



Cocoa agroforestry systems: adoption and valorization

*A dynamic standard
developed by Nitidæ*

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In cocoa production, agroforestry appears to be one of the relevant levers for (i) helping the agronomic management of plots (shade, maintenance of soil fertility, microclimate, pest management, etc.), (ii) contributing to the regeneration of the productive potential of degraded post-forest land and (iii) participating in the maintenance of cultivated biodiversity. Although many definitions of agroforestry systems exist, none of them currently allows the valuation of these practices on the market on the basis of measurable indicators. This standard therefore proposes an approach allowing the valuation of this production method on world markets, while encouraging the transition from "full-sun cocoa" cropping systems to agroforestry ones.

There is a wide variety of agroforestry systems, ranging from the simplest (association of cocoa trees with a fruit specie such as orange trees) to the most complex (association of fruit and forest species on several strata). In order to guarantee that certified systems are complex, this standard is based on two criteria: **cover** and **diversity**. However, since a complex agroforestry system takes a long time to be set up, it seems important to value the efforts of producers who have begun a transition toward agroforestry practices and who have not yet reached the expected criteria of complex agroforestry systems.).

The SAF-ART¹ standard therefore values two types of cocoa production systems::

- Cocoa produced in a mature, dense and complex Agro-Forestry System (SAF-Agro-Forestry System),
- Cocoa produced in a plot where a transition toward agroforestry has been started following the voluntary commitment of a producer in regenerative agriculture practices (ART-Transitional Regenerative Agriculture).

In order to guarantee both the reliability and the ease of collecting field data to characterize agroforestry systems, two simple indicators will be monitored:

- The **basal area**², which allows the characterization of the tree cover without the needing of exhaustive inventories, which are too cumbersome to be scaled up.
- The **distribution of the origin of the trees** (in a cocoa agroforestry system a tree can either be remnant, naturally regrown or planted) which allows to characterize the potential diversity of the trees present in the plot. Indeed, these three origins contain different species. Thus, trees' origin is used in this label as a proxy for biodiversity in order, once again, to avoid having to resort to exhaustive inventories³.

This standard aims to create a collaborative tool between producers, research, civil society, institutions and the private sector in order to contribute to the development of cocoa agroforestry on the market. It also aims to encourage the adoption of agroforestry practices by producers.

¹ SAF-ART : Agro-Forestry System & Transitional Regenerative Agriculture

² Basal area is a measure of the area occupied by the trees' trunks on the ground over the whole plot's area. It is a good indicator of the forest-like aspect of a plot and can be estimated in a few minutes with a relascope.

³ Regularly, Nitidæ research teams will make sure that despite the evolution of the systems due to introduction of new trees, the trees' origin will remain a good proxy for the diversity.

/!\ Promoting agroforestry and fighting deforestation are two very different issues. This standard aims to promote agroforestry, it is not a tool in itself to fight deforestation⁴.

1_ An agroforestry standard

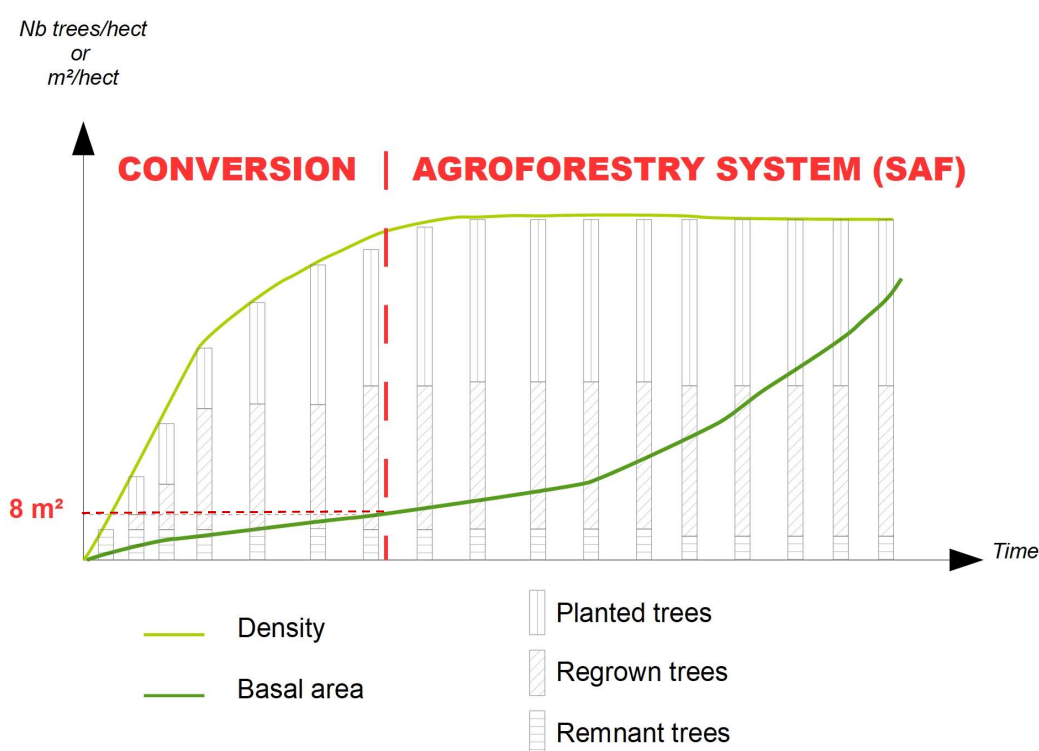
- In cocoa-producing regions, there is a reduction in forest areas and related biodiversity
- There is also a consumer demand for agroforestry cocoa
- In the main producing countries, cultivation practices of a majority of producers are evolving towards a reintegration of trees in cocoa plots, such evolution must be encouraged and supported.
- Paying for environmental services linked to the introduction and conservation of trees in a cocoa-based cultivation system (Payments for Environmental Services) can support such changes.
- Organic Agriculture has a robust traceability system allowing the localization of farms. This standard therefore chooses to rely on the "Organic Agriculture" specifications and the "Internal Control Systems" set up by producers and their organizations
- The measurement of the "basal area" makes it possible to evaluate and monitor the forest cover in a plot. It is therefore the indicator chosen to be at the heart of the standard. This indicator is easy to measure and is an effective proxy for carbon storage in a cocoa plot (Nitidæ, 2019)
- The application of this standard by producers will be subject to the payment of an "Agroforestry Premium for Environmental Services" by the buyer, which must be negotiated with the buyer and must be added to the premium linked to Organic Agriculture

⁴ For the fight against deforestation as such, please contact the national platforms of commitment against deforestation in your country or contact our teams.

2_ From conversion to agroforestry system: taking into account dynamic evolution

Encourage evolution rather than the current situation. It is a question of accompanying a transition towards more or less complex agroforestry systems adapted to the needs of producers. Thus, plantations that are very far from being a SAF will not be excluded but will be accompanied in the transition. We therefore propose a two-stage standard:

- The conversion period
- The SAF (Agroforestry System) period itself.

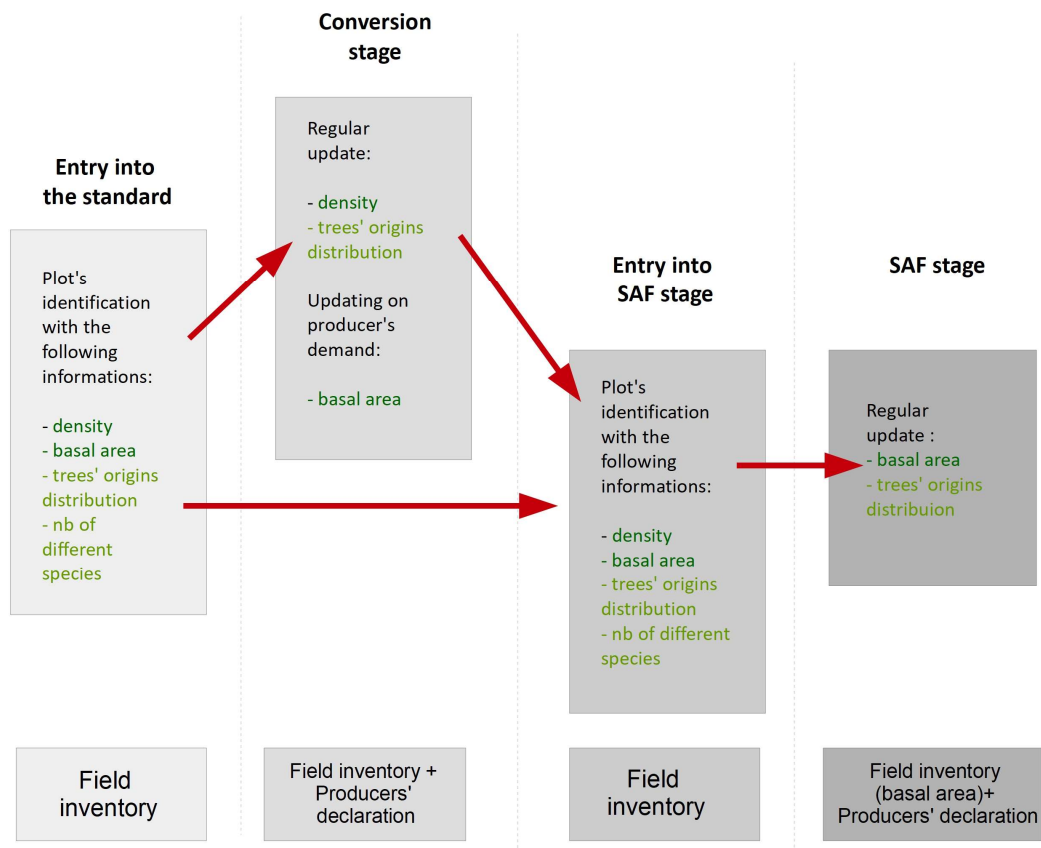


These two periods make it possible to label not only existing dense and complex agroforestry systems but also the **involvement of producers in the agroforestry transition** of their plots. Indeed, since the constitution and sustainability of complex agroforestry systems can take several decades, it is important to value the efforts of producers who are committed in this agroforestry transition by planting trees and/or selecting trees from regrowth. The table and diagram below present the characteristics of these two periods and the indicators monitored:



SAF ART

Cocoa from
AgroForestry



Characteristics of conversion periods and agroforestry system according to density and basal area:

	Entry into the label	Conversion	Entry into the "Agroforestry System" stage	Agroforestry System
Definition	A producer voluntary enters the label when he/she wishes to do so, either to enhance an agroforestry system he already has or to start an agroforestry transition.	The conversion period begins when a producer wishes to start an agroforestry transition in his plot and becomes SAF labeling when a basal area of 8 m ² /hectare is reached (for a minimum density of 20 trees per hectare).	A plot reaches the "SAF" stage when the basal area is at least equal to 8 m ² /hectare for a minimum density of 20 trees per hectare.	A plot is maintained in an agroforestry system as long as it respects the criteria of cover (basal area) and diversity (presence of different tree origins).
Density	Trees' density is measured.	The producer remains in the agroforestry transition process as long as the density measured at the entrance to the label does not decrease by 50%.	Minimum 20 trees per hectare	NOT FOLLOWED IN SAF PERIOD
Basal area	Basal area is measured: if it is under 8 m ² /hectare, the producer is in the conversion stage, otherwise he/she can move on to the agroforestry stage (on condition that the diversity criteria are also met)	NOT FOLLOWED IN THE CONVERSION PERIOD. (NB: at the producer's request, the basal area can be measured to know if the plot has reached the threshold of 8 m ² /hectare).	Minimum 8m ² /hectare	The basal area must be at least equal to 8m ² /hectare and remain stable or increase from one year to the next one (due to the growth of trees or the introduction of new trees).
Diversity	The proportion of trees' origin is measured (% remnant, % regrown, % planted). The number of different species is assessed (without individual species identification).	Remnants trees should be kept. Spontaneous regrowth trees must represent at least 20% of the trees.	The number of different species is assessed (without species identification).	Remnants trees should be retained. Spontaneous growth trees must represent at least 20% of the trees. The number of different species is assessed (without species identification).

3_Indicators monitored by the standard

3.1 Density

Density: monitored during the conversion period

Basal area increases very little in the first years of conversion, but density can increase significantly (preservation of spontaneous growth and planting). Density is therefore the indicator that will allow us to follow the conversion period. The density must therefore evolve positively at least until it reaches a minimum value of 20 trees per hectare. It is when the basal area of the trees reaches **8m²/hectare** that the plantation passes to the SAF stage. The density is then no longer monitored.

3.2 Basal area

Basal area: measured during the conversion period at the request of the producer to trigger the transition to the SAF period and monitored during the SAF period

The basal area is monitored from the conversion period and triggers the transition to the SAF stage when it reaches 8m² per hectare. During the SAF period, it is the evolution of basal area that is monitored. It must increase (natural growth of trees or introduction of new trees) from one year to the next one or at least remain stable.

The basal area measurement replaces the density measurement in SAF period for several reasons:

- It is a simple tool, quick to measure in the field and therefore applicable on a large scale
- It is a flexible criterion that does not allow for excessive prescriptions in terms of agroforestry systems and allows producers to be creative
- It is a forest indicator that can easily be correlated to the provision of ecosystem services such as carbon storage or shade.

3.3 The origin of the trees

Tree origin: monitored during the conversion and SAF periods

An exhaustive inventory, or even by transect, of the biodiversity of a plot is long and costly. The standard proposes to use a *proxy*: the origin of trees present on the plot. There are three main types of trees' origin in cocoa farms in Côte d'Ivoire:

- **Remnant trees** (= present in the previous system and not cleared when the cocoa farm was created)
- **Regrown trees** (= that have regrown naturally in the cocoa farm since its creation)
- **Planted trees** (= planted by the farmer)

The study of these different groups of trees in already existing agroforestry systems in West Africa illustrates the way these origins contribute to the overall diversity of the plots (each origin is composed of different species) and to the enhancement of the provision of environmental services (these origins are at different stages of maturity and allow long-term carbon storage) (Sanial, 2019).

Thus, our proposed SAF model must maintain a good balance between these origins. The distribution of trees' origins as well as the presence of remnant trees should be monitored from the beginning and can guide the transition and introduction methods chosen for new trees.

- Remnant are the trees that existed in the system prior to the cocoa farm (forest, fallow, old cocoa farm). These trees are mature trees (older than the cocoa farm) they can be seed-bearing and store most of the carbon of the system. These trees are also often species that are no longer present in the spontaneous regrowth (evergreen species).
- Spontaneous regrowth trees, through the effect of natural selection, have a better chance of survival than the planted trees. They are more vigorous and adapted to the environmental conditions of the cocoa farm. They are very cheap to introduce. The spontaneous regrowth offers a wide range of species, many of which are not (or not yet) domesticated and could not be easily planted.
- Planted trees are also important. Species that are no longer present in the spontaneous regrowth should be favored as well as useful exotic species (fruit, wood) that are not invasive. The varieties of trees planted can also help improve cocoa production constraints that are essential for organic cocoa production (services provided by complementary trees).

The SAF clearly aims at an agronomic improvement of cocoa production through the introduction of these trees, in particular through their capacity to provide shade and regulate hygrometry.

4 Identification and monitoring of criteria by the producer organization's ICS

For each plot the producers' organization must provide:

Indicators	Units
Density measurement (conversion plots only)	Number of trees/ha
Basal area measurement	m ² /ha
Proportion of complementary tree origins	% regrown trees Number of remnants

Since the aim is to capture the dynamics of recent evolution, even very young trees must be inventoried (therefore, there is no minimum inventory diameter as in a traditional forest inventory). The inventories should therefore take place as soon as possible AFTER the weeding of the plot, once the producer has selected the trees he will keep. Ideally, producers should mark the trees to be retained (stakes, tape, or other). The auditor will compare three sources of information each year to measure the evolution of the parameters monitored and their consistency:

- The documentation of the producers' organization should include the indicators mentioned above, especially the identification sheets of the organic certification plots, the control sheets of the ICS inspectors, the contracts, the producer list...
- Producer statements, through interviews conducted by the auditor during the audit
- Observations/field surveys by the auditor, through sampling of the plots with a similar method as the one used in organic farming, according to the level of risk.

The choice was made to rely on organic certification in order to have the capacity to intervene at the plot level within the framework of the ICS inspection mandate (economy of scale). The criteria mentioned above will therefore have to be integrated into the ICS manual (contract, inspection form, plot sheet, producer list, etc.).

Initial training in the producer organization's ICS will be provided on the measurement of indicators: density and basal area and their integration into the monitoring system.

5_Communication

- A text to be affixed to the finished product: "*product paid for environmental forest services*" or "*cocoa from agroforestry*"
- A colored or black and white logo:

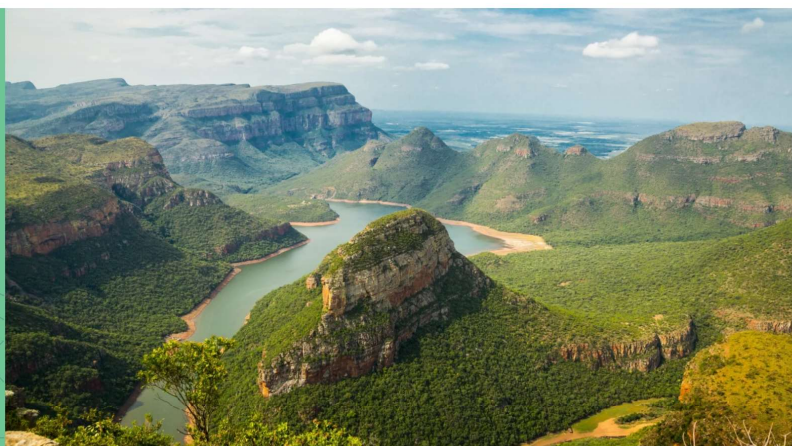


- A transparent online document
- A geoportal serving as a dashboard with the georeferenced plots and the major indicators of this standard: density, number of different species (estimated at the time of entering the label or in the SAF phase), distribution of tree origin and basal area.
- This standard belongs to Nitidæ, it is being improved and may integrate new modalities/components according to the feedback of the partners' networks in which we are involved, which may be formalized by a revision committee. Any suggestion for improvement is welcome in order to better regulate the use of the term 'agroforestry product' and to ensure field impacts through its use.

6_Methods of control

- The standard requires the certification in Organic Agriculture beforehand
- The control work is carried out by the ICS of the producer organization and annual physical field audits, ensured, for the moment, by Nitidæ. External control by a third party is not planned for the moment, Nitidæ will guarantee the verification and the conformity of the application of this standard and the results of analysis will be public, in order to guarantee the transparency of the controls. It could then be delegated to a third party to improve the impartiality of its control and its credibility.

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