ownership of tree resources appear to be difficult to establish and maintain even on private land. This disincentivizes farmers to plant non-cocoa trees at their own expense because they themselves may not be able to realize the use benefits)	Cooperative or department; national
	Overview of key environmental and historical drivers for current farming activities and change	Cooperative or department; national

	Number of farmers certified under different schemes, broken down by number, cooperative and location	
Program scale & impact	Number of farmers in the Ecookim network	National
	Volume of cocoa produced by Ecookim cooperatives per year	National
	Number of hectares under cocoa cultivation	National
	Current forest cover in Ecookim cooperative production areas	Landscape; cooperative or department; national
	Current rates and/or scale of key challenges (such as deforestation) within Ecookim cooperative regions	Landscape; cooperative or department; national
	Mapping of areas of most rapid change or most significant degradation with regard to key challenges (such as deforestation)	Landscape; cooperative or department; national
	Mapping of areas or groups most vulnerable to key challenges such as soil degradation, drought and disease pressure	Landscape; cooperative or department; national
	Estimates of the current carbon balance for average cocoa farming practices	Cooperative or department; national

1.2.3. Reflection on the Applicability of Approach for West Africa

The approach summarised here is broadly applicable to other west African countries. It is based around techniques that are explicitly designed to understand and work with the variations of the local context. The approach is explicitly non-prescriptive and solutions are driven largely by the conditions of the specific communities involved in the program. The outcomes of this same approach applied in different contexts will be different, but the approach itself can be broadly similar.

Some of the most significant differences for the development of the program itself are likely to be the capacities of program developers, commercial partners, and other field staff in different locations. This will impact the degree to which in-the-field activities such as model farm development and options-by-context methodologies can be effectively implemented.

For example, the extension service context in Côte d'Ivoire has its own idiosyncrasies compared to neighbouring Ghana, Burkina Faso, Mali, Liberia and Guinea, and there are a different set of challenges and opportunities to be addressed. In Côte d'Ivoire, a logical approach may be to work either with NGO extension networks or staff within the cooperatives themselves, rather than increasingly under-funded government networks. In Ghana, by comparison, the significant decentralised network of government extension workers may allow for the integration of agroforestry activities into their programs, but a challenge may be instead to coordinate key elements of the approach across the network on a national level.

References

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reNature.

ECOOKIM Agroforestry Transition Plan

Report Deliverables

2.1. Description of ECOOKIM fit-for-purpose cocoa agroforestry, including:

2.1.1. ECOOKIM farmer segments;

2.1.2. Implementation guide of fit-for-purpose agroforestry for different farmers segments;

2.1.3. Farmers business model for different farmers segments;

2.2. Action plan for ECOOKIM to transition to fit-for-purpose cocoa agroforestry, including:

2.2.1. Action plan for transition to fit-for-purpose agroforestry model, including:

2.2.1.1. 'Onboarding' strategy and activities;

2.2.1.2. Activities during transition period(trainingsandothers);

2.2.1.3. Continuous support activities(trainingsandothers);

2.2.1.4. Overview of required training materials and other elements needed for the support(e.g. demo plots);

2.2.1.5. Budget estimate for the different action plan elements.

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Executive Summary

Understanding the contexts of farmers helps one determine approaches to transition. By reviewing examples of farmer segments and their designs, we can begin to imagine how cocoa monoculture plantations can transition to cocoa agroforestry systems. In this report, we will review core agroforestry practices, examples of farmer segments, examples of segment designs, and methodological approaches to design and transition that place an emphasis on adaptability and function.

Diversity among farmers' social, economic, and environmental contexts poses a necessity for tailored approaches to design and transition. The methods and processes proposed are designed as such to be flexible to the widely varying contexts of ECOOKIM's +31,000 smallholder farmers. The functional focus behind the designs and approaches is what makes these processes adaptable, useful, and relevant to the reality of cocoa plantations in Ivory Coast. Through the data and research conducted, we have come to conclude that developing designs and financial models that allow for the data/inputs to be manipulated by agroforestry trainers/consultants is optimal. By creating modifiable templates whose frameworks and functions allow for modification, farmers' contexts can be integrated into the designs and models more intimately which allows for an even more context-specific solution to be developed.

2.1. Description of ECOOKIM Fit-for-purpose Cocoa Agroforestry

We have identified 5 key farmer segments in the ECOOKIM network.

As outlined in chapter 1, while there are some minor climatic and soil differences amongst some cooperatives, we did not include these as criteria for the farmer segmentation exercise. The systems presented here, and the management recommendations, are flexible enough to account for these differences.

We also acknowledge that there are fine-scale variations in farm type in addition to the segmentation criteria we have identified. This variation is accounted for in the flexibility of the designs and the recommended transition approach. It is therefore essential that the transition approach includes a participatory farmer decision-making process that allows farmers to adjust these general designs to their specific contexts.

As outlined in sections 1.1.2 and 1.1.3, there are some agroforestry practices that we recommend for *all* farmer segments. These are supplemented by segment-specific recommendations.

A note on the transition approach applicability of fit-for-purpose agroforestry systems

As described in section 2.2 below, we explicitly recommend a non-prescriptive approach to agroforestry transition in ECOOKIM's farmer network. Farmer decision-making processes and context-specific variation are seen as essential to producing a meaningful, and just transition that benefits farmers while meeting broader impact goals. As such, the fit-for-purpose designs developed here are not intended as final designs to be 'rolled out' wholesale across the ECOOKIM network.

These designs provide insight into the core practices, challenges, and decision-making processes involved in developing truly fit-for-purpose agroforestry systems of Côte d'Ivoire. Paired with the business models, they also provide indicative insight into the economic implications of developing systems that are more resilient, diverse and that deliver diverse value

to the wider landscape that they are part of. On this basis, this report is intended to provide a set of parameters by which IDH and ECOOKIM can develop a tailored program for transition based on in-the-field engagement and problem solving with the farmers, communities and cooperatives involved.

The subsequent sections describe the main agroforestry practices recommended for ECOOKIM's cocoa farmers, describes how these could be applied to different farmer segments, and explores some of the trade-offs that may need to be considered between maximising positive impact and economic viability of farming systems.

2.1.0. Core Agroforestry Practices

The agroforestry systems are designed to balance cocoa productivity and resilience with increased biodiversity & ecosystem services. The designs also aim to diversify production to improve the quality and resilience of cocoa farmers' livelihoods, including the production of non-cocoa cash crops, food crops, and other products such as firewood, timber and medicinals.

Not all of the improvements made are quantifiable within the parameters of the economic model, and it is likely that some trade-offs may need to be made between achieving optimum cocoa income and the delivery of other diverse values. This should be used to inform the kinds of support developed during the transition program. For example, agroforestry can increase carbon sequestration and storage compared to monoculture cocoa, but this can reduce gross production of cocoa per hectare per year. In this case, carbon financing may be an appropriate solution to facilitate transition to agroforestry.

Biomass inputs and continuous soil cover

All systems are designed to increase the natural inputs and cycling of carbon and other key nutrients into the production system. This essential element of healthy agroforestry systems will support the long-term productivity of the cocoa crop as well as other crops incorporated into the system.

Soil quality will be improved and maintained by frequent input of biomass from fast-growing biomass species, as well as biological nitrogen fixation. Soil conservation will be ensured by

maintaining continuous soil cover by green manures or mulching of biomass species. Mulching soils will also reduce soil surface evaporation during the dry season, helping to maintain greater soil moisture. Over the long term, soil water retention and infiltration capacity will also increase as a result of improved soil structure.

Shade species

Shade trees provide a number of benefits to agroforestry systems. While the exact shade species and overall arrangement will vary between segments, all designs will have shade trees incorporated. During the first five years after cocoa tree establishment, shade may be as high as 70-80% cover. However, after cocoa trees reach 5 years of age it is recommended that shade area cover is maintained between 30-50% of the total plantation area.

Some key benefits of incorporating shade species into cocoa plantation at this spacing include:

- Increasing the productive lifespan of cocoa
- Diversifying income and use value of cocoa plantations (for men this may include more cash crops, for women this may include species that are lower maintenance and have other use or local trade value)
- Diversifying the cocoa production landscape to increase biodiversity & forest conservation value

Tree lines

All designs incorporate trees into the cocoa plantations in a linear pattern. This is intended to both increase the functioning of the system and to simplify its implementation for farmers. This simplification process is described in the implementation guide in section 2.1.2

A number of productive and resilience-related benefits of having tree lines running through plantations include:

- The interruption of pest & disease spreading (an in-plot version of the “cordon sanitaire” principle)
- The creation of both shade & structural diversity while minimising water competition from intercrops. The cocoa tree placed furthest away from the tree lines will experience

minimal competition for water with the tree crops, while benefiting from their nutrient deposition and shade.

- Establishing tree lines on steep slopes will decrease soil erosion and increase water infiltration into the soil

The following section describes the specific farmers segments and the designs developed for each.

2.1.1. ECOOKIM Farmer Segments & Designs

General comments on agroforestry design segment parameters

Five farmer segments have been defined based on focus groups carried out amongst ECOOKIM's cooperatives in September and October 2020. These segments have been identified based on five key variables. These variables include:

1. Plantation size
2. Farmer gender
3. Plantation yields
4. Farmer age
5. Farmer income management

Table 2.1. describes how each of these factors influences fit-for-purpose agroforestry design.

Table 2.1: The agroforestry design implications of each of the five main segmentation variables

Segmentation variable		Implications for design
1	Plantation size	Larger plantations are more likely to need simplified processes and outputs for production at scale. There is also likely to be a need for greater need for in-plot diversity to improve the matrix value of large monocultures (linked to biodiversity) and reduce the risk of large-scale disease risk. The largest plantations may be 5-10 hectares in size, giving opportunities for cultivation of cash crops that benefit from larger scale production for viability, such as timber.
2	Gender	Gender inequality is a significant challenge in Côte d'Ivoire's cocoa sector. Women are typically responsible for care of the family, household and trade for food and other subsistence goods. They are also responsible for ensuring a supply of water and firewood. Conversely, men are typically responsible for the production of cash crops (such as cocoa, palm oil and rubber). On-farm strategies should support women to improve their own livelihoods, including the production of: food crops(yield and quality), other subsistence crops (yield and quality) and firewood. Additionally, off-farm support will be needed to increase women's access to market and increase the prices available to women for their goods. Here, there may be an opportunity to exploit niche and high-value markets. For men, strategies can focus more on the production of cash crops.
3	Plantation yield	Those with low yield need to focus on increasing their cocoa yield to a sustainable level. Those with medium or high yield should focus on maintaining site quality (such as soil) and increasing the stability of yield between years, including mitigating risks that can lead to serious yield losses, such as pests and diseases.

4	Age of farmer	It is likely that older farmers have a lower labour capacity, and need more hired labour which is often not readily available. This means that labour inputs into systems should be minimised, especially for older farmers. To improve the business case where paid labour is required, focus will be on increased cash generation per unit of labour input - i.e. increasing the profitability of the system.
5	Income management	Income management refers to the planning and budgeting activities of the farmer regarding his/her cocoa field. With a high level of income management, it is assumed that the farmer makes a budget and plans for investments. Thus, a higher level of income management would be related to a more entrepreneurial or business-minded approach to the cocoa farming, rather than growing cocoa because it is there and has been there for generations. Those with low levels of income management are expected to be less innovative and ready to start something new, less interested in investing in new species, and less interested in a very diverse new agroforestry system. Those with a high level of income management, who approach cocoa farming more as a business, are more likely to invest in new species and varieties and aim to have an optimally functioning agroforestry system with investments also in labour and other necessities.

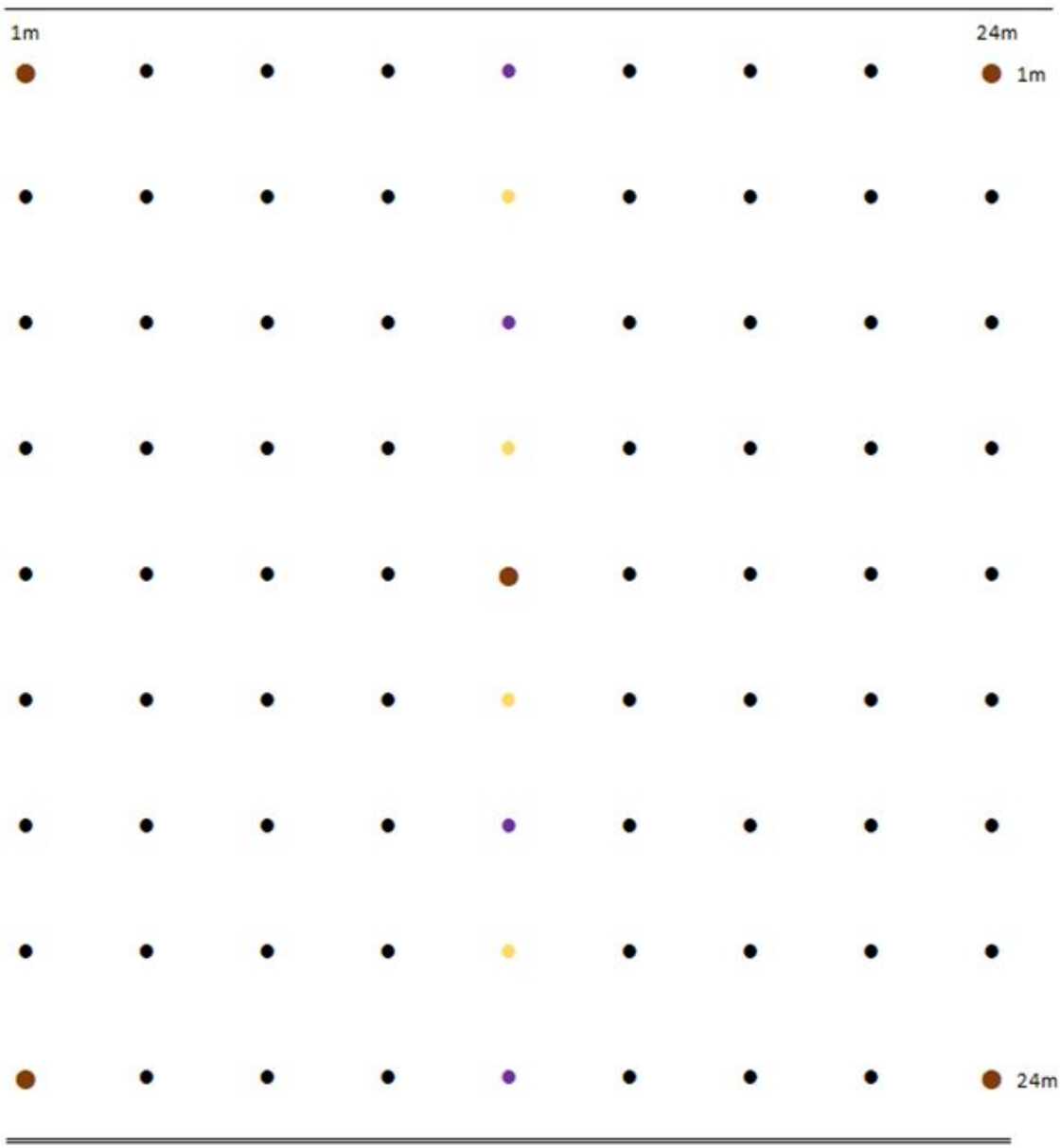
The following designs are created according to the 5 segments defined, as well as a number of other critical design factors that are seen as important considerations for agroforestry systems. These are listed in full in Appendix A.

Segment 1

Large, male-owned plantations with high yields. The farmers are generally young and have good financial management practices.

This system is designed to **diversify cacao production with a timber cash crop** (e.g. African Mahogany), which also provides a relatively **even shade of between 30-50%**. These two core system elements of cocoa and timber shade are supported by **nitrogen-fixing biomass producers** (e.g. Gliricidia) and a **coppice/biomass species**. If banana is chosen as the coppice/biomass species, this will also produce fruit for farmers' own use or local sale. The biomass will be used as mulch to maintain soil health and fertility, and to reduce soil surface evaporation during the dry season.

It is intended for the timber species to be thinned by 50% every 7-9 years. If a longer timber cycle is preferred, then a wider **spacing (24 x 24m)** is recommended, to avoid excessive plantation shading. Timber species can be replaced every time a tree is felled. This produces a rolling timber crop, diversifying income while maintaining the desired shade throughout the plantation. The timber species example given here is *Khaya ivorensis* ("Côte d'Ivoire Mahogany"/"Acajou"). *Terminalia superba* is another example of a very suitable timber species for this system.



Legend & Bill of Quantities

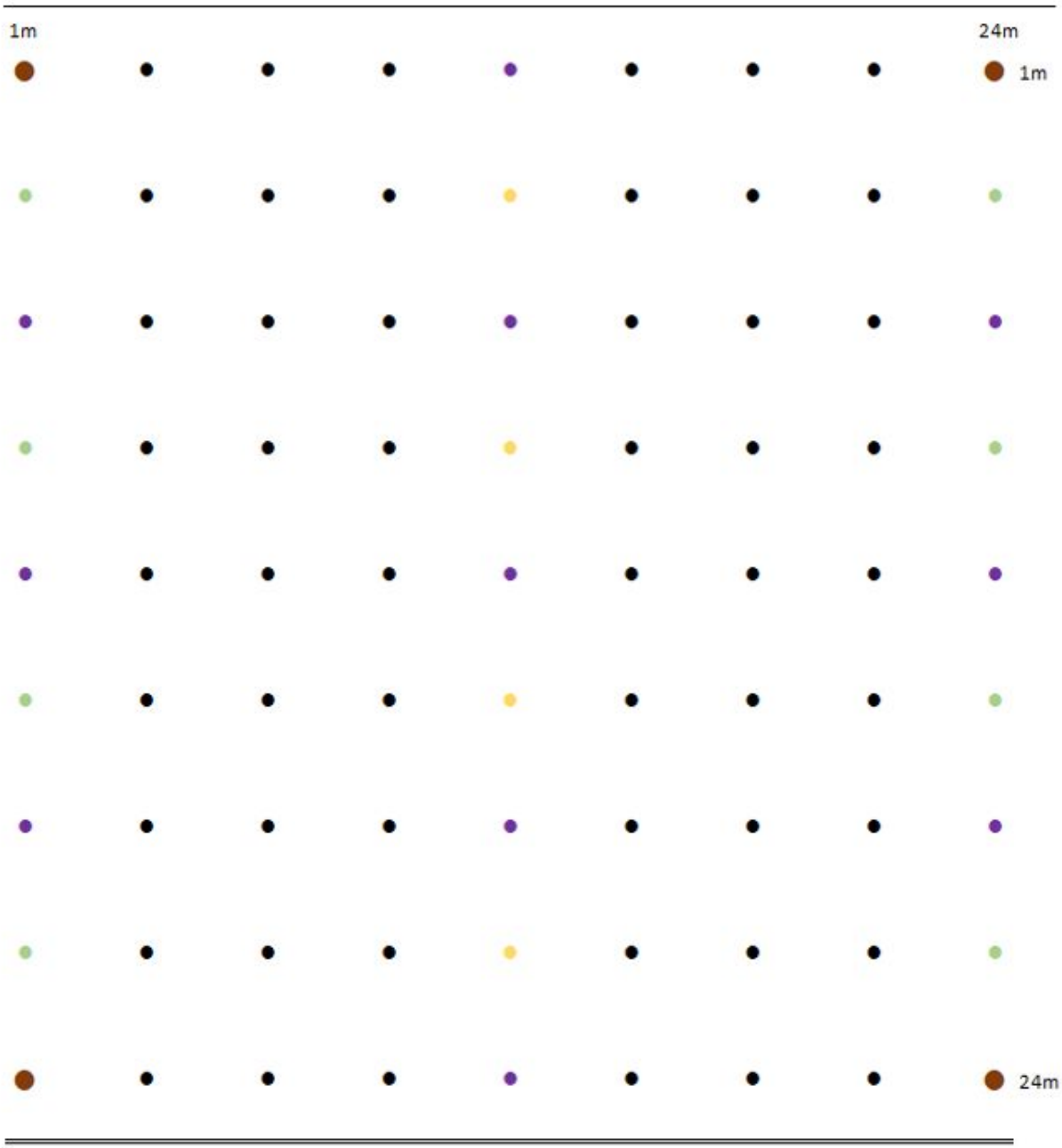
Functional groups	Species examples	Spacing (m)	Mono; qty./ha	Qty./ha
● Main cash crop	*Theobroma cacao*	3 x 3	1111.111111	920.1388889
● Understory: Service	*Musa spp.*	6 x 24	69.44444444	60.76388889
● Understory: Service	*Gliricidia sepium*	6 x 24	69.44444444	60.76388889
● Upper canopy	*Khaya ivorensis*	12 x 12	69.44444444	69.44444444

Segment 2

Small, female-owned plantations with low yield. The farmers are generally old with varied financial management practices.

This system is designed to **diversify cacao production with a variety of directly-usable and locally tradable crops**, to facilitate a resilient livelihood for women. However, the primary focus is on the **improvement of cocoa yield** through **high inputs of biomass and nitrogen** from coppice/biomass species and service species both in the understory and upper canopy.

The production of other products can be increased by choosing multi-purpose species such as banana or plantain (*Musa spp.*) which produces both **biomass and fruit**, and Bridelia micrantha which is a good **firewood or charcoal species**.



Legend & Bill of Quantities

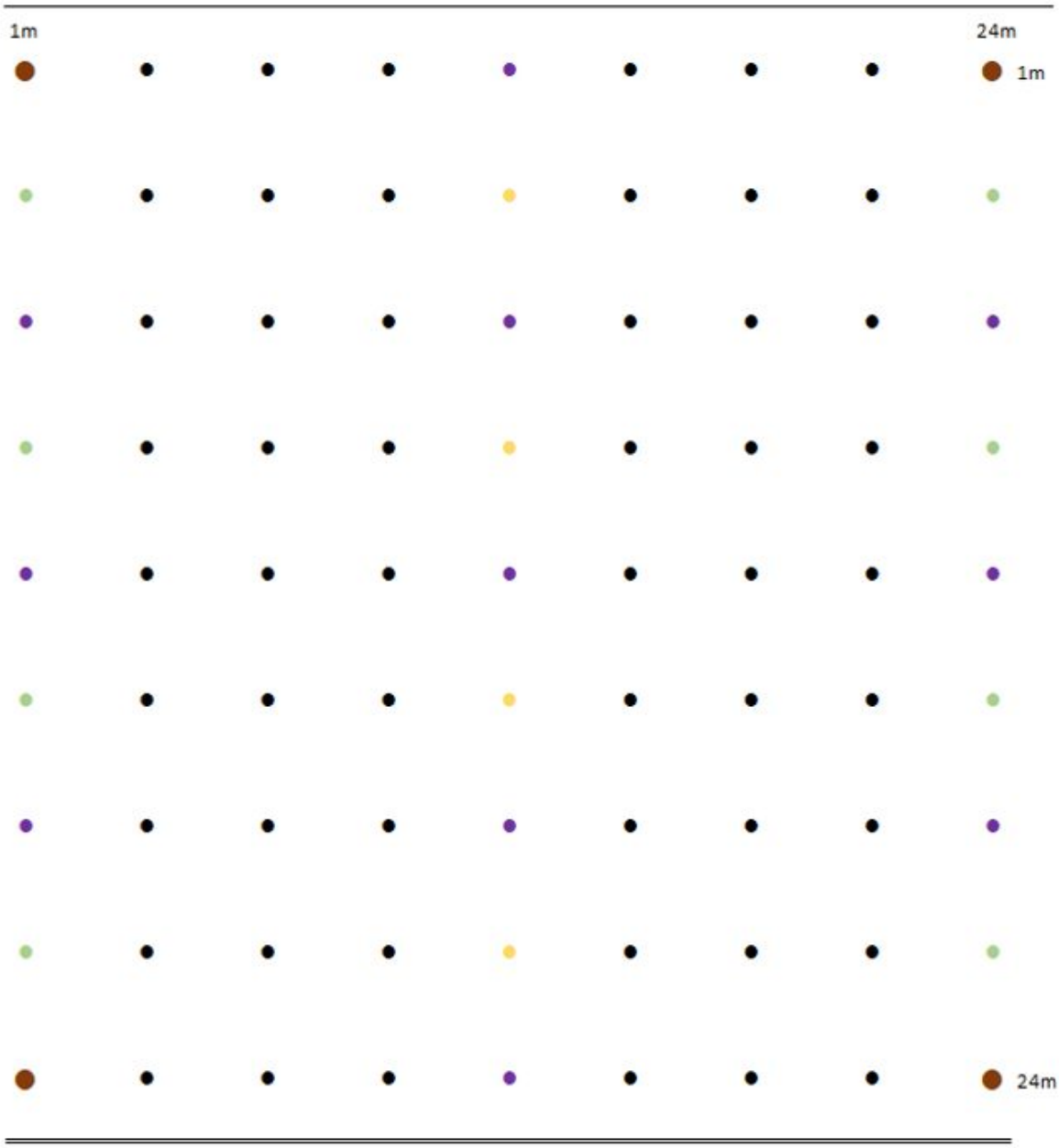
Functional groups	Species examples	Spacing (m)	Mono; qty./ha	Qty./ha
● Main cash crop	*Theobroma cacao*	3 x 3	1111.111111	885.4166667
● Coppice/biomass	*Bridelia micrantha*	6 x 24	69.44444444	69.44444444
● Understory: Service	*Musa spp.*	6 x 24	69.44444444	69.44444444
● Understory: Service	*Gliricidia sepium*	6 x 24	69.44444444	69.44444444
● Upper canopy	*Albizia ferruginea*	24 x 24	17.36111111	17.36111111

Segment 3

Small, male-owned plantations with low yield. The farmers are generally middle-aged with varied financial management practices.

This system focuses on **increasing the productivity of cocoa** while providing some opportunity for **income diversification** if the farmer chooses. The **high quantity of coppice/biomass** species creates a relatively high labour burden for this system, but allows for **rapid improvements of soil quality & fertility**. This will help farmers to increase and maintain yields. Incorporating species such as banana/plantain (*Musa spp.*) can provide **additional food or income**.

Shade is provided by a single upper canopy layer. In this case *Albizia ferruginea* is used as an example because it is a multi-purpose nitrogen-fixing tree with good form. It also provides a food source for pollinating insects. If farmers choose, it can be sold for timber. Other alternatives could be selected as upper canopy to increase income, such as rubber (*Hevea brasiliensis*).



Legend & Bill of Quantities

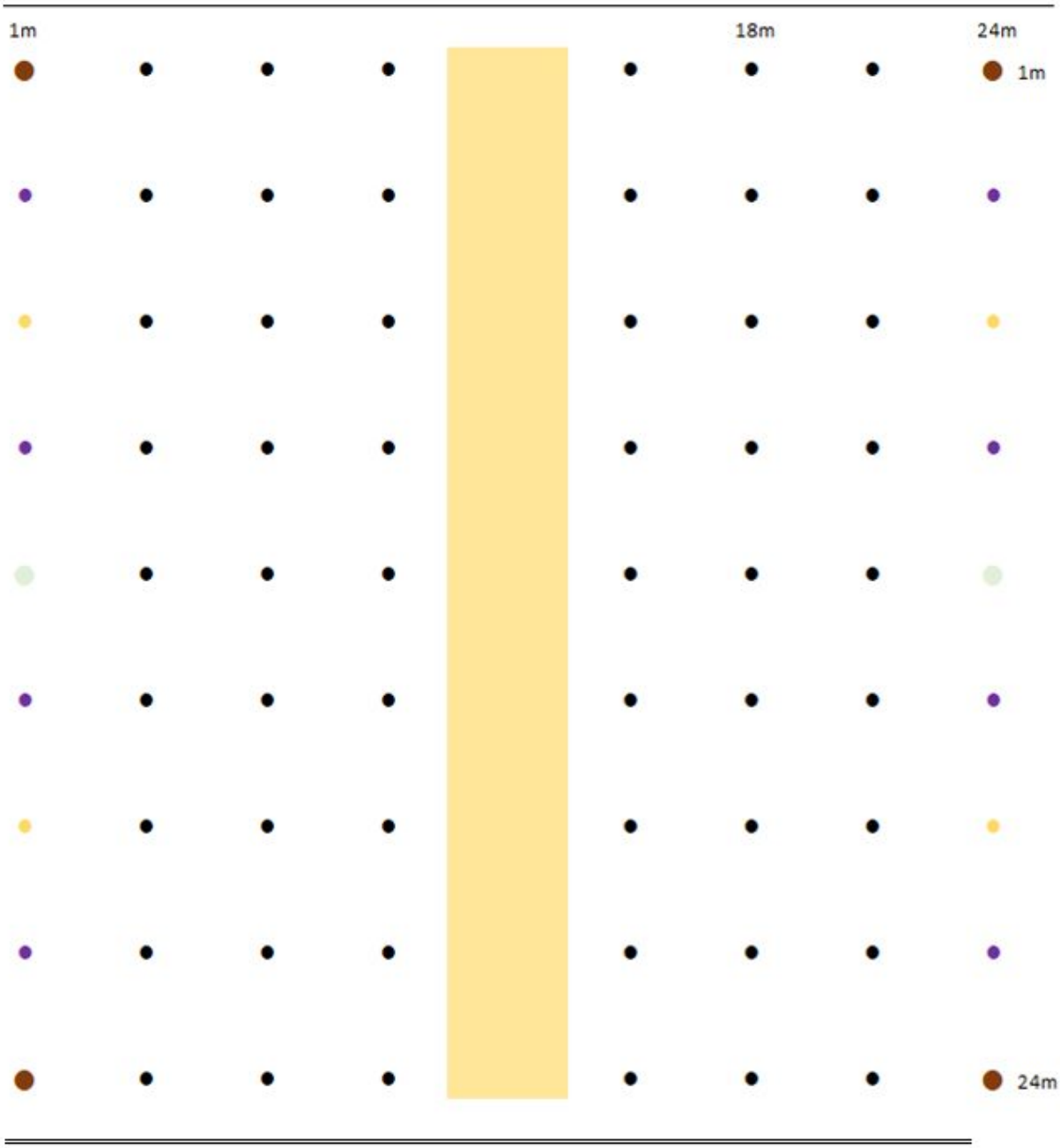
Functional groups	Species examples	Spacing (m)	Mono; qty./ha	Qty./ha
Main cash crop	*Theobroma cacao*	3 x 3	1111.111111	824.6527778
Coppice/biomass 1	*Bridelia micrantha*	6 x 24	69.44444444	69.44444444
Understory: Service	*Musa spp.*	6 x 24	69.44444444	69.44444444
Understory: Service	*Gliricidia sepium*	6 x 12	138.8888889	130.2083333
Upper canopy	*Albizia ferruginea*	24 x 24	17.36111111	17.36111111

Segment 4

Small, female-owned plantations with high yield. Farmers are generally young and have good income management.

This system is designed to **diversify cacao production** with a variety of **directly-usable and locally tradable crops**, to facilitate a resilient livelihood for women. It allows the cultivation of **both perennials** - combining cocoa and fruits (in this case citrus) - **with annual/biennial staple crops**. A rotation is recommended within the annual/biennial production, to include the staple starch crops **manioc or yam** rotated with the **nitrogen-fixing protein crops pigeon pea or peanut**. This rotation provides a combination of food crops while **maintaining soil fertility**. The cocoa and fruit element provides a **diversified income and supplementary nutrition.**

Multi-purpose fast-growing biomass species are also included, primarily to provide biomass and shade for the cacao. This could include species such as banana (or plantain; *Musa spp.*), which also serves as a staple food crop, or Akpi (*Ricinodendron heudelotii*), a versatile species that can be coppiced for biomass, harvested for valuable seeds, or allowed to grow taller to provide shade. The system is designed to supplement the already-high yields of farmers with other crop types. Less emphasis is given to biomass species compared to, for example, segment 5 because yields are already high. Focus is therefore on maintaining soil fertility rather than increasing it.



Legend & Bill of Quantities

Functional groups	Species examples	Spacing (m)	Mono; qty./ha	Qty./ha	
● Main cash crop	*Theobroma cacao*	3 x 3	1111.111111	779.3209877	
● Coppice/biomass	*Ricinodendron heudelotii*	6 x 24	69.44444444	60.76388889	
● Understory: Service	*Gliricidia sepium*	6 x 24	69.44444444	60.76388889	
● Large shrub/small tree	*Citrus reticulata*	6 x 24	69.44444444	69.44444444	
● Upper canopy	*Albizia ferruginea*	24 x 24	17.36111111	17.36111111	
Annual/biennial*	*Dioscorea sp.- C. cajan*			1250	123.46 **

*Annual/biennials are presented in terms of m2 cropped area, not qty. of individual plants. The number of cocoa plants lost to this crop is included

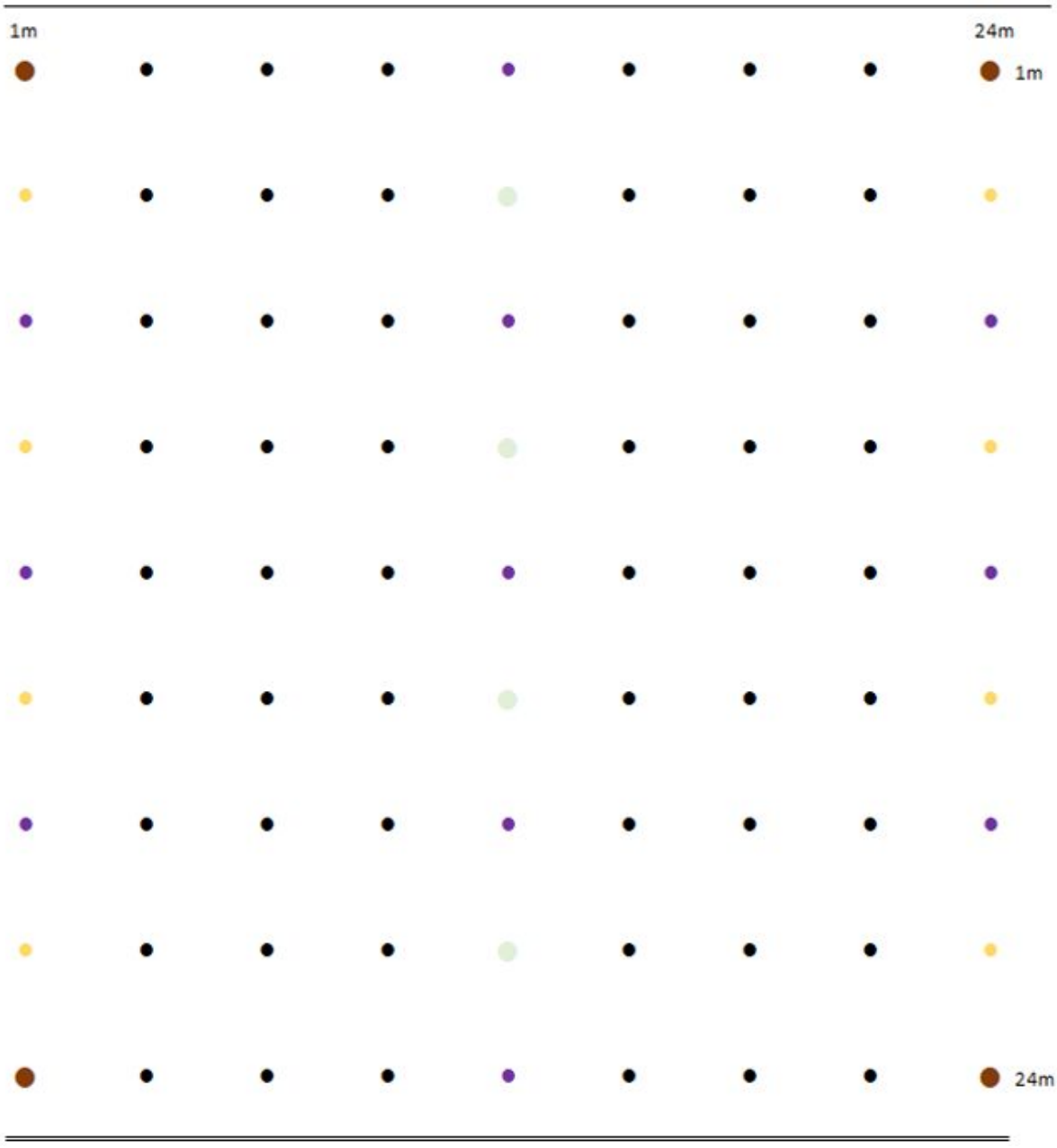
**The number of cocoa trees lost to annual/biennial cropping area

Segment 5

Medium-sized, female-owned plantations with high yield. Farmers are generally middle-aged with good income management.

This system is designed to **diversify cacao production** with a variety of **directly-usable and locally tradable crops**, to facilitate a resilient livelihood for women. It combines services such as **nitrogen fixation and biomass production** with the production of **other perennial crops** (such as citrus reticulata) which can either be **used directly by farmers or sold locally**.

The system focuses less on biomass production than system 2 because of the already-high yields of the segment's farmers. The inputs from service trees require relatively little labour, especially if, for example, the upper canopy favours nitrogen fixers such as *Albizia ferruginea*. Gliricidia is also an N-fixer and can produce biomass, but has a lower labour requirement than some fast-growing service species which need coppicing every year.



Legend & Bill of Quantities

Functional groups	Species examples	Spacing (m)	Mono; qty./ha	Qty./ha
● Main cash crop	*Theobroma cacao*	3 x 3	1111.111111	815.9722222
● Understory: Service	*Musa spp.*	6 x 24	69.44444444	69.44444444
● Understory: Service	*Gliricidia sepium*	6 x 12	138.8888889	138.8888889
● Large shrub/small tree	*Citrus reticulata*	6 x 24	69.44444444	69.44444444
● Upper canopy	*Albizia ferruginea*	24 x 24	17.36111111	17.36111111

2.1.2. Implementation Guide of Fit-for-purpose Agroforestry for Different Farmers Segments

The systems are designed in a way that all components can be implemented simultaneously at the beginning of a cocoa plantation cycle. However, to begin, two key observations should be noted:

1. The vast majority of farmers represented in the five farmer segments are working with already-established cocoa plantations. This implementation guide therefore focuses on integrating agroforestry step-by-step into existing cocoa plantations.
2. In the majority of plantations cocoa plants have irregular planting spacing. We strongly recommend that any new plantations are planted with a regular spacing to encourage consistent positive outcomes and improve management efficiency. However, it is not possible for farmers to change the layout of the existing plantations

The implementation of these systems must be tailored to farmers' context. There are a wide number of variables which make a single implementation approach impossible. This implementation plan should therefore be seen as a starting point from which to develop more detailed and context-specific fit-for-purpose systems in the field. The process for doing this is described in more detail in section 2.2.

General implementation guidance

Rapid establishment of the upper canopy strata to provide shade and other ecosystem services.

Shade trees in the upper canopy provide the simplest agroforestry intervention for farmers, and brings a range of benefits. For example, shade trees encourage the conservation and cycling of key nutrients in the system, add biomass through the production of leaf litter, and in the case of nitrogen fixing species, add nutrients to the system in the form of nitrogen. An appropriate amount of evenly distributed shade cover in plantations (30-50%) also reduces the risk of key pests and diseases in Côte d'Ivoire such as the cocoa mirid.

Rapid establishment of biomass production species for improved soil health and conservation

Poor access to agricultural inputs and poor soil health is a key challenge experienced by many of ECOOKIM's farmers. Poor soil quality also reduces the soil's capacity for water infiltration and storage, increasing susceptibility to negative impacts of drought. Establishment of biomass species in the plantations will provide farms with an on-site source of large quantities of organic matter, which can be added to the soil as mulch on a regular basis. This will both protect the surface of the soil, decreasing soil evaporation and erosion, while adding carbon to build structure and cycling key nutrients such as nitrogen. The relatively dense lines created through the plantation by these species will also act to interrupt the spread of pests and diseases.

Establishment of tree lines across steep slopes for optimum soil conservation and water retention

On steep slopes, soil losses from exposed soil during heavy rain events will be high, and water retention on site is likely to be lower. Tree lines should be established across slopes in steeper plantations to conserve soil and improve soil water infiltration. On flatter ground tree lines should be established in an East-West orientation.

First priority: multi-purpose shade species

The upper canopy shade trees are the lowest maintenance and most basic elements of the agroforestry systems. Even alone, shade trees will begin to deliver some key benefits to farmers. These can also be more readily integrated into existing cocoa plantations because they are dispersed.

- Establishes diversified structure
- Protects the cocoa crop from extreme conditions
- Improves the ecosystem service provided e.g. soil conservation & improvement, biodiversity, redacted incidence of some diseases
- Begins the production of some additional products e.g. firewood

Second priority: Biomass/Coppice Species

The biomass/coppice species are typically higher maintenance than shade trees and are more challenging to integrate into existing mature cocoa plantations. However, they deliver important benefits to the system, addressing key production challenges and support the yield performance of cocoa.

- Intensifies key productive improvements (e.g. addition of biomass to the soil; breaks up plantations to interrupt pest & disease spread)
- Intensifies the provision of ecosystem services
- Intensifies the provision of diverse products

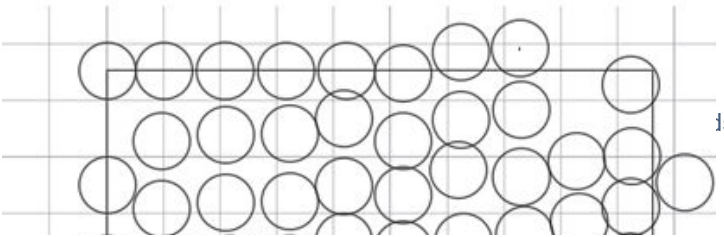
Third priority: Additional diversity according to farmer priorities

Once the two elements of shade tree cover and biomass/coppice species have been established, farmers can consider further diversification of the plantation. This may include, for example, taking out relatively unproductive lines of cocoa and replacing them with fruit or other productive trees. This can be done either simultaneously with the shade trees and biomass/coppice species, or over time as finance and labour allow, or when the opportunity arises (e.g. when cocoa trees die for other reasons).

Applying agroforestry in the field: a worked example

The application of agroforestry practices is not a one-size-fits all model. We recommend an approach that facilitates farmers to make decisions about the trade-offs involved in transitioning their cocoa production systems to agroforestry. This is an essential element of the three transition strategy pillars outlined in chapter 1.2, and the basic logic for the activities recommended for phase 1 of the transition action plan, detailed in this chapter under section 2.2.1.

The following graphics outline how agroforestry may be established into an established cocoa farm plot. With this approach cocoa trees are progressively removed to establish the agroforestry structure.



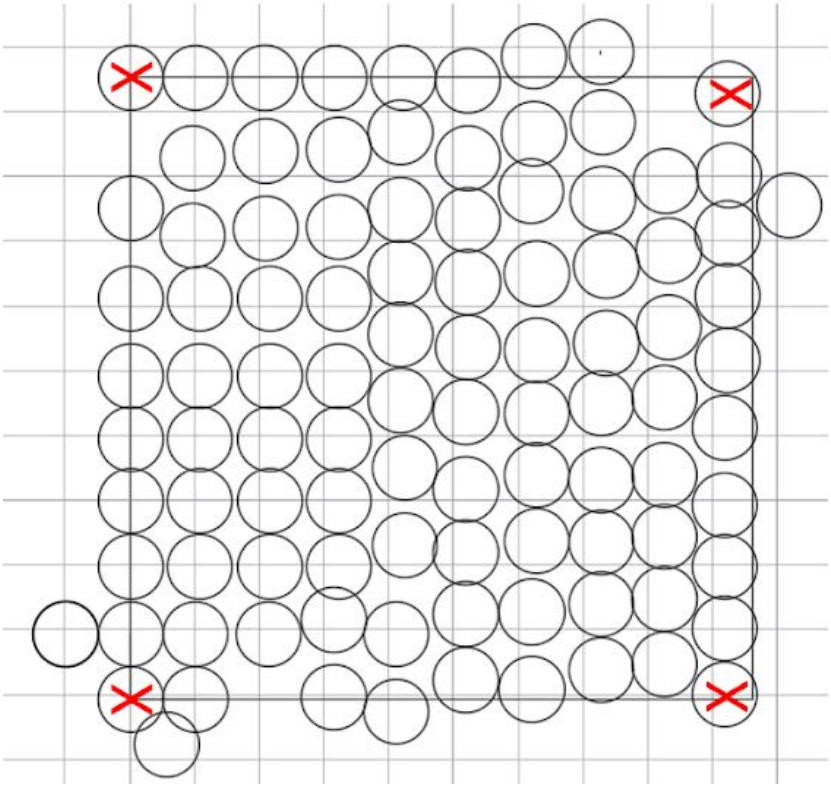
Starting point: cocoa monoculture

The image shows a birds-eye schematic drawing of a cocoa monoculture plot. Trees are somewhat irregularly spaced, with an approximate tree spacing of 2.5m x 2.5m.

This reflects the likely starting point for agroforestry transition in ECOOKIM's cooperatives.

As shown in the profile image below, this is a single-strata system.

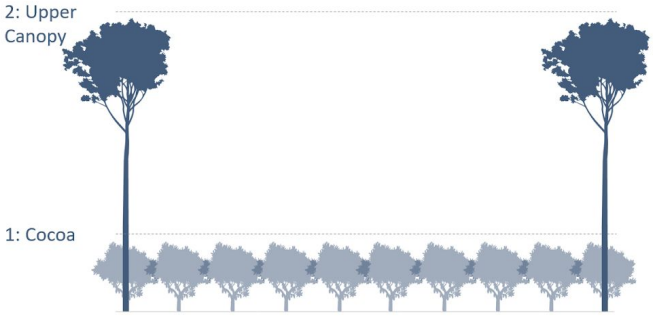
Establishment Step 1: Identify sites approximately 24m apart in the plot to establish shade trees.

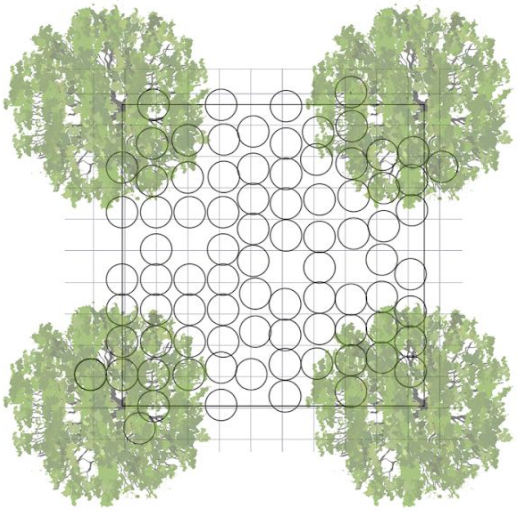


A logical starting point is to select either a gap between cocoa trees or an unproductive or diseased tree that could be removed with minimal yield loss.

From this starting point, the farmer can walk either East or West by 24m to identify the next point for shade tree establishment and so on.
The site for the next tree line can be established in the same way, with the farmer starting at a single shade tree and walking either North or South 24m to establish the next one.

The plot becomes a 2-strata system.

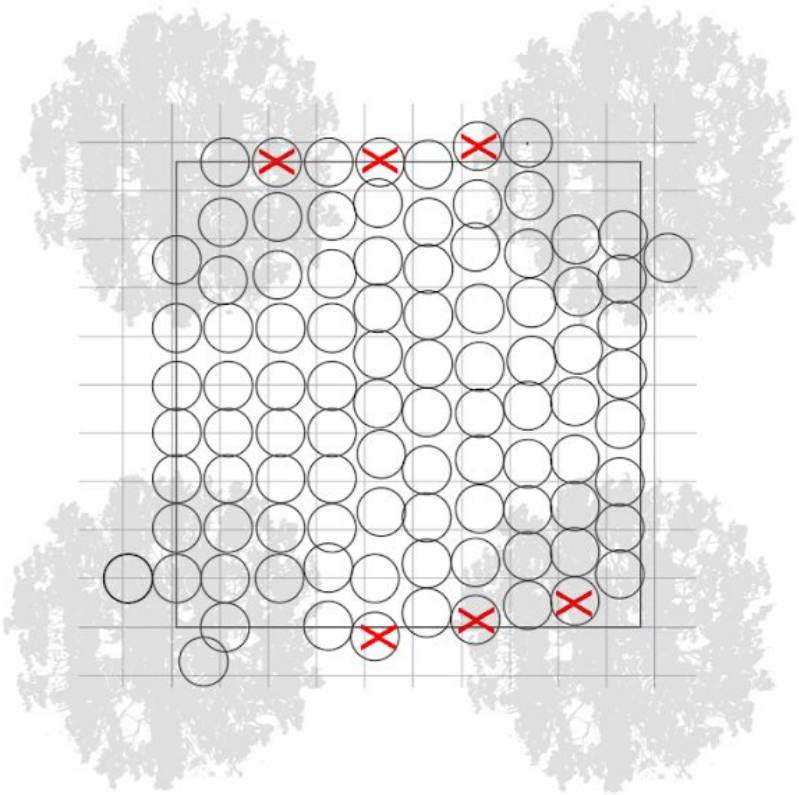


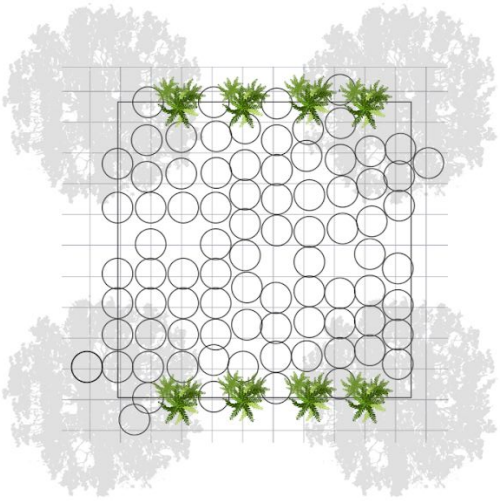


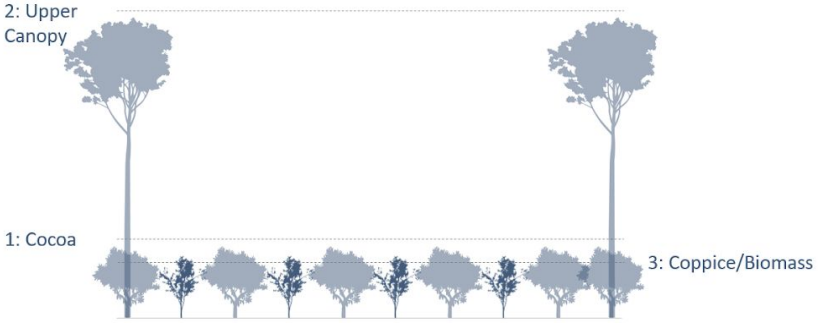
Step 2: Create a line between the shade trees by replacing every other cocoa tree in the line with a biomass species. Lines should be established East-West if not on a steep slope

Tree lines can be easily established in the field by eye simply by removing every second cocoa tree in the lined running East-West between to upper canopy shade trees.

The plot becomes a more complex 2-strata system.





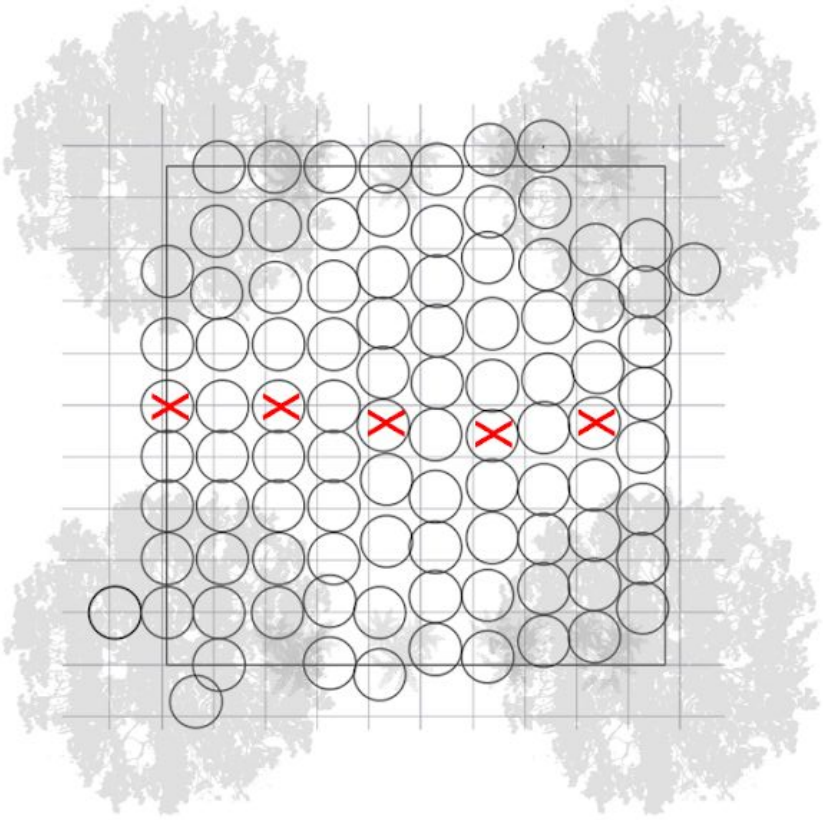


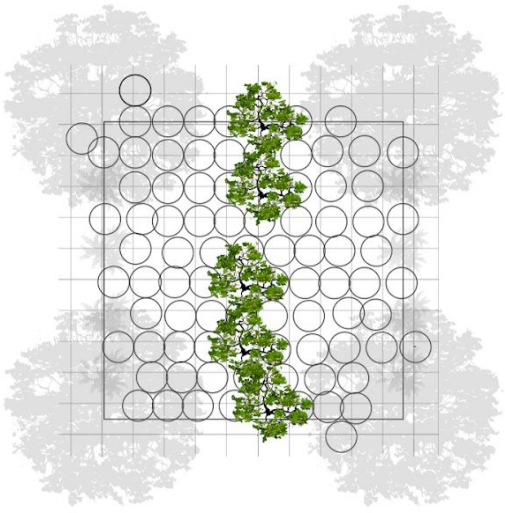
Step 3: Establish a line in between these two lines by removing 1 of every 2 trees in a row halfway in between the two existing lines.

Finally, other elements such as fruit species can be added an additional line between primary tree lines.

These can be established directly half way between the existing tree lines.

The plot becomes a 3-strata system.






2: Upper
Canopy
4: Lower canopy
1: Cocoa
3: Coppice/Biomass

2.1.3. Farmers Business Model for Different Farmers Segments

A note on the limitations of cash income from diversified agroforestry systems

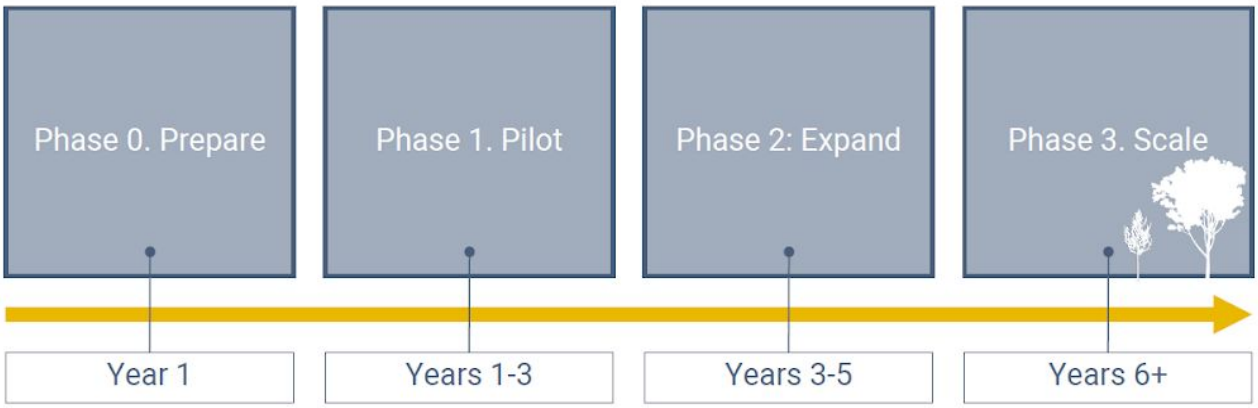
The designs are created primarily with the goal of improving the productive potential and resilience of cocoa, as well as the provision of locally usable or tradable items. There is space in each for the integration of major cash crops such as rubber or palm oil. However, the segmentation exercise indicated that access to even local markets is a major challenge for many of the farmers. Increasing the cash output of these systems should therefore be seen as a long-term goal rather than one that can be solved only through agroforestry design.

The enabling environment must be developed, including for example improving access to market and developing clear off-taker arrangements for additional additional products produced. The proposed action plan therefore emphasises the need for a long-term, multi-phased approach to agroforestry transition in order to effectively generate a wide range of non-market value to farmers, while building a strong foundation for improving the production and profitable sale of cash crops at a fair price. The next section details our recommendations for this transition.

2.2. Action Plan for ECOOKIM to Transition to Fit-for-purpose Cocoa Agroforestry

This section outlines how IDH and ECOOKIM can effectively generate a meaningful transition to agroforestry amongst ECOOKIM's farmers over the coming years. We propose a multi-phase action plan for transition, focused first on developing a network of a relatively small number of committed farmers practicing fit-for-purpose agroforestry (Phase 1) on so-called "model farms) and subsequently scaling activities based on this solid foundation. This model farm network should be developed strategically throughout the ECOOKIM cooperatives, as it will become the skeleton for expanding the program in the future. The per-farmer transition costs during the first phase will be relatively high by comparison with later phases, emphasizing high-quality learning and direct support for the transition.

For phase 1 we have developed a set of recommended activities from onboarding, to transition support and ongoing support. This will likely take 2-3 years to develop effectively and is the main focus of this report.



Phases 2 represents an intermediate stage in the transition program, reaching a greater number of farmers for lower cost, but still focusing on establishing a strong baseline of context-specific in-the-field knowledge and infrastructures to facilitate scaling up. Phase 3 will expand the program based mainly on large-scale, low cost mechanisms to drive change throughout the farmer network. This will build on key infrastructure, knowledge and staff established in phases

1 and 2.

Peer-to-peer learning amongst farmers is emphasized as a key method in this context (see section 1.2 for an overview of the approach. An effective transition depends largely on a meaningful sense of process ownership amongst farmers, linking to a will to learn, share and adapt practices amongst their peers. The model farm approach, combined with the ability for farmers to adapt designs to their own context (what we call here “options-by-context”) allows farmers to gain direct support from specialists and each other, to see practices in action, and to adapt them according to their needs and preferences.

The activities of phases 2 and 3 depend heavily on the developments achieved in phase 1. As mentioned above, this report is focused on the activities of phase 1, and how these can translate into success in phases 2 and 3.

The following section outlines key transition phases, from “Phase 0” to “Phase 3.

2.2.1 A strong foundation for transition: Phases 0 & 1

Phase 0: Year 1

Significant work must be done to establish core capacities and networks in the field before agroforestry can be effectively scaled throughout the ECOOKIM network. Phase 0 is our suggested starting point for the program partners to build on this report, before any major fieldwork is initiated. The two main goals of this phase are to:

A. Establish specifically which cooperatives are suitable for the first phase of the transition
B. Establish a consortium of implementation partners with appropriate skills and on-the-ground capacities to make the program a success.

ECOOKIM has 23 many cooperatives. Not all of these will participate in phase 1. Table 2.2 below introduces a preliminary criteria that should be used to identify which cooperatives are most suitable for participation in phase 1.

Table 2.2: Proposed selection criteria for selecting cooperatives for model farm development.

	Selection criteria question	Rationale
1	Is the cooperative representative of key farmer segments and the different geographies within the ECOOKIM network?	During phase 1, a strong network of model farms will be implemented, creating a network that can be built upon for effective transition in phases 2 and 3. It is therefore important that there are model farms throughout the ECOOKIM network.
2	Is the cooperative or members of the cooperative located in a priority area?	Some cooperatives and farmers will be located in more sensitive areas related to key goals, such as forest conservation areas. Phase 0 must identify what factors are most important to prioritise in greater detail and select areas where transition is both most urgent and most likely to generate significant positive impact. For example, agroforestry may have a significant positive impact on biodiversity if it is implemented to create a biodiversity corridor in between forest fragments.
3	Is the cooperative actively engaged with ECOOKIM?	The first phase of the transition is dependent on strong ability to communicate amongst partners, and to build engagement based on meaningful interactions between farmers, cooperative leaders and program staff. Working with cooperatives whose leaders and farmers are already engaged with ECOOKIM will make this process significantly more effective in the early stages.
4	Does the cooperative have a well-organised and active organisation?	Similar to criteria 3, working with well-organised cooperatives is likely to make communication between program staff and farmers much more productive. A good level of organisation is also essential if key activities such as model farm implementation, capacity-building and options-by-context methods are to be used effectively.
5	Is the cooperative already engaged in other transition programs?	If a cooperative is already involved in another transition program, this may present either an opportunity or a risk. It may be an opportunity because there could be infrastructures in place that could be utilised by the agroforestry program, such as a network of extension workers, other technical staff, or monitoring capabilities. It presents a risk because participation in too many programs may create conflicting goals for farmers or create too many activities and goals to achieve. These factors must be considered when selecting which cooperatives should participate in Phase 1.

This phase should also be used to establish a baseline of Key Performance Indicators (KPIs) that the program hopes to achieve. This requires IDH and ECOOKIM to together define the core priorities for the program, how these relate to broader challenges in Côte d'Ivoire's cocoa sector, and how progress will be judged.

The FAO's (2019) Tool for Agroecological Performance (TAPE) provides a valuable framework that we recommend as the project partners' point of departure in this process. The table below shows the criteria included in TAPE as an example of the types of conditions. Other key impact metrics not included in TAPE may need to be considered, such as carbon sequestration rates, or program metrics such as number of farmers engaged or transitioned. Appendix A in chapter 1.1 also highlights the range of key challenges relevant to the Côte d'Ivoire cocoa sector, and can

be used to inform the process of setting KPIs.

Table 2.3: FAO (2019) TAPE's "Core Performance Criteria" for assessing agroecological performance (p.25)

MAIN DIMENSION	#	CORE CRITERIA OF PERFORMANCE	PROPOSED METHOD OF ASSESSMENT IN SURVEY	SDG	SDG INDICATORS
Governance	1	Secure land tenure (or mobility for pastoralists)	Type of tenure over land: property, lease + duration, verbal, not explicit (**SDG 1.4.2, 5.a.1 and 2.4.1 sub-indicator 11**) Existence and use of pastoral agreements and mobility corridors	1 2 5	1.4.2 2.4.1 5.a.1
Economy	2	Productivity	Farm output value per hectare (**SDG 2.4.1 sub-indicator 1**) Farm output value per person	2	2.3.1 2.4.1
	3	Income	Outputs - inputs - operating expenses - depreciation + other income (**SDG 2.4.1 sub-indicator 2**)	1 2 10	1.1.1, 1.2.1 and 1.2.2 2.3.2 2.4.1 10.2.1
	4	Added value	Net income +rents +taxes +interests - subsidies	10	10.1.1 10.2.1
Health & nutrition	5	Exposure to pesticides	Quantity applied, area, toxicity and existence of risk mitigation equipment and practices	3	3.9.1 3.9.2 3.9.3
	6	Dietary diversity	Minimum Dietary Diversity for Women (FAO and FHI 360, 2016)	2	2.1.1 2.1.2 2.2.1 2.2.2 2.4.1
Society & Culture	7	Women's empowerment	Abbreviated Women's Empowerment in Agriculture Index, A-WEAI (IFPRI, 2012)	2 5	2.4.1 5.a.1 5.a.2
	8	Youth employment opportunity	Access to jobs, training, education or migration (**SDG 8.6.1**)	8	8.6.1
Environment	9	Agricultural biodiversity	Relative importance of crops varieties, livestock breeds, trees and semi-natural environments on farm (**SDG 2.4.1 sub-indicator 8.1, 8.6 and 8.7**)	2 15	2.4.1 2.5.1
	10	Soil health	Adapted SOCLA rapid and farmer friendly agroecological method to assess soil health (Nicholls *et al.*, 2004)	2 15	2.4.1 15.3.1

Phase 1: Years 1-3

This phase focuses on the development of model farms in strategic locations and communities across ECCOKIM's cooperatives. It involves establishing strong in-the-field relationships, giving tailored, in-depth and on-the-ground support to farmers, and testing assumptions about designs, farmer needs and economic trade-offs.

It will establish a strong base of practices & knowledge with a small group of farmers that will form the foundation for phases 2 & 3. The farmers involved in the first clusters will be the second "wave" adopting agroforestry practices, creating a multiplier effect.

Based on the short-listing exercise in Phase 0, farmers will be identified for developing model farms in strategic locations throughout the ECOOKIM cooperative network. These farmers will be the first adopters and will form the "core" group of innovators who will be inspiration and examples for other farmers to follow. Some key considerations for this phase include:

- **Partnering with farmers for tailored local solutions and deep learning:** The main activities of this first phase will emphasise close partnership with the model farmers. It will be a relatively resource-intensive process that is intended to lay solid foundations for a successful and widespread transition in program Phases 2 & 3. The first pilot plots will be established with these farmers. These plots will be the sites for practical, supported learning for both the model farmers and for other farmers within the community.

- **Building a body of context-specific knowledge:** This phase will also be an opportunity to gather more detailed knowledge on different farm contexts throughout the ECOOKIM network, as well as refine designs, on-farm transition processes, and build knowledge for phases 2 & 3.

- **Establishing an enabling framework for agroforestry:** This phase will also be an opportunity to assess the key enabling and disabling factors facing agroforestry transition in specific cooperatives and locations. For example, availability of seedlings, market access constraints, knowledge & equipment constraints and landscape challenges or needs (such as conservation priorities) can all be understood in greater depth and addressed in future stages.
- **Funding the transition:** All on-farm activities during this phase should be fully funded. This is especially important when the program team has relatively little knowledge about the specific context on the ground, and limited connection with local partners.

The exact number of cooperatives and model farms involved in this phase will depend on a number of factors, especially program development capacity and funding. As an example, an effective and realistic goal for the first year of phase 1 would be to develop a program as follows:

- 5 cooperatives in strategic locations, including:
    - 1 in the southeastern region
    - 1 in the southwestern region
    - 2 in the eastern central region
    - 1 in the south-central region
- Each with 2-5 model farms
- With 10 farmers in each of the model farm clusters

These pilots may be expanded in the second year of phase 1 to create a larger network of model farms. Table 2.6 below illustrates the main activities and training materials associated with Phase 1.

Resource burden versus large-scale impact

Larger numbers of farmers may be reached in the earlier stages depending on two main factors:

1. **The resources available for program development.** Section 2.2.6 describes the indicative budget involved in developing a model farm in this context. Greater financial support and the ability to scale necessary capacities (e.g. increased number of trained field staff) will allow for a larger number of farmers to be brought into the program in the first phase.
2. **The relative complexity of agroforestry practices adopted.** As described in section 2.1.2, different agroforestry practices can be introduced into farms in sequence, becoming progressively more complex over time. Simpler systems may be associated with a reduced impact, but may be sufficient for the goals of farmers, ECOOKIM and IDH goals. If simpler systems are adopted, it may be feasible to establish more farms more rapidly in phase 1.

Using model farm development activities to build a detailed picture of conditions in the field

FAO TAPE provides a method for translating findings from relatively few case studies into insights that are useful for application across larger, relatively homogenous communities. This allows findings to be generalized and large-scale actions to be determined with relative confidence. Section 3.3 of the FAO (2019) TAPE report details this methodology, so it will not be repeated here.

This approach can be adapted to inform the transition from phase 1 of the program, which is small-scale in terms of impact, into phases 2 & 3 which progressively and significantly increase impact.

2.2.2. Phase 1: Activities & Training Materials

Onboarding strategy

The “onboarding” strategy for phase 1 emphasizes direct interpersonal between program staff, specialists, cocoa farmers and cooperative staff. The first priority in this foundational phase of the program is to give farmers direct and in-depth support as they take on new practices. In reNature’s experience with farmers across the globe, farmer onboarding activities within unpiloted programs should emphasize in-person and step-by-step process of engagement. This not only gives farmers confidence that they are supported in making what may be perceived as a challenging transition, but program staff are also given the opportunity to observe and respond with flexibility according to what they are learning from the farmers.

Once cooperatives and a shortlist of model farmers have been identified (see Phase 0), program field workers will visit the identified cooperatives to conduct preliminary site assessments and run introductory work sessions with model farm cluster farmers. These will be followed by the first implementation sessions on the model farm plots.

Strategy during transition period

Once farmer groups are introduced to the program, and the first implementation sessions are complete, the goal will be to continue providing hands-on, timely support and capacity-building as the established systems develop. During this time agroforestry specialists and field staff should be readily available to provide basic decision-making support, and help farmers to address key challenges as they arise. The early-adopting farmers of the first model farms will be fully supported through the earliest - and often most challenging - part of the transition process.

The transition period for each model farm may last up to maximum two years (otherwise costs may become excessive). Towards the end of this period, we recommend undertaking further options-by-context and co-design worksessions with all farmers in each cluster, in which each farmer maps out an agroforestry system for their own farm. In this stage the work & design sessions should be relatively flexible and exploratory, establishing a clear baseline of agroforestry practices and potential species. Flexibility in the design process will remain in phases 2 and 3, but it will be built around a stronger framework of the possible methods and species identified in phase 1.

During this period, key data will also be collected for the model farm cooperatives, such as the availability of genetic material, market data, capacity & tool limitations for farmers, and other key barriers and opportunities.

Strategy for continuous support following the transition

Ongoing support activities should transition smoothly from the hands-on support given to farmers during onboarding and transition. The main focus at this point will be to maintain a network of peer-to-peer support for farmer clusters, with the option to access additional knowledge from field staff as needed.

Plot monitoring and evaluation should also be carried out in the years following establishment, to ensure that program KPIs are being met. It is preferable that the majority of these M&E activities can be carried out remotely to reduce costs and to facilitate on-demand retrieval of data by program developers or other interested parties.

Activities & Materials

As a general principle, **we recommend that capacity-building and implementation materials match what is typically available to farmers in the field.** In order to achieve scalability, practices must be possible without significant investment in new materials and tools on the part of the farmers.

However, it may be necessary to establish a baseline availability of tools and equipment in cases where they are particularly limited. In many cases farmers may not even have access to the most basic tools for cutting (saws, machetes), digging (e.g. spades/mattocks) and for transporting materials in bulk (e.g. wheelbarrows, buckets). One of the activities recommended during the transition period is to characterise the typical availability of basic tools & equipment for farmers in each community or cooperative. On this basis, phase 2 may include activities that:

A. Tailor agroforestry transition strategies to local tool availability and
B. Increase farmers' access to basic tools to encourage the easy adoption of agroforestry practices.

Nevertheless, we recommend a "lean" transition approach that relies on as few materials as possible.

It is assumed that program staff - such as agroforestry specialists and field staff will have access to basic digital tools such as computers. We therefore do not include these in the list of materials. Some additional tools can be useful in undertaking efficient fieldwork. For example, drones can be used to clearly map local areas and record progress of the systems each time program staff makes a field visit. **While drones are not essential, cameras of reasonable quality are highly recommended for recording progress and documenting activities.**

A number of the recommended activities focus on mapping conditions and capacities of cooperatives in detail. **Whenever these mapping activities are undertaken, variations according to farmer segment categories - such as the gender of farmers - should be assessed simultaneously. This will support a further refinement of the farmer segments.** As described in section 2.2.4, this will lay the foundation for well-informed scaling-up activities in phases 2 & 3.

The recommended activities and associated materials for the phase 1 are summarised in Table 2.4 below.

Table 2.4: Activities and materials recommended per model farm in phase 1

	Activity	Description	Main materials / staff capacities required
Onboarding activities	Preliminary farm visits	This will be the first time program field workers are on site at the potential pilot locations proposed by the cooperatives. This will be a moment to get to know cooperative staff and the nominated model farmer, and to make final decisions on which plots and farmers will be most suitable for model farm development.	Agroforestry specialists; local field staff; car; drone for site mapping (optional)
	Kick-off group workshops, design sessions & local seedling inventory	This will be the first gathering of the selected model farm clusters and should take place on the site of the model farm. Here, the options-by-context approach will be started, including the creation of a preliminary species list, organised into functional groups, and participatory design sessions. This will also provide field staff the	Agroforestry specialists; local field staff; car; basic stationary (e.g. pens, paper)

		opportunity to assess the availability of inputs, such as seedlings, in the local area around the model farm. It is recommended that these first sessions take place at least 2 months before the first implementation session. This will allow time to source the necessary seedlings for the first implementations.	
	Practical implementation sessions	Together, the farmers of each model farm cluster will establish the first system.	Agroforestry specialists; local field staff; car; basic agroforestry tools, including saws, machete and mattocks; genetic materials e.g. seedlings.
Activities during the transition	Workshops/field schools	Participatory worksessions will take place throughout the season at key management stages (e.g. establishment, pruning etc), accompanied by relevant capacity-building sessions and knowledge exchange between farmers. These will also be an opportunity to identify solutions to potential challenges and questions that may emerge throughout the season.	Agroforestry specialists; local field staff; car; basic agroforestry tools, including saws, machete and mattocks; genetic materials e.g. seedlings, basic stationary (e.g. pens, paper)
	Inventory availability of genetic material per cooperative	The presence of field staff during the implementation and capacity-building activities should be used as an opportunity to assess the local availability of genetic material (i.e. seeds, seedlings etc). This will include interviews with cooperative leaders, visits to nurseries used or run by the cooperative, and visits to other local nursery facilities if applicable.	Agroforestry specialists; local field staff; car
	Inventory of typical tools & equipment available to farmers	Through the implementation and capacity-building activities, field staff should characterise the typical availability of tools and equipment within the cooperative.	Agroforestry specialists; local field staff; car
	Provision of basic tools	In the case of some model farms, it may be useful to provide additional basic tools during phase 1 to facilitate adoption of agroforestry systems. While the model farm pilot selection process should emphasise the involvement of some relatively high-capacity farmers (e.g. those with basic tools), this may not always be possible.	Agroforestry specialists; local field staff; car
	Remote support (e.g. expert Q&A)	Agroforestry specialists should be available on a regular (e.g. monthly) basis throughout the first and second seasons of establishment to answer questions arising from the field. Local field staff can assemble key technical questions from the model farmers and farmer clusters to be answered directly. The queries and challenges that arise in these contexts, and the potential solutions should be recorded and used as further information for developing phases 2 & 3 of the program.	Agroforestry specialists; local field staff
	Facilitated peer support	Farmers from the farmer cluster should meet regularly (e.g. every month) to discuss model farm progress and discuss & address key challenges together. This begins to establish processes of peer-to-peer learning and can be facilitated by field staff.	Agroforestry specialists; local field staff
	Further inventory of most valuable and marketable	During fieldwork data should be collected on the local products sold & traded, market accessibility for different communities, and the prices of those goods according to ket variables such as levels of processing,	Agroforestry specialists; local field staff

	species per cooperative or region	quality or means of sale.	
	Participatory design sessions with whole farm cluster	Every farmer in the cluster has the opportunity to think through their own design with the support of peers and facilitating specialists before implementing for themselves. This provides a deep familiarity with agroforestry processes and techniques in an engaging and low-risk way. It is an important step in priming farmers to take on agroforestry practices themselves either later in phase 1 or in phase 2.	Agroforestry specialists; local field staff; car; basic stationary (e.g. pens, paper)
Ongoing support activities	Extension networks	Farmers should have access to a network of trusted technical advisors. The nature of this extension network will depend on the field and program resources available.	Local field staff
	Plot monitoring & evaluation	Mechanisms must be established to assess the level of success of agroforestry model farms. Ideally, this should be remote wherever possible and with minimal administrative burden on farmers.	Monitoring partner staff; local field staff; cameras
	Peer support groups (village-level farmer clusters)	Peer support mechanisms established during the transition phase should be maintained to ensure that farmers can continue to learn together and adapt agroforestry practices to their own context.	Local field staff

2.2.4. Phase 1: Budget Estimate for the Different Action Plan Elements

We recommend that a full budget is defined for phase 1 during phase 0.

The program budget will depend on a range of variables including which organisations are selected as partners, the number of model farms developed, the size of model farms, agroforestry practices, as well as existing infrastructure and staffing capacities within villages, cooperatives and nationally. As an example, selection of agroforestry specialists in-country (if available) is likely to lead to significantly lower investment than working with specialists out-of-country. This is linked both to exchange rates and to the costs associated with fieldwork logistics (e.g. international travel).

Broadly the budget for phase 1 can be divided into three main categories:

1. Program development
2. In-the-field staffing and materials per model farm
3. Planting/genetic materials and other on-farm inputs per model farm

Tables 2.5A- 2.5C give a broad indication of budgetary requirements for the development of a single model farm cluster, but we are unable to estimate other program costs at this stage.

Not all costs increase in a linear fashion with increased number of model farms developed (i.e. the cost of two model farm clusters is not necessarily double the cost of one), as some costs may be saved if multiple model farms are developed simultaneously. For example, if an agroforestry specialist requires international travel, a single field visit may include work with multiple model farm clusters, reducing transport costs per model farm. These logistical costs are not included in the current budget indication and must be considered in detail during phase 0.

Note that this budget is only intended as an indication, it is not representative of final costs and is subject to significant change based on a wide range of variables. Because staffing costs are likely to be diverse, staff cost per hour is considered as a blended rate.

Table 2.5A: Indicative budgetary estimate for the staff development of one model farm cluster in ECOOKIM's farmer network. These costs are not intended as a final budget and are subject to significant alteration based on program development outcomes.

	Activity	Time indication		Budget indication	
		Low	High	Low	High
Onboarding activities	Preliminary farm visits	1	2	€250.00	€500.00
	Kick-off group workshops, design sessions & local seedling inventory	1	2	€250.00	€500.00
	Practical implementation sessions	1	3	€250.00	€750.00
Activities during the transition	Workshops/field schools	6	15	€1,500.00	€3,750.00
	Inventory availability of genetic material per cooperative	1	3	€250.00	€750.00
	Inventory of typical tools & equipment available to farmers	0.5	1	€125.00	€250.00
	Provision of basic tools	0	0	€0.00	€0.00
	Remote support (e.g. expert Q&A)	2	3	€500.00	€750.00
	Facilitated peer support	0.5	3	€125.00	€750.00
	Further inventory of most valuable and marketable species per cooperative or region	3	5	€750.00	€1,250.00
	Participatory design sessions with whole farm cluster	2	5	€500.00	€1,250.00
Ongoing support activities	Extension networks	10	30	€2,500.00	€7,500.00
	Plot monitoring & evaluation	5	10	€1,250.00	€2,500.00
	Peer support groups (village-level farmer clusters)	0	0	€0.00	€0.00
			TOTAL (EUR)	€8,250.00	€20,500.00
			TOTAL (XOR)	CFA5,408,865	CFA13,440,210

Table 2.5B: Indicative budgetary estimate for on-farm input costs per hectare of model farm, including seed, seedling and other field inputs and additional tool costs

Item type	Cost ha-1	
	Low	High
Seeds, seedlings & field inputs	€25.00	€450.00
Tools	€1.00	€10.00
TOTAL	€26.00	€460.00

TOTAL (XOF)	XOF 17,046.12	XOF 301,585.20

Table 2.5C: Data used in tables 2.7A &2.7B

Costs per tree		Trees ha-1		Exchange
Low	High	Low	High	EUR to XOF
€0.25	€1.50	100	300	XOF 655.62

2.2.5. The long-term program: Phases 2 & 3

Phase 2: Years 4-5

This phase is focused on expanding agroforestry practices to a larger - although still relatively focused - group of farmers. Farmer training and implementation support will be more group-focused and less tailored to individual farmers. Transition activities will emphasise the communication of agroforestry practices effectively to groups, in combination with supportive mechanisms such as covering key transition costs. The work of program staff will be supplemented by the model farmers, who will play a role in communicating practices and lessons learned to others.

This phase will test mechanisms for expanding agroforestry transition to a larger number of farmers, while maintaining a small enough reach to allow for some focused attention and trouble-shooting for farmers establishing agroforestry on their farms. Broadly, activities include:

- Selecting an expanded group of farmers from model farm cooperatives/villages for the second phase of transition
- Developing farmer field schools for hands-on capacity-building and knowledge exchange
- Developing community-based agroforestry support structures, such as facilitation of peer-to-peer learning and knowledge exchange
- Providing resources and building capacity and infrastructure for more widespread agroforestry transition e.g. seedlings and inputs (this may be free/subsidized)
- Beginning the establishment of infrastructure to enable broader agroforestry transition, such as high-quality nurseries, a network of support staff within cooperatives or nationally.
- Identifying opportunities for broader incentivisation measures and large-scale changes o the enabling/disabling environment, to be developed fully in phase 3
- Trialing market development programs, such as connection with off-takers for diversified cash crops
- Trialling incentivisation mechanisms such as pricing premiums for agroforestry cocoa or other products, to test assumptions, build appropriate relationships (e.g. with cocoa processors or retailers) and refine mechanisms
- Establishing remote monitoring & evaluation systems to track farmer progress throughout ECOOKIM's network

By the end of this phase, the program should have:

- An expanded network of engaged farmers practicing agroforestry cocoa production
- Established trials for incentives and other scaling mechanisms
- A growing network of in-country field staff able to support farmers with transition processes
- A sound base of knowledge for each region/group of ECOOKIM farmers involved in agroforestry transition, including the key barriers to agroforestry transition, key target mechanisms for overcoming those barriers, key infrastructural needs, costs of agroforestry establishment for a variety of systems, access to markets and market development opportunities
- A clear understanding of the long-term and large-scale goals of the program, defined with specific detail that facilitates the roll-out of a large-scale program in phase 3 (e.g. a multi-tiered system characterizing different levels of agroforestry transition, such as the traffic light system, TAPE p.26)
- A set of trialled marketing, off-taker and incentivisation mechanisms ready for rolling out in phase 3.

Phase 3: Years 6+

This phase builds on the solid foundation of phases 1 & 2 to rapidly scale up agroforestry practices throughout ECOOKIM's farmer network.

The focus will be to establish mechanisms that allow large numbers of farmers to receive capacity-building, access support for transition and implement their own agroforestry systems. By this time it will be important that major disabling factors have been addressed and strong enabling factors have been developed.

This phase will include:

- Large-scale incentivization & facilitation programs, such as offering price premiums for agroforestry cocoa (some resources may need to be offered in advance to facilitate the transition)
- Decentralized capacity-building and knowledge exchange processes, including, for example a network of local agroforestry extension workers/facilitators, local peer learning groups and, where possible, remote or on-demand educational tools

- Development of large-scale mechanisms for processing & marketing of non-cocoa cash crops (e.g. timber, rubber etc.)
- Consolidated and expanded infrastructure such as nurseries, equipment & other input providers to ensure the large-scale provision of key inputs for farmer transition.

References

FAO (2019). *Tool for agroecology performance evaluation process of development and guidelines for application. Test version.* FAO: Rome

Appendix A

Appendix A. Critical design factors

	Challenge	Goal	Relevant program element	Critical design factor	Priority level
Farm & land management	Low cocoa productivity	To increase average cocoa yield	Agroforestry design	Practices must improve average cocoa yield	Primary
	Inconsistent cocoa productivity	To increase inter-year cocoa yield consistency	Agroforestry design	Practices must improve the consistency of cocoa yields	Primary
	Deforestation	To reduce pressure on forest resources	Agroforestry design	Practices should encourage sustainable production & exploitation of timber and non-wood forest products.	Primary
	Degradation of biodiversity	To increase the biodiversity value of cocoa production landscapes	Agroforestry design	Practices must diversify to increase the biodiversity value of cocoa plots	Secondary
	High incidence of pest & disease	Reduce incidence of pest & disease	Agroforestry design	Practices must reduce the potential for serious disease pressure from high-risk diseases	Primary
	Soil degradation	Regenerate soil quality and ensure long-term soil conservation	Agroforestry design	Practices must regenerate soil and facilitate the long-term conservation of soil on farms	Primary
	Long-term tension between food production, forest exploitation and cocoa production	To establish a long-term balance between goals of food production, forest exploitation and cocoa production	Agroforestry design	Practices must combine the production of cocoa with other food and/or forest products.	Secondary
	Financial viability of agroforestry systems	To increase the financial viability of cocoa agroforestry systems	Agroforestry design	Practices must balance other benefits with basic financial viability and resilience	Primary
	Lack of land tenure & tree ownership	To establish systems that either increase land tenure rights or can benefit farmers in spite of tenure uncertainty	Agroforestry design	Practices must work with local land and resource access practices to ensure that the target group benefits from changes in the production system. Where possible and appropriate, practices must strengthen the land and resource access of target groups.	Secondary

Enabling/disabling environment	Poor access to agricultural inputs	Achieve acceptable soil fertility and pest & disease levels with minimal agricultural inputs	Agroforestry design	Practices must maximise use efficiency of agricultural inputs and reduce or eliminate the need for these inputs.	Primary
	Poor access to seedlings/genetic material	To increase access to high-quality genetic material and increase the viability of systems using locally-available species	Agroforestry design/transition plan	Early-stage practices must use locally available species	Primary

reNature.

ECOOKIM Agroforestry Business Model

Report Deliverables

3.1. Report describing the different agroforestry aspects that can/could be incorporated in ECOOKIMs business plan, including:

- 3.1.1. Carbon credits
  - 3.1.1.1. Overview of main requirements for cocoa agroforestry systems to be applicable to carbon credits;
  - 3.1.1.2. Assessment ECOOKIM's proposed agroforestry model's potential to generate carbon credits;
  - 3.1.1.3. Assessment of additional revenue ECOOKIM/ cooperative members could generate through carbon credits;
  - 3.1.1.4. Next steps necessary for ECOOKIM to access carbon credits.
- 3.1.2. Payment for ecosystem services
  - 3.1.2.1. Overview of opportunities for cocoa agroforestry models to generate additional income through 'payment for ecosystem services';
  - 3.1.2.2. Assessment of potential additional revenue ECOOKIM/cooperative members could generate through PES;
  - 3.1.2.3. Next steps necessary for ECOOKIM to access proposed PES.
- 3.1.3. Market premiums
  - 3.1.3.1. Assessment of potential of cocoa agroforestry models to access additional premiums (organic certification or others);
  - 3.1.3.2. Assessment of potential additional revenue due to accessing premium markets;
  - 3.1.3.3. Next steps that need to be taken by ECOOKIM to be able to access additional premiums.
- 3.1.4. Agroforestry products
  - 3.1.4.1. Estimated volume of selected additional crops that can be sourced by ECOOKIM from its members;
  - 3.1.4.2. Assessment of potential for value-add activities for additional crops;
  - 3.1.4.3. Evaluation of local and international market for (processed) additional crops;
  - 3.1.4.4. Estimate of potential additional income for ECOOKIM through product diversification.
- 3.1.5. Investment needs
  - 3.1.5.1. Overview of investment needs and/or capex requirements due to

transition to agroforestry.

3.2. Updated ECOOKIM business plan and updated financial model

Table of Contents

Executive Summary

This Agroforestry Business Model Report describes different agroforestry-related options, such as carbon credits, payments for ecosystem services, and premium markets, that could be incorporated in ECOOKIM's business plan. Further analysis will be required to identify the most applicable options, as the net gains from many of these activities are directly related to the cocoa agroforestry designs and possible removal of currently present biomass (pruning/tree removal/soil disturbance).

As with all activities that may have a potential impact on the lives of the cocoa farmers working with ECOOKIM, we recommend a phased implementation strategy for any of these options. Starting with an introduction at the primary coop level, then the frontrunners can be selected and trained before implementation. This gives the highest probability of success.

Introduction

Cocoa farmers in Côte d'Ivoire with cocoa are very diverse. They are men and women, young and old, with small and large fields, and with different immediate needs and purposes. From the data we received, the diversity between the different farmers is even larger than expected. This further challenges the idea of a specific fit-for-purpose agroforestry design, that ECOOKIM should encourage farmers to implement. Rather, to encourage agroforestry practices, and step-by-step implementation of more resilient farming systems, ECOOKIM should be able to provide guidelines and recommendations to farmers based on their situation. This is possible with an adjustable agroforestry design, where the exact number of cocoa trees, additional trees, shrubs, and other crops can be changed depending on the individual farmers' preferences. The best way of convincing people to do anything is by proving the outcome. This is in the case of agroforestry systems, only possible after a few years with trial plots. However, we have provided a basic tool that can help to understand the monetary benefits of implementing an agroforestry system, based on values provided by the farmer him/herself.

Through using the tool, ECOOKIM gets a better understanding of the needs and wishes of the individual farmers. Once it is clear what farmers are willing to invest in and how, it also becomes clear how many trees, shrubs, and/or other crops exactly will be additionally planted, and hence only then can it be calculated what the exact options for additional market premiums, other revenue-generating activities through for example agroforestry products and carbon credits are.

1. Market Options

ECOOKIM is currently involved in cocoa and cashew processing and marketing. In general, we recommend not to expand these crops with additional crops for the time being, as other crops require new skills, new staff, and new market channels. And it will take at least some years before the new commercial crops from the agroforestry designs become available in commercial volumes. Unfortunately, we are also not able to calculate the possible volumes of other crops, as we have no production data available of the farmer of ECOOKIM.
However, we made an overview of the different crops that can be used in the agroforestry designs, and we indicated the different market potentials for ECOOKIM. When a large number of farmers implement a similar agroforestry system with the same species, there is potential for ECOOKIM to act as a marketing agent for:

- Akpi (groundnut tree, *Ricinodendron heudelotii var. africanum*):
  The akpi is a seed that is used in the kitchen of Côte d'Ivoire. It can be used when ground or crushed in hot preparations, or it is processed to extract oil for cosmetics products or essential oils.
  To obtain the seed for cooking, the fruit needs to be decomposed so that the pulp is easy to remove. Then the shell needs to be crushed to extract the seeds. This process is currently done manually but could be mechanized when volumes are high. This is something ECOOKIM could coordinate. And while currently the seeds are mainly sold locally, with the current international increase in 'natural' products and specific oils, the demand for this product might rise. Also, the seed can be preserved for two years, enabling sales all year round.

- Oranges (*Citrus reticulate*):
  Oranges are produced and sold by individual farmers already, but ECOOKIM could coordinate the collection, transport, and sales.
  The orange is in-season before the great period of cocoa harvest. In general, the trade of oranges is allocated to women who will collect them in several villages, obtain a large enough volume to justify a transport, and finally transport them to the nearest cities where the demand for oranges is high. ECOOKIM could facilitate these women by providing transport and offering a collection point at a higher level where women could

deliver the oranges before ECOOKIM could coordinate transport to the largest cities for sales.

- Cola nut (*Cola nitida*):
  This nut is mainly exported to neighboring countries. There are different varieties and different species and different levels of quality, but if enough farmers grow these nuts, ECOOKIM could provide logistic support by coordinating collection and transport to sell the product in bulk, rather than on the local market. ECOOKIM could also provide storage space for the cola nut (while in pods) in order to sell the product in the low production season when prices tend to be higher.

				The market potential for ECOOKIM
Main cash crop	*Theobroma cacao*	Cocoa	Cocoa	Export- already ongoing
Annual/biennial	*Arachis hypogaea*	Arachides	Peanut	No market potential for ECOOKIM. Crops can be sold on the local market or used for home consumption
	Cajanus cajan	Pois d'angole	Pigeon pea	
	Dioscorea alata	Bete-Bete/Florido / igname	Yam	
	Dioscorea rotundata	Lokpa/ igname	Yam	
	Manihot esculenta	manioc	Manioc	
	Oryza glaberrima	Riz	Rice, African	
	Oryza sativa	Riz	Rice, Asian	
	Solanum melangena	Aubergine	Eggplant	
	Zea mays	Mais	Corn/maize	
Coppice/biomass	*Bridelia micrantha*		Bridelia	No market potential for ECOOKIM. These crops are for biomass and have no market value
	Musanga cecropioides	Parasolier	African corkwood	
	Ricinodendron heudelotii var. africanum	Akpi	Groundnut tree	Market potential for cooperatives under ECOOKIM to coordinate volume and local sales.
Understory: Service	*Gliricidia sepium*	Gliricidia	Gliricidia	No market potential for ECOOKIM. This crop is for

				biomass and has no market value
	Musa spp.	Banana/plantain	Banana/Plantain	Market potential for cooperatives under ECOOKIM to coordinate volume and local sales. Export potential for ECOOKIM through a third party
Local Understory: Large shrub/small tree	*Anacardium occidentale*		Cashew	Export- already ongoing
	Carica papaya	papayer	Papaya	No market potential for ECOOKIM. Local sales or home consumption
	Citrus reticulata	citronier	Orange	Market potential for cooperatives under ECOOKIM to coordinate volume and local sales.
	Coffea spp.	cafeier	Coffee	Export potential for ECOOKIM
	Cola nitida	colatier	Kola nut	Export potential for ECOOKIM to neighboring countries.
	Psidium guajava	goyavier	Guava	No market potential for ECOOKIM. Local sales or home consumption
Secondary shade	*Mangifera indica*	manguir	Mango	
	Persea americana	avocatier	Avocado	
Primary shade	*Afzelia africana*	Lingué/ doussie	African mahogany	Once the new law regarding ownership of trees is passed and implemented, there might be potential for coordinating volumes for sales, but this business requires dedicated skills. Not recommended as a business for ECOOKIM.
	Khaya ivorensis	Acajou	Ivory coast mahogany	
	Milicia excelsa	Iroko	African teak	
	Terminalia ivorensis	Framiré	Black afara	
	Terminalia superba	Fraké	White afara	
	Albizia ferruginea	Samba/Mandinka	Samba	No market potential for ECOOKIM. This crop is for biomass and has no market value
	Cocos nucifera	Coco/cocotier	Coconut	Local marketing potential for cooperatives to coordinate sales in primary form. No market potential for ECOOKIM
	Elaeis guineensis	Crocro/ palme a huile	Oil palm	

				as these crops require detailed processing
	Hevea spp.	Caoutchouc de para/ hevea	Rubber	Local market potential for individuals. Not recommended for ECOOKIM to promote as it risks to replace cocoa.
	Inga edulis	Ingá	Inga	No market potential for ECOOKIM. This crop is for biomass and has no market value

1.1 Carbon Credits

Introduction to climate change (adapted from Nasa, 2020):

In the last 650.000 years, there have been 7 major climate changes on the earth, with the end of the last ice-age around 11.700 years ago. Scientists are now 95% certain that the current climate change we are experiencing, is directly related to the man-made increase in CO_2 and other greenhouse gasses in the atmosphere. These gases cover the earth like a blanket and prevent the earth to radiate the sun's warmth back into space.

The burning of fossil fuels like oil, gas, and coal, deforestation for timber and land-use change, intensive livestock management, wetland rice production, and decomposing waste in landfills are all examples of human activities that contribute to the accumulation of greenhouse gases in the atmosphere.

The effects of global climate change can already be observed: glaciers are shrinking, ice on rivers and lakes is melting earlier, plants and animals can now be found in areas which they did not use to be in and trees are flowering sooner. Weather patterns are also changing: certain areas of the world experience longer droughts, other more intense rainfall and hurricanes are stronger and more frequent.

The response to climate change involves a two-pronged approach:

1. Reducing emissions of and stabilizing the levels of heat-trapping greenhouse gases in the atmosphere ("mitigation")
2. Adapting to the climate change that cannot be avoided ("adaptation")

Mitigation involves reducing the flow of heat-trapping greenhouse gases into the atmosphere, by reducing the emissions of these gases or by sequestering them in so-called "sinks" (such as the oceans, forests, and soil).

Adaptation involves adjusting to actual or expected future climate. The goal is to reduce our vulnerability to the harmful effects of climate change (like sea-level encroachment, more intense extreme weather events, or food insecurity).

1.1.1 Overview: Main Requirements for Cocoa Agroforestry Systems to be Applicable to Carbon Credits

While the climate crisis is a global issue, it is felt on a local scale and especially by smallholder farmers. By implementing agroforestry systems, they can prepare their farms for changing weather patterns (climate-smart agriculture) and at the same time be part of the solution by sequestering an increased amount of carbon in the above and below-ground biomass (trees, leaf litter, soil organic matter).

The quality of carbon projects and their resulting carbon credits depend on the ability to present a project that indeed will reduce the amount of greenhouse gas (GHG) emissions (e.g. through fuel-efficient cookstoves and avoided deforestation) or sequestered the amount of carbon dioxide (e.g. through reforestation) it claims. Below are the criteria used to define whether such claims are credible (adapted from Chagas et all, 2020):

Baselines represent the business-as-usual (BAU) scenario: how emissions would have increased (or decreased) had the project not been implemented. Credible baselines need to be conservative.

Additionality refers to the requirement that emission reductions or removals would not have happened without carbon finance. Additionality is closely linked to the baseline setting.

Permanence reflects the need for an emission reduction or removal with a long-term mitigation benefit. This is particularly relevant when credits are issued for storing carbon in trees since there is a risk that the sequestered carbon is released back into the atmosphere. This could happen through natural causes (a forest fire due to drought) or by human activities when for example a farmer decides it is more profitable to grow crops instead of trees and fells the trees before the planned harvest time.

Leakage is the increase of GHG emissions outside of the scope of the project that is still related or caused by it. Positive leakage means there are additional reductions outside of the accounting area and is generally discounted. Negative leakage happens when a reduction in emissions within the project boundary leads to higher emissions elsewhere.

Quantification of GHG emissions and removals is the accurate and precise measurement of GHG reductions and removals. Quantification relies on the collection, analysis, and archiving of data for measuring GHG emissions and removals.

The Standards

There are some differences between the various standards and their ideas about agroforestry, carbon, and smallholder farmers. Fair Climate Fund has made an overview of some characteristics of the most common carbon standards (++++ = perfect, +++ = good, ++ = adequate, + = insufficient, empty = absent):

	CDM	VCS	SC Vista	Gold Standard	CBB Standard	Plan Vivo	Fair Trade
Reliability and transparency	+++	+++	+++	+++	+++	+++	+++
Labor conditions	+++	+++	+++	+++	+++	+++	+++
Democratic procedures	+	++	++	+++	++	+++	+++
Protecting and enhancing biodiversity	+	+	+	+++	++	+++	+++
Local capacity building			+	+	++	+++	+++
Local producer organization owner of credits					+	+++	+++
Opportunities for adaptation to climate change via premium						+	+++
Project covered by minimum price							+++
End-buyer emissions reduction plan							+++

Table 02: Characteristics of the most common carbon standards (Source: Fair Climate Fund, 2020)

The Fair Trade standard gets the best review, and the minimum carbon credit price of EUR 13.00 + EUR 1.50 social premium is an important incentive to use this standard, especially for organizations that are already Fair Trade certified.

As a reference, here are the average prices for carbon credits, data from 2019.

Voluntary carbon offset type	**Volume in MtCO2e**	**Average Price in USD**	**Value in USD**
Renewable energy	42.4	1.40	60.1 M
Forestry and land use	*36.7*	*4.30*	*159.1 M*
Waste disposal	7.3	2.50	18.0 M
Household devices	6.4	3.80	24.8 M
Chemical processes / industrial manufacturing	4.1	1.90	7.7 M
Energy efficiency / fuel switching	3.1	3.90	11.9 M
Transportation	0.4	1.70	0.7 M

Table 03: Traded volume and average prices for carbon credits in 2019 (Source: Forest Trends Ecosystem Marketplace Insights Brief, 2020)

Even though the Fair Trade standard gets the best review, we still see the Plan Vivo standard as the most suitable standard for ECOOKIM, and smallholder agroforestry farmers in general. The Fair Trade standard is an add on to the Gold Standard, and from our experience, we can say that the Gold Standard still has little experience with (agro)forestry projects and has very limiting rules such as only 1 tree species per management unit, etc. Plan Vivo approaches carbon projects from the perspective of the smallholder farmer who will be planting the trees, without losing sight of the need to do a scientifically correct evaluation of the proposed projects, the carbon accounting, reporting, and finally the correct distribution of the benefits for all parties

involved in the project. And there is already discussion of adding Plan Vivo to the standards that can receive the Fair Trade standard as an add on.

A final advantage of Plan Vivo over the other standards is that Plan Vivo can issue all the carbon credits from carbon captured by the trees over the project period (e.g. 40 years) upfront, these are called ex-ante credits. They believe it is important to help projects (particularly smaller ones) to cover upfront costs. In other words: by selling (some of) the projected credits upfront, costs for project design and implementation could be covered, which would make starting such a project more feasible.

It will be essential for ECOOKIM to gather and manage all data related to reforestation and carbon efficiently and with great precision, and set up a good management plan to make sure that all the planted trees survive to the end of the project, or are replaced in case of death, forest fires, etc. Specialized carbon project platforms like Farm Trace would make the execution of a carbon project more feasible, as it reduces the need for outside experts significantly and increases the ease of managing and storing large amounts of data over long periods. Another advantage of this platform is that Farm Trace at the moment is being reviewed by Plan Vivo to become an officially accepted tool for carbon project accounting and management. This process should be concluded by March of 2021.

1.1.2 Assessment ECOOKIM's Proposed Agroforestry Model's Potential to Generate Carbon Credits

To analyze the potential of the proposed agroforestry model to generate carbon credits, it is important to have a very detailed understanding of the current farming systems and their surroundings. How many farms use a monoculture cocoa system, how many have already incorporated (some) shade, and how many trees can be added without affecting the productivity of the cocoa. Also, it would be important to know whether there are areas next to the current cocoa plantations where trees could be planted in higher densities, in combination with grasslands, on fallow land that is not apt for cultivation, etc. The latter option would greatly increase the carbon sequestration potential, as a higher tree density would contribute considerably to the total amount of carbon sequestered. Only the carbon sequestered by trees that are newly planted within the scope of the project can be converted to carbon credits.

From ECOOKIM's household data survey, we deduced that an average of 6 trees per hectare of cocoa plantation is present, which indicates a good potential for planting additional trees, depending on the agroforestry design that will be chosen. The five example designs show a total of between 17 and 69 trees/hectare, making the average potential to increment trees between 10 and 60/hectare. Over the 81,750 hectares mentioned in the Terms of Reference, this would mean 817,500 to almost 5 million trees, so in general, we can say that there is a good potential to generate carbon credits. Whether it would be profitable depends on the operating costs of the project: will ECOOKIM be able to gather, manage, and report on data efficiently and credibly.

Gockowski & Sonwa (2010) have found the following data when comparing forest, agroforest, and monoculture cocoa areas, showing that there is a potential for additional carbon sequestration when changing full sun (= monoculture) cocoa plantations to agroforestry:

Land Use	**Above ground C stock (t/ha)**	**Above ground TACS (t/ha)**	**Below ground C stock (t/ha)**	**Overall TACS (t/ha)**	**Mean number of vascular plant species (species/200 m)**
Forest	227 (12.0)	227 (12.0)	45.4 (3.78)	273 (14.2)	75.8 (31.1)
Cocoa agroforest	88.7 (14.1)	61.0 (9.71)	43.2 (3.63)	104 (11.1)	71.5 (8.50)
Full sun cocoa	49.1 (7.13)	24.5 (3.56)	43.2 (3.63)	67.7 (6.44)	

Table 04: Mean time-averaged carbon stock (TACS) and plant biodiversity in full sun cocoa, cocoa agroforest, and forest land uses in southern Cameroon (standard errors in parenthesis) (Souce: Gockowski, 2010)

Some specific points to take into consideration when discussing carbon credit potential:

- 1 tree captures an average of 1 ton of CO2 over a 40-year lifespan (Arborday, 2020)
- 1 ton of CO2 equals 1 carbon credit

- A buffer of 30% of carbon credits cannot be sold to compensate for potential tree loss (death, fire, etc.)
- Removal of cocoa trees and disturbance of the soil (for tree planting) are sources of carbon emissions that need to be compensated for, before selling credits

1.1.3 Assessment of Additional Revenue ECOOKIM/Cooperative-Members Could Generate Through Carbon Credits

The additional income for individual cocoa farmers generated by selling carbon credits should not be the principal reason to start a carbon certification project. Many projects have failed, or left farmers disappointed as expectations were high in the beginning, but then pay-outs could be as low as USD 10 per year per farmer.

Through our own experience and talking to experts, we have identified 4 reasons to enter a carbon project with smallholder farmers in an agroforestry setting:

1. It is an opportunity to finance the plantation of trees and/or installation of whole agroforestry systems by pre-selling the future carbon credits through sequestration projections based on growth curves of the used tree species and the number of trees planted/to be planted. This could work through a loan-for-credits scheme (for most standards) or by selling ex-ante credits (Plan Vivo). Loan-for-credits schemes usually apply very low to no interest rate, and no money out of pocket would be needed to repay the loan. Both options require a great deal of trust between the financiers and the farmer organization as these are usually very long-term commitments and work best with a specialist intermediary that acts on behalf of the financier and does the follow up on the project.
2. It would provide ECOOKIM with many marketing resources as cocoa buyers increasingly look for sustainably produced cocoa and could additionally offset their carbon emissions by purchasing carbon credits from within their supply chain.
3. ECOOKIM could use part of the generated carbon credits to offset their carbon emissions and thereby be able to offer carbon-neutral cocoa (and possibly other crops and commodities like cashew nuts) at a premium price.
4. At the end of the carbon project, the farmers can harvest (part of) the timber which can be sold for additional income to the household.

For a more direct type of carbon credits and revenue, ECOOKIM could also consider an additional cookstove project, in which smallholder households are supplied with fuel-efficient cookstoves. This reduces the use of fuelwood and thus helps avoid GHG emissions and deforestation, and ECOOKIM could receive carbon credits for these reductions. But it also has additional health benefits, as many smoke-related illnesses of lungs and eyes would be significantly reduced. A minimum of 5,000 participating families is usually required to make a cookstove project feasible. There are already several certified cookstoves projects in Ivory Coast, a description of one such certified projects can be found on the Gold Standard(b) website.

1.1.4 Next steps necessary for ECOOKIM to access carbon credits.

Designing and developing a carbon project takes a long time, requires a lot of technical expertise and considerable financial resources for the initial set-up. There are ten steps to be run through to develop a carbon project of which the first five are simple checks, whether the project idea is feasible and should be pursued. The last five steps need to be taken together with a project developer who thinks that the project is viable (adapted from Seeberg, 2010).

1. Type and scope of the project: A clear idea of where and which type of project needs to be developed, i.e. afforestation, reforestation, improved farming techniques (soil carbon sequestration), avoided deforestation, cookstoves, biogas, etc.

2. Resources check: a significant amount of time and money needs to be invested to develop a carbon project. Analyze why it would be attractive to engage in undertaking a carbon sequestration project and what are the driving motivations?

3. Project group: Farmers that want to participate need to be identified and the project boundary (geographically) has to be established. The project area needs to be big enough to generate enough emission reductions to qualify for a carbon project: for a REDD project the minimum project size area is around 30-40,000 ha and for an Afforestation/Reforestation project 10,000 ha. Also, clear land-use and tenure rights are essential.

4. Institutional back-up: To organize, aggregate, and represent farmers, a strong and transparent institution is required, which is trusted by the project participants. It helps if the

institution has some expertise in carbon project development, carbon measurements and accounting, and business plan development.

5. Funding: Develop a business plan which takes into account all costs and benefits of the project. Ensure sufficient funding for the initial set-up of the project. With the information gathered in the first 5 steps a Project Idea Note (PIN) should be developed which can be used for step six.

6. Identification of project developer: In collaboration with the institution a project developer has to be selected who can assist with the formulation of the project. The project developer is responsible for preparing it for the market. This can be either the back-up institution (step 4) if they have sufficient experience or a specialized project developer company.

7. Further steps with project developer: From the different available standards, the appropriate one has to be selected, market demand assessed, costs & revenues calculated, and a commercialization strategy developed. The project developer should start to select potential credit purchasers.

8. Project planning/development: The baseline and methodology need to be selected. Projects must use approved methodologies to calculate emission reductions. The project's chance of being registered and the likelihood of more rapid project preparation increases by using approved methodologies. Assess additionality, leakage, and permanence and estimate the full GHG inventory of the emissions and uptake of the project. All this information will be assembled in a Carbon Project Document.

9. Validation: The project developer determines a third-party certifier (accredited by a specific carbon standard) who will review the Carbon Project Document. the project needs to be validated to ensure the transparency of the project design.

10. Registration: The VERs of the validated project are kept in a Registry on behalf of the owner until they are bought.

On average it takes at least 12 months to go through steps 1 to 9, and 1.5 months to register a project (step 10).

From our personal experience, we have found that the formulation of a carbon project for certification purposes can cost anywhere between 50.000 and 200.000 Euros, depending on the project type, availability of information, etc.

1.2 Payment for Ecosystem Services

Payments for ecosystem services (PES) allow individuals, governments, non-governmental organizations (NGOs), and private sector companies to pay for carbon storage, biodiversity, and water conservation, by supporting local-level projects that additionally facilitate community development and poverty alleviation (Kinzig, 2011).

1.2.1 Overview of Opportunities for Cocoa Agroforestry Models to Generate Additional Income Through 'Payment for Ecosystem Services'

The proposed agroforestry model is completely designed to facilitate the implementation of climate-smart agriculture practices such as soil cover, shade, and biomass production. These practices not only facilitate an increase in cocoa yield and generate additional crops and income. They also provide ecosystem services such as erosion control, protection of water springs, above and below ground carbon sequestration, and others.
We see an increase in PES projects executed by smallholder groups and financed by their off-takers (traders, chocolatiers, etc.) who wish to invest in their relationship with the producers. Insetting carbon from the value chain is also an option for PES project financing and it does not require official carbon certification. This could be the first option to gain experience and get farmers acquainted with the concepts of carbon sequestration, climate change, etc.

1.2.2 Assessment of Potential Additional Revenue ECOOKIM/Cooperative-Members Could Generate Through PES

For PES projects, the same reasoning applies as for carbon projects: the main reason to do them is the opportunity to create lasting relationships within the supply chain and receive financing for projects that contribute to ecological and social objectives. The advantage of PES projects is that they can be done at any scale. For example, if a smaller value-chain partner would like to invest in on-farm tree planting, ECOOKIM could connect this partner with one

primary cooperative, and then the project's overall impact would be concentrated on a smaller number of farmers, but the impact itself would be significant. By communicating on this type of achievements and impact, ECOOKIM could potentially generate much more interest from value chain partners to engage in similar activities, to reach additional primary cooperatives.
An interesting option here is the combination of planting timber trees for carbon and timber, and biomass trees for fuelwood, possibly in combination with fuel-efficient cookstoves. Biomass trees for fuelwood cannot be included in a carbon certification project, as the sequestered carbon will be released as soon as the wood is harvested. But it can help to protect remaining forests from being cut down for fuelwood and reduce the labor of bringing fuelwood to the homes of the farmers. Thus the project has a strong ecological, but also a social component, which appeals very much to a large part of the value chain partners that want to invest in their supply chain.

1.2.3 Next Steps Necessary for ECOOKIM to Access Proposed PES

1. Investigate which cooperatives are interested in executing PES projects, which type of projects, and their potential in scale.
2. Investigate which value chain partners are interested in financing PES projects and what their specific interests regarding activities and impact are.
3. Present proposals to the identified value chain partners, making sure that the proposals are easy to execute and include a budget, expected quantifiable results, and expected impact. ECOOKIM can add a small handling fee to the budget but be aware that some partners might only want to finance activities directly related to the implementation of the project, and not the overhead costs.
4. Communicate about the obtained results, on the website and social media, to interest more partners in engaging directly with the producers of their cocoa beans.

1.3 Market Premiums

1.3.1 Assessment of Potential of Cocoa Agroforestry Models to Access Additional Premiums

Three well-known independent certification schemes are applicable to cocoa: Fairtrade, Utz/Rainforest, and Organic. It is also possible that companies have their own 'standards' which might be presented as certifications, but they are not independently audited and verified. Utz/Rainforest does not provide a standard additional premium, while Fairtrade provides a minimum price that farmers should receive for their cocoa, and organic adds a premium to the cocoa. It is also important to note that there is more certified cocoa produced, than what is sold under certification. Ivory Coast produces the largest volume of certified cocoa in the world, both Fairtrade (70% of world volume), Rainforest (71%), and Utz (67%) (CBI, 2020). However, the volume of organic cocoa is negligible to zero.

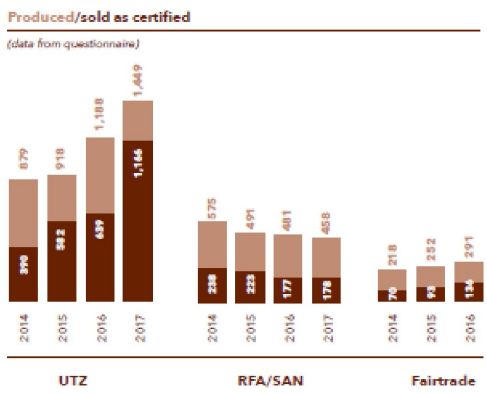


Figure 1. Volumes of cocoa produced and certified. Source: Cocoa Barometer 2018 (Fountain and Hutz-Adams, 2018)

Organic cocoa

Ivory Coast has very little to no organically certified cocoa. Most of the organically certified cocoa comes from the Dominican Republic and Peru. However, because of the cadmium problems in Peru, where the cadmium contamination was found to be high in some cocoa-growing regions of the country, buyers started looking for other alternative sources of

organic cocoa (CBI, 2020). This might interest ECOOKIM to start producing organically certified cocoa.

Implementing an agroforestry system should enable improvement of soil and microclimate, and therewith result in higher yields without using external inputs. This, therefore, is a good combination with organic certification.

Sustainable cocoa

There is an increasing demand for sustainable cocoa. This does not necessarily mean certified cocoa. Cocoa traders and chocolate makers are required to have a long-term vision about sustainable cocoa, and they are also required to act to it. The trend towards more certified cocoa has been visible for quite some years, but now also large cocoa- companies are promising 100% sustainable cocoa by 2025, and hence the current demand is still growing. However, certification alone is no longer enough. The idea of sustainability beyond certification is becoming more prominent. As certification schemes can provide a base for a more sustainable and fair production system, there is a lot of criticism on their effectiveness.

> *"Certified cocoa cannot be claimed to be sustainable merely on the basis of certification, whether this certification is Fairtrade, Rainforest, ISO/ARSO, organic, or any other standard."*
> Cocoa Barometer 2020 (Fountain and Hutz-Adams, 2020, page 34).

There are therefore other trends that might also be interesting to take into account and that can help ECOOKIM access additional premiums for their cocoa.

Forest-friendly cocoa

Cocoa production especially in West-Africa has received a lot of attention in the past year as being a source of deforestation. Large areas of the forest seem to have been lost due to the increased use of these areas for cocoa production. The demand for 'forest-friendly' cocoa therefore is also increasing. Cocoa produced in agroforestry systems would be one way of showing the cocoa is 'forest-friendly'.

Cocoa from agroforestry systems has already received a lot of attention in the past years, amongst which the Cocoa & Forest Initiative was launched in 2017. Large cocoa-related companies have signed an agreement where they:

"We, the signatories of the Joint Framework for Action, commit to work together both technically and financially for the preservation and rehabilitation of forests, according to and as defined in prevailing national forest policy, in Côte d'Ivoire."
Joint Framework for Action Côte d'Ivoire

ECOOKIM, as one of the organizations selling cocoa to these companies, is part of implementing these initiatives and therefore strengthens their relationship with the signed parties to sell their product. However, there does not seem to be any premium price (yet) agreed to sustainably support the preservation and rehabilitation of forests implemented to cover the costs made by the producers of the cocoa.

Child-labor free cocoa

The use of child-labor is another problem that has received a lot of attention in the past years in consuming countries. Several reports have shown that the use of children in cocoa fields is still quite prevalent within the cocoa sector, especially in Ghana and Ivory Coast. Therefore, it is becoming more and more important for cocoa-companies to show that they are involved with cocoa that is child-labor-free. It should even be mentioned that recently some containers in the US have been blocked, as there was reasonable doubt that child labor or improper handling was part of the production of the goods. The EU is now looking into changing its regulations when it comes to child labor in cocoa.

One of the main organizations that are focusing on combatting child labor is International Cocoa Initiative (ICI), together with Nestlé and several other industry players they work to reduce child labor by implementing what is called Child Labor Monitoring and Remediation Systems (CLMRS). Different from other programs is that when child labor is flagged, the family is offered support instead of being punished by dropping the premium. Cooperatives that implemented CLMRS put more effort into countering child labor than other cooperatives, and they can provide more reliable and transparent data.

It might be useful for ECOOKIM to consider also implementing such a system with all their cooperatives to have an advantage over other organizations not doing so.

Traceable and transparent cocoa

There is an increasing demand from consumers to know where their products come from. Aggravated by the covid-19 lockdowns worldwide, and the availability of products in the shops,

more and more people are thinking about their consumption patterns and demand to know where products come from. Also, in the case of chocolate, consumers are increasingly questioning the source, and how sustainable the source of the product is. What has then become obvious is the lack of transparency and traceability of the cocoa.

Through digitalizing the value chain from the farmer to the consumer, this demand from the consumer can be met. Small and specialized chocolate makers are increasing and being able to show who exactly produced the cocoa that is used for the chocolate is also on the rise. These kinds of chocolate bars are also increasingly easier and more available.

Digitalization of the cocoa value chain within ECOOKIM enables tracking the cocoa from the farm to the consumer. Progreso is developing an online farmer app that enables tracking the cocoa from the farmer to an organization like ECOOKIM. ECOOKIM would be able to show their buyers, through the use of this application, exactly who has delivered which quantities of cocoa and hence show exactly where this cocoa has come from. This is an added value for many buyers who want to show their consumers this specific information. The application also provides ECOOKIM with detailed insights into their full operation from farm to warehouse.

Digitalization enables the fast sharing of information for certification, reporting, and any requests buyers might have. It also enables the organization to show that they are complying with the demands of their buyers, such as forest-friendly cocoa, child-labor-free cocoa, and/or organically produced cocoa.

Be aware that digitalizing the cocoa value chain might become more a required necessity than a nice-to-have add-on sooner than later, as ongoing discussions are indicating that laws in the EU might be developed that would prohibit the import of cocoa that does not comply with Due Diligence requirements. Laws in the United States and Japan might follow this trend.

1.3.2 Assessment of Potential Additional Revenue Due to Accessing Premium Markets

Organic certification

Organic certification does require very strict controls about the actual use of chemicals, and it requires a yearly fee. This certification fee is based on a per-member fee, plus the total amount of organic cocoa invoiced in the previous year.

The organic premium is 300 USD/MT. This means that organic cocoa beans are sold for the market price of + 300 USD/MT. In combination with Fairtrade, which has a minimum price of 2400 USD/MT, Fair Trade and organic certified cocoa beans are sold for 2400 + 240 as Fair Trade premium + 300 as organic premium = 2940 USD/MT.

	Minimum price	**Premium**	**Total price USD/MT**
Organic	Market price	+300	Market +300
Fairtrade	2400	+240	2640
Fairtrade and Organic	2400	+300 +240	2940

Table 5: Cocoa base prices and premiums

It seems that ECOOKIM is already involved in a project where 9 cooperatives and 1800 members are transforming to organic certified cocoa producers. This project is in cooperation with Nitidae, in the period from July 2018 to June 2021 (Nitidae, 2020-a). A more detailed business analysis on the actual market potential is therefore not included here.

Other premiums

Assessing the potential additional revenue for child-labor-free cocoa and traceable cocoa are more difficult. There are no international agreements on the standards for these, nor are there international agreements on the premium price benefits. While the demand for these kinds of products is increasing, often the actual volumes bought are low and with low additional price incentives. However, due to the increasing demand from consumers and the discussions about international laws restricting sales and import of cocoa when Due Diligence is not met, the shift

to traceable, forest-friendly, and child-labor-free cocoa might be the only option to continue selling the product.

Premium markets as a necessity, not increasing income

The value chain of cocoa is regulated in Ivory Coast by the Coffee and Cocoa Council (CCC). All the prices paid within the country related to cocoa, are determined by the beginning of the season. Therefore, one must have very good bargaining power and skills to obtain premium agreements for their product. ECOOKIM, as a union of cooperatives, has an advantage over other companies in terms of the vision that it has. A Union of cooperatives is more likely to be seen as 'doing well for the farmers and paying a better price' than large companies. However, the largest majority of the cocoa buyers outside of Ivory Coast, still aim to get the cheapest 'sustainable' product. Very few cocoa related companies are willing to pay higher prices for their product. Entering certain premium markets by ECOOKIM might therefore be seen as a necessity to continue being able to sell the product in the future, rather than to aim at increasing the overall income.

1.3.3 Next Steps that Need to be Taken by ECOOKIM to be Able to Access Additional Premiums

ECOOKIM seems to be already on a very diverse path of accessing additional premium markets. It is working with Nitidae on transforming 9 cooperatives and 1800 members to organic cocoa production (Nitidae, 2020-a).
ECOOKIM also seems to be involved in another project with Nitidae, CTA (Technical Centre for Agricultural and Rural Co-operation), and Gaiachain to develop and test a blockchain-based traceability system to increase transparency in the sector, reduce transaction costs and increase profit margins for sustainably produced cocoa (Nitidae, 2020-b).

At this moment it is not clear what and how many initiatives ECOOKIM is already involved in concerning cocoa premium markets. We, therefore, recommend ECOOKIM to compile and communicate about the different initiatives ongoing that already aim to access cocoa premium markets. Then also building a strong marketing strategy would be important. Without buyers interested in the product, no premium will ever be obtained.

By implementing agroforestry systems, having an organic certification, and digitalizing the operations through a blockchain-based solution, ECOOKIM will have an advantage over other organizations. What does seem to be very important is for ECOOKIM to show this advantage and use it to market their product.

When visiting the website of ECOOKIM currently, the majority of the information is about projects done for the communities. While this is important, it seems that the information is out-dated and no new developments are added. We suggest that ECOOKIM reconsider their marketing strategy to add more of the currently required aspects, show that they are actually working currently on different new market segments, and therewith position themselves stronger as a leading party in Ivory Coast that is making sure their cocoa is forest-friendly, child-labor-free, with different certifications and traceable.

2. Investment Needs

2.1 Overview of Investment Needs and/or Capex Requirement Due to Transition to Agroforestry

The following exercise was done with the use of a very limited set of data and is based on a large number of assumptions. So like the farmer segments and the agroforestry systems, this chapter is purely illustrative.

Basis of the model: 20% of ECOOKIM's members implement agroforestry system design 1, 2, 3, 4 or 5.

Assumptions:

- We assume that farmers start implementing any agroforestry first on 1 hectare of land, not all the land they have.
- Different systems are calculated with different yield levels of cocoa, depending on their segments. Even though the aim is to improve productivity, we have based this calculation on the level of cocoa yield they currently have.
- Low cocoa yield = 250 kg/hectare (systems 2 and 3)
- Middle cocoa yield = 500 kg/hectare
- High coco yield = 750 kg/ hectare (systems 1,4 and 5)
- The total number of farmers is 31,127 so 20% of these farmers are 6,225 farmers.
- We calculated under the assumption that the agroforestry system will be implemented in empty fields.
- We assume that all products from the system are sold at the local market.
- We have excluded labor costs and other investment and maintenance costs.

The investment and sales prices used are the following:

	Investment cost per seedling (FCFA)	**Investment cost per seedling (EURO)**	**Sales price per KG (FCFA)**	**Sales price per KG (EURO)**

Cocoa (*Theobroma cacao*)	300	0.46	1,000	1.53
Banana (*Musa spp.*)	100	0.15	400	0.61
Gliricidia	-	-	-	-
Ricinodendron heudelotti	500	0.76	5,000	7.63
Bridelia	-		-	-
Khaya ivorensis or *Albizia ferruginea*	500	0.76	-	-
Citrus reticulata	2,000	3.05	1,200	1.83

Table 6: Investment costs and sales prices

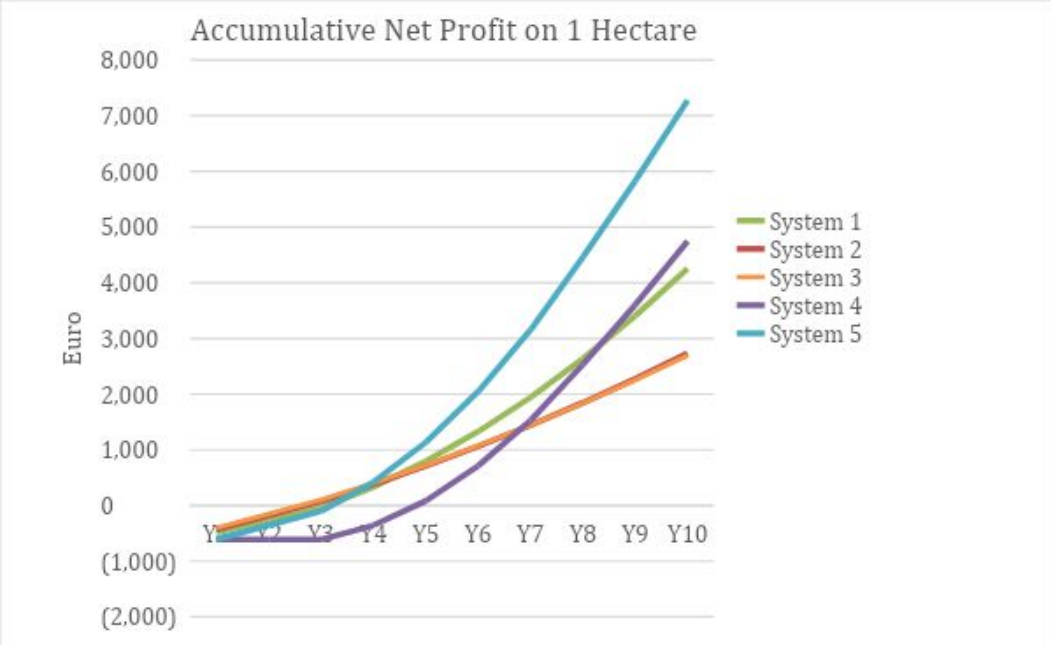


Figure 2: Cumulative net profit on 1 hectare according to type of system

To plant 1 hectare of land with the required species indicated in the system designs, the farmers need to have the following investments per system:

System 1: 483 Euro. This investment would be recovered with the crops from the system in year 4.
System 2: 429 Euro. This investment would be recovered with the crops from the system in year 3.
System 3: 401 Euro. This investment would be recovered with the crops from the system in year 3.
System 4: 609 Euro. This investment would be recovered with the crops from the system in year 5.
System 5: 607 Euro. This investment would be recovered with the crops from the system in year 4.

If ECOOKIM would like to support 20% of its farmer members, being 6,225 farmers, to implement any of the systems on 1 hectare, ECOOKIM would require:

3,007,958 Euro to implement system 1 (approx. 483 Euro / farmer)
2,669,622 Euro to implement system 2 (approx. 429 Euro / farmer)
2,495,702 Euro to implement system 3 (approx. 400 Euro / farmer)
3,792,973 Euro to implement system 4 (approx. 609 Euro / farmer)
3,781,569 Euro to implement system 5 (approx. 607 Euro / farmer)

These would only be costs for the actual seedlings required. Labor costs, organizational costs, training costs and costs of tools are excluded. We also have not made the calculation for farmers who would like to implement these systems in existing cocoa fields, in that case the cost for cocoa seedlings would not occur.

Once the desired agroforestry systems have been designed with the tools, and a similar analysis has been done to define the actual costs and revenue, using up to date information, this can be presented to the farmers. From our own experience, we know that most farmers are unwilling to invest in something new when the actual investment returns are not yet clear.

2.2 Updated ECOOKIM Business Plan and Updated Financial Model

As we have not received a copy of the current ECOOKIM business plan nor financial model, we cannot provide an update.

In general, we can say that by implementing the proposed agroforestry strategy and possible carbon/PES projects, over time, ECOOKIM will help the farmers to improve cocoa productivity, most likely increase quality as well, and make cocoa production a more profitable business. And this is the best basis for ECOOKIM to grow as a farmers' organization, through a solid member base. With this effort comes a very powerful marketing tool, as ECOOKIM will be able to promote its cocoa (and cashew), produced on sustainable farms, free of deforestation, providing various ecosystem services and by farmers that are increasingly improving their living standards. In the long run we see this as a solid growth-strategy with a much more satisfying outcome for all value chain partners, from the farmers all the way to the consumers.

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reNature.

Reflection

Report Deliverables

4.1. Note on the wider applicability of the used approach and the agroforestry specific additional revenue streams for companies/organizations in Côte d'Ivoire and the wider West Africa region.

4.2 Recommendations based on the outcome of the project and in general

4.1. Wider Applicability

The financial modelling tool and design framework is flexible in regards to what crops an individual farmer would like to include, or what crops the producer organization/company would like to promote, so long as the agroforestry functional groups are respected. Selected species would fall under one or multiple agroforestry functional design groups, and the quantities of the species used could be used in the financial modelling tool to understand potential costs and profits based on the yields of the system and species selection.

As the provided approach argues for flexibility and has provided agroforestry systems that indeed are flexible, with the related tool to have a simple business calculation for the farmers, this approach and tool is also applicable in the whole of West-Africa and even worldwide. The combination of different functional groups in the agroforestry systems are applicable anywhere, it is the exact choice of species that can, and should, change.

Market prices, seedling costs, species productivity, and other variables inevitably change, which is why our approach has focused on adaptability and modular function. By providing a framework and process that allow for inputs to be manipulated the processes can be respected while the inputs can be manipulated to create projections for future and changing use.

4.2 Recommendations

From our current standpoint, we would like to share the following recommendations with ECOOKIM.

Commercial

We understand from this project that there is an interest from ECOOKIM in expanding to additional (export) products, next to cocoa and cashew. With all the national and international changes in regulations and due diligence related to cocoa (think deforestation, child labor, human rights, climate change, etc.), we would recommend ECOOKIM to first make sure that their cocoa farmers are equipped to comply with all new regulations and due diligence requirements, and help them implement climate-smart agriculture techniques, such as agroforestry. Cocoa is ECOOKIM's main source of income, and any additional commercial activities will initially depend significantly on cocoa's sustained income as a guarantee for additional investments.

Land Use Efficiency

Although we have not had a representative sample of productivity data to be able to speak on behalf of all ECOOKIM's farmers, we have noticed that there are many farmers with relatively low cocoa productivity on several hectares of cocoa. We can imagine how this might have come about, but it is a very inefficient use of land, money, and labor. By increasing cocoa productivity on one hectare in a well-designed agroforestry system, the remaining hectares could be used to plant an agroforestry system with a different cash crop as the main crop, for example, citrus. This way, cocoa productivity can be maintained or even improved, and a larger volume of a second cash crop could be produced. The second cash crop would have to be complementary to cocoa from a resource perspective (i.e., competing inputs, timelines, etc.)

Model/Pilot Farms

Farmers world-wide are hesitant to make large changes on their farms, especially if they require capital investment if the direct financial benefits are not immediately obvious. A large part of the success of our designs depends on the use of biomass crops to ensure an adequate level of organic matter to improve soil conditions (water retention capacity, healthy soil microorganisms, nutrient cycling, etc.). As these plants and trees often do not generate a sellable crop, and benefits take time to become apparent, it is often hard to convince farmers of the need to invest in them. We, therefore, recommend that ECOOKIM implements model farms, where farmers can see what an agroforestry system looks like, what the benefits are, what investments are required, etc. This can be as simple as supporting selected farmers to implement it on their farms and have others come to visit. If funding would be available, official model farms could be set up, including various agroforestry systems side by side, including a facility where training could be conducted. Such a model farm over time could become a self-sustaining entity as the crops that are produced can be sold, seeds/planting material/seedlings could be sold, compost could be produced and sold, and a fee could be asked for the educational programs.

Tree Planting

There seems to be hesitation among cocoa farmers to invest in tree planting, as it is not yet clear to them if they will be recognized as the owners of those trees, and therefore the beneficiaries at the time of harvesting.

> The Ivory Coast Forestry Code (Law N° 2019-675, from 23 July 2019) clearly states in article 27:
> *'ownership of a natural forest or natural tree rests with the owner of the land on which they are located. Ownership of a forest created, or a tree planted rests with the landowner or the person who created or planted it under an agreement with the said owner'.*

However, this is a new law in which the question remains whether this law is being enforced and respected. We would recommend ECOOKIM to investigate this and inform the primary cooperatives accordingly before any reforestation activities are planned.

Farmer Finance

If there will be a program to support farmers in implementing an agroforestry system, please make sure that the terms of the loans, especially regarding the tenor, are adjusted to the time it will require the farmers to get a return on the investment. This is essential to make sure the loan program is a success, benefits the farmers, and builds trust among the farmers, the primary cooperatives, ECOOKIM, and the financier(s).

Marketing

We recommend ECOOKIM to strengthen their communication and develop a strong marketing strategy through which it becomes clear for potential buyers what ECOOKIM is doing concerning sustainable cocoa. There seem to be more initiatives already ongoing than what is visible when searching for ECOOKIM on the internet. Especially now, when online presence is becoming the primary source of information, ECOOKIM must be able to show potential new buyers their added value when comparing them with other cocoa-companies in Ivory Coast.

Consolidation

We recommend that ECOOKIM consolidates the multiple efforts and projects it is conducting, so that projects, consultants, investors, and buyers can also learn from each other and build upon each other's work, for the benefit of ECOOKIM. This is in line with an improved marketing communication to potential buyers, but also to strengthen additional partnerships and efforts for ECOOKIM.