Project Design Document template for Plan Vivo projects

PDD Part	Indicative size
Executive summary	2 pages
Part A: Aims & Objectives	1 page
Part B: Site Information	2 pages
Part C: Community & Livelihoods Information	2 pages
Part D: Project Interventions & Activities	1 page
Part E: Community Participation	2 pages
Part F: Ecosystem Services & Other Project Benefits	4 pages
Part G: Technical Specifications	10 pages
Part H: Risk Management	1 page
Part I: Project Coordination and Management	5 pages
Part J: Benefit Sharing	1 page
Part K: Monitoring	3 pages
Annexes	As required

Acronyms

AEDD	Environment and Sustainable Development Agency
AFR100	African Forest Landscape Restoration Initiative
AF	Agroforestry System
ASER	Senegalese Rural Electrification Agency
CBO	Community Based Organisation
CCOCSAD	Comité Communal d'Orientation, de Coordination et de Suivi des Actions de Développement
CDM	Clean Development Mechanism
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
Ci-Dev	Carbon Initiative for Development
CIRAD	Centre de coopération internationale en recherche
CLOCSAD	Comité Local d'Orientation, de Coordination et de Suivi des Actions de Développement
CO_2e	Carbon Dioxide equivalent
CROCSAD	Regional Committee for the Orientation, Coordination and Monitoring of Development Actions
DNEF	National Directorate of Water and Forests
DREEC	Regional Directorate for the Environment and Classified Establishments
DREF	Regional Directorate of Water and Forests
DryDev	Drylands Development Programme
FMC	Forest Management Committee
FPIC	Free, Prior and Informed Consent
GALS	Gender Action Learning System
GDRFF	Sustainable Management of Forest and Wildlife Resources
GGW	Great Green Wall
ICRAF	World Agroforestry
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IER	Institute of Rural Economy
IOC	International Olympic Committee
IPR/IFRA	Rural Polytechnic Institute
JOA	Jersey Overseas Aid
KLM	Kolimbiné-Lac Magui
MEADD	Ministry of the Environment, Sanitation and Sustainable Development
MEDD	Ministry of the Environment and Sustainable Development
NA-GGW	National Agency for the Great Green Wall
NGO	Non-Government Organisation
NTFPs	Non-Timber Forest Products
REDD	Reducing Emissions from Deforestation and Degradation
RHoMIS	Rural Household Multi-Indicator Survey
SCF	Standardized Crediting Framework
SDC	Swiss Agency for Development Cooperation
SHAMBA	Small-Holder Agriculture Monitoring and Baseline Assessment
SIDA	Swedish International Development Cooperation Agency
SWC	Soil and Water Conservation
TLLG	The Landscapes and Livelihoods Group
UNFCCC	United Nations Framework Convention on Climate Change
VTE	Village Tree Enterprise

Title of Project

The Olympic Forest

Executive Summary

The climate crisis is already having devastating consequences in the African drylands. Rising temperatures and changing weather patterns are making it harder for dryland communities to survive. Alongside climate breakdown, anthropogenic pressures including overuse of land, clearing of forests for farms and overgrazing, mean Africa's soils are rapidly losing fertility and, in many areas, are no longer productive. Consequently, people struggle to produce enough food, and poverty and migration are increasing.

Trees provide a solution. They absorb carbon dioxide, a leading cause of climate change. They also improve soil fertility, prevent erosion, and provide shade. Trees also increase community resilience. Where crops fail, trees survive to produce fruit, nuts and seeds, to eat and sell. That's why we are working with communities to grow trees, restore land, create green jobs and tackle the climate crisis.

Tree Aid's project will take place in two sub-catchments that are direct tributaries to the Senegal River, the Kolimbiné-Lac Magui (KLM) sub-catchment in Mali and the Falémé sub-catchment in Senegal. Despite their importance for drinking water, domestic and agricultural activities, the sites have been severely degraded leading to reduced water retention and water quality and increased surface runoff. Exacerbated by low rainfall, agricultural productivity has significantly declined affecting community resilience. Without effective management, unsustainable farming activities and clearing of riverine areas that are protecting the riverbanks will continue to impact the biodiversity and ecosystem services that these landscapes support.

The project will contribute to Africa's Great Green Wall[1] by restoring degraded savannah and wooded savannah and farmland areas and sequestering CO_2 in designated villages in both sub-catchment areas. This will be achieved through enrichment planting and the promotion of agroforestry systems with the planting of diverse native trees, benefitting both rural communities and the environment. In support of each country's Rural Land Tenure Law, local land charters will be defined and communities' capacity developed to sustainably manage the restored ecosystems.

In addition to the climate and environmental benefits, the project will have a positive impact on livelihoods of participating communities by providing opportunities for the development and sale of NTFP value chains, cash-for-work, improving farm yields in agroforestry plots, access to firewood from dead/pruned branches.

42.7% of people in Mali and 39% in Senegal live below the poverty line. Women in the area predominantly work in agriculture. Where they are employed, they work in the informal sector. They lack access to land, equipment and training, so remain economically marginalized and absent in decision-making processes. The region is rich in diversified forest species, which provide income-generating opportunities, especially for women. Various NTFPs are exploited like moringa, baobab, shea and African locust bean. However, these livelihood opportunities are jeopardized by the increasing deforestation. Additionally, NTFP value chains are underdeveloped with a lack of resources to improve the quantity and quality. Furthermore, groups are usually not officially registered, and their fragility of means they lack access to working capital. The planting of trees that will provide economic benefits in the long-term through fruits and nuts, as well as trees that can help improve farming productivity will support in developing livelihoods and making them sustainable in the face of challenges from changing climate and limited options for diversification. Furthermore, opportunities will exist in cash or food for work, and payment for producing trees in locally developed nurseries.

This project aims to generate at least 243,500 tonnes CO2e of additional carbon sequestration over a period of 30 years. It is likely that the project will be expanded to other communities within the project area in order to generate an additional 600,000 tonnes CO2e over a period of 30 years in a second phase of the project. The timeline for the second phase is not certain but the project will be developed as a grouped project, where new instances can be added over time.

The project is being implemented by Tree Aid in Mali and La Lumière in Senegal. Technical support will be provided by The Landscapes and Livelihoods Group (TLLG), based in the UK.

Tree Aid is a registered charity in the UK, and a registered NGO in Burkina Faso and Mali. This project is part of a larger programme implemented by Tree Aid in support of the GGW for the benefit of rural communities. Tree Aid has over 30 years' experience implementing restoration activities across the Sahel, alongside forest governance and livelihood development interventions. In our current strategy 2017-2022, we have planted and regenerated nearly 6.5million trees across our five countries of intervention (Mali, Burkina Faso, Niger, Ghana and Ethiopia).

LA LUMIÈRE is a local development support organisation based in Tambacounda. It has branches in the Kédougou, Kolda and Sédhiou regions. Its mission is to contribute to the harmonious socio-economic development of vulnerable and disadvantaged groups. The NGO works mainly in the following areas: Promotion of children's and women's rights; Education and training; Advocacy; Community and preventive health; Social, family, professional and economic integration of children and women in difficult situations; Preservation of the environment and living environment; Microfinance; Promotion and protection of human rights.

Since its establishment in April 2017, TLLG has provided technical support to projects including development of Plan Vivo projects in Indonesia and West Africa, research support in sub-Saharan Africa with the University of Edinburgh, program evaluations for CARE International, development of conservation strategies in dryland and marine ecosystems with ZSL and The Biodiversity Consultancy and providing technical support to Tree Aid projects in Burkina Faso.

Part A: Aims and Objectives

Tree Aid's project will take place in two sub-catchments that are direct tributaries to the Senegal River, the Kolimbiné-Lac Magui (KLM) sub-catchment in Mali and the Falémé sub-catchment in Senegal. Despite their importance for drinking water, domestic and agricultural activities, the sites have been severely degraded leading to reduced water retention and water quality and increased surface runoff. Exacerbated by low rainfall, agricultural productivity has significantly declined affecting community resilience. Without effective management, unsustainable farming activities and clearing of riverine areas that are protecting the riverbanks will continue to impact the biodiversity and ecosystem services that these landscapes support.

The project will contribute to Africa's Great Green Wall[1] by restoring degraded savannah and wooded savannah and farmland areas and sequestering CO_2 in designated villages in both sub-catchment areas. This will be achieved through enrichment planting and the promotion of agroforestry systems with the planting of diverse native trees, benefitting both rural communities and the environment. Under each country's Rural Land Tenure Law, local

[1] https://www.greatgreenwall.org/about-great-green-wall

land charters will be defined and communities' capacity developed to sustainably manage the restored areas. This project aims to generate at least 243,500 tonnes CO_2e of additional carbon sequestration over a period of 30years. It is likely that the project will be expanded to other communities within the Project Region in order to generate an additional 600,000 tonnes CO_2e over a period of 30years in a second phase of the project. The timeline for the second phase is not certain but the project will be developed as a grouped project, where new instances can be added over time.

Part B: Site Information

B1 Project location and boundaries

B1.1 Defining the Project Area

The project will take place in a transboundary region that includes sites in Senegal and Mali (see Figure 1).

The project has planned a phased approach for the realisation of 800,000 tonnes CO2e. The 'phase 1' component of the project is already funded by the International Olympic Committee (IOC) and will sequester 243,500 tonnes CO2e. More funding is being sought to realise the sequestration of a further 600,000 tonnes CO2e, in 'phase 2'. The Project Region for the grouped project comprises 9 local arrondissements (5 in Mali and 4 in Senegal) and 21 Communes (10 in Mali, 11 in Senegal) that will be targeted during Phase 1 and Phase 2 of the project (Figure 1,Table 1).

Selected communes are key to water retention, groundwater recharge, flood control, river shoreline stabilisation, as well as maintaining the hydrological balance of the Senegal River basin.

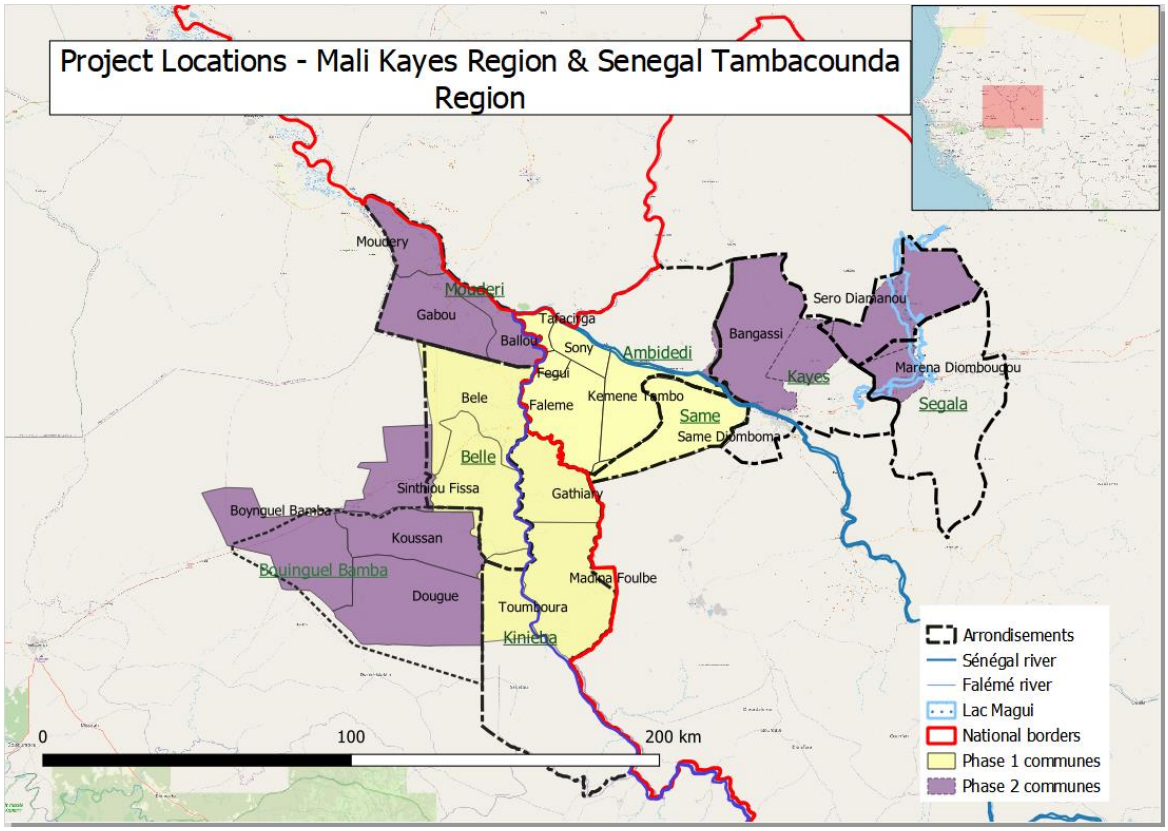

Figure 1: Overview of project location, showing phase 1 and phase 2 arrondissements and communes, with local water bodies

Table 1: Phase 1 and Phase 2 Communes in the Project Region

Country	Region	Cercle/ Department	Arrondissement	Commune	Planned Project Phase
Mali	Kayes	Kayes	Ambidedi	Faleme	Phase 1
				Fégui	
				Kemene Tambo	
				Fégui	
				Tafacirga	
			Same	Same Diomboma	
			Diadioumbera	Sero Diamanou	Phase 2
			Kayes	Bangassi	
				Gory Gopela	
			Segala	Marena Diombougou	
Senegal	Tambacounda	Bakel	Bele	Bele	Phase 1
				Sinthiou Fissa	
			Kinieba	Gathiary	
				Madina Foulbe	
				Toumboura	
			Moudery	Ballou	Phase 2
				Gabou	
				Moudery	
		Goudiry	Boynguel Bamba	Boynguel Bamba	
				Dougue	
				Koussan	

B2 Description of the Project Area (PV requirement 5.1.1)

B2.1 Geophysical description

The Project Region is dominated by chains of hills and grassy plains. The Sahelian climate prevails throughout the region, characterised by three main seasons: the hot dry season (March-June), the cold season (October-February) and rainy season (July-September). However, there are fluctuations between seasons or months due to strong rainfall variability. The dry season is characterised by hot sunshine and temperatures approaching peaks of 45°C in the shade (April-May), when the hot, dry harmattan winds blow from the Sahara. The cold season is characterised by mild temperatures (around 15°C) and frequent, dusty winds.

The rainy or winter season is characterised by frequent strong winds. The maximum rainfall is recorded from July-August and the average rainfall is around 600mm per year. The rains are often sparse and do not cover the whole area, resulting in an extended dry season. This phenomenon creates hardship to the communities (low agricultural yields, degradation of pastures) and ecologically (lowering of water table, drying up of water points, destruction of flora and fauna).

In terms of hydrography, all target communes receive water from 3 main water systems, the

Falémé River, with its tributaries, the Senegal River and Kolimbiné River with Lac Magui (see Figure 1). The presence of these watercourses in these communes gives rise to riverine forest formations that are dense in places. The Falémé dries out periodically from February to May. Other smaller tributaries that feed water into the Falémé rarely have water for more than 6 months (June-November). The subsoil in some areas around Falémé river is rich, containing gold, manganese and other unexplored resources. At present, manganese is exploited further upstream on the Falemé River on the basis of a contract with the state by an Indian mining company, while gold is still exploited in an artisanal manner by local people and some foreign operators.

Generally, the vegetation is that of the Sahelian zones, a mosaic of savannah with sparse trees and patches of dryland forests. The savanna has a continuous layer of perennial grass species and a heterogeneous layer of woody species. The savannah-type forest or shrub steppe are dominated by species such as *Acacia spp., Balanites aegyptiaca,* Baobab *(Adansonia digitate),* Jujube *(Ziziphus mauritania), Guiera senegalensis and Combretum micranthum*. Along the lowland wetland and marshes, there are some bamboo groves and rows of trees. The pastures that used to abound in the area are now mostly degraded due to prolonged and uncontrolled livestock grazing, from November/December to June/July.

The project area has experienced a decrease in rainfall and a medium to long dry spell in recent years. The area is subject to excessive temperatures and strong winds accompanied by dust. The impacts of these phenomena have been observed on the resources and livelihoods of communities through low agricultural and livestock production, fishing resources, and the reduction or even disappearance of certain forest and wildlife species. The consequences have been poverty and food insecurity at farm level.

With regards to infrastructure in the project area - in Senegal, the national road (N1) crosses the communes of Sinthiou Fissa and Bélé on both sides. The Mairies of these two communes are located on this road. In Mali the project area is crossed by the RN1 Kayes-Kidira road, 02 Kayes-Senegal-Dakar and Kayes-Mauritania power lines, and rails. The existing infrastructures can be used as firebreaks for the managed forest blocks. There are also watering points for animals, and mini dams to hold back water have been built in some villages.

The project sites are adjacent to one another, across the border between Senegal and Mali. The Tree Aid Mali team, in Kayes, are closer to some of the Senegalese sites than the partner team, based in Tambacounda. This proximity has allowed for exchange visits and oversight to take place across the two teams. This approach facilitates a consistent approach, where necessary and pertinent, and to encourage best practice. The border has, at times, become more insecure, but this has tended to be for foreign nationals. In January 2022, the Economic Community of West African States decided to close its borders with Mali, and this made travel between countries difficult. Sanctions were lifted again in July 2022, after negotiations regarding elections.

B2.2 Presence of endangered species and habitats

Locally threatened trees species

In Senegal, *Adansonia digitata*, baobab (30.7% of villages consulted), *Ziziphus mauritiana,* jujubier (12.8% of villages) and *Balanites aegyptiaca,* balanites (5% of villages) as the species under most threat due to forest degradation.

In Mali, communities' perception of threatened tree species include baobab (62.7% of villages consulted), Acacia species, especially the gum arabic tree (*Acacia senegal* (L.)

Willd) (50% of villages), balanites (49% of villages) and jujubier (33.33% of villages).

Locally and globally threatened mammals

Village consultations reported Lion *Panthera leo* (IUCN Red List status: Vulnerable) as one of several mammal species that are locally threatened:

- In Mali, the three most mentioned animals were hyenas and deer (31.4% of villages) and lions (21.6% of villages).

- In Senegal, the consultations showed the following animals were considered most affected by degradation of the wooded savanna: Lion (44.8% of villages), gazelle (28.2% of villages), and hyenas (23% of villages).

Globally threatened avifauna

With support from Royal Society for the Protection of Birds (RSPB), a survey was undertaken in March 2022 by Nature, Community, Development (NDC), in Senegal to assess the birdlife nesting sites in the area. This reconnaissance visit on avian biodiversity in the forest blocks gave us an idea of the richness of the avifauna, despite the disturbances of the Sudano-Sahelian ecosystems and the end of the winter period for migratory birds. Censuses during the period of the visit in the area allowed the team to inventory 63 species, divided into 21 orders and 33 families. This avifauna is dominated by resident landbirds, and the order Passeriformes records the largest number of species and individuals.

Table 2: Inventories bird species in intervention site

Order	Number of families	Numbers of species	Number of individuals
Passériformes	16	35	1519
Columbiformes	1	7	837
Bucérotiformes	3	4	214
Accipitriformes	1	3	10
Accipitriformes	1	2	35
Coraciiformes	2	2	46
Cuculiformes	1	1	1
Falconiformes	1	1	1
Galliformes	1	1	1
Musophagiformes	1	1	1
Apodiformes	1	1	2
Piciformes	1	1	1
Psittaciformes	2	2	54
Pterocliformes	1	1	7
Sources: NDC report (march 2022)			

The majority of the species identified in the survey are classified as "Least Concern" on the IUCN Red List. However, two species recorded in the survey and present in the intervention area are classified as threatened with extinction (Vulnerable) at the global level. These are the Turtle Dove (*Streptopelia turtur*) and the Southern Shrike (*Lanius meridionalis*). A full list of species and their IUCN status is provided in Annex 1 Avifauna survey, Senegal.

Table 3: Conservation status of avifauna

	Total numb	IUCN Red List				
		CR	EN	VU	NT	LC

	er					
Aves	63			2		61
(%)				3%		97%
Sources: NDC report (march 2022)						

B2.3 Land cover classification to identify enrichment planting sites

In both Mali and Senegal, potential enrichment sites were identified through community consultation. For Senegal, these sites were analysed using composite image of collated imagery and ground-truthing data. The classes and definitions used by the classification employed by the government of Senegal were used, these can be found in the land cover protocol to carry out ground-truthing (Annex 2).

In Senegal, land cover maps were generated for the identified communal land and for the 2022 enrichment planting sites from a composite image of collated imagery from the Landsat 7, Landsat 8, Sentinel 1, Sentinel 2 and Digital Elevation Model (DEM) between 01/01/2022 and 01/06/2022. The classification algorithm was supported using ground data. Figure 2 and Table 4 illustrate the breakdown in land cover across the Senegal enrichment planting sites.

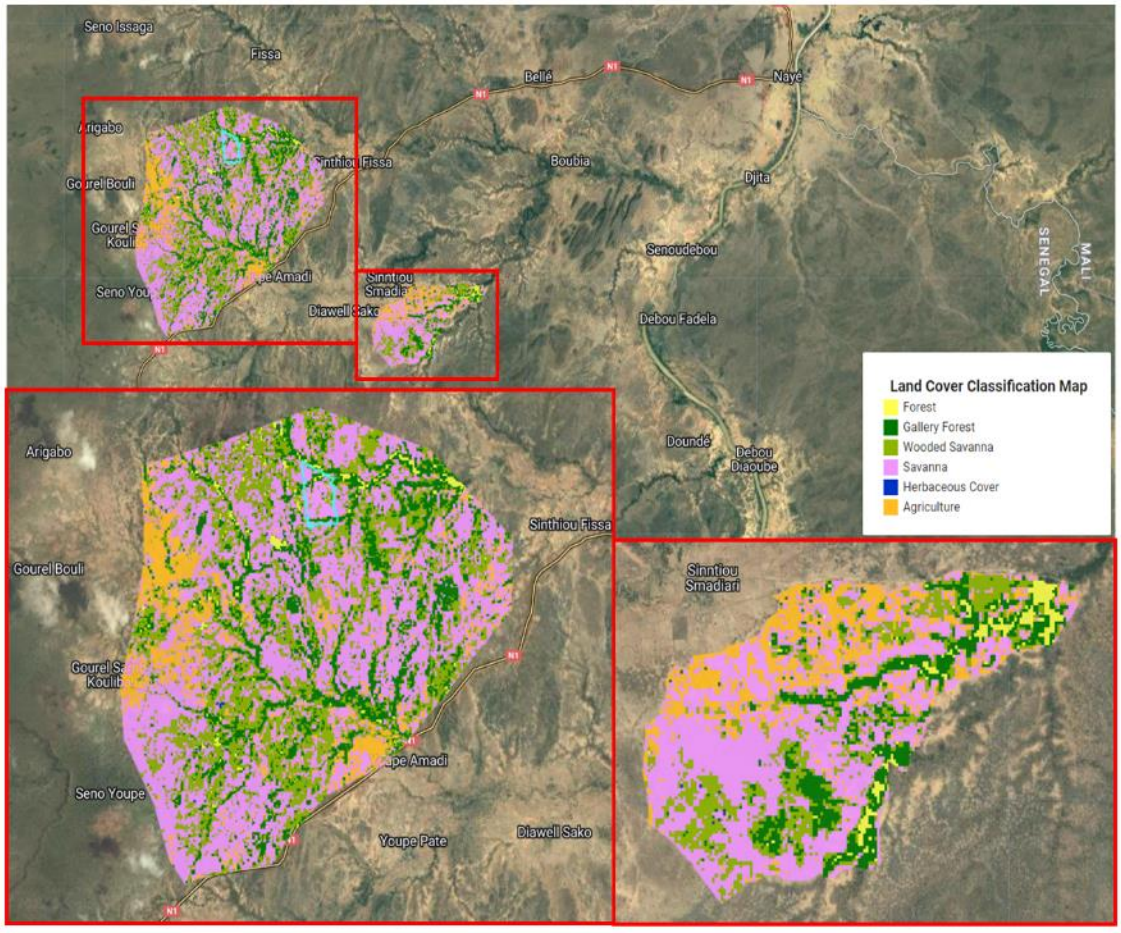

Figure 2: Boulé Bané (left) and Barsafai (right) land cover classifications, Senegal

In Senegal, the sites are mostly savannah and wooded savannah. Enrichment planting will target these zones.

Table 4: Land cover across the enrichment sites in Senegal

Land Cover Class	% coverage	# hectares
Forest	1.47	66.22
Gallery Forest	15.02	676.61
Wooded Savannah	30.15	1358.17
Savannah	45.08	2030.73
Herbaceous	0.07	3.15
Agriculture	8.21	369.84
		4,504 ha

In Mali, the delimitations of the sites with communities have been taken for the forest blocs for enrichment planting. The land cover classification data has also been collected, but not yet analysed. This will be done in the first quarter of 2023.

Figure 3: Delimitation of forest blocs

B3 Recent changes in land use and environment conditions

Land use practices within the Project Region are mainly agriculture, livestock grazing, firewood fetching and charcoal making. The effects of these practices include less water availability - rivers and wetland areas drying out or become silted; deforestation and increased instances of burning of pastures resulting in vegetation loss (tree and pasture species); and a decline in crop and fruit tree productivity. The combined effects of successive droughts and human activities have resulted in significant reduction in the vegetation cover.

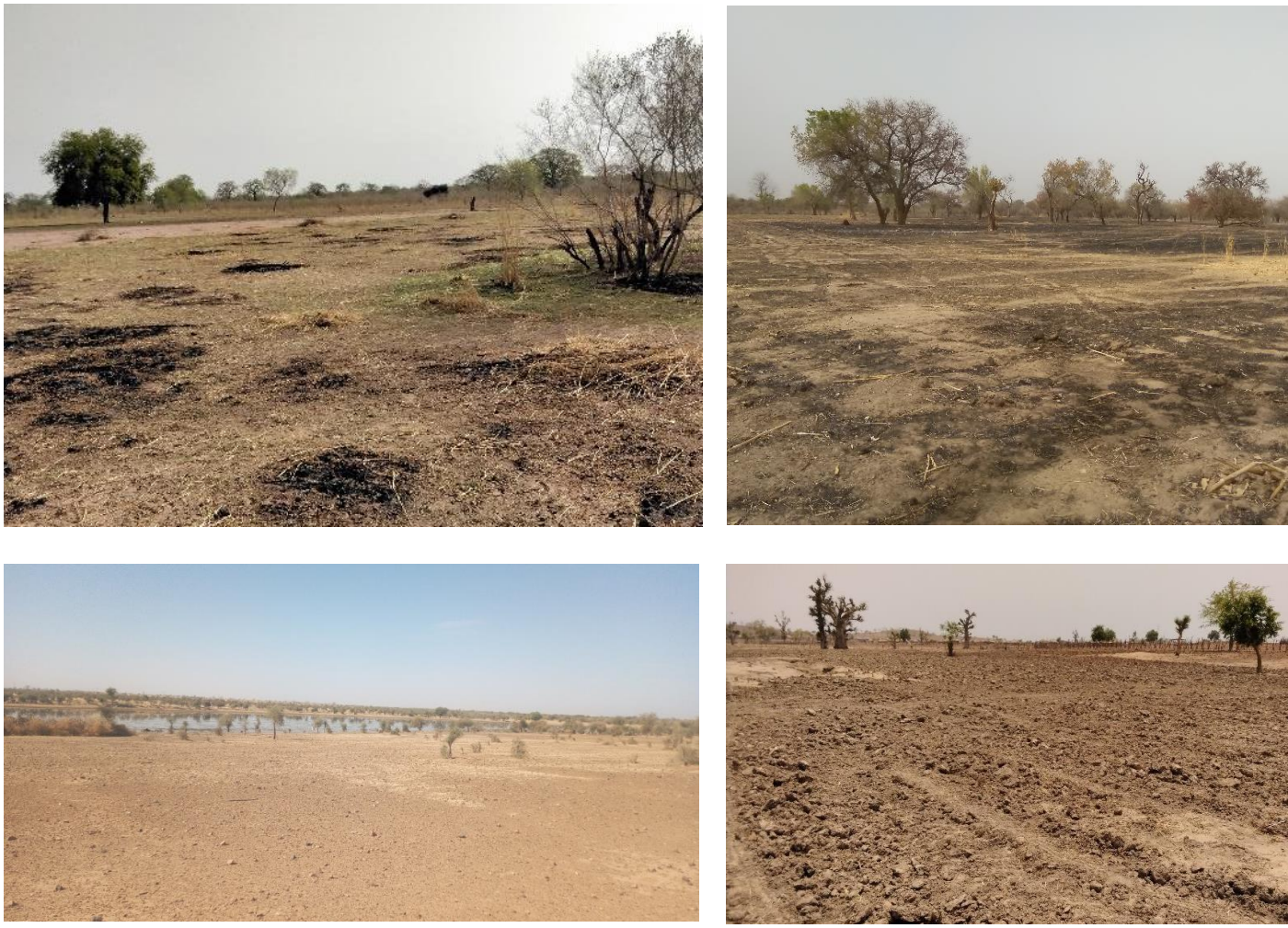

Figure 4: Degradation of land adjacent to waterways, Kabou village. Photo taken during village-level consultation in Mali

The consequences of land degradation can be summarized as follows:

- Regression or loss of vegetation cover and a decrease of diversity (inter species and genetic). Examples of trees species highly affected and near to extinct mentioned by the communities during the situation analysis include: *Adansonia digitata, Ziziphus mauritiana and Balanites aegyptiaca;*
- Reduction in quality of pasture zones leads to depletion or disappearance of some grass forage species;
- Sedimentation of rivers, streams and wetlands, reducing water points for animals to access
- High temperatures of surface layers of soil affect the biodegradation of organic matter;
- Impoverishment of the local communities with increased pressure on remaining natural resources as bare soils are unsuitable for production and vulnerable to wind and water erosion, and thus leads to loss of productive capacity;
- Increased conflicts between pastoralists and farmers

During the village consultations carried out in early 2022, communities in Senegal reported signs of degraded lands caused by bush fires, and cutting of trees for fodder by pastoralists.

In Mali, village consultations showed that across 51 villages, an estimated 1,173 hectares of land have been abandoned because of its total loss of productivity and 6,538.5 hectares are considered degraded.

B4 Drivers of degradation

Land degradation and reduction of woody cover is widespread in the project region. This section describes the key drivers and assesses trends in above-ground biomass.

Natural drivers

Natural causes of land degradation relate to the hydro-rainfall conditions, which have been very unfavorable in the Senegal River basin (as well as in the rest of the Sahelian and Sudanian region). In the proposed project region, average annual rainfall fell by 30-40% between 1951-1970 and 1971-1990.[1] More recently, a succession of years with pronounced rainfall deficit has led to high tree mortality and has negatively affected the regeneration capacity of the vegetation cover.

Anthropogenic drivers

Anthropogenic causes of land degradation in the Project Region include:

- Slash and burn farming: excessive land cultivation and deforestation reduce the vegetation cover. Soils become vulnerable to erosion and hence affect water regimes and freshwater ecosystems. Shifting rice cultivation requires areas of riverine forests/woodlands to be cleared each year.

- Bush fires: some of the current agro-pastoral practices in the project region are based on seasonal burning. In terms of agriculture, land is often cleared by fire is that it limits the amount of weed in the fields and the ashes from burning contribute temporarily to soil fertility. Pastoralists also often use fire (generally from November-March) to encourage the regrowth of nutritious grasses that are highly palatable to livestock. Hunters also sometimes use bushfires to hunt. In some cases, fires are used for preventive purposes: controlled burning reduces the highly flammable biomass to mitigate destructive fires. Bushfires are one of the main factors in the degradation of soils and savannah ecosystems in West Africa, and particularly in the Senegal River basin. They disrupt the natural cycle of plant mortality and regeneration, and cause or accelerate erosion, runoff, and the long-term loss of soil fertility.

- Fodder: destructive pastoral practices that compromise the regeneration of woody vegetation, such as topping and lopping of trees, are increasing in the face of the scarcity of fodder resources.

- Exploitation of timber, firewood and charcoal: the low standard of living in the project region explains in part the recourse to the exploitation and marketing of wood, in order to meet urgent survival needs. Combined with bush fires and clearance for agriculture, the reduction in tree numbers in the landscape also reduces the biological diversity of both fauna and flora, exposes the soil, and makes it vulnerable to erosion and contributing to the silting up of the three river systems and degradation of riverbanks.

- Overgrazing: Trans-humance pastoralists, as well as local agro-pastoral farmers, are known to let their animals move freely during the dry season, often allowing them to sleep in the bush overnight. In the rainy season and post-harvest this process has a more limited impact on vegetation cover and land degradation. However, in the dry season

during November and June, animals trample and graze vegetation that is growing – further impacting natural regeneration or survival rates of planted trees.

- Mining: Both formal and informal mining is common in the region (especially on the Senegalese side of the border). These mines cause soil degradation, deforestation, pollution of rivers through sedimentation, pollution of air and surface water through the use of mercury for amalgamation of gold, among others. 20 sites were reportedly closed by the government in 2021-22 in the Tambacounda region.

In Mali, village consultations were able to rank the key anthropogenic drivers of degradation as overgrazing by livestock (76% of villages), agriculture (52%) and fires (37%), compounded by drought. In Senegal, these were similarly, overgrazing (74%), exploitation of the forest (68%) and drought (47%).

Trends in above-ground biomass

In the period directly prior to the start of the project (2015 – 2019), L-band satellite images, obtained from the Phased Array L-Band Synthetic Aperture Radar (PALSAR) sensor on-board Japan's Aerospace Exploration Agency (JAXA's) Advanced Land Observation Satellites (ALOS-2) were used to look at the trends in above-ground biomass (AGB) across the Project Region. There is long history of using this data to estimate forest cover and above-ground biomass in African savanna landscapes (Mitchard et al. 2011; Ryan and Williams 2012), and while there is not yet a statistically significant correlation between AGB and backscatter local to the Project Region to determine the AGB in the landscape, approximate biomass loss and biomass gain were determined (See Figure 5). A degradation index (% of area undergoing biomass loss - % of area undergoing biomass gain) was estimated for each Commune/Arrondissement (See Table 5), and demonstrated that net degradation is present in all Communes.

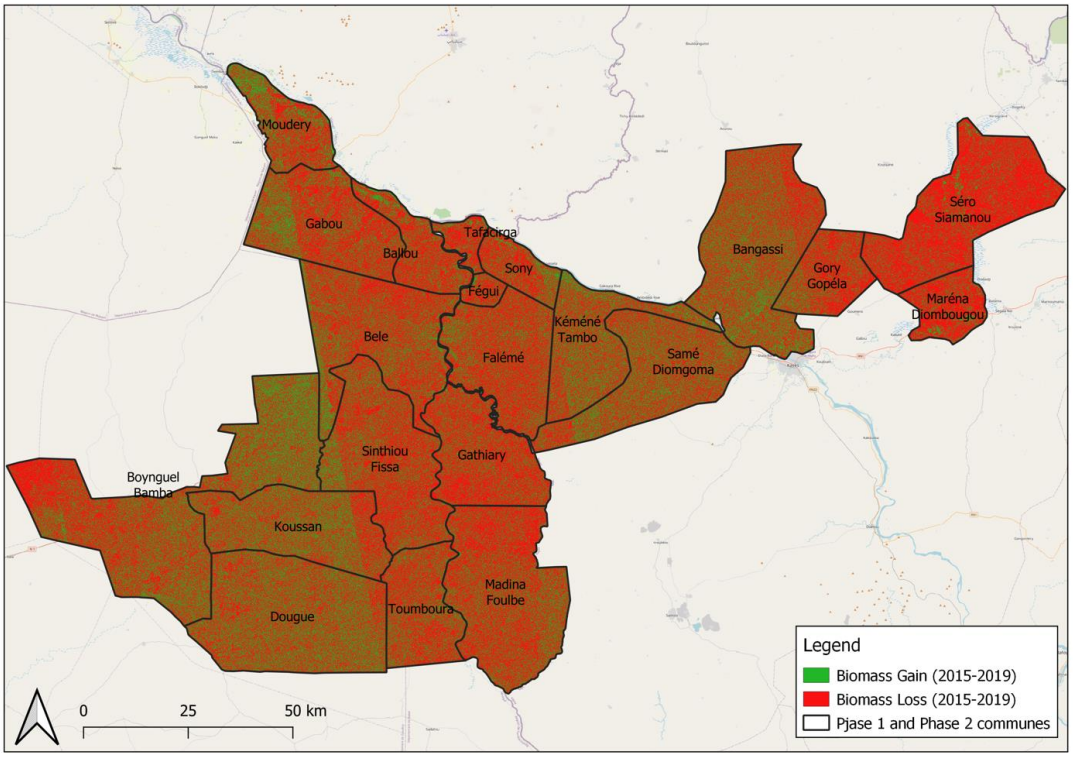

Figure 5: Map showing biomass loss and biomass gain between 2015 and 2019 across the Project's Phase 1 and Phase 2 target Communes

Table 5: Degradation Index for each of the Project's Phase 1 and Phase 2 target Communes

Country	Region	Cercle / Department	Arrondissement	Commune	Planned Project Phase	biomass gain (count)	biomass loss (count)	total count	Proportion of land undergoing biomass gain (%) between 2015 and 2019	Proportion of land undergoing biomass loss (%) between 2015 and 2019	Degradation Index (Biomass loss (%) - Biomass gain (%))
Mali	Kayes	Kayes	Ambidedi	Faleme	Phase 1	372562	767265	1139827	33%	67%	0.35
				Fégui		33437	75509	108946	31%	69%	0.39
				Kemene Tambo		411702	548207	959909	43%	57%	0.14
				Sony		116093	224332	340425	34%	66%	0.32
				Tafacirga		49265	119367	168632	29%	71%	0.42
			Same	Same Diombomba		540545	757902	1298447	42%	58%	0.17
			Diadioumbera	Sero Diamanou	Phase 2	292123	1261745	1553868	19%	81%	0.62
			Kayes	Bangassi		747580	1082207	1829787	41%	59%	0.18
				Gory Gopela		170394	400603	570997	30%	70%	0.40
			Segala	Marena Diombougou		94624	327837	422461	22%	78%	0.55
Senegal	Tambacounda	Bakel	Bele	Bele	Phase 1	541200	980086	1521286	36%	64%	0.29
				Sinthiou Fissa		498292	991144	1489436	33%	67%	0.33
			Kenieba	Gathiary		288036	715469	1003505	29%	71%	0.43
				Madina Foulbe		559951	1150557	1710508	33%	67%	0.35
				Toumboura		273826	506395	780221	35%	65%	0.30
			Moudery	Ballou	Phase 2	161528	338620	500148	32%	68%	0.35
				Gabou		412386	757647	1170033	35%	65%	0.30
				Moudery		238407	333216	571623	42%	58%	0.17
		Goudiry	Boynguel Bamba	Boynguel Bamba		1105315	1537821	2643136	42%	58%	0.16
				Dougue		856840	1101338	1958178	44%	56%	0.12
				Koussan		535902	712338	1248240	43%	57%	0.14

[1] IPCC (2007): Summary for policy-makers. In: Climate Change 2007: The physical Science Basis. Contributions of Working Group I to the Forth Assessment Report of the Intergovernmental Panel on Climate Change; Hadley Centre Climate Change Consultancy; Sahelian climate: past, current, projections (2010)

Part C: Community and Livelihoods Information

C1 Describe the participating communities/groups (PV requirement 1.1, 7.2.1, 7.2.7, 7.2.8)

Phase 1 sites include 40 villages in Mali and 50 villages in Senegal. These are divided into

villages targeted for enrichment planting and villages targeted for agroforestry, with 26 villages targeted for both interventions.

C1.1 Participating communities - Mali

The Kayes region of Mali is bordered to the north by Mauritania, to the west by Senegal, to the south by Guinea and to the east by the Malian region of Koulikoro. Kayes region has a population of c.2 million[2], with significant urban centres and sparsely populated rural districts. Across the region, density averages 16 inhabitants per km².

In the Project Region, Tafacirga Commune has the highest population density (83 inhabitants per km²) and Falémé the lowest (14 inhabitants per km²). Target villages range in size from 160 people per village (Diakandapé plantation) to 6,465 per village (Dramané).

The ethnic composition of the area includes: Bambaras, Soninkés, Kassonkés, Peulhs, Bozos, Bobos, Mossis and Maures. There is reportedly little conflict between groups, though Peulhs (or Fulani), as pastoralists, sometimes come into conflict over access to resources for their cattle. The project is tackling this issue by implementing information and awareness-raising activities for communities on the need to involve livestock farmers in the process of identifying forest sites and in actions to preserve and protect these sites. Conflicts can be contained by drawing up a forest management plan and ensuring that it is properly implemented through concerted management with forestry operators, aided by functioning management bodies (village management committees and surveillance brigades). Marginalised/vulnerable groups exist in the region. They include landless households, female-headed households or families, and the elderly (with or without children). These people have had difficulty engaging in stakeholder consultation processes in the past.

During the IOC project agroforestry census, some producers were identified as being people who did not have the means to engage in agroforestry activities (difficult access to land, water problems, lack of fencing, etc.). Similarly, during the FPIC process, it became apparent that some households would not be able to provide labour for community work. Some women were unable to participate in the production of seedlings because of a lack of support for household activities in their absence. Furthermore, as a result of their poverty, some of the marginalised/vulnerable groups engage in activities that affect the forest: indiscriminate gum arabic gathering, wood cutting, etc.

The situation of women in Mali[3] as a whole is challenging:

- The country ranked 184th out of 189 countries on the 2019 UNDP Human Development Index and ranked 184th in the world on the Gender Inequality Index in 2020.
- Respect for human rights is weak, especially for women and young people, subject to structural inequalities and sociocultural customs that affect their health and severely limit their education, participation in governance, and social and economic independence.
- The maternal mortality rate is nearly 10 percent and food insecurity particularly affects women and children.
- Agriculture accounts for the livelihood of most people (mainly women) unclear land rights have contributed to conflicts between herders and farmers, particularly in the central regions.
- Gender-based violence and female genital mutilation remain widespread across the

[2] 2009 census. https://www.city-facts.com/kayes/population
[3] https://africa.unwomen.org/en/where-we-are/west-and-central-africa/mali accessed 15 December 2022

country and women do not often have access to justice due to social pressures and ignorance of their rights.

Table 6: Population and ethnic groups of target villages in Mali

Commune/ Arrondissement	Village name	Population	Cultural/ethnic groups
Falémé	Diabougou	855	Soninkés, Peulhs, Bambaras, Malinkés, Kassonkés and Maures
	Dialambi	1513	
	Diboli	4207	
	Fouroukarane	891	
	Naye Peulh	898	
Fégui	Fegui	6441	
Kemené tambo	Ambidedi rive gauche	317	Soninkés, Bambaras
	Dramané	6465	
	Gakoura rive gauche	2000	
	Gouele	1600	
	Kanaguile	700	
	Makadougou	1000	
	Moussala	2800	
	Toubaboukane	1200	
	Walikané	1190	
Same diongoma	Bada	782	Bambaras, Soninkés, Peulhs, Bozos, Bobos, Mossis and Maures Bambaras, Soninkés, Peulhs, Bozos, Bobos, Mossis and Maures
	Baldinkaré	457	
	Darsalam macina	791	
	Darsalam plantation	1588	
	Diawara counda	590	
	Diendjé	1299	
	Dogofili	314	
	Gouka	1882	
	Kassana	400	
	Kofoulabé	212	
	Kossoumalé	607	
	Madina	512	
	Marena	1364	
	Samé plantation	1898	
	Samé Wolof	2219	
	Sankara	954	
	Sinsincoura	413	
Sony	Digokori	2500	Soninkés, Peulhs, Bambaras, Malinkés, Kassonkés and Maures
	Kabou	2000	
	Lany	6500	
	Sobokou	4300	
Tafacirga	Goundiamou	2150	Soninkés, Peulhs, Bambaras, Malinkés, Kassonkés and Maures
	Kotéra	3291	
	Ségala	1400	
	Tafacirga	2285	

C1.2 Participating communities - Senegal

In Senegal, the Tambacounda region has a population of 900,000 (2021 data) and is relatively sparsely populated (20 inhabitants per km²). The population is predominantly made up of youth (under 20) (52.07%). The region is made up of a number of ethnic groups: Malinkés, Peulhs, Soninkés and Diakhankés.

Education is limited and fewer than six out of ten (58.5%) school students move beyond the 6th grade.

While the project has not yet gathered community-level data, in relation to gender equity there has been some progress[4] in Senegal as a whole in recent years:

- The Government of Senegal made significant progress for the promotion of a gender-sensitive environment, through the adoption of the Parity Law, the Standard Operating

[4] https://africa.unwomen.org/en/where-we-are/west-and-central-africa/senegal_africa accessed 15 December 2022

Procedures on GBV, a National Action Plan on GBV/Human Rights and the Empowerment of Women, and the validation of the new National Strategy for Gender Equality and Equity. These measures have been developed and implemented under the technical leadership of the Ministry of Woman, Family and Childhood.

- Senegal's 2001 constitution guarantees equality between women and men in its article 7. The country has ratified the Convention on the Elimination of All forms of Discrimination against Women (in 1985), and the Optional Protocol on violence against women (in 2000). The country has not reported to the CEDAW committee since 1994. Senegal ratified the Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa in 2005.
- A National Strategy for Gender Equality and Equity (SNEEG) has been developed with the support of UN Women Senegal Program Presence to run from 2005-2015 and was updated in 2016. SNEEG aims to eliminate inequalities between women and men so as to ensure women's rights and protection, by ensuring their full participation in decision-making processes and equitable access to development resources and benefits.
- Public policies at sectoral and territorial level are part of the process of institutionalizing the gender dimension of gender sensitive budget development. In this same perspective, parliamentarians are committed to follow the budgets for their alignment in the perspective of gender, particularly the collective of women parliamentarians.
- Gender-sensitive M & E mechanisms are developed by the Ministry of women family and gender to produce and collect indicators and gender variables at the administrative level and at the National Statistical System level.

Table 7: Target communes and total population in Senegal, including relevant village names and ethnic groups

Commune	Population	# Households	Village name	Ethnic groups
Madina Foulbé	2488	268	Lally	Malinkés, Peulhs, Soninkés and Diakhankés
Toumboura	3553	309	Bancouba Didde Gassama Goundafa Missirah Sansanding Toumboura	Malinkés, Peulhs, Soninkés and Diakhankés
Gathiari	3037	145	Diyala Amadou Gathiary Sabouciré Sanakholé Takhoutala2 Tamé	Peulhs, Soninkés and Diakhankés
Bélé	16968	1290	Dounde Arigabo Arihara Bèlé Daharatou Dialinguel Diybougou Mossi Gourel Ablaye Diaw Gourel Bouly Gourel M bara Gourel Mama Ciré Gourel Sory Lamine Guirobé Mama Ndaw Nayé Oubowol Ouro Himadou sénédébou	Peulhs, Soninkés and Diakhankés

			Séno Issaga Sinthiou dialinguel Voubavol	
Sinthiou Fissa	8326	580	Bababe Bani Pely Diamwely pathe Pathe Mbaye Fidjibidji Gédékou Goundiourou Hamdalaye Bocar Sada Sakhocounda Sambakolo Senodiarale Sinthiou Fissa Sinthiou Samba Ndiarde Sitabantan Soumbouroudaka Takhoutalla Yerimale Youpé Hamady Youpé Pathé	Peulhs, Soninkés and Diakhankés

During the situational analysis at the start of the project, the project identified a number of vulnerable groups, including women and youth. It also identified the different ethnic groups (including those with different uses of the land e.g. Fulani/Peulh). During our meetings, representatives from all social and professional categories (farmers and stockbreeders) and age groups took part in the village assembly, where all the decisions were taken.

To ensure that women are effectively represented and involved, the project require at least the president of the women's group to be present when a village meeting is called. The project also ensures that women are integrated into the committees and cooperatives, and is finding that some women are benefiting from agroforestry despite not being traditional landowners.

The vulnerability of young people can be analysed from the point of view of access to employment. With a low level of education and no vocational training centres, unemployment is endemic. This, combined with low agricultural yields due to climate change, exacerbates the vulnerability of young people. Emigration is an option in the area.

Young people are included in the project as members of the forestry brigades and prioritised for reforestation activities, in particular the "cash for work" scheme.

C2 Describe the Socio-economic context (PV requirement 7.2.2-7.2.5)

C2.1 Livelihood activities including access to land, natural resources and energy

Groups that will be involved in the project include subsistence farmers, pastoralists, herders and traders. Climatic hazards have a profound impact on these vital activities.

The project area is one of the poorer regions of Senegal. In Tambacounda, 61.9% of the population live below the poverty line[5] (the second highest in the country, while the national level is 37.8%). In Kayes, 30% of the population live below the poverty line and 64% under $3.10.

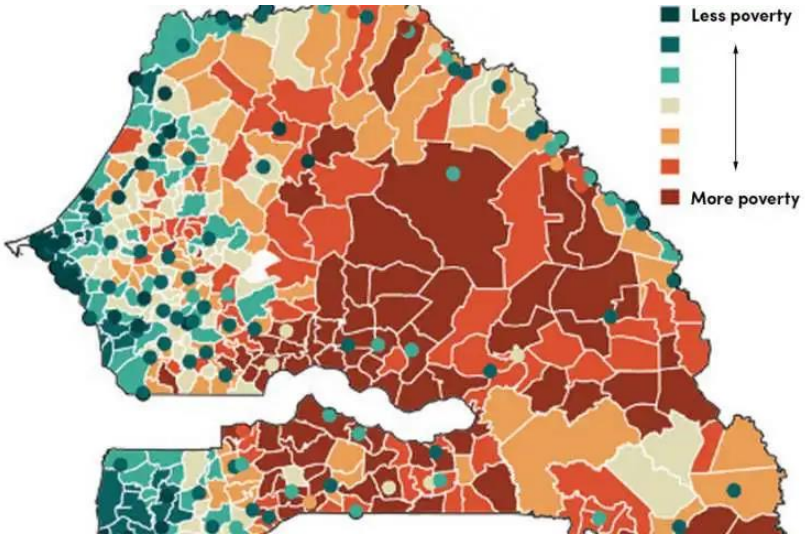

Figure 6: Poverty distribution across Senegal from *Combining disparate data sources for improved poverty prediction and mapping* Neeti Pokhriyala, and Damien Christophe Jacques

Target communities are greatly reliant on subsistence farming and sale of crops, livestock and non-timber forest products (NTFPs). A socioeconomic survey in Senegal, undertaken in October 2022, in Tambacounda, showed that 100% of respondents live under the poverty line, and 48% of households have negligible cash income - an average of $0.32 Total Value of Activities per day. Further socio-economic data collection will be carried out in both Mali and Senegal once the PDD is approved.

In Senegal the average household size is eleven (11) members in rural areas, compared with eight (08) in urban areas. The harmonised survey of household living conditions in Senegal shows inequalities in poverty levels between urban and rural areas, as well as between regions. According to data from the 2023 general population census (ANSD), the average household size in our intervention area is as follows: Bélé (13), Gathiary (21), Medina Foulbe (8), Sinthiou Fissa (14), Toumboura (11).

Mali's poverty index over the last 10 years has been 49% at national level. The Kayes region has a poverty index of 24%. The average household size in the Kayes cercle is 19.3 people per household, compared with 5.3 people per household nationwide. Farms in Mali have an average surface area of around 7 hectares, and in the Kayes region the average is 4.04 hectares, with only 63.7% having access to land. In rural areas, ownership is established by the testimony of people attesting to the fact that a piece of land belongs to a farmer, based on

[5] Based on poverty line of US$1.90 per person per day, which was updated in September 2022 to US$2.15 per person per day

historical occupation of the land by generations of a family. The method of acquisition by inheritance favours men, who are expected to keep the property in the family, over women, who are expected to marry. The telecommunications infrastructure network has improved with the arrival of telephone companies in 2007, which now serve almost the entire circle. Despite this progress, the development of telecommunications in the district is hampered by low household incomes, which makes access to telephony difficult.

Agriculture is the main activity in the project region, with rainfed agriculture and market gardening occupying more than 90% of the population. Agriculture is still rudimentary and carried out with hand tools and a few animal-drawn ploughs. The impoverishment of the soil, bad weather and rain scarcity make this low yielding agriculture. This agriculture suffers from all kinds of constraints including lack of labour, inputs, and agricultural equipment alongside poor soil and low rainfall. In the dry season, along the Senegal River valley, populations do market gardening.

On average, 61% of cash income is derived from farming and 37% from Non-Timber Forest Products (NTFPs). Alongside cash income, crop produce consumed per household is valued at an average $1,176 per year, making it the primary source of household subsistence. The most commonly reported cash and subsistence crops are sorghum (100% villages), corn (100% villages), peanut (96% villages), cowpea (45% villages).

Livestock-rearing is considered the second most important activity in the communes' economy, and is practiced in all villages as a secondary activity. The majority (74%) of farming cash income is from livestock as opposed to crops (though crop production sustains households). Livestock plays a social role in Malian and Senegalese traditions, especially during rituals, weddings, baptisms and as gifts and an indicator of wealth. Difficulties faced by herders include decreased rainfall, lack of health monitoring and disputes with other farmers over land use.

In the project region, livestock consists of cattle, sheep, goats, donkeys and horses. The animals are traditionally kept within settlements or in parks located on the outskirts of the villages. Livestock-rearing is practiced mainly for savings purposes to better secure financial capital. Livestock breeding maintains a commercial flow based on the sale of live animals for local consumption and for export. Livestock are periodically threatened by epizootic diseases. Transhumance has become a major driver of land degradation in the region as herders cut trees and branches to feed their livestock.

37% of cash income was reported as coming from Non-Timber Forest Products (NTFPs) (baobab and jujube were highlighted as key products). In Mali, the villages of Kofoulabé, Lany takoutala, and Gouthioube reported deriving more than 50% of incomes from NTFPs, 22% of villages in Mali reported deriving 20-50% of income from NTFPs and 72% reported getting less than 20% of income from NTFPs. Only 3% of income was derived in any other way. Gold panning was mentioned on the Mali-Senegal border in Diboli, Kayes as both a source of income and an environmental problem. The subsoil of the commune is very rich. It contains gold, manganese and other unexplored resources. At present, manganese is mined on the basis of a contract with the state by an Indian mining company, while gold is still mined in an artisanal manner by local people and other foreign operators. The commune benefits very little from this wealth for the moment because there are not enough economic and social benefits while the environment is suffering negatively.

Migration is an essential element in the life of the rural communities in the project region. There are seasonal migrations as farmers search for income generating activities, and herders search for pasture during the dry season. Especially around the gold mines, there is a number of migrants from Burkina Faso, Mali, Ghana, Togo, Mauritania, Nigeria and Guinea. The region is

also source of high emigration, mainly to Europe and the countries of West and Central Africa. Most of the villages have people (mainly men) who emigrated for economic reasons. This emigration provides an important source of income for many families, and a source of funds for development of basic infrastructure and social facilities in the communes.

Fishing, although it provides a living for some ethnic groups (Bozos and Somonos – ethnic fishermen from Segou and Mopti, in Mali), is not sufficiently developed. It is practised in the Senegal River with artisanal means and is important during flood periods. It is also practised in the ponds and marshes by the local populations (traditional fishing).

C2.2 Cultural and religious context

The average household size is over 10 people, which corresponds to the traditional family.

Mali

A multitude of ethnic groups can be found in the target project regions. The Bambaras, the Soninkés, the Peulhs, the Bozos, the Bobos, the Kassonkés, the Mossis, the Malinkés and the Maures are the main ethnic groups in Mali. The most dominant population in the region remains the Soninkés, followed by the Bambaras. There is not a great deal of conflict between the dominant ethnic groups and the minorities. Soninke, Bambara and Peulh are among the most widely spoken languages.

Islam is the dominant religion and is practiced throughout the region. Christians represent about 1% of the population. Some animist practices are still practiced in some localities.

The populations of the commune are strongly Islamized. The village of Dramané, in Kaméné Tambo, is home to great ulama and scholars of the Koran and has a strong influence on the other villages of the commune. The dominant Soninke culture is strongly influenced by religious rules. The events celebrated are: the feast of Tabaski, the feast of Ramadan and civil ceremonies (baptisms, weddings) and traditional ceremonies (circumcisions, initiations). In several villages, there are theatre groups formed by young people who exploit the Soninke cultural heritage.

Senegal

In Senegal, the indigenous population is divided among four ethnic groups: Malinke, Peulh, Soninke and Diakhanké. The population is 100% Muslim. The main brotherhood is the Tidianes. Housing is of the traditional type and consists of a hut topped with a conical straw roof. The rare hard constructions are most often built by immigrants. All around the dwellings are the fields. They roughly enclose the family enclosures and bear the main crops. They also house the livestock, whose manure helps maintain the fertility of the soil. The majority of villages are located along the Falémé River or near watercourses. The presence of water is the main criterion for choosing the location of villages. The human settlements are characterized by their wide dispersion in space and by the small size of the population. The main migratory movements observed are:

- the rural exodus of young people to the city in search of jobs and professional qualifications
- emigration of young people, especially Fulani (herders), to France, Gabon and Angola.

Increasingly, transhumants and Baol Baol are settling in the commune to exploit NTFPs (baobab fruit, jujube, etc.).

C2.3 Assets, incomes and poverty status

Groups that will be involved in the project in both countries live in poverty. In Tambacounda,

61.9% of the population live below the poverty line[6] (the second highest in the country). In Kayes, 30% of the population live below the poverty line and 64% under $3.10. Target communities are greatly reliant on subsistence farming and sale of crops, livestock and non-timber forest products (NTFPs). The project's socioeconomic survey showed that 100% of respondents live under the poverty line, and 48% of households have negligible cash income and an average of $0.32 Total Value of Activities (which measures the value of the output of the work, not the cash that is received for it) per day.

C3 Describe land tenure & ownership of carbon rights

C3.1 Land tenure in Mali

Land tenure in Mali is divided into two main systems: the formal, written legal system established by the state during the colonial and post-colonial period, and customary systems, which mostly pre-date the French colonial period. Due to the many inconsistencies and conflicts in their application, a legal reform process is underway supported by civil society. Land legislation in Mali[7] is based on five important principles:

- equality of citizens
- state ownership
- decentralization
- access to property through land registration and title
- recognition of customary rights.

The **formal legal system** can grant access to land through a number of mechanisms: the rural concession, transfer, rental or assignment as well as the lease, emphyteutic (requirement to improve the land through e.g. agriculture) or ordinary.

The **customary system** is however the most common in rural areas and operates in parallel to the formal system, generally granting only use rights to **smallholders,** as gaining formal title or a rural concession through the formal legal system is generally too onerous for rural households. Customary land regimes in Mali are diverse but share common principles: the pre-eminence of kinship and the principle of autochthony (original settler) based on the more or less apparent pre-eminence of first installed, gerontocracy (governed by the elderly) and its corollary the principle of seniority, the principle of non-mixing of gender with a certain discrimination of women, and the sacralization of the earth. Despite the existence of these principles common to the various customary systems, the rules of access to land vary according to local issues, socio-historical specificities and the influence of state law.

In the Kayes region the principle of autochthony is followed. The predominant form of access to land, common to all zones, is intra-lineage access, which can take two main forms: allocation of a portion of lineage land or inheritance. Family members have the right to be allocated a portion of the family land to carry out farming activities. Most local people farm family land in this way. As land ownership is passed down within families, inheritance not only provides access to the land, but also makes it possible to manage it in accordance with customary rules, according to which land is managed within the family.

Community lands are lands located in forest and non-forest zones over which a community has rights or access. These lands have an agricultural, agro-pastoral or forestry vocation and

[6] Based on poverty line of US$1.90 per person per day, which was updated in September 2022 to US$2.15 per person per day

[7] World Bank/IPAR/FAO (2016) CADRE D'ANALYSE DE LA GOUVERNANCE FONCIERE MALI.

the law recognizes the rights and customs of community members as long as they are not in opposition to it. However, these lands are generally not clearly identified due to vagueness and legal ambiguities and regulations, as well as the lack of spatial delimitation. In addition, there are sometimes conflicts between different users, due to the exercise of the same activities on the same space (e.g. farmers and pastoralists). The legal definition of the 'community' is not always clear as to who the rights-holders representatives are.

C3.2 Land tenure and carbon rights in the Project Region in Mali

In the Kayes Cercle, the geographical area of the project and a subdivision of Kayes Region, customary law prevails in the exercise of tenure rights. Family descendants of village founders hold the use rights to community land surrounding the village under the **autochtony principle**[8]. In the communes of Ambidedi and Same Diomboma, the rural villages that have committed to project interventions hold the user rights of the land identified where the enrichment planting will be carried out. Alongside the competent authorities at the commune level, the project will work to have the customary user rights validated through a Municipal Council decree. Community members will contribute both their land and time invested in planting and seedling protection activities, defined in land management plans and village land charters. In return communities (lineage) will own the rights to the carbon sequestered through the project, as well as NTFPs generated.

The project has received a no objection for its implementation from the Malian government (see Annex 3).

C3.3 Land tenure in Senegal

In the 50 years since independence, Senegal has pursued a decentralized model of governance. Land legislation and codes concerning natural resources rely on the communes and especially on rural communities. Senegal 's formal legal system, including the National Domain Law of 1964, the 1972 Rural Community Law, and the Decentralization Law of 1996 (as well as multiple decrees) have decentralized land administration functions to a subnational system of regional and local governing bodies.

Under the National Domain Law of 1964, the key institution regulating land management in rural communities is the **rural council** which is elected by the population of a rural community, a jurisdiction comprising several villages, and has the following responsibilities**:**

- *De facto* delegated authority to administer and allocate land and natural resources on land in the national domain classified as territorial land (*zones de terroir*), which include agricultural land (including pastureland) and non-classified forests[9], though some oversight of the council actions is still maintained by the central government.
- Responsibility for land-use planning, establishing land productivity standards with relation to land-use plans, managing land allocations and unallocated land, maintaining public areas, and resolution of land disputes.
- Responsibility for maintaining land records.

[8] The principle of autochthony, based on the more or less apparent pre-eminence of first settled peoples, constitutes one of the frameworks of the rural land organization. In the name of this principle, the village chieftaincy as well as the management of the various social organizations (in particular age groups), are entrusted to the descendants of the founding family. Moreover, they have village land control. They ensure the allocation of land to people from elsewhere ('allochtones' who arrived after them).

[9] The Rural Community Law of 1972 (*Loi relative aux Communautés Rurale*s) that provided the structure for the elected rural councils (*counseils ruraux*) and the ambit of their authority and the Decentralization Law, Law No. 96-06 of March 22, 1996, which clarifies the subnational governance structure at the regional and commune levels. As the representative of the rural community, the rural council has the authority to allocate use-rights to land.

The National Domain Law thus permits rural councils to allocate territorial land for use under customary principles so long as the land is used productively. The councils do not grant a permanent right of ownership, but rather an indefinite right of use based on development and granted to the residents of the rural community. These assignments cannot be the subject of any form of transaction such as sale, rental or pledge. The sub-prefect, as the representative of the State, must approve the assignments and de-assignments by the rural council[10].

C3.4 Land tenure and carbon rights in the Project Region in Senegal

There are no national or jurisdictional results-based finance mechanisms for GHG emission reductions or removals that overlap with the project region or project interventions, and no regulations that nationalize or otherwise limit ownership of carbon rights are in place. It is therefore assumed that ownership of carbon rights follows the same customary systems as for land rights. In the communes of Bélé and Sinthiou Fissa, the rural villages that have committed to project interventions hold the user rights of the land identified where the enrichment planting has and will be carried out.

Alongside the competent authorities at the commune level, the project will work to have the customary user rights validated through a Municipal Council decree. The project works alongside customary land rights in the target zone. For communal land, the project will validate the land rights through the inter-village committees and through communal authorities to ensure the land use is formally recognised. The project is confident that this approach will be recognised by all stakeholders. The georeferencing of the agroforestry and forest enrichment sites carried out by the project provides a good basis for the start of the formalisation of land use rights. The owners of these lands have been recognised by the village communities as the owners of these areas. The agroforestry activities will take place on inherited familial land. There are no land deeds that formalise the ownership of land. Within the project framework, the village chief will be able to confirm ownership and use through Plan Vivo agreements that the project will develop with different parties.

Several steps are taken to formalise rights of usage and rights of access from the very start and to secure this for the long term. In particular, the 'plan d'amenagement et de gestion' (PAG), the management plans, are established to ensure communities receive the recognition (the PAG are validated at the municipal /district level) of how these areas are to be managed and made more productive. The 'charte foncier' the bylaw document is in addition a very precise set of role and responsibilities that helps vulnerable communities access resources and ebnsure the way all users reap benefits from the lanscape does not affect its productivity.

Community members will contribute both their land and time invested in planting and seedling protection activities, defined in land management plans and local land charters. In return communities (lineage) will own the rights to the carbon sequestered through the project, as well as NTFPs generated.

For the implementation of the activities, Tree Aid has developed a risk management strategy to ensure that smallholders and communities retain land tenure and carbon rights to the land. The project team has carried out community surveys to better elucidate the status of the land made available. Farmers who volunteered for the agroforestry activities were selected on the basis that they had some form of recognised land ownership within the community. All the agroforestry plots were georeferenced. As for the forest enrichment sites, they were identified by the communities through the holding of general assemblies in all the villages bordering the forests. These meetings made it possible to ensure that the communities had rights over the land. TreeAid feel that the risk is relatively low due to the fact

[10] https://landportal.org/fr/book/narratives/2022/senegal accessed 15 December 2022

that the traditional approach to land management and use, which the project will work with, has existed for many generations. The specific sites identified through the initial assessment were also chosen due to the low risk of land tenure conflict and will be held to signed agreements, which specify that the land must be maintained and protected for 30 years.

A request for a no objection opinion has been sent to the competent services in Senegal. The process is underway. In addition, a tripartite convention is also being initiated between the Ministry of the Environment, Tree Aid and the NGO La Lumière for an institutional anchoring of the project.

Part D: Project Interventions & Activities

D1 Project interventions

Project activities undertaken in the Project Region include two different "intervention types": ecosystem restoration and improved land use management (agroforestry system).

D1.1 Ecosystem restoration through enrichment planting on communally-owned savanna areas.

The project's primary objective is enrichment planting to restore large areas of degraded savannah and wooded savannah with the use of native tree species with high restoration and NTFP potential. Planting sites and tree species to be used are agreed through a participatory process in collaboration with local communities, with lists of species provided in Part G: Technical Specification. The purpose is to assist the recovery of these areas through the reparation of ecosystem processes, productivity and services. Tree Aid's approach combines enrichment planting of native woody species with community-led soil and water conservation (SWC) practices.

The approach that Tree Aid established with World Agroforestry (ICRAF) under the Drylands Development Programme (DryDev) has been identified as a cost-effective practice for combating desertification, and for restoring agro-sylvo-pastoral systems11. This approach broadly involves building farmers' skills in SWC, including half-moons to collect water at the base of trees, or Zai pits to improve water retention in the root zone, and soil fertility improvements, including compost making, liquid manure and crop rotation. This integrated land restoration approach has been applied successfully since 2013 in Burkina Faso, Mali and Niger. It is well suited to different landscapes, highly adaptable to varying ecological and socio-economic conditions and therefore fit for replication and scaling-up.

D1.2 Promotion of agroforestry system on farmland

The main objective of this activity is to guide farmers in the adoption of agroforestry systems to restore and recover degraded farmlands, using strategies that reconcile conservation with social benefits. Farmland restoration is achieved through planting native species with strong NTFP potential, selected by communities (see Technical Specification for species list), on fallow and agricultural land. Participants are encouraged to combine trees with crops. The yield from agricultural land with trees is regularly higher than traditional cultivated land, and soil conditions are often better. Agroforestry will provide an alternative to the current farming practises. SWC practices will be promoted alongside agroforestry, in order to improve water

[11] Funded by the Ministry of Foreign Affairs of the Netherlands and executed by World Agroforestry (ICRAF) and implementing partners such as Tree Aid, DryDev has developed farmers' skills on the conservation of water and soil, compost production and soil enhancement, seedling production and reforestation; and established local organizations to better link farmers to markets and financial services. In the Sahel, Dry Dev worked in Burkina Faso, Mali and Niger.

harvesting and water retention around the seedling roots and farmland. This practice significantly improves the survival rate and establishment of trees but also improves farmer's understanding of the potential improvements in water retention and in yields these SWC practices can have.

The activities put forward as project interventions are only eligible for smallholder farmers or communities with land where tree planting is possible or where community have some form of long-term customary user rights.

The theory of change, developed in light of baseline data collection with communities, and validated during regional and site level workshops is visualised in Figure 7 and Table 8. It focuses on the two-pronged approach of the project- agroforestry and enrichment planting. In agroforestry sites, the benefits will be through access to trees that can provide NTFPs and ecological benefits for the land being used for agriculture, which should lead to improved yields (Table 9). In the land restoration areas, communities will be given access to funds for investment in community schemes or as a credit mechanism for community members to use for their own priorities. or investment in community schemes or as a credit mechanism for community members to use for their own priorities.

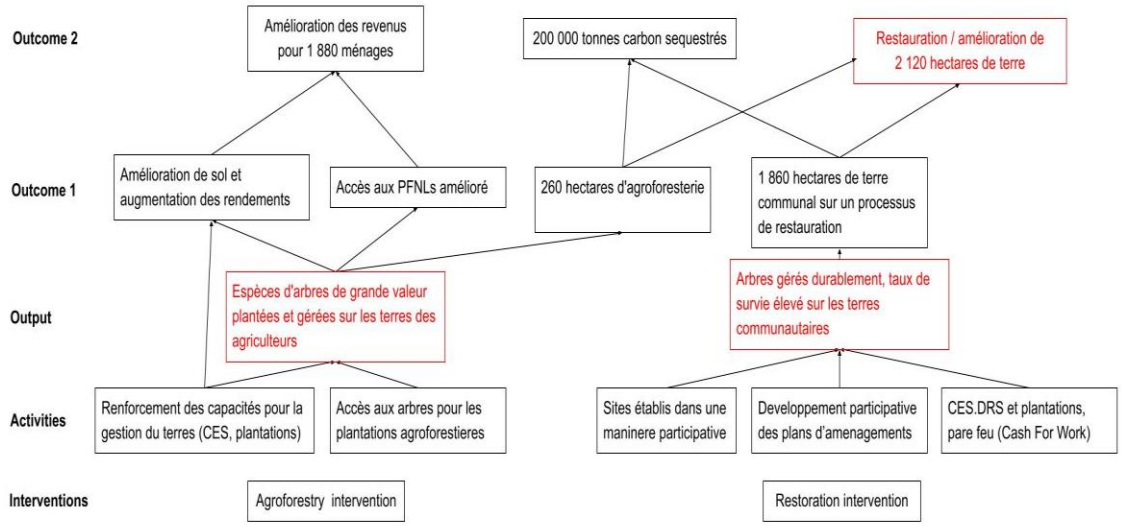

Figure 7: Theory of Change

Table 8: Project Objectives

Aim: Restoration of 2,120 hectares of degraded communal and farmland in target areas, for the benefit of communities through improved farming and access to Non-Timber Forest Products (NTFPs), and finance through PES		
	Description	**Assumptions/Risks**
Outcomes		
Carbon Benefit	243,500 tonnes CO2e sequestered	The growth rate and survival rates of trees meet expectations to sequester target tonnes of carbon. Risk buffer is sufficient.
Livelihood Benefit	Increase in revenues for 1,880 households	Benefits of tree planting derive a long-term benefit to incomes from NTFPs or improved agricultural yields.
Ecosystem Benefit	Restoration/improvement of 2,120 hectares of land with associated ecosystem benefits including habitat creation, improved air quality, water supply, soil quality	Survival rates of trees enable benefits to be felt on planted land, and there is no destructive leakage to other sites that impact ecosystem benefits. Numbers of hectares are sufficient for planting to achieve 243,500tCO2e. SWC and firebreak work

		protects planted trees.
Outputs and activities		
Output 1	Sustainably managed trees with high survival rate on 1 860 hectares of community land	Quality of seedlings and capacity of communities and farmers is sufficient to obtain high survival. Planting sites are maintained and managed. Management plans and training will be put in place to manage. Sites will be identified in participative way.
Activity 1.1	Enrichment Planting sites established in a participatory manner	Availability of good quality seedlings will be ensured through development of local nurseries. Communities will go through a lengthy process of site identification to ensure no conflicts exist.
Activity 1.2	Participatory development of land management plans	Committees established by the project will be heavily involved in developing management plans that are complementary.
Activity 1.3	Soil and Water Conservation and plantations, firewall (Cash For Work)	Communities are motivated to mobilise and carry out the work. The quality of the work is sufficient to realise objectives. The project will provide cash for work to motivate participants, and the project will conduct training to ensure quality.
Output 2	High-value tree species planted and managed on farmers' land	Farmers are motivated by the species on offer to receive, plant and protect them. They see the long-term benefits (outside of any modest PES payments).
Activity 2.1	Access to trees for agroforestry plantations	Availability of good quality seedlings. Any purchased seedlings will be monitored on-site, and any unsuitable ones rejected. Farmers have sufficient land and motivation to plant and protect trees.
Activity 2.2	Capacity building for land management (SWC, plantations)	Farmers are motivated to mobilise and carry out the work. The quality of the work is sufficient to realise objectives. The project will raise awareness of the benefits of the trees, and support with training and follow-up to ensure sites are well managed.

D2 Summarise the project activities for each intervention

Agroforestry and enrichment planting activities take place through facilitation by local teams. In Mali, the Tree Aid team – made up of a project coordinator and three facilitators (that work across the villages day-to-day), based in Kayes, works with local stakeholders to identify suitable farmers (agroforestry) and communal sites (enrichment). The trees are either purchased or grown through project nurseries for distribution and planting. The same approach is used in Senegal, where the partner team at La Lumière, provide the support to ensure sites are identified, trees are available and the communities are mobilised to receive and plant the trees.

This process specifically involves: the development of committees to agree enrichment planting sites, and to represent agroforestry individuals; development of forest management plans for communal sites and agreeing expectations with agroforestry participants (to be formalised through plan vivo agreements).

Cooperatives are established in each village involved in enrichment planting, which will facilitate management, cooperation and mobilisation of the community, and for payments in future. Equipment and training will be provided to the groups to aid in land preparation for planting and then maintenance of the sites thereafter.

Activities also include strengthening the functioning of cooperatives and committees, establishing surveillance brigades to watch over the sites, and to raise awareness across the communities (and those neighbouring) about the new management plans and any associated byelaws. This will provide a strong foundation for the local communities to manage the planting sites.

Table 9: Description of activities

Description of activities				
Intervention type	**Project Activity**	**Description**	**Target group**	**Eligible for PV accreditation**
Improved land management	Agroforestry	Intercropping fruit trees and nitrogen-fixing trees with crops. Application of soil and water conservation practices.	Smallholder farmers	Yes
Ecosystem restoration	Enrichment planting	Tree planting on degraded savannah and wooded savannah with the use of native tree species with high restoration and NTFP potential. Application of soil and water conservation practices.	Community groups	Yes
• Note that for each intervention eligible for PV certification, a technical specification must be included in Part G. Several project activities may contribute to a single project intervention • Please also list the project interventions (and major activities) for which Plan Vivo certification will not be sought				

The project plans to plant trees in two ways:

- 1) Enrichment planting on communal land that is land under customary and traditional authorities. The approach on communal land will be to identify degraded sites that are considered prime areas for reforestation that a village (or surrounding villages), with user right access, agree to manage and protect. The tree species planted on these sites will typically be indigenous and drought-resistant, with a strong preference for those with economic potential.

  2) Agroforestry sites on existing farmland: these will be identified with individual volunteers that want to adopt agroforestry on their farmland. Fruit trees and trees that provide economic potential will be planted here.

For the large-scale enrichment planting, in 2022, 5,328 ha (Senegal) and 9,569 ha (Mali) of communal land was identified through a site selection process for potential enrichment planting (Table 10, Figure 8 and Figure 9). The extent of enrichment planting sites is determined through further community consultation and land management planning.

Table 10: Communal land sites identified with communities in Senegal and Mali forfor sustainable land management and identification of enrichment planting sites:

Country	**Communal land for potential planting**	**Hectares**	**Associated villages**
Mali	Site 1	5,959.11	Bada Baldinkaré Sinsincoura Kossoumalé

			Kofoulabé Marena Madina
Mali	Site 2	3,610.22	Ambidedi rive gauche Moussala Takoutalé/Walikané
Senegal	Barsafai	823.53	Diabougou_mossi_(kip_souleye) Sakho coundo Séno Diaral Soumbroudaka Samba colo Sinthiou Samba Bababé Fijibidji Yérimalé Goudiourou Séoudji Youpé pathé
Senegal	Boulé Bané (Youpé Hamady)	4,504.72	Youpé Hamady Arigabo Sinthiou Fissa Gourel Boul
		14,897.58	

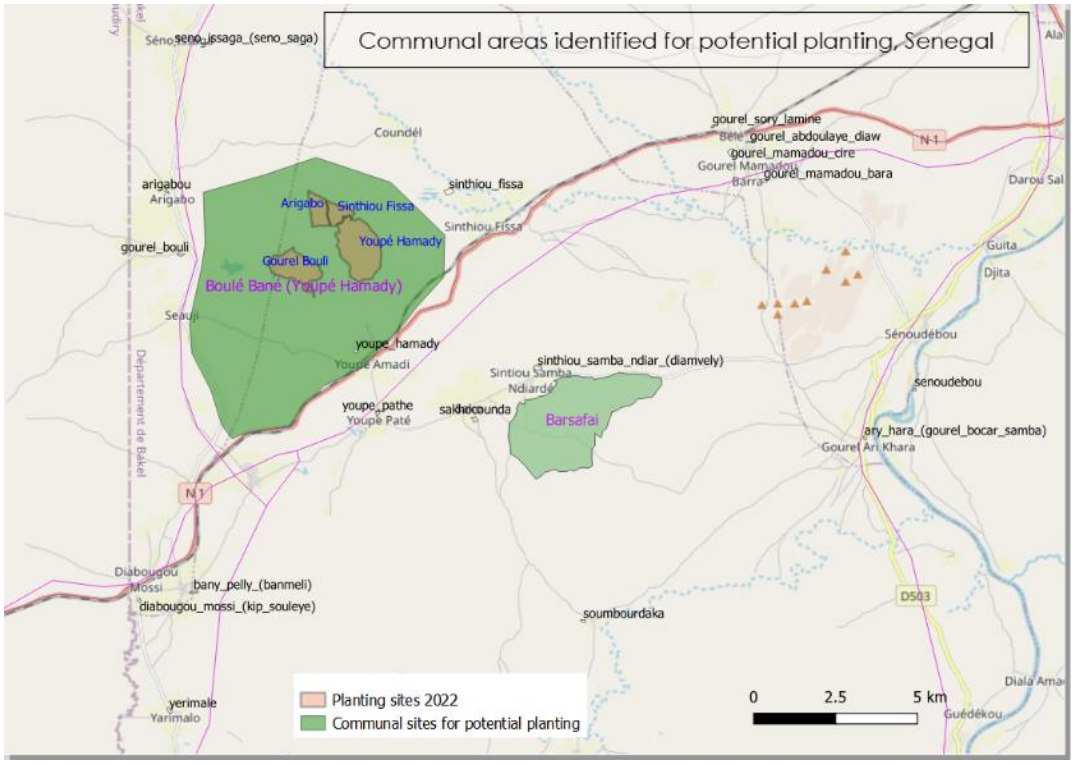

Figure 8: Communal areas identified for potential planting, Senegal

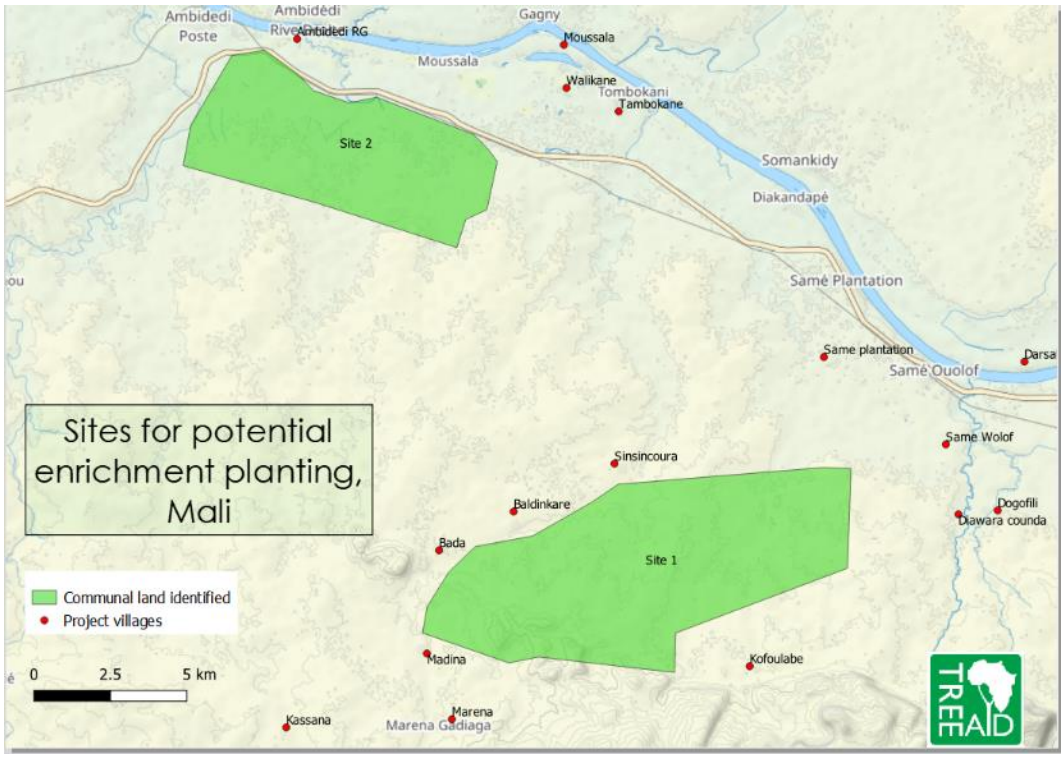

Figure 9: Sites identified for potential planting, Mali

For agroforestry, in 2022, 214 small-holder farmers in Senegal and 322 small-holder farmers in Mali (322 farms on 250 ha) voiced interest in developing agroforestry on their farms. From digital data collection survey forms in ODK format, done with farmers to georeference the site, the 214 farms in Senegal identified 264.95ha and the farmers in Mali identified 250ha. The

mapped area averages 0.96 ha per farm. Figure 10 and Figure 11 show the location of the farm sites identified for the agroforestry activity. The list of farms included in the project, along with details of the specific intervention are included in Annex 4 Agroforestry sites 2022. This number may increase in future, should more agroforestry participants decide to volunteer.

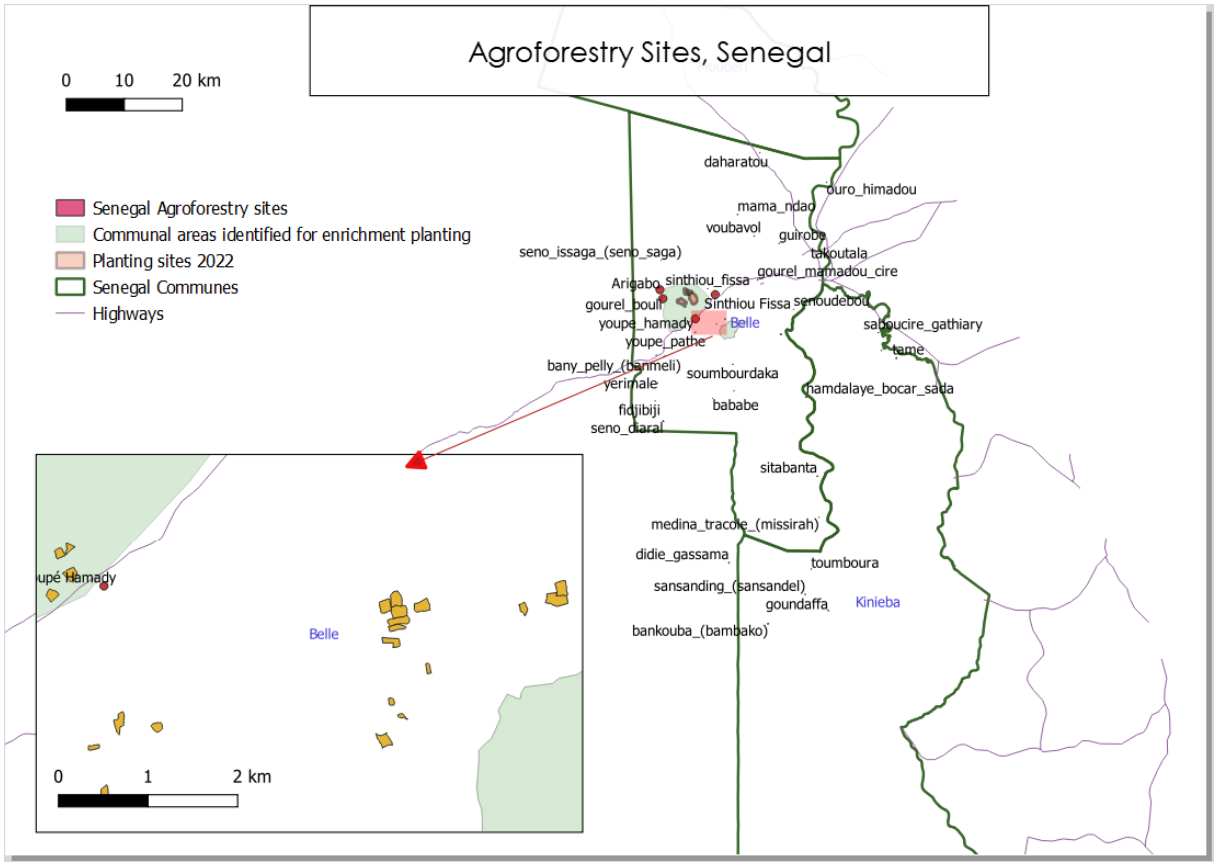

Figure 10: Map showing agroforestry sites identified in Senegal

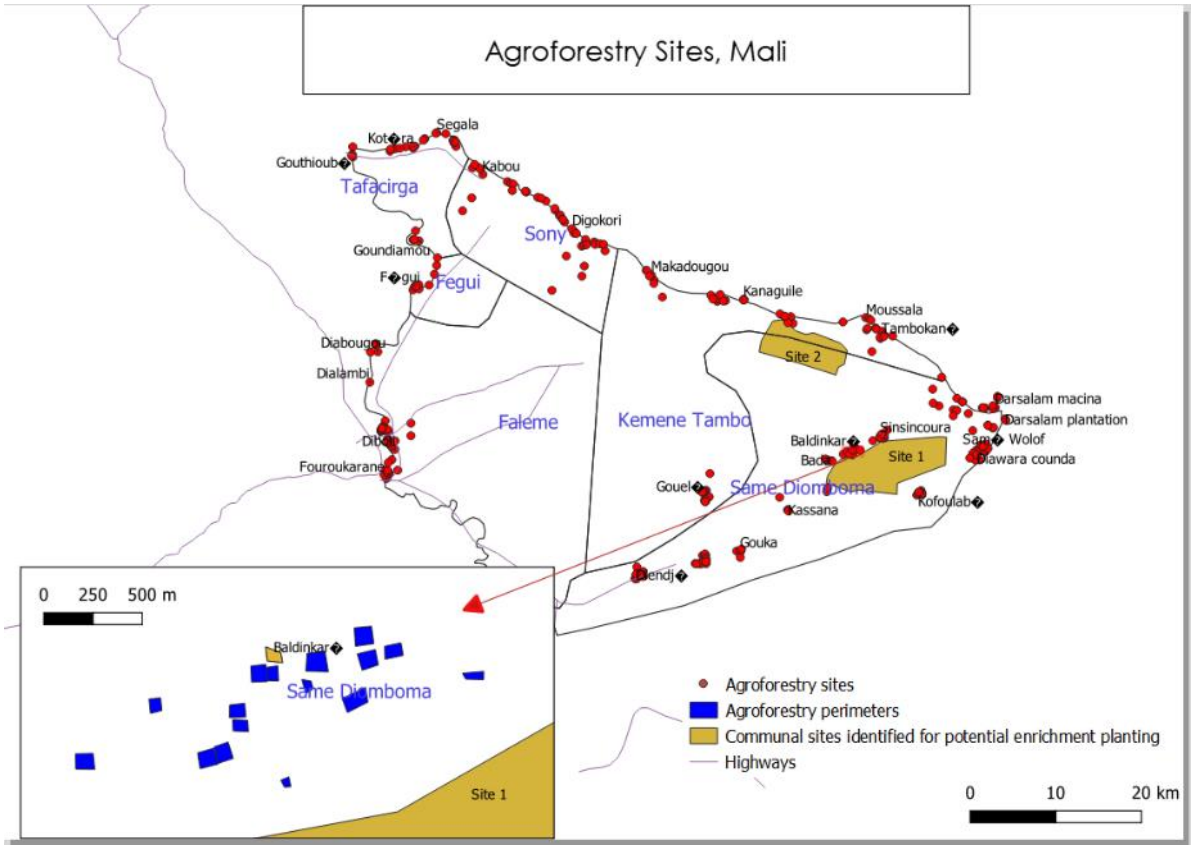

Figure 11: Map showing agroforestry sites identified in Mali

Phase 1 sites

Phase one of the project is targeting 2,120 hectares of land for enrichment planting and agroforestry planting. Approximately 1,8850 hectares of degraded savannah and wooded savannah will be agreed with local communities for enrichment planting. And approximately 471hectares of land will be identified for the adoption of agroforestry systems on farmland. There are no legally designated/protected conservation areas within or overlapping to the Project Region in Phase 1 in either Senegal or Mali.

Phase 2 sites

In the second Phase of activities, in Senegal, work will be expanded to include 6 additional communes in Tambacounda Region - three in the arrondissement of Goudiry: Koussan, Dougue and Boynguel Bamba and three in the arrondissement of Bakel: Ballou, Gabou and Moudery. In Mali, Phase 2 will include the communes of Bangassi and Gory Gopela in the arrondissement of Kayes, Séro Diamanou in the arrondissement of Diadoumbera and Maréna Dioumbougou in the arrondissement of Segala. Sero Diamanou and Manega Diombougou contain the Ramsar site of Lac Magui, a permanent freshwater lake, receiving run-off from several creeks. The lake supports water retention, groundwater recharge, flood control and is important in maintaining the general hydrological balance of the Senegal River basin. The lake is an important site for migrating birds with over 95 species identified, including Garganey *Anas querquedula*, Northern Pintail *Anas acuta*, Glossy Ibis *Plegadis falcinellus* and Purple Heron *Ardea purpurea*. The lake is also an important source of food and spawning ground for fish from the River Senegal.

Since participants will be encouraged to form farmers groups, it will be easier for Tree Aid to organise capacity building workshops to provide them with extra training in addition to the

required sessions on Plan Vivo sustainable management systems. Indeed, the participants are already receiving and will continue to receive training on sustainable land management, sustainable energy use, farming as a business. In general, these groups will have the right to access any additional activity that is facilitated by the project. Monitoring and management of these activities will be done in the similar way to other groups without Plan Vivo intervention.

D3 Effects of activities on biodiversity and the environment

This Plan Vivo project promotes indigenous and well adapted tree species to the environmental conditions present in the intervention area. By so doing it create good environment for biodiversity and ecosystem management. Trees provide both environmental and livelihood benefit to participating communities. Trees conserve soil moisture, reduce soil erosion, act as windbreak and are habitats for birds, insects and some small animals. Specifically, the project is generating, the following biodiversity and environmental benefits

- Restoration, protection and management of degraded and threatened ecosystems
- Promotion of indigenous tree species, the expansion of native biodiversity areas
- Regulation of micro-climates
- Water purification
- Soil stabilisation and improved moisture retention on slopes

In a recent completed project in Mali biodiversity was improved through activities linked to regeneration, planting and improved management and governance. A baseline endline comparison showed that six tree species returned to the restored sites, some of which identified by the communities as threatened. A study on the distribution of trees by diameter class also showed that improved management of the restored sites helped reduce the loss of trees. In 2020, the percentage of trees above 30 cm rose to 22.1% from a figure of 16.8% in 2017. Furthermore, with improved forest management, there is the appearance of larger diameter trees in the 80-99 cm category in 2020.

Part E: Community participation

E1 Participatory project design

This section describes the participatory planning process that Tree Aid put in place to design and implement the Olympic Forest Project.

E1.1 Concept development

Throughout 2021, Tree Aid worked with La Lumière in Senegal and the Tree Aid Mali team to identify suitable communes and villages to work with for the planting of the Olympic Forest. *Ingenierie pour le Développement au Sahel*, a consultancy firm, also provided stakeholder consultations to assess the situation in each commune. This process helped to both identify suitable villages, but also get feedback from villages as to the project approaches. Through this, the project design was changed, for example, to reduce the planned target of agroforestry trees and hectares due to the lower level of agricultural practice in the target region. Specific management plans will be developed for enrichment sites by community representatives organised into committees. For the agroforestry interventions, representative committees will also be established to allow for consultation over the project approach and Plan Vivo Agreements.

E1.2 FPIC and participatory design process

The Olympic Forest Project has been developed through a participatory and inclusive approach. To ensure a high level of participation at the project design stage, Tree Aid, with the backing of TLLG, developed a Free Prior and Informed Consent (FPIC) Protocol to guide and support project field staff (see Annex 5). Activities in this protocol start from the project design phase and continue into the implementation phase. FPIC encourages bottom-up project planning and generates a stronger sense of buy-in. It also provides a level playing field for local communities to discuss, negotiate and consent to the terms of the project and the interventions on their land. A signed FPIC for the community of Arigobo is attached in Annex 6. The protocol is aligned to the Plan Vivo Standard requirements.

E1.3 Identifying target groups and support organisations

The implementers of the project are primarily the individual farmers and village communities willing to undertake tree planting while adhering to the technical specifications. However, the successful implementation of the project will involve the participation of various actors:

- Rights-holders: Included village councillors, village chiefs and other village rights-holders. Through representation at regional and village level, they have been involved in the design, set up and implementation of the project.
- The owners and implementers of the agroforestry interventions: To participate in these activities the farmers have expressed their willingness by committing to plant trees and to manage their natural resources according to the conditions discussed during consultation meetings (see Figure 20).
- Village authorities: villages chiefs and village councillors have all been involved in the decision making processes of each participating villages (see Figure 12)
- Management committees: for management of natural resources – forest resources, livestock, market gardeners, fishermen.
- Support organisations: these include farmer-formed and owned groups/networks, Tree Aid, La Lumiere, government entities, TLLG, the Plan Vivo Foundation. Their main roles are to facilitate farmers to prepare and implement plans that can be acceptable as per Plan Vivo standards and thus be able to trade carbon credits (Plan Vivo certificates).

Figure 12: engagement with local village councillors

Figure 13: Village de Sambocolo – selection of families interested to participate in the project

Figure 14: Meeting for the establishment of a cooperative for the Sakho forest site and preparation for the delimitation of the site, Senegal

E1.4 Target group governance

Depending on the intervention type, participants to this Plan Vivo project are organised to form community groups with leadership (chairperson, secretary and treasurer). All groups will open bank accounts through which their payments are channelled. Bank account signatories are selected among the group members (usually are three). Community groups which are participants of Plan Vivo project, are represented by appointed personnel (teacher, religious leader, village councillors) and this one joins the respective group in the area. The representative from Community Group gives the feedback to whatever is done/ discussed or decided by the group. The decisions on how to use the fund received by the community group is done during group meetings.

E1.5 Overcoming barriers to participation

This section describes the barriers to participation and Tree Aid's approach to overcoming these.

Barriers to participation:

- Customs prohibiting land ownership by women
- Customs affecting women and youth participation
- Low level of knowledge on importance of trees
- Weak financial and human capital.

Addressing the barriers:

- Gender mainstreaming in the community project
- Awareness creation/ facilitation on the importance of trees
- Awareness raising on nature resource management and the potential women have in developing income opportunities through NTFP value chain development

- To address the lack of capital, Tree Aid highlights the pivotal place of women and other socially excluded groups to ensure that they are accepted and supported.
- Capacity building and training in functional areas such as finance, literacy skills, marketing, production and managerial skills are also offered.
- Access to credit by women at the level of micro and small-scale enterprises is facilitated through innovative programs and financing arrangements that go beyond the conventional approaches.

At the structural level, there is a high level of female participation in forest protection and management activities through community organisations. However, the leadership of these community organisations is strongly represented by men, and women are under-represented in most of the community organisations with a mixed configuration. This implies that great efforts will be put in place by the project to ensure the real inclusion of women in the decision-making, management and local governance of forest resources.

Specifically we will work on 3 interlinked and mutually reinforcing areas:

- Improve the conceptual integration of the gender approach in the project – Activities here will work to:
  - Achieve balanced results for each category of participant (M/F): to ensure equity;
  - To identify as many women as possible in the target groups;
  - Develop actions to fight against gender biases related to women's success;
  - Specifically encourage the leadership of women and men role models

- Strengthen the capacity of stakeholders to effectively integrate the gender approach at the level of project actors – Activities here will focus on:
  - integrating the specific needs of men and women in the formulation of land charters (equity);
  - facilitating the access of dynamic and literate women to positions of responsibility and decision-making;
  - Equitable access of men and women to positions of responsibility in the reorganisation of forest management structures, consultation frameworks and colleges of wise men (participation, decision-making power, strategic interest);
  - Maintain women in the post-project process (sustainability);

- Women's empowerment – Activities here include:
  - Mobilising and organising women to facilitate their access to forest products;
  - Take stock of profitable IGAs for women and men based on forest products;
  - Supporting women to develop diversified IGAs based on forest products)

It's essential to provide the means for women to improve their livelihoods and increase resilience to climate change. Empowering women can make a big difference in increasing community resilience and reduce food insecurity. Women will be supported to participate in governance structures, increasing capacity and their sense of ownership over natural resources, increasing their voice and decision-making power. Women's capacity will be built in business skills, who will be empowered by contributing directly to household income, alongside improved skills and confidence. Activities will be adapted to take into account the time constraints of women/girls when setting the training/awareness raising schedules.

E1.6 Ensuring stakeholder representation

To ensure that the project addresses the needs of local resource users and that their input is given in the participatory planning activities in an effective manner, the project set up two levels of rights-holder representation, one at the Regional Steering Committee and one at the Inter-village level Committee:

- In the Regional Steering Committee, stakeholder representatives are nominated and put forward. Members of this committee include rights-holders participating in the project, farmers with user-rights to the communal land, representative of village government, government institutions, and local organizations. Between the month of October and December 2022 the project set up two consultation workshops in both Mali and Senegal. At this regional level the members engage and discuss project design activities such problem analysis and development of the Theory of Change, propose project intervention; and identify and discuss potential environmental and social risks/impacts. Members also look at Plan Vivo agreements, benefit sharing mechanism, and how a functional grievance mechanism can be set up in the project (Annex 7).

- In the Inter-village Committee, stakeholder representatives are nominated and put forward to represent rights-holders at the village/inter-village level. Different socio economic and demographic groups are included, these comprise of community elders, young generations, women, NTFP collectors, hunters, gatherers, and other groups (in the present intervention areas this included pastoralists) that potentially will be affected by the proposed project interventions, who have access (and management rights) to the Project Region. In Senegal, the project set up 2 *inter-village natural resource management committees*, one covering the Barsafai site and one the Boulé Bané (Youpé Hamady) (included in Annex 8 the minute reports). In 2013, these committees will evolve into a "*Société coopérative de gestion forestière*" as per directives coming from the "*Organisation pour l'Harmonisation en Afrique du Droit des Affaires" in particular the revised uniform acts on commercial companies and economic interest groups*. At the regional level a Union des sociétés coopératives de gestion forestière will be set up. For the agroforestry activities, a Société coopérative des producteurs agroforestiers is set up at each commune of project intervention.

Figure 15: Inter-village committee meeting, Senegal

In Mali, provisional village committees have been set up in the ten villages. The members of the provisional committees will be deployed as village delegates at the constitutive general meeting of the forest management cooperative for the forest block. At the end of the process, a forest management cooperative will be created. This organisation, with a board of directors, will be representative of all the villages bordering the same forest block. These Inter-village level committees are informed of, discuss and validate the design activities and content put forward by the regional body. They will also design activities including the development of land management plans, and Plan Vivo agreements. Substantial content of the management plans and Plan Vivo agreements (such as grievance mechanism, benefit-sharing mechanism) will be derived from inputs given by the Regional Steering Committees.

E1.7 Site selection

To support the successful identification of intervention sites in both countries, the project developed a guideline document to help advise and structure discussions with communities. The document goes through a set of questions from within a broad range of attributes (climate, biophysical, socio-economic). Through community group meetings, where project objectives and goals were indicated, project staff and communities identified a set of attributes considered 'critical' in the choice and selection of sites to ensure the project is successful, as well as a set of additional criteria linked to biophysical and socio-economic suitability that are considered desirable.

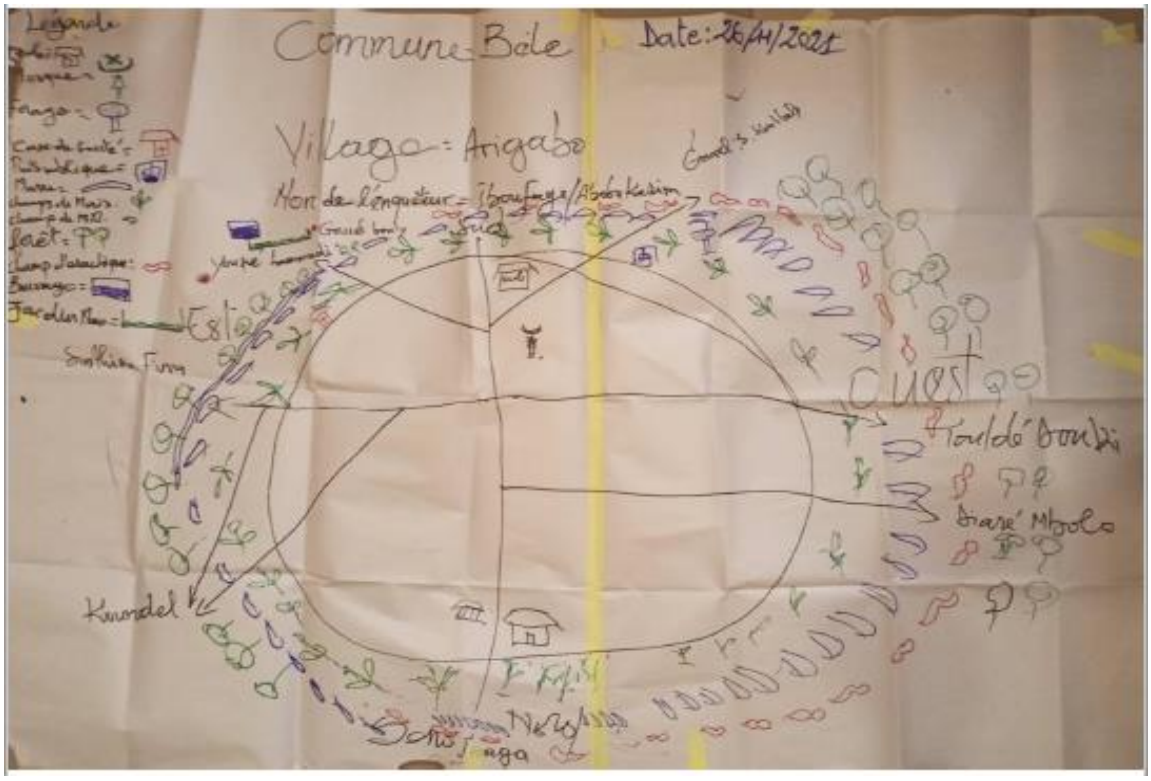

Figure 16: Participatory mapping exercise carried out with potential villages

Critical indicators are the ones that would negatively affect the successful implementation of the project. A key factor here is 'land status' that consider land tenure and land user rights. Assessing sites where tenure is not formalised, disputes exist and where risks of land tenure disputes are considered very high with communities will raise a red flag. If and when red flags are raised in the eligibility criteria assessment with communities, the site under review is not considered for further assessment in the biophysical and socio-economic suitability screening process.

All the sites that were retained in this Plan Vivo project, went through a selection criteria process. All sites were either smallholder land or community-owned land with some form of long-term customary ownership. Land tenure or user rights were considered secure and stable by the communities as well as the ability to commit to project interventions for the duration of the project. Evidence of proof of land and customary ownership was provided by local leadership, all in line with the national legislations.

Households that wish to join the project do so during village meetings and register their name with the project team in a simple verbal application. The project team record their generalities and discuss with the participating household the list and number of tree species of interest to them.

Figure 17: community discission in which people can request consideration to be part of the project

Figure 18: Meeting with communities to set up cooperatives in Goudiourou and Bani Pelly

At a later stage, using a Global Positioning System (GPS) device, the area and perimeter of the site are measured and recorded including the GPS points. A sketch of their site is then drawn on paper (the plan vivo) and the GPS points of the farm's corners and of the centre are also recorded. These maps are subsequently archived at Tree Aid project office and stored electronically in suitable GIS format.

E1.8 Environmental and social risk assessment

E&S risks were identified throughout early consultations and discussions with stakeholders from different villages during the identification and selection process. Furthermore, these were presented during workshops at regional and project site level. All feedback has been consolidated in the E&S document (Annex 9).

E1.9 Grievance mechanism

The grievance mechanism used Tree Aid's basic approach as a starting point and was presented to relevant stakeholders at Regional and Project Site workshops. Amendments were made to make the process more specific to the project governance structure, with recognition of partner, Tree Aid Mali, Tree Aid regional (Burkina Faso) resource. The final grievance mechanism (Annex 10) was presented to participants and approved.

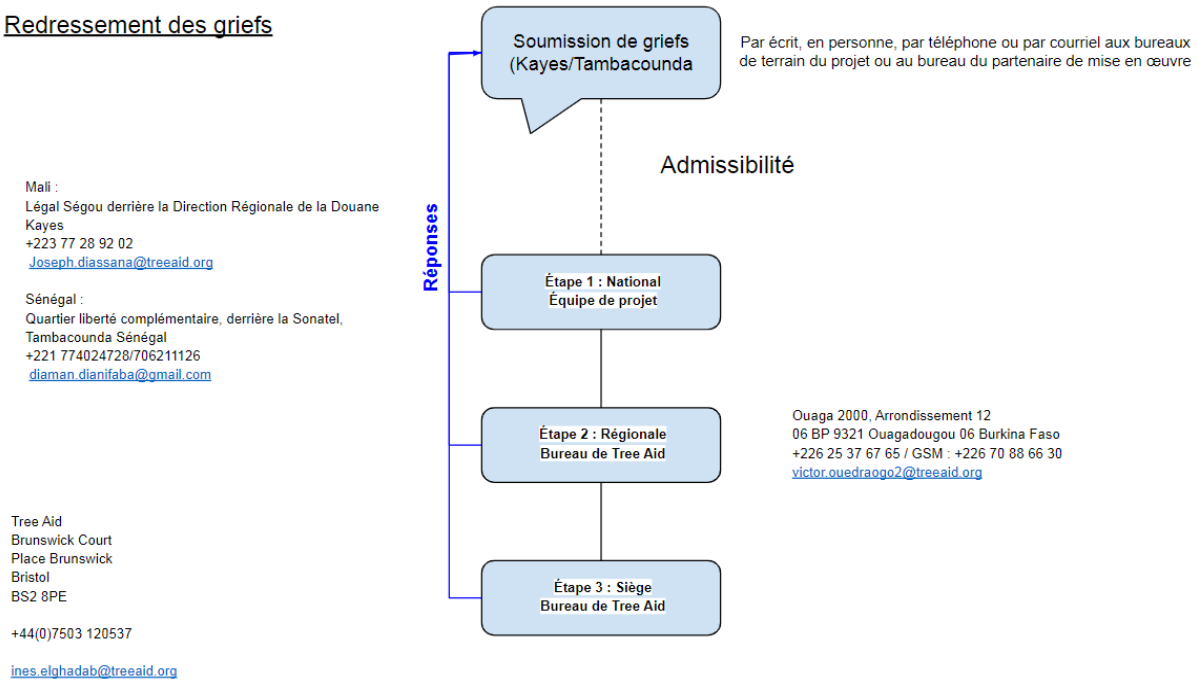

Figure 19: summary of the project grievance process

E2 Community-led implementation

Through community group meetings and meetings at the *inter-village natural resource management committees*, the project provides an opportunity for villagers to meaningfully participate in the decision-making process of the project so as to select activities that suit their livelihood needs. At all stages of project development, Tree Aid and La Lumiere's role within the project has been directly communicated to the communities through informal training practices and meetings and through community and village leadership and stakeholder consultations.

Figure 20: Facilitation of community consultation meeting in Senegal

The project also has held regular meetings with the participating communities jointly organised in local *inter-village natural resource management committees* in order to discuss intervention activities, receive suggestions on how to improve the project's management and activities related to patrolling the Project Region.

Selecting members of the local inter-village natural resource management committee took place during village assembly meetings. Everyone was present from the village and different posts, with their respective roles and responsibilities were discussed. During the plenary participants were given the opportunity to volunteer themselves, and roles were assigned based on their experience and activities linked to the communal land in question. During the setting up of these committees the project guided the villages to make sure that as many different user groups (e.g. cattle grazers, farmers, women, NTFP users, different ethnicities, different ages...) should be represented.

Finally, members were selected from three social strata according to:
- Village leaders and dignitaries (village chief, advisers to the village chief, iman, etc.)
- Women (women leaders)
- Young people (youth leaders)

In addition to being a representative of a social strata/user group, selected village forest management committee members also need to be seen as trustworthy, hard-working and socially committed.

The organisation of how to resolve conflicts with those who do not adhere to the land use plan as well as proposals for mitigating leakage were discussed by the village committees, to come to a consensus. At the end of the consultation process, with the support of rural councils, the project will enable communities to draft a management plan and a local land charter for each enrichment site. These land charters will contain rules relating to conservation of shared natural resources and managing land disputes. They are created at the village level in a participatory manner that includes a representative group of

stakeholders (including women, forest users, pastoralists, and youth), and is aided by the rural council. These are adopted at the village level, and submitted and validated through a Municipal Council meeting (Annex 11a, 11b and 11c). This will mean that in terms of carbon ownership, local communities, responsible for works in the field will own the associated carbon revenues and will be legally eligible to claim the benefit of carbon revenues.

E3 Community-level project governance

Community consultations will continue to take place throughout the lifetime of the project between all key stakeholders and target groups, including the district and municipality governments, Tree Aid, La Lumiere, participating villages and the surrounding communities.

The project budget allows for staff to continue to support the project throughout the 10-year project life cycle. For the rest of the quantification period, Tree Aid will continue to monitor the project sites remotely and through on-the-ground visits and meetings with stakeholders.After 2024, support will cover annual data collection and reporting, and assisting agroforestry participants and committees charged with managing enrichment sites. Government agencies will be engaged at the local level to ensure that support is provided to the project in the longer-term too.

Participating communities will receive training on self-monitoring. The *inter-village natural resource management committees* will decide on all the ancillary activities other than tree planting to be conducted as part of the project. Through forum meetings, participants will decide how to deal with identified implementation challenges and the proposed solution may not contravene the conditions for participation or the technical specifications. The participating committees will also be encouraged and facilitated to join or to form a network, which is then supposed to stand alone and to coordinate all Plan Vivo activities when sufficiently trained.

Tree Aid believe elite capture will not occur, as a result of the following:

- During the baseline assessment the project looked at the different stakeholders and how best to ensure proper inclusion of these throughout project activities and after Tree Aid withdraws active involvement.
- Considering this, the project team set up local structures (inter-village and agroforestry committees) with members from different sectors of society to ensure proper representation. These structure will be the ones which will be responsible to lead on the progress at each Plan Vivo site to ensure that obligations over a 10-year period are being met.
- Monitoring visits by the project will be made as per monitoring plan (see Part K below). Payments to be made to participants will only be made on the verification that the obligations have been met – or at least a % of payment will be made, based on the % complete against the expected targets.

Currently, no grievances have been recorded, but the Standard operating procedure for the project requires that any grievances related to the Plan Vivo project are declared and recorded as soon as they occur (outlined in Annex 10). In essence, once a specific grievance is raised, it will be first reported to the respective group leadership for a possible solution involving all the members. In the event that the group is unable to resolve it, village leaders of the respective area will be involved. The preference is that grievances are solved at the smallest local level whenever possible. Nonetheless, if the village leaders are unable to resolve the grievance in turn, then Tree Aid and the local government officials on respective district will be involved.

Part F: Ecosystem Services & Other Project Benefits

F1 Carbon benefits

- Complete Table F1 to summarise the carbon benefits per ha for each intervention over the project crediting period e.g.:

Table 11: Carbon benefits estimates by year for Agroforestry and Reforestation combined

Year	*Baseline Removals*	*Project Removals (Woody Biomass)*	*Leakage*	Uncertainty Discount	Climate Benefit	Buffer	Climate benefit MINUS buffer	Units per year
1	0	53	0	13	39	8	32	32
2	0	631	0	158	473	95	378	347
3	0	1,635	0	409	1,226	245	981	603
4	0	3,016	0	754	2,262	452	1,809	829
5	0	4,935	0	1,234	3,701	740	2,961	1,151
6	0	7,523	0	1,881	5,642	1,128	4,514	1,553
7	0	10,854	0	2,713	8,140	1,628	6,512	1,999
8	0	14,995	0	3,749	11,246	2,249	8,997	2,485
9	0	20,016	0	5,004	15,012	3,002	12,010	3,012
10	0	25,971	0	6,493	19,478	3,896	15,582	3,573
11	0	32,916	0	8,229	24,687	4,937	19,750	4,167
12	0	40,900	0	10,225	30,675	6,135	24,540	4,790
13	0	49,975	0	12,494	37,482	7,496	29,985	5,445
14	0	60,182	0	15,045	45,136	9,027	36,109	6,124
15	0	71,566	0	17,891	53,674	10,735	42,940	6,831
16	0	84,167	0	21,042	63,125	12,625	50,500	7,561
17	0	98,025	0	24,506	73,519	14,704	58,815	8,315
18	0	113,174	0	28,293	84,880	16,976	67,904	9,089
19	0	129,653	0	32,413	97,240	19,448	77,792	9,888
20	0	147,494	0	36,873	110,620	22,124	88,496	10,704
21	0	166,732	0	41,683	125,049	25,010	100,039	11,543
22	0	187,420	0	46,855	140,565	28,113	112,452	12,413
23	0	209,534	0	52,384	157,151	31,430	125,721	13,269
24	0	233,136	0	58,284	174,852	34,970	139,882	14,161
25	0	258,263	0	64,566	193,697	38,739	154,958	15,076
26	0	284,939	0	71,235	213,704	42,741	170,963	16,005
27	0	313,184	0	78,296	234,888	46,978	187,910	16,947
28	0	343,031	0	85,758	257,274	51,455	205,819	17,908

29	0	374,503	0	93,626	280,877	56,175	224,702	18,883
30	0	407,623	1,342	101,906	304,375	60,875	243,500	18,799

F2 Livelihoods benefits

- Complete Table F2 to describe how the project will affect different livelihoods aspects of the participating groups (use a separate table for each group if necessary) (PV requirement 7.3)
- Clearly identify any livelihoods aspects that may be negatively affected as well as those that will be positive (PV requirement 7.5)
- If any possible negative impacts are identified describe mitigation measures to address them (PV requirement 7.5)

Table 12: Livelihoods benefits

Livelihoods benefits							
Food and agricultural production	**Financial assets and incomes**	**Environ-mental services (water, soil, etc.)**	**Energy**	**Timber & non-timber forest products (incl. forest food)**	**Land & tenure security**	**Use-rights to natural resources**	**Social and cultural assets**
Agroforestry	Sale of farm products	Retain soil moisture, improved soil fertility	Firewood from dropping/ pruned branches	Fruits, medicines, oils, condiments,	Adds to the value of the land		Improved nutrition and health benefit
Enrichment planting	Development and Sale of NTFPs value chains	Add organic matter in the soil Retain soil moisture, prevent soil erosion	Firewood from dead/ pruned branches, thinned trees	Fruits, medicines, oils, condiments,	Adds to the value of the land		Improved nutrition and health benefit

Livelihood aspects that might be negatively affected by the project are:

- Competition of crops and trees (for agroforestry)
- Misuse of payment received

To mitigate the risk of undesired competition between crops and trees on farms, trees are selected through community consultation to ensure that they are desired by farmers. Furthermore, the spacing of tree planting was conducted density of 50-100 tree per hectares, which is a very favourable density to enable functional agriculture and trees to co-exist. In the unlikely eventuality that undesired overshadowing of crops occurs, the project will train farmers to prune trees at an appropriate frequency.

To mitigate against the risk of misuse of payments received by cooperatives, financial training will be given to groups that manage the dispersal of funds. Furthermore, financial auditing of groups that manage the dispersal of funds will be conducted

F3 Ecosystem & biodiversity benefits

Afforestation and Agroforestry will contribute to habitat creation, water conservation, improved soil fertility and improved air quality (as detailed in Table 13).

Table 13: Ecosystem impacts

Ecosystem impacts				
Intervention type	**Biodiversity impacts**	**Water/watershed impacts**	**Soil productivity/conservation impacts**	**Other impacts**
Agroforestry	Improved tree species diversity	• Reduction of run-off through stem and root effects on soils • Reduction of water loss through reduced evaporation due to canopy cover. • Improvement of ground water recharge systems through enhanced water infiltration due to increased residence time.	• Nitrogen-fixing trees will increase soil fertility • Reduced soil erosion through binding effect of tree roots. • Improved soil organic matter	• Act as wind break hence control dust • General improvement in microclimate associated with trees including shade provision
Enrichment planting	• Improved tree species diversity • Habitat creation for birds, small mammals, reptiles, amphibians, butterflies, insects and pollinators	• Reduction of run-off through stem and root effects on soils • Reduction of water loss through reduced evaporation due to canopy cover. • Improvement of ground water recharge systems through enhanced water infiltration due to increased residence time.	• Improved soil fertility through biological nitrogen fixation and addition of nitrogen-rich organic residues and through nutrient cycling • Reduced soil erosion through binding effect of tree roots. • Reduction of evapotranspiration through shade and cooling provided by organic matter	General improvement in microclimate associated with trees including shade provision

Part G Technical Specifications

G1 Project Interventions and Activities

G1.1 Introduction

This technical specification provides conservative estimates of expected climate benefits from project sites undergoing the following interventions:

- Enrichment Planting (see Section G1.3.1)
- Agroforestry (See Section G1.3.2)

The expected climate benefits from each of these interventions, and the methods by which they are estimated are provided in Section G5. Indicators for monitoring and verifying the climate benefits achieved are provided in Section K.

The Technical Specifications can be applied to claim ex-ante certificates for climate benefits

expected to occur within 30-years of planting. The minimum monitoring period for each site is 10-years, though the project aims to continue monitoring throughout the quantification period.

G1.2 Applicability Conditions

The Technical Specifications are applicable to sites that meet the following conditions:

- They are located within the Project Region as defined in Section B of the PDD;
- Enrichment planting activities are implemented on land classified as savannah or woody savannah;
- Project site have not been deforested within the last 10 years;
- The baseline land use scenario in the enrichment planting project sites is savannah, has a history of degradation, have financial, technological and social barriers to afforestation, and can be conservatively assumed to be zero;
- Project activities are not carried out in areas where tree planting is planned in the baseline scenario;
- Soils in the project sites are not waterlogged or flooded regularly, and are at least 30 cm deep.

The Technical Specifications are applicable to project interventions that meet the following conditions:

- Project activities will not increase GHG emissions or reduce carbon stocks in or around the project sites, relative to the baseline scenario, by changing a. Manure application; b. displacement of grazing or agricultural activities; c. External organic inputs such as mulch; d. Tillage, leaching or erosion of soil; or e. Management of existing trees and woody vegetation;
- Pre-project shrubs are not removed during planting;
- No pre-project trees are harvested, cleared, or removed throughout the crediting period of the project interventions;
- Soil disturbance attributable to the intervention affects less than 10% of the project sites;
- No burning of woody biomass for the purpose of site preparation prior to planting

G1.3 Project Interventions

Sections G1.3.1 and G1.3.2 provide descriptions of the interventions' inputs and activities.

G1.3.1 Enrichment Planting

Planting sites

Enrichment planting sites are established on communal land that is classified as either savannah or woody savannah.

Species

The species that can be planted under the enrichment planting intervention are listed in Table G1.1. The species were selected by representatives of communities during project planning meetings both at the regional level during February and March 2022 and for site-specific species - at the local level during the month of March and April. Table G1.1 demonstrates why species are relevant for the enrichment planting intervention and their appropriateness to the Project Region's biophysical environment.

Table G1.1 Project species for enrichment planting

Species	Native/No	Uses/ Benefits	Justification for use

	n-Native		
Acacia albida	native	important for raising bees, since its flowers provide bee forage at the close of the rainy season, when most other local plants do not.	Its deep-penetrating tap root makes it highly resistant to drought. It also fixes nitrogen and improved soil quality
Acacia nilotica	native	Forage and fodder The exudate gum, known as gum arabic or acacia gum has a long history as a prized export	well adapted to an arid environment. It also fixes nitrogen and improved soil quality. The potential market value of its gum makes it an attractive species to communities
Acacia senegal	native	Forage and fodder The exudate gum, known as gum arabic or acacia gum has a long history as a prized export	well adapted to an arid environment. It also fixes nitrogen and improved soil quality. The potential market value of its gum makes it an attractive species to communities
Acacia mellifera	native	fencing, livestock feed and building material for huts	well adapted to an arid environment. Leaves can constitute an important part of goat diets
Adansonia digitata	native	A traditional food plant in Africa and the region. Fruits and leaves are edible. Leaves are dried and the powder is called lalo in Mali and sold in many village markets	Adaptations to survive frequent fires include a thick and fire-resistant bark. Trees older than about 15 years have thick enough bark to withstand the heat of most savannah fires, while younger trees can resprout after fire
Balanites aegyptica	native	the leaves are eaten raw or cooked, the oily seed is boiled to make it less bitter and eaten. The seed is pressed for its oil which is used at home or sold	well adapted to an arid environment. The tree is considered valuable in arid regions because it produces fruit even in dry times. The seed cake remaining after the oil is extracted is used as animal fodder
Citrus limon (Citronniers)	naturalised	Lemon juice, rind, and peel are used in a wide variety of foods and drinks	potential market value makes it an attractive species to communities
Cordyla pinnata	native	Forage and fodder	It also fixes nitrogen and improved soil quality
Khaya senegalensis	native	Primarily for wood	Within its first year, the seedling develops a deep root system that makes it drought resistant. Has experienced high amounts of exploitation, and little regeneration takes place. The community want the tree back in their landscape and

			protected. the IUCN Red List of Threatened Species considers it a vulnerable species.
Parkia biglobosa	native	primarily grown for its pods that contain both a sweet pulp and valuable seeds. The fruit pulp, the leaves and the seeds are also used to feed livestock and poultry. The flowers are attractive to bees and a good source of nectar	The cultivation of this tree is seen as an important economic activity for many in the community, including a large portion of women
Psidium guajava (Goyaviers)	naturalised	edible fruit, can be eaten raw or cooked. Processing of the fruits yields by-products that can be fed to livestock. Fruit rich in Vitamin C	The sweetness of the fruit and its potential market value makes it an attractive species to communities
Pterocarpus erinaceus	native	Wood/ Foliage is a nutritious fodder for farm animals	Within its first year, the seedling develops a deep root system that makes it drought resistant. Has experienced high amounts of exploitation, and little regeneration takes place. The community want the tree back in their landscape and protected. It is an is an endangered species of tree in the IUCN Red List
Sclerocarya birrea	native	fruit is traditionally used for food	The harvest and sale of fruit, even if only for two to three months, is an important income to poor rural people, especially women
Tamarindus indica	native	sweet, tangy pulp in fruit used in food/ drinks	potential market value makes it an attractive species to communities
Zizyphus mauritiana (Pommes du sahel; Jujubier)	native	fruit is eaten raw, pickled or used in beverages. It is quite nutritious and rich in vitamin C. leaves are readily eaten by camels, cattle and goats	hardy tree that copes with extreme temperatures and thrives under dry conditions. Quick growing tree starts producing fruits within three years

Preparation and planting

Seedlings planted for the enrichment planting intervention must be at least 40 cm tall and at least 4 to 5 months old. This height and age will allow the seedlings to develop a strong enough rooting system to provide the plants with enough vitality to establish well in the planting hole and for its survival at the end of the rainy season.

Trees are planted with a spacing of 2-3m for species with narrow crowns and with a spacing of 4-5m for others. Planting under the shade of existing trees is avoided. The same distances are observed for shrubs. Consequently, tree planting density is higher in Savannah than Wooded Savannah. Hardy species such as *Acacia mellifera* are planted along the road to serve as a living hedge but also in relatively rocky areas. Species such as *Khaya senegalensis and Piliostigma reticulatum* are favoured around temporary waterways to take advantage of the humidity and micro climate much longer.

When the planting schedule allows, the "half moon" soil preparation technique is applied prior to planting. This involves finding the direction of surface water flow, digging out a half moon (15-30cm deep) perpendicular to the flow of surface water, piling the soil on the edge of the arc, and piling cow dung into the half moon. The tree will be planted in the half moon. The practice will contribute to accelerate the growth of the plant.

Survival rate will be calculated from monitoring data collected across all enrichment planting sites. If survival rate is below 75%, additional trees will be planted until survival rate is above 75%. The climate benefit calculations account for a survival rate of 75%.

Tree management

For each enrichment planting site, a management plan and local land charter should be developed detailing rules relating to protection, conservation of shared natural resources and regulations with regards cutting and grazing (see Annex 11a, 11b and 11c for an example of a land charter with regulations on cutting and grazing).

Harvesting

Three of the species listed in Table G1.1 (*Khaya senegalensis, Pterocarpus erinaceus and Tectona grandis*) are primarily used for wood products. While *Khaya senegalensis* and *Pterocarpus erinaceus* are threatened species under IUCN's classification, and as such harvesting of these trees would be discouraged under the management plan/local land charter, harvesting of approximately 50% of the *Tectona grandis* after 10 years is possible, and this is reflected in the expected carbon benefit from this species.

Furthermore, *Gliricidia sepium,* introduced for its fast growth rates in denuded areas and ideal in initial stages of reforesting, will likely be managed as a "cut and carry" forage plant.

Grazing

It is common for uncontrolled grazing to take place on communal land in the project region. As part of the project, grazing control measures will be established at project sites to limit grazing to other areas of communal land that are not designated for enrichment planting and where grazing will not lead to greater degradation that would have occurred in the project sites. The project will also implement activities to increase fodder production and improve pastures to further reduce the potential for displaced grazing to reduce carbon stocks outside the project sites.

Pruning and thinning

The branches of planted trees should be pruned to ensure good canopy and tree growth, but there should be no thinning of stems.

G1.3.2 Agroforestry

Species

The species planted at each agroforestry site should be selected by a group of volunteers from each village assembly. The volunteers should be chosen by way of a vote during the village assembly. Project facilitators should provide some guidance to avoid species that require a lot of water and regular watering, especially since access to water is difficult in certain areas. Potential species for agroforestry planting are summarised in Table G1.2. The

species planted on any particular farm are selected by the land owner.

Table G1.2 Project planting species – Agroforestry planting

Species	Native/Non-Native	Uses/ Benefits	Justification for use
Adansonia digitata	native	A traditional food plant in Africa and the region. Fruits and leaves are edible. Leaves are dried and the powder is called lalo in Mali and sold in many village markets	Adaptations to survive frequent fires include a thick and fire-resistant bark. Trees older than about 15 years have thick enough bark to withstand the heat of most savannah fires, while younger trees can resprout after fire
Anacardium occidentale (Anacardiers)	naturalised	Nut and fruit	potential market value makes it an attractive species to communities
Citrus limon (Citronniers	naturalised	Lemon juice, rind, and peel are used in a wide variety of foods and drinks	potential market value makes it an attractive species to communities
Detarium microcarpum Guill. & Perr. (sweet detar)	native	edible fruit (eaten raw, cooked, or made into flour. The fruit pulp is suitable for concentrated juice and jam processing	potential market value makes it an attractive species to communities
Khaya senegalensis	native	Primarily for wood	Within its first year, the seedling develops a deep root system that makes it drought resistant. Has experienced high amounts of exploitation, and little regeneration takes place. The community want the tree back in their landscape and protected. the IUCN Red List of Threatened Species considers it a vulnerable species.
Mangifera indica (Manguiers)	naturalised	fruit is eaten raw, pickled or used in beverages. It is quite nutritious and rich in vitamin C	potential market value makes it an attractive species to communities
Parkia biglobosa (néré)	native	primarily grown for its pods that contain both a sweet pulp and valuable seeds. The fruit pulp, the leaves and the seeds are also used to feed livestock and poultry. The flowers are attractive to bees and a good source of nectar	The cultivation of this tree is seen as an important economic activity for many in the community, including a large portion of women
Psidium guajava	naturalised	edible fruit, can be eaten raw or cooked. Processing of the fruits	The sweetness of the fruit and its potential market value makes it an attractive species

(Goyaviers)		yields by-products that can be fed to livestock. Fruit rich in Vitamin C	to communities
Zizyphus mauritiana (Pommes du sahel; Jujubier)	native	fruit is eaten raw, pickled or used in beverages. It is quite nutritious and rich in vitamin C. leaves are readily eaten by camels, cattle and goats	hardy tree that copes with extreme temperatures and thrives under dry conditions. Quick growing tree starts producing fruits within three years

Preparation and planting
Agroforestry trees for planting must be at least 40cm and 5 months of age. This height and age will allow the seedlings to develop a strong enough rooting system to provide the plants with enough vitality to establish well in the planting hole and for its survival at the end of the rainy season.

To avoid turning the fields into an orchard, a minimum spacing of 8x8m is recommended to farmers with a 5 to 7m gap with the field fence. Spacing can be greater, depending on the farmer's preference. These spacings will allow project participants to grow crops under rainy conditions with hitched equipment or market gardening without the plants interfering with their activities.

For each tree, circular holes are created with a diameter and depth of 50cm. Soil is mixed with one to two buckets of decomposed organic manure. The hole is then filled with this mixture to within 5 to 10cm of the edge. This space will allow to retain water from watering or rain before its infiltration.

Tree management
Planted trees mush receive regular maintenance to ensure the individual protection of the plants, including regular watering according to the availability of water, mulching to reduce evaporation, and pruning of suckers to allow the plant to develop more quickly. For the first three years after planting, any dead trees must be replaced.

G2 Additionality and Environmental Integrity

G2.1 Regulatory Surplus
The project has identified relevant laws and regulations for forest and land management in Mali and Senegal (see Annex 12). The activities in this project are not part of any existing legal or regulatory requirement. The project therefore demonstrates that it goes beyond the regulatory framework with regards to land-use and land management in both Mali and Senegal.

G2.2 Barrier Analysis
Enrichment planting on communal land, intercropping on small-holder farms, and the maintenance required for trees to become established would not be possible without the project. Tree planting is not commonly practised by farmers in the region due to lack of resources and incentives to implement the activity on a voluntary basis. Furthermore, technical capacity within the Project Region is insufficient for soil preparation and land management to ensure the success of growth. A summary of these barriers, and how project activities will enable the community to overcome them, is provided in Table G2.1.

Table G2.1. Additionality Analysis

Barrier	Description	How the project overcomes the barrier
Financial	Local communities lack the finances for inputs required for tree planting (e.g. seeds, equipment, nurseries)	The project will provide the inputs needed for establishment of nurseries, seedlings and equipment
	Local communities lack financial capacity to plant and look after trees	The project will pay community members to plant or look after planted trees. The project will pay farmers for the maintenance of the trees on their land. Payments will either be cash or payments in kind (food) as agreed through the benefit sharing mechanism.
	Local communities have low incentives to invest time/finance into tree-planting in the short-term. The benefits provided by trees (e.g. NTFPs) will only be realised in the long term.	A portion of finance from the sales of credits will be made available to communities through a community grant . This will be used to develop rotating loans and/or business support for communities, as determined by communities.
	Lack of finance for effective governance, e.g. the development of management plans and bylaws, organisation of surveillance, monitoring	The project will help communities establish new and/or build capacity of governance structures to develop governance mechanisms such as management plans and bylaws.
Technical	Farmers lack access to good quality saplings and seedlings	The project will provide the inputs needed to establish nurseries, train members of the community in growing trees from seed, provide seeds.
	Local communities lack technical knowledge and experience to breed high quality seedlings, implement effective tree planting, agroforestry approaches, prevent planted trees from being subject to fire, pest and disease attach and skills for ecological monitoring including forest inventories.	Community members will be trained in effective tree planting and maintenance (for enrichment sites, farms identified for agroforestry), and ecological monitoring.
	Community institutions lack organizational instruments to overcome technological barriers. Lack experience in developing management plans and bylaws.	The project will develop new and build capacity of existing governance structures for management of natural resources. The project will contract consultants with experience in land management planning to co-develop land management plans and bylaws with the community.
	Communities and local authorities lack knowledge and understanding on the legal texts around natural resource management.	The project will build capacity within all stakeholders, to empower communities and government authorities with the knowledge of the rules and regulations around natural resources and decentralised forest management, to ensure sustainable exploitation in the long-term. Support will be provided for the development of management plans, and to village management committees for effective implementation of these plans.

G2.3 Double Counting

Three potential sources of double counting have been considered in the design of the project:

i) within the project – if finance raised for biodiversity conservation or other types of ecosystem service payments were used to fund protection of the same area for which

Plan Vivo certificates had been sold;

ii) with other carbon projects – if the community, or other parties, entered into agreements for the sale of emission reduction credits as part of a project or jurisdictional programme that covered the Plan Vivo Project Region; and

iii) if Plan Vivo certificates are used to offset emissions from parties outside Mali (The International Olympics Committee), and the Government of Mali use those same emissions reductions to meet their Nationally Determined Contributions to the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC).

Measures the project will take to avoid double counting from these sources are summarised below.

Within the project

The project is being entirely funded by the IOC. The credits will be retired immediately and "sold" to IOC as certified carbon sequestration. The project will not be marketed to funders whose primary interest is biodiversity conservation, or forest protection. Later phases of the project will be marketed to IOC and parties connected to IOC for the further development and implementation in exchange for the carbon credits generated by adding additional sites to the project.

Other carbon projects

When the community groups enter into Plan Vivo agreements, they relinquish all rights to the carbon sequestered within the project sites as a result of the activities carried out under the project to the project coordinator, effectively preventing them from developing other carbon projects that deliver the same benefits with other parties or standards. At the time of development there are no other projects or initiatives within the Project Region (Phase 1 and Phase 2).

Nationally Determined Contribution (NDC)

Mali's NDC includes mitigation scenarios for the energy, agriculture, and forestry and landuse change sectors. Strategies for forestry and land-use under the conditional mitigation scenario include reforestation/afforestation, assisted natural regeneration, and management of classified forests and protected areas. Senegal's NDC includes mitigation scenarios for energy; industrial processes; water; and agriculture, forests and land use sectors. For the forestry sector, strategies under the unconditional scenario include restoration/reforestation of mangroves and forests, and reduction of forest fires. Strategies under the conditional scenario include mangrove restoration/reforestation, forest protection, creation of 500,000 ha of reforestation, reduction of burned areas, assisted natural regeneration, and implementation of forest management plans.

Project activities may therefore contribute to activities listed under both Mali's and Senegal's NDCs. There are no national or jurisdictional results-based finance mechanisms for GHG emission reductions or removals in either country, however, and no regulations that nationalize or otherwise limit ownership of carbon rights are in place. It is therefore assumed that ownership of carbon rights follows the same customary systems as for land rights. No issues in trading voluntary carbon credits are foreseen in either country, but the project developers will continue to monitor the situation and provide any updates through Annual Reports to Plan Vivo.

G3 Project Period

The project start date where the first planting occurred is 02 August 2022. Each enrichment planting site or agroforestry site has a 30-year quantification/crediting period. For those sites planted in 2022, the quantification/crediting period will be until 2048. The first phase of planting will continue at new enrichment planting sites until the estimated climate benefits for each site's 30-year quantification period total the 243,500 tonnes of CO2.

If the project is extended with additional funding, the project period will extend for 30years after the date of the last planting.

Trees planted under the afforestation and agroforestry interventions are however, anticipated to remain within the landscape beyond this period due to their benefits to local communities, and thus it is anticipated that further carbon benefits will be achieved by these interventions beyond those accounted for here.

Each planting site will be monitored for 10-years to ensure that payments are correctly made in line with carbon sequestration rates, and the project's monitoring period will extend from the project start date to the end of the quantification period.

The project will be verified after year 5 and year 10 – with payments to communities being made in line with the verification.

G4 Baseline Scenario

G4.1 Carbon Pools

The carbon pools expected to make the most significant contribution to the climate benefits of project activities are above-ground biomass (AGB) and below-ground biomass (BGB). Climate benefits from increase in Soil Organic Carbon (SOC) was estimated using the Plan Vivo Approved methodology PT002[12], but excluded because increases were not shown to be significant. Dead wood and litter are conservatively excluded as increases in these pools are not expected to be significant because communities will collect a lot of the deadwood as fuelwood. They are also considered difficult to measure in the context of community-based monitoring, so are conservatively excluded. It is assumed that there will be no burning of woody biomass for the purpose of site preparation prior to planting, and this is included as an applicability condition for this technical specification, so emissions of CH_4 and N_2O from this source are not estimated.

Table G4.1: Carbon pools and emissions in the baseline and project scenarios

Carbon Pool	Inclusion	Justification
Above ground biomass	Yes	The above ground woody biomass pool is expected to increase significantly in both interventions as a result of enrichment planting and intercropping. It can easily be modelled using the SHAMBA methodology, combined with data collected from the project sites.
Below ground biomass	Yes	The below ground woody biomass pool is expected to increase significantly in both interventions as a result of enrichment planting and intercropping. It can easily be modelled using the SHAMBA methodology, combined with data collected from the project sites.
Soil organic carbon	Excluded	Soil organic carbon pool is expected to increase as a result of enrichment planting and intercropping. It was modelled for the 2022 enrichment planting sites using the SHAMBA methodology, using data on the

[12] The University of Edinburgh (2015). Small-holder Agriculture Mitigation and Baseline Assessment (SHAMBA) Tool. https://www.planvivo.org/Handlers/Download.ashx?IDMF=5b30948b-26f3-4d7a-803f-0fcce593acbd

		intervention and global soil datasets. The estimated climate benefits (between 0.64 and 1.55 tCO_2e per hectare for 2022 enrichment planting sites) were considered insignificant relative to the effort required to monitor input parameters, and therefore have been excluded from the overall climate benefit calculations.
Tree litter	Excluded	Expected to increase as a result of project activities but unlikely to contribute significantly to climate benefits; Difficulty of measuring additional carbon pools in the context of community-based monitoring.
Dead wood	Excluded	As above.
Harvest products	Excluded	As above
Emission sources		
Organic fertilisers	Excluded	Enrichment planting will take place on savanna and wooded savanna land cover only. No agricultural activity is present in the sites identified for enrichment planting
Synthetic fertilises	Excluded	Enrichment planting will take place on savanna and wooded savanna land cover only. No agricultural activity is present in the sites identified for enrichment planting
Biomass burning	Excluded	SOC is excluded from climate benefits

G4.2 Baseline Methodology

The baseline scenario of the project activity implemented under the applied methodology is the continuation of the pre-project land use. The identification of this baseline scenario is demonstrated below following the procedure described in the tool "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities" (Version 01)[13].

STEP 0. Preliminary screening based on the starting date of the A/R project activity

This step, used for the screening of CDM projects, is not applicable for Plan Vivo projects.

STEP 1. Identification of alternative land use scenarios to the proposed project activity

Sub-step 1a. Identify credible alternative land use scenarios to the proposed project activity

When defining the baseline scenario, the following potential scenarios were considered:

Scenario 1: Continuation of current land use activities and land management processes at present the project area is left exposed to bush fires, destructive pastoral practices, overgrazing, exploitation of timber, firewood and charcoal. In the mid 1900s, small farming communities were scattered throughout a mosaic of wooded savannahs and open woodlands. Today, these unsustainable management processes have replaced in many parts vestiges of the natural vegetation. These both result in continued degradation of woody savannahs and compromise the regeneration of woody vegetation. The continuation of the pre-project land use is a realistic and credible alternative scenario.

Scenario 2: Implementation of afforestation and agroforestry activities on the land within the project boundary by communities without being registered as the Plan Vivo A/R project. In this scenario, the forestation activities would be performed without GHG. In fact, the local people living within the project area are not extensively familiar to planting and cultivating

[13] https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-02-v1.pdf

plants species that produce fruits or other parts for nourishment and commercial purposes on their farmland. In addition, the project area is degraded and not easily accessible because of its remote location, therefore, it is not interesting for afforestation and forestry.

Scenario 3: Activities similar to the proposed project activities on at least part of the land within the project boundary of the proposed Plan Vivo A/R project at a rate resulting from:

- Legal requirements; or
- Extrapolation of observed similar activities in the geographical area with similar socioeconomic and ecological conditions to the proposed project activity occurring in the period beginning ten years prior to the project start date.

In this scenario the enrichment planting activities would be performed resulting from 1) Legal requirements or from 2) Extrapolation of observed forestation activities. This scenario is not realistic alternative scenario as there is either no legal requirements for forest establishment nor observed plantations in nearby areas which could be extrapolated to cover the lands or the parts of the lands within the project boundary. Currently no laws and regulations prevent or enforce the project activity or baseline land use scenarios. Laws and regulations do not prevent or prescribe either agriculture and cattle breeding in the project area, nor forest conversion. More specifically for Senegal, in compliance with the Senegal's Forest Policy for the years 2005-2025[14] there are not any laws or regulations which would force the forestation activities to be implemented

Outcome of Sub-step 1a: List of credible alternative land use scenarios that could have occurred on the land within the project boundary of the project.

As described before, the list of credible alternative land use scenarios is Scenario (i) and (ii).

Sub-step 1b: Consistency of credible land use scenarios with enforced mandatory applicable laws and regulations

The alternative scenarios to the project activity presented above as the outcome of Sub-step 1a are all in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and Board decisions on national and/or sectoral policies
and regulations. In Senegal for example the proposed project is in compliance with directions set in the Senegal National Forest Policy as it introduces agroforestry activities in a degraded land and affects positively to both to the soil restoration as well as to the welfare of the local population.

National, local and sectoral land-use policies or regulations are listed in Annex 12:

Thus, the scenario (i) Continuation of pre-project land use is in compliance with mandatory legislation and regulations.

Therefore scenario (ii) Project activity on the land within the project boundary performed without being registered as the Plan Vivo project is also in compliance with mandatory legislation and regulations.

Outcome of Sub-step 1b: List of plausible alternative land use scenarios to the proposed project that are in compliance with mandatory legislation and regulations taking into account their enforcement in the region or country, national and/or sectoral policies and regulations.

Thus Scenario (i) and (ii) remains possible baseline scenarios.

[14] Politique Forestiere du Senegal 2005-2025, Rèsumè Exècutif. Ministere de l'environnement et de protection de la nature, Republic du Sengal, 2005

STEP 2. Barrier analysis
Sub-step 2a: Identification of barriers that would prevent the implementation of at least one alternative land use scenario

A barrier analysis is completed in Section G2.1.

1. Financial barrier
The financial barriers are summarised as 1) lack of finance for inputs (seeds, saplings, tools) into tree planting activities; 2) lack of financial capacity to plant and look after the trees; 3) lack of finance to develop the governance structures and tools that required to develop and manage the interventions; and little private capital is available from domestic or international capital markets due to risks associated with investments in Mali and Senegal[15].

Moreover, specially the domestic investments are hindered by an under-developed financial sector. In Mali and Senegal, all the commercial banks present have conservative lending guidelines and high interest rates. Collateral requirements dominate bank lending. Few domestic firms are eligible for long-term loans, and small and medium sized enterprises have little access to credit. In addition, primary banks such as BNDA (Agricultural Development National Bank) in Mali only lend money to guaranteed and organized sectors such as cotton and rice. Rural loans offer is not sufficient and farmers have an access problem to it. Moreover, there is no micro-finance mid/long term offer, which would be essential to farmers in the project case. The financial benefits obtainable through the carbon finance could represent a way to overpass these obstacles.

2. Technological barriers
The technical barriers are summarized as 1) lack of afforestation and forest management technology; and 2) lack of skilled or properly trained labour force. If planting trees within the project boundary without registration as a Plan Vivo project (scenario (ii)), these technical barriers would be applied to the local residents, and lead to the failure of the project.

Lack of access to planting materials, breakdown of the agricultural economy (including lack of seeds for the requested tree species, agricultural credits, and agricultural equipment) are among the major technological barriers. These barriers have been identified, for example in Senegal by Tappan et al. (2004)[16], to be among the main reasons for decrease of the agricultural land-use. The result of these constraints is to reduce the productivity and declines the soil organic carbon content with a resultant declines in soil fertility.

3. Barriers due to social conditions
Local communities are committed to enrichment planting but need adequate technical and organizational assistance to implement and maintain reforestations. The support offered by Tree Aid by providing local communities knowhow and training (especially in successful tree planting, as well as protecting planted trees from fires) and the financing from carbon credits has proven to be of critical importance.

Sub-step 2b: Elimination of land use scenarios that are prevented by the identified barriers.

Scenario (i) does not require extra investment or labour force. Thus, it is not prevented by any of the identified barriers. Scenario (ii) faces the investment and technical barriers.

In sum, Scenario (ii) is not feasible. Scenario (i), continuation of pre-project use remains the possible baseline scenario.

[15] For the Moody's rating for Senegal and Mali see http://www.tradingeconomics.com/senegal/rating
[16] Tappan G.G., Shall M., Wood E.C. and Cushing M. 2004. Ecoregions and land cover trends in Senegal. Journal of Arid Environments 59, pp. 427-462.
http://www.sciencedirect.com/science/article/pii/S0140196304000783#

Sub-step 2c: Determination of baseline scenario

In accordance with the decision tree of the used tool, the Scenario 1 "Continuation of the pre-project land use" is the baseline scenario and the additionality demonstration needs to be continued with Step 4 "Common practice analysis", see below.

STEP 3. Investment analysis (if needed)
Scenario (i) remains the only possible baseline scenario, which makes investment analysis unnecessary.

STEP 4. Common practice analysis

There are no other afforestation, reforestation or restoration projects on a similar scale within the
project region. As explained in step 2 afforestation activities, in scales similar to the project, face three main barriers (Investment barriers, other than economic/financial barriers, Technological barriers and Barriers due to social conditions). To develop an activity with the specific characteristics of this project (scale, number of local villages implicated, number and location of planted areas, reforestation techniques, etc.) it is necessary to be able to overcome all those barriers.

In Tambancounda Region in Senegal, the Program for Agricultural Development and Rural Entrepreneurship - Phase II (PADAER-II) (2018-2024) aims to improve food and nutrition security and the incomes of smallholder farmers and pastoralists. PADER II will develop the production and marketing of rice, maize, *fonio* (*Digitaria exilis* and *D. iburua*), and small ruminants, and will contribute to improving poultry farming. In addition to these main agricultural sectors, it will support complementary products such as millet, sorghum, rice and banana. No activities will look at supporting enrichment planting and agroforestry systems.

Thus, there is currently no similar project activity identified within the common practice boundary, so step 4 is satisfied.

In conclusion, the proposed project is not a common practice and the proposed afforestation
project activity is not the baseline scenario, so it is additional.

3.1.5 Additionality

The additionality has been demonstrated and assessed in the above section 3.1.4.

3.1.6 Methodology Deviations
N/A

G43 Baseline Emissions

In 2022, a biomass survey of above and below ground woody biomass in pre-project trees was completed, in 40 pilot sample plots across the savannah class, within which the Project's enrichment planting sites will be situated. The size of the sample plots is 10m in radius (0.126 ha). Only trees equal or greater than 5 cm in diameter were measured. The field data was collected using Tree Aid's protocol for inventory (Annex 15). The baseline assessment is documented in Annex 16.

Based on results from the pilot biomass survey, the Winrock sample plot calculator

spreadsheet tool[17] was applied to estimate the sample size required of a full biomass survey needed to attain a 90% Confidence Level. The full survey is planned for 2024. The results from the pilot survey are summarised in table G4.1.

Table G4.1. Woody biomass for savannah (mean, standard deviation)

Strata	Above ground woody biomass (tC/ha)	
	Mean	Std. Dev.
Savannah	0.67	0.77

Once the final baseline survey has been completed, initial biomass values are not expected to change under the baseline scenario (see Section G6.4.1).

G4.3.1 Woody biomass

Expected baseline removals (BR_a) in each project site is 0. The following conditions will be met for the potential project sites so the change in carbon stock in tree and shrub biomass in the baseline scenario is assumed to be zero for each year of the crediting period:

- Continuation of pre-project land use, resulting in the continued degradation of pre-project trees has been argued as the only possible baseline scenario (Section G5.1)
- The pre-project trees are neither harvested, nor cleared, nor removed throughout the crediting period of the project activity;
- The pre-project trees do not suffer mortality because of competition from trees planted in the project, or damage because of implementation of the project activity, at any time during the crediting period of the project activity;

It should be noted however, that separate monitoring of trees planted in enrichment planting sites from trees present prior to the start of the project will be challenging and therefore, a full baseline biomass survey will be completed to account for biomass in pre-project trees.

G4.4 Data Sources

G4.4.1 Woody Biomass

Expected removals from increases in above-ground and below-ground woody biomass in each project site are calculated with;

$$PR_{WB,a} = \sum_{s=1}^{n}\left(AGB_{a,s} + BGB_{a,s}\right) \cdot CF_s \cdot MF_s \cdot VF \qquad \text{Equation 2}[18]$$

Where:

$PR_{WB,a}$= Expected project removals from woody biomass in site *a* during the quantification period (t CO_2e);

$AGB_{a,s}$ = Expected above-ground tree biomass for the quantification period for all

[17] https://winrock.org/document/winrock-sample-plot-calculator-spreadsheet-tool/

[18] See Plan Vivo approved methodology PU001 – Equation 2

trees of species *s* planted within site *a* (tonnes of dry mass; see Annex 13 and Annex 14);

$BGB_{a,s}$ = Expected below-ground tree biomass for of the quantification period for all trees of species *s* planted within site *a* (tonnes of dry mass; see see Annex 13 and Annex 14);

CF_s = Carbon fraction of dry matter for species *s* (see Table G4.1);

MF_s = Mortality factor for species *s* (see Table G4.1);

VF = Conversion factor for converting from carbon to CO_2e of $\frac{44}{12}$; and

n = Number of species planted in project site *a*.

Table G4.1 documents the Carbon Fraction and Mortality Factor applied in Equation 2.

Table G4.1 Parameter values applied for estimating project removals from woody biomass

Tree Species	Carbon Fraction*	Mortality Factor**
Trees	0.47	0.75

*IPCC[19]; ** It is assumed that there will be some mortality of trees as a result of climate or management, and while management activities require the replacement of trees that die, this mortality factor is a conservative deduction to account for mortality of up to 30% of trees that are not replaced.

Aboveground biomass

Equation 3 is used to estimate expected aboveground biomass at the end of the quantification period.

$$AGB_{a,s} = \sum_{t=1}^{n} AGB_{t,s}$$

Equation 3

Where:

$AGB_{a,s}$ = Expected above-ground tree biomass for the quantification period for all trees of species *s* planted within project site *a* (tonnes of dry mass, e.g. Tables G5.1 – 5.3);

$AGB_{t,s}$ = Expected aboveground biomass at the end of the quantification period for tree *t*, of species *s* (tonnes of dry mass; see see Annex 13 and Annex 14); and

n = Number of trees of species *s* planted in project site *a*.

Annual AGB and BGB increments are calculated from expected diameter increment of trees, applying allometric equations and woody density values (see Table G4.2, G4.3 and see Annex 13 and Annex 14). Where species specific allometric models were not available the generalised allometric model for tropical trees (Chave *et al.* 2014) was used. It was assumed that the expected diameter increment would be maintained throughout the 30-year crediting period, and that survival rates represent the survival of planted trees after 30-years. All parameters and calculations to be used for project tree species (Table G1.1) are provided in Annex 17.

[19] Table 4.3, page 4.48. IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4 Agriculture, Forestry and Other Land Use.

Harvesting

It is estimated that for those enrichment planting sites where *Tectona grandis* is planted, a percentage (c. 50%) of *Tectona grandis* stems will be harvested for wood products. This may vary between enrichment planting sites and will be agreed with project participants under the management plan/local land charter. For this species in the sites where it is present, estimation of removals in woody biomass are based on the long-term average carbon stock over a period of at least one full rotation that includes the final harvest, as shown in Equation 4.

Calculation of long-term average removals in woody biomass with even-aged management

$$\mathrm{BR}_{\mathrm{WB\_LT\ A,a,y}} = \frac{\sum_{t=1}^{z} BR_{W\ B,a,t}}{z} \qquad \text{Equation 4}$$

Where:

$\mathrm{BR}_{\mathrm{WB\_LT\ A,a,y}}$ Long-term average net GHG removals in aboveground woody biomass under the baseline scenario for project site a up to year y (t CO2e)

$BR_{W\ B,a,t}$ Net GHG removals in aboveground woody biomass under the baseline scenario for project site a in year t (t CO2e; see Section 5.2)

z Number of years in one or more full rotations (years)

Where Tectona grandis is part of the pre-project tree species at an enrichment planting sites, large trees (> 5cm dbh) will be inventoried prior to planting to ensure that pre-project trees are not included in the population that are harvested.

Table G4.2 Growth parameters of each tree

Species	Age and dbh applied in the model					Annual increment of diameter at breast height (cm/year) used in the model	Source of information for annual dbh density
	yr5	yr10	yr15	yr20	yr25		
Acacia albida	2.53	5.060	7.59	10.12	12.65	0.506	Gebrekirstos, Aster, et al. "Climate–growth relationships of the dominant tree species from semi-arid savanna woodland in Ethiopia." Trees 22.5 (2008): 631-641.
Acacia senegal	2.53	5.06	7.59	10.12	12.65	0.506	Gebrekirstos, Aster, et al. "Climate–growth relationships of the dominant tree species from semi-arid savanna woodland in Ethiopia." Trees 22.5 (2008): 631-641.
Adansonia digitata (Baobab)	3.335	6.670	10.005	13.340	16.675	0.667	Kelly et al. 2022; Romero et al. 2014
Anacardium occidentale	4	8	12	16	20	0.8	Aderounmu, A. F., OGIDAN, O. A., ADAMS, B. A., & ADENIRAN, T. (2020). SILVICULTURAL IMPLICATIONS OF SEED SIZE ON GERMINATION AND EARLY GROWTH OF CASHEW (Anacardium occidentale L.) ADEROUNMU,. Ethiopian Journal of Environmental Studies & Management, 13(2), 253–260. Indradewa, A., & Indrdewa, D. (2019). Growth and Yield Characters of Two Cashew (Anacardium occidentale L .) Cultivars at Different Ages in Baubau City , South-East Sulawesi Province. Ilmu Pertanian, 4(1), 1–8. Nduka, B. A., Sunday, O., Akanbi, O., Mohammed, I., Adeosun, S. A., & Ugioro, O. (2020). Cashew Growth and Canopy Dynamics as Influenced by Manuring in a Guinea Savanna Agro- Ecology of Nigeria. Advances in Research, 21(9), 80–88. https://doi.org/10.9734/AIR/2020/v21i930236 Opoku-Ameyaw, K., & Appiah, M. R. (2000). Improving the growth of cashew (Anacardium occidentale) seedlings interplanted into mature sheanut stands in northern Ghana. Ghana Journal of Agricultural Science, 33, 156–164.
Azadirachta indica	4.05	8.1	12.15	16.2	20.25	0.81	Kumar KVS and Tewari VP (1999) Aboveground biomass tables for Azadirachta indica a. Juss. International Forestry Review. 1, 109-111; Nanag DM et al. (1997) Growth and yield of Neem (Azadirachta indica A. Juss.) plantations in Northern Ghana. The Commonwealth Forestry Review. 76, 103-106
Balanites aegyptiaca	6	12	18	24	30	1.20	**Wood, E. 2021.** *'Growth rates of key tree species at Tree Aid sites in West Afirca',* Report, Tree Aid and University of Edinburgh. Table 5.3
Citrus limon	4.55	9.1	13.65	18.2	22.75	0.91	Ortuño et al. (2004) Interpreting trunk diameter changes in young lemon trees under deficit irrigation. Plant Science, 167, 275-280.
Cordyla pinnata	2.15	4.3	6.45	8.6	10.75	0.43	Mbow, Cheikh, et al. "Potential of dendrochronology to assess annual rates of biomass productivity in savanna trees of West Africa." Dendrochronologia 31.1 (2013): 41-51.
Detarium microcarpum	6.45	12.9	19.35	25.8	32.25	1.29	**Wood, E. 2021.** *'Growth rates of key tree species at Tree Aid sites in West Afirca',* Report, Tree Aid and University of Edinburgh. Table 5.3
Khaya senegalensis	4.9	9.8	14.7	19.6	24.5	0.98	Wood, E. 2023. 'Ecosystem Restoration in the White Volta Catchment – Estimating growth rates of key tree species'.

Mangifera indica	4.8	9.6	14.4	19.2	24	0.96	Woods, E. 2021. 'Growth rates of key tree species at Tree Aid sites in West Africa', Report, Tree Aid and University of Edinburgh. Table 5.3
Parkia biglobosa	7.7	15.4	23.1	30.8	38.5	1.54	**Wood, E. 2021.** *'Growth rates of key tree species at Tree Aid sites in West Afirca',* Report, Tree Aid and University of Edinburgh. Table 5.3
Psidium guajava	4.35	8.7	13.05	17.4	21.75	0.87	Naik, Sushanta Kumar, et al. "Biomass production and carbon stock in Psidium guajava orchards under hot and sub-humid climate." Current Science 120.10 (2021): 1627.
Sclerocarya birrea	2.793	3.774	4.755	5.736	6.717	1.81	Talla, Ramata, et al. "Dendrochronological Potential and Impact of Climate Factors on Radial Growth of Two Species in the Sahelian Zone: Boscia senegalensis (Pers.) Lam. ex Poir and Sclerocarya birrea (A. Rich) Hoscht (Ferlo Nord/Senegal)." American Journal of Plant Sciences 12.4 (2021): 498-517. AND Hamidou, Abdourhamane, et al. "Potential germination and initial growth of Sclerocarya birrea (A. Rich.) Hochst, in Niger." Journal of Applied Biosciences 76 (2014): 6433-6443.
Tamarindus indica	6.65	13.3	19.95	26.6	33.25	1.33	**Wood, E. 2021.** *'Growth rates of key tree species at Tree Aid sites in West Afirca',* Report, Tree Aid and University of Edinburgh. Table 5.3

Table G4.3 Tree growth equations used in models

Species	Above-ground biomass	Root:shoot ratio / Below-ground biomass	Source (AGB)	Source: Root-shoot ratio	Woody density	E (estimated from lat and long)	Source (Woody density)
Acacia albida	lnY = -2.740 + 2.4629 lnDBH; where Y is the total dry biomass in kg and DBH is diameter at breast height in cm	0.642	Moussa, Massaoudou, and Larwanou Mahamane. "Allometric models for estimating aboveground biomass and carbon in Faidherbia albida and Prosopis africana under agroforestry parklands in drylands of Niger." Journal of Forestry Research 29.6 (2018): 1703-1717.	Mokany, Karel et al. "Critical analysis of root: shoot ratios in terrestrial biomes." Global change biology 12.1 (2006): 84-96.			
Acacia senegal	AGB = exp(−2.024−0.896∗E + 0.920∗log(WD) +2.795∗log(D)−0.0461∗(log(D)²); where AGB is aboveground biomass in kg, E is a measure of environmental stress estimated from the site latitude and longitude, WD is wood density, D	0.642	Réjou-Méchain, Maxime, et al. "biomass: an r package for estimating above-ground biomass and its uncertainty in tropical forests." Methods in Ecology and Evolution 8.9 (2017): 1163-1167. (An update on: Chave, Jérôme, et al. "Improved allometric	Mokany, Karel et al. "Critical analysis of root: shoot ratios in terrestrial biomes." Global change biology 12.1 (2006): 84-96.	0.77	0.77	Zanne, Amy E. et al. (2009), Data from: "Towards a worldwide wood economics spectrum". Dryad, Dataset, https://doi.org/10.5061/dryad.234 AND Nyg, Robert, and Björn Elfving. "Stem basic density and bark proportion of 45 woody species in young savanna coppice forests in

	is diameter at breast height (1.3 m).		models to estimate the aboveground biomass of tropical trees." Global change biology 20.10 (2014): 3177-3190.)				Burkina Faso." Annals of forest science 57.2 (2000): 143-153.
Adansonia digitata (Baobab)	AGB = 2.234966 × dbh^1.43543 where AGB is aboveground biomass in kg and DBH is diameter at breast height in cm.	0.642	Book: Allometric tree biomass and volume models in Tanzania. Eds. R.E. Malimbwi, T. Eid and S.A.O. Chamshama (2016)	Mokany, Karel et al. "Critical analysis of root: shoot ratios in terrestrial biomes." Global change biology 12.1 (2006): 84-96.	0.28		Zanne, Amy E. et al. (2009), Data from: "Towards a worldwide wood economics spectrum". Dryad, Dataset, https://doi.org/10.5061/dryad.234
Anacardium occidentale	AGB = exp(−2.024−0.896∗E + 0.920∗log(WD) +2.795∗log(D)−0.0461∗(log(D)²); where AGB is aboveground biomass in kg, E is a measure of environmental stress estimated from the site latitude and longitude, WD is wood density, D is diameter at breast height (1.3 m).	0.642	Réjou-Méchain, Maxime, et al. "biomass: an r package for estimating above-ground biomass and its uncertainty in tropical forests." Methods in Ecology and Evolution 8.9 (2017): 1163-1167. (An update on: Chave, Jérôme, et al. "Improved allometric models to estimate the aboveground biomass of tropical trees." Global change biology 20.10 (2014): 3177-3190.)	Mokany, Karel et al. "Critical analysis of root: shoot ratios in terrestrial biomes." Global change biology 12.1 (2006): 84-96.	0.45	0.77	Zanne, Amy E. et al. (2009), Data from: "Towards a worldwide wood economics spectrum". Dryad, Dataset, https://doi.org/10.5061/dryad.234
Azadirachta indica	AGB = exp(−2.024−0.896∗E + 0.920∗log(WD) +2.795∗log(D)−0.0461∗(log(D)²); where AGB is aboveground biomass in kg, E is a measure of environmental stress estimated from the site latitude and longitude, WD is wood density, D is diameter at breast height (1.3 m).	0.642	Réjou-Méchain, Maxime, et al. "biomass: an r package for estimating above-ground biomass and its uncertainty in tropical forests." Methods in Ecology and Evolution 8.9 (2017): 1163-1167. (An update on: Chave, Jérôme, et al. "Improved allometric models to estimate the aboveground biomass of tropical trees." Global change biology 20.10 (2014): 3177-3190.)	Mokany, Karel et al. "Critical analysis of root: shoot ratios in terrestrial biomes." Global change biology 12.1 (2006): 84-96.	0.64	0.77	Zanne, Amy E. et al. (2009), Data from: "Towards a worldwide wood economics spectrum". Dryad, Dataset, https://doi.org/10.5061/dryad.234
Balanites aegyptiaca	AGB = 1.929 × DBH + 0.116 × DBH² + 0.013 × DBH³; where AGB is aboveground biomass in	0.642	Mbow, Cheikh, et al. "Allometric models for aboveground biomass in dry	Mokany, Karel et al. "Critical analysis of root: shoot ratios in			

	kg and DBH is diameter at breast height in cm.		savanna trees of the Sudan and Sudan-Guinean ecosystems of Southern Senegal." Journal of Forest Research 19.3 (2014): 340-347.	terrestrial biomes." Global change biology 12.1 (2006): 84-96.			
Citrus limon	AGB = exp(−2.024−0.896∗E + 0.920∗log(WD) +2.795∗log(D)−0.0461∗(log(D)^2); where AGB is aboveground biomass in kg, E is a measure of environmental stress estimated from the site latitude and longitude, WD is wood density, D is diameter at breast height (1.3 m).	0.642	Réjou-Méchain, Maxime, et al. "biomass: an r package for estimating above-ground biomass and its uncertainty in tropical forests." Methods in Ecology and Evolution 8.9 (2017): 1163-1167. (An update on: Chave, Jérôme, et al. "Improved allometric models to estimate the aboveground biomass of tropical trees." Global change biology 20.10 (2014): 3177-3190.)	Mokany, Karel et al. "Critical analysis of root: shoot ratios in terrestrial biomes." Global change biology 12.1 (2006): 84-96.	0.74	0.77	Zanne, Amy E. et al. (2009), Data from: "Towards a worldwide wood economics spectrum". Dryad, Dataset, https://doi.org/10.5061/dryad.234
Cordyla pinnata	AGB = 1.929 × DBH + 0.116 × DBH^2 + 0.013 × DBH^3; where AGB is aboveground biomass in kg and DBH is diameter at breast height in cm.	0.642	Mbow, Cheikh, et al. "Allometric models for aboveground biomass in dry savanna trees of the Sudan and Sudan-Guinean ecosystems of Southern Senegal." Journal of Forest Research 19.3 (2014): 340-347.	Mokany, Karel et al. "Critical analysis of root: shoot ratios in terrestrial biomes." Global change biology 12.1 (2006): 84-96.			
Detarium microcarpum	AGB = exp(−2.024−0.896∗E + 0.920∗log(WD) +2.795∗log(D)−0.0461∗(log(D)^2); where AGB is aboveground biomass in kg, E is a measure of environmental stress estimated from the site latitude and longitude, WD is wood density, D is diameter at breast height (1.3 m).	0.642	Réjou-Méchain, Maxime, et al. "biomass: an r package for estimating above-ground biomass and its uncertainty in tropical forests." Methods in Ecology and Evolution 8.9 (2017): 1163-1167. (An update on: Chave, Jérôme, et al. "Improved allometric models to estimate the aboveground biomass of tropical trees." Global change	Mokany, Karel et al. "Critical analysis of root: shoot ratios in terrestrial biomes." Global change biology 12.1 (2006): 84-96.	0.74	0.77	Zanne, Amy E. et al. (2009), Data from: "Towards a worldwide wood economics spectrum". Dryad, Dataset, https://doi.org/10.5061/dryad.234

			biology 20.10 (2014): 3177-3190.)				
Khaya senegalensis	AGB = exp(0.004 + 1.084*ln (D)); where AGB is aboveground biomass in kg,D is diameter at breast height (1.3 m).	BGB =exp(-0.002 + 0.016*ln(D)); where BGB is belowground biomass in kg, D is diameter at breast height (1.3 m).	Awé et al. (2021) Climate Change Adaptation and Mitigation Options through strengthening carbon Management in Central Africa: Biomass allometric models of Khaya senegalensis (Desr.) A. Juss (meliaceae) in Cameroon	Awé et al. (2021) Climate Change Adaptation and Mitigation Options through strengthening carbon Management in Central Africa: Biomass allometric models of Khaya senegalensis (Desr.) A. Juss (meliaceae) in Cameroon	0.63		Zanne, Amy E. et al. (2009), Data from: "Towards a worldwide wood economics spectrum". Dryad, Dataset, https://doi.org/10.5061/dryad.234
Mangifera indica	AGB = exp(−2.6554+2.2630*ln(D)); where AGB is aboveground biomass in kg, D is diameter at breast height (1.3 m).	0.642	Dao A (2021) Using allometric models to estimate aboveground biomass and predict carbon stocks of mango (Mangifera indica L.) parklands in the Sudanian zone of Burkina Faso. Environmental Challenges 100051.	Mokany, Karel et al. "Critical analysis of root: shoot ratios in terrestrial biomes." Global change biology 12.1 (2006): 84-96.	0.55		Zanne, Amy E. et al. (2009), Data from: "Towards a worldwide wood economics spectrum". Dryad, Dataset, https://doi.org/10.5061/dryad.234
Psidium guajava	AGB = exp(−2.024−0.896∗E + 0.920∗log(WD) +2.795∗log(D)−0.0461∗(log(D)^2); where AGB is aboveground biomass in kg, E is a measure of environmental stress estimated from the site latitude and longitude, WD is wood density, D is diameter at breast height (1.3 m).	0.27	Réjou-Méchain, Maxime, et al. "biomass: an r package for estimating above-ground biomass and its uncertainty in tropical forests." Methods in Ecology and Evolution 8.9 (2017): 1163-1167. (An update on: Chave, Jérôme, et al. "Improved allometric models to estimate the aboveground biomass of tropical trees." Global change biology 20.10 (2014): 3177-3190.)	Naik, Sushanta Kumar, et al. "Biomass production and carbon stock in Psidium guajava orchards under hot and sub-humid climate." Current Science 120.10 (2021): 1627.	0.73	0.77	Zanne, Amy E. et al. (2009), Data from: "Towards a worldwide wood economics spectrum". Dryad, Dataset, https://doi.org/10.5061/dryad.234
Sclerocarya birrea	y = 0.355x^2 + 10.35x - 12.90; where y is aboveground biomass in kg, and x is DBH (at 1.3 m) in cm.	0.642	Talla, Ramata, et al. "Development of Allometric Models for Estimating the Biomass of Sclerocarya birrea	Mokany, Karel et al. "Critical analysis of root: shoot ratios in terrestrial biomes."			

			(A. Rich) Hoscht and Boscia senegalensis (Pers.) Lam. ex Poir." Open Journal of Ecology 10.08 (2020): 571-584.	Global change biology 12.1 (2006): 84-96.			
Tamarindus indica	AGB = exp(−2.024−0.896∗E + 0.920∗log(WD) +2.795∗log(D)−0.0461∗(log(D)^2); where AGB is aboveground biomass in kg, E is a measure of environmental stress estimated from the site latitude and longitude, WD is wood density, D is diameter at breast height (1.3 m).	0.642	Réjou-Méchain, Maxime, et al. "biomass: an r package for estimating above-ground biomass and its uncertainty in tropical forests." Methods in Ecology and Evolution 8.9 (2017): 1163-1167. (An update on: Chave, Jérôme, et al. "Improved allometric models to estimate the aboveground biomass of tropical trees." Global change biology 20.10 (2014): 3177-3190.)	Mokany, Karel et al. "Critical analysis of root: shoot ratios in terrestrial biomes." Global change biology 12.1 (2006): 84-96.	0.97	0.77	Zanne, Amy E. et al. (2009), Data from: "Towards a worldwide wood economics spectrum". Dryad, Dataset, https://doi.org/10.5061/dryad.234 AND Sayed, R. M. M. "ABOVE-GROUND BIOMASS AND SOME WOOD PROPERTIES OF 30-YEARS-OLD CHRYSOPHYLLUM OLIVIFORME AND TAMARINDUS INDICA TREES GROWN IN ASWAN, EGYPT." Journal of Plant Production 3.11 (2012): 2723-2732.

G5 Ecosystem Service Benefits

G5.1 Climate Benefits Methodology

G5.1.1 Methodological tools applied

The Technical Specifications reference the following Methodological Tools:

- Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities
- Plan Vivo Methodology Agriculture and Forestry Carbon Benefit Assessment Methodology PM001
- Plan Vivo Module Estimation of baseline and project GHG removals by carbon pools in Plan Vivo projects PU001

The expected carbon benefits from each enrichment planting site and each agroforestry site are estimated with Equation 1.

$$CB_a = \left(PR_{WB,a} - BR_a - LE_a\right) \cdot UD \qquad \text{Equation 1}^{20}$$

Where:

CB_a = Expected climate benefit from project site a (tCO_2e);
$PR_{WB,a}$ = Expected project removals from woody biomass in site a ($t\ CO_2e$; see Section G5.1);
BR_a = Expected baseline removals in site a ($t\ CO_2e$; see Section G4.1);
LE_a = Leakage emissions from site a ($t\ CO_2e$; see Section G6.1); and
UD = Uncertainty adjustment factor (see Section G6.2).

G5.1.2 Parameters Recorded for New Enrichment Planting Sites

When a new enrichment planting site is added to the project the following details must be recorded:

- Name of enrichment planting site
- Extent of planting site (in hectares)
- GPS boundary of planting site
- Pre-project land cover land use
- Number of trees of each species planted
- Harvesting plan for *Tectona Grandis*
- Extent of grazing areas of communities prior to planting

G5.1.3 Parameters Recorded for New Agroforestry Sites

When a new agroforestry site is added to the project the following details must be recorded:

- Name of Commune/Village
- Name of farmer
- Extent of planting site (in hectares)
- GPS boundary of planting site
- Number of trees of each species planted

G5.1.4 Progress Monitoring

The Progress indicators in Tables G5.1 and G5.2 must be collected annually for the first 3 years after planting of any afforestation and agroforestry sites to ensure survival rates of juveniles required to meet project requirements is met. Further monitoring is then required for each verification during the 10-year monitoring period. Project sites that fail to reach the target

[20] See Equation 7 from PM001 https://www.planvivo.org/Handlers/Download.ashx?IDMF=9362bb39-5dc5-45c1-a240-600148494ae9

values must implement the corrective actions outlined in Tables G5.1 and G59.2.

Table 5.1 Monitoring indicators for Enrichment planting sites

Indicator	Details	Target	Corrective Action
Progress Indicators			
# trees planted	Reported by project team	100% of planned yearly planting	Inquiry into delays in tree planting and devise supportive action with farmers to address these in the next planting season
% survival of each species planted	Forest inventory, stratified by enrichment planting site	At least 70%	Inquiry into tree loss to identify causes of loss, and supportive action with farmers to address these.
% of dead trees of each species that have been replanted	Reported by project team	# of trees to ensure that survival rate is 70% of planted trees	Provision of support to assist with replanting.
Performance Indicators			
Estimated woody biomass of project trees	Forest inventory (subtracting woody biomass from pre-project trees), stratified by enrichment planting site	80% of value expected from growth models in Table G4.2	Evaluation of growth challenges for trees, and actions to be developed and implemented with project participants.

Table 5.2 Monitoring indicators for Agroforestry sites

Indicator	Details	Target	Corrective Action
Progress Indicators			
# trees planted	Reported by project team	100% of planned yearly planting	Inquiry into delays in tree planting and devise supportive action with farmers to address these in the next planting season
% survival of each species planted	Calculated from a complete census of planted trees by project participant	At least 70%	Inquiry into tree loss to identify causes of loss, and supportive action with farmers to address these.
% of dead trees of each species that have been replanted	Reported by project participant	# of trees to ensure that survival rate is 70% of planted trees	Provision of support to assist with replanting.
Performance Indicators			
Average DBH of planted trees and DBS of planted shrubs of each species	Every tree planted	80% of value expected from growth models in Table G4.2	Evaluation of growth challenges for trees, and actions such as increased mulching, watering, removing of grazers or other actions to be developed and implemented with farmers.
Basal area of pre-project trees/shrubs	Calculated from measurement of all pre-project trees in the project area	80% of pre-project value.	Investigate causes of reduction, and if losses are related to the project intervention a conservative deduction for loss of pre-project tree biomass must be applied.

G G5.1.6 Verification of Carbon Benefits

The Performance Indicators in Tables G5.1 and G5.2 will be measured across all enrichment planting and agroforestry sites respectively, annually for the first three years after planting a site, and then for every verification.

If a Performance Indicator target is not met for any project area, the corrective action in Tables G5.1 and G5.2 must be implemented in that project site.

G5.1 Verified climate benefits

At each verification, actual carbon benefits realised at enrichment planting sites and agroforestry sites are calculated with Equation 5.

$$CBV_a = \left(PRV_{WB,a} - BR_a - LE_a\right) \cdot U \qquad \text{Equation 5}$$

Where:

CBV_a = Actual climate benefit realised at project sites *a* (tCO_2e);
$PRV_{WB,a}$ = Actual project removals from woody biomass in site *a* (t CO_2e; see Section G10.2);
BR_a = Actual baseline removals in site *a* (assumed to be 0 tCO_2e; see Section G4.1);
LE_a = Leakage emissions from site *a* (tCO_2e; see Section G6.1); and
U = Uncertainty adjustment factor (see Section G6.2).

Verified climate benefits must be calculated for each project site.

G5.1.7 Woody Biomass

Enrichment planting sites
Verified removals from increases in above-ground and below-ground woody biomass in each enrichment planting site are calculated with Equation 6.

$$PRV_{WB,a,y} = \left(\left(AGBV_{a,y} + BGBV_{a,y}\right) - \left(AGB_{a,bsl} + BGB_{a,bsl}\right)\right) \cdot \mathrm{CF} \cdot VF \qquad \text{Equation 6}$$

Where:

$PRV_{WB,a}$= Actual project removals from woody biomass in site *a* during the quantification period (t CO_2e);
$AGBV_{a,y}$ = Above-ground tree biomass within site *a,* in monitoring year *y* (tonnes of dry mass, estimated from forest sample plot data and species specific equations in G6.3);
$BGBV_{a,y}$ = Below-ground tree biomass within site *a,* in monitoring year *y* (tonnes of dry mass);
$AGB_{a,bas}$ = Above-ground tree biomass within site *a,* as estimated in the baseline (tonnes of dry mass, see Section G4.3);
$BGB_{a,bas}$ = Below-ground tree biomass within site *a,* as estimated in the baseline (tonnes of dry mass, see Section G4.3);
CF = Carbon fraction of dry matter (see Table G6.2)*;*
VF = Conversion factor for converting from carbon to CO_2e of $\frac{44}{12}$; and

Above- ground woody biomass within an enrichment planting site is calculated from measurements taken across a network of forest sample plots across the site. As for the baseline assessment, measurements will be taken from a number of pilot forest plots which will then inform the number of plots required from the survey. Woody biomass for each tree is calculated using species specific equations documented in Section G6.3, and the tree measurements.

Agroforestry sites
Actual removals from increases in above-ground and below-ground woody biomass in each agroforestry site are calculated with 7.

$$PR_{WB,a} = \sum_{s=1}^{n}\left(AGB_{a,s} + BGB_{a,s}\right) \cdot CF_s \cdot VF \qquad \text{Equation 7}$$

Where:

$PR_{WB,a}$= Actual project removals from woody biomass in site *a* during the quantification period (t CO_2e);

$AGB_{a,s}$ = Actual above-ground tree biomass for the quantification period for all trees of species *s* planted within site *a* (tonnes of dry mass);

$BGB_{a,s}$ = Expected below-ground tree biomass for of the quantification period for all trees of species *s* planted within site *a* (tonnes of dry mass);

CF_s = Carbon fraction of dry matter for species *s* (see Table G4.1);

VF = Conversion factor for converting from carbon to CO_2e of $\frac{44}{12}$; and

n = Number of species planted in project site *a*.

For each site, the project trees will be measured, and species-specific allometric equations applied to estimate biomass

Aboveground biomass

Equation 8 is used to estimate expected aboveground biomass at the end of the quantification period.

$$AGBV_{a,s} = (\sum_{t=1}^{n} AGBV_{t,s}) \qquad \text{Equation 8}$$

Where:

$AGBV_{a,s}$ = Actual above-ground tree biomass for the quantification period for all trees of species *s* planted within project site *a* (tonnes of dry mass);

$AGBV_{t,s}$ = Actual biomass at the end of the quantification period for tree *t*, of species *s* (tonnes of dry mass); and *n* = Number of trees of species *s* planted in project site *a*.

G5.2 Expected Climate Benefit and Summary

Expected climate benefits must be calculated for each new project site.

The expected carbon benefits from enrichment planting site established in 2022 prior to project validation are summarised in Table G5.1. The full calculations for $PR_{WB,a}$ are available in Annex 13 respectively.

Table G5.1 Estimated Climate Benefits from enrichment and agroforestry planting sites

* UD = Uncertainty discount, calculated as 25% of unadjusted carbon benefits.

Year	*Baseline Removals*	*Project Removals (Woody Biomass)*	*Leakage*	Uncertainty Discount	Climate Benefit	Buffer	Climate benefit MINUS buffer	Units per year
1	0	53	0	13	39	8	32	32
2	0	631	0	158	473	95	378	347
3	0	1,635	0	409	1,226	245	981	603
4	0	3,016	0	754	2,262	452	1,809	829
5	0	4,935	0	1,234	3,701	740	2,961	1,151

6	0	7,523	0	1,881	5,642	1,128	4,514	1,553
7	0	10,854	0	2,713	8,140	1,628	6,512	1,999
8	0	14,995	0	3,749	11,246	2,249	8,997	2,485
9	0	20,016	0	5,004	15,012	3,002	12,010	3,012
10	0	25,971	0	6,493	19,478	3,896	15,582	3,573
11	0	32,916	0	8,229	24,687	4,937	19,750	4,167
12	0	40,900	0	10,225	30,675	6,135	24,540	4,790
13	0	49,975	0	12,494	37,482	7,496	29,985	5,445
14	0	60,182	0	15,045	45,136	9,027	36,109	6,124
15	0	71,566	0	17,891	53,674	10,735	42,940	6,831
16	0	84,167	0	21,042	63,125	12,625	50,500	7,561
17	0	98,025	0	24,506	73,519	14,704	58,815	8,315
18	0	113,174	0	28,293	84,880	16,976	67,904	9,089
19	0	129,653	0	32,413	97,240	19,448	77,792	9,888
20	0	147,494	0	36,873	110,620	22,124	88,496	10,704
21	0	166,732	0	41,683	125,049	25,010	100,039	11,543
22	0	187,420	0	46,855	140,565	28,113	112,452	12,413
23	0	209,534	0	52,384	157,151	31,430	125,721	13,269
24	0	233,136	0	58,284	174,852	34,970	139,882	14,161
25	0	258,263	0	64,566	193,697	38,739	154,958	15,076
26	0	284,939	0	71,235	213,704	42,741	170,963	16,005
27	0	313,184	0	78,296	234,888	46,978	187,910	16,947
28	0	343,031	0	85,758	257,274	51,455	205,819	17,908
29	0	374,503	0	93,626	280,877	56,175	224,702	18,883
30	0	407,623	1,342	101,906	304,375	60,875	243,500	18,799

The expected carbon benefits from agroforestry sites established in 2022 prior to project validation are summarised in Tables G5.2. The full calculations for $PR_{WB,a}$ are available in Annex 14 respectively.

G6 Leakage & Uncertainty

G6.1 Leakage

Three potential sources of leakage could result from the project's interventions:

1. **Direct activity shifting**, where project activities directly cause actors within the Project Region to move their emission-causing activities to elsewhere;
2. **Indirect market effects**, where the reduced supply of emission-causing goods from the Project Region (i.e. timber) increases the market price of goods, thus leading to increased production (and emissions) elsewhere; and
3. **Indirect super-acceptance**, where the benefits from the project are so great that they attract new people to the region thus putting further pressure on forests.

Regarding indirect effects, participants in the project are not significant contributors to local

timber and fuelwood industries, thus no market effect is expected from project activities. Likewise, while the enrichment planting intervention and agroforestry intervention aim to improve the livelihoods of project participants through NTFPs, fuelwood provision from dead/fallen stems and improved soil fertility (see Table 12), these improvements to ecosystem services from tree planting and other benefits from the community fund financed from sale of credits are expected to provide incremental improvements in income, with existing livelihood activities (i.e. grazing and agriculture) remaining the core of people's income.

The main risk of leakage comes from activity shifting, where the land management measures for participating communities may influence participants to displace their grazing from the enrichment planting sites to other areas of communal land. The risk level of leakage from displaced grazing is assessed as negligible because:

- Land cover maps (see Annex 2) demonstrate that the majority of the land use adjacent in the project region is the same or lower biomass than the project sites. Very little forest land or gallery forest land exists. The project can ensure through land management plans and local land charters that the forests and/or gallery forest on communal land are not affected by the displacement.
- The project will implement activities to increase fodder production and improve pastures to avoid reduction in carbon stocks around enrichment planting sites caused by the displacement of grazing.
- Community-based committees track where grazing activities are displaced to, the type of land that grazing activities are displaced to (source – land cover maps). The monitoring data will be used to ensure that livestock are not being displaced to areas of higher biomass than the enrichment planting sites.

Upon review of our agroforestry activities, leakage was taken into consideration through potential activity-shifting leakage due to reduce agricultural yield. Literature shows a mixed impact of agriculture on the yields of sample, staple crops such as Maize, Millet, and Sorghum, when planted in an agroforestry system with some of our trees such as Shea, *Acacia*, and *Faidherbia albida*. The mean overall yield change across all literature obtained showed a mean increase of 140.96%. However, in the interest of being conservative, when observing only the negative values, this shows a mean yield reduction under shade of 34.46%. Therefore, to continue the trend of being conservative, it was assumed that all agroforestry farmers who observe yield loss will shift their agricultural activity elsewhere, reducing the existing biomass of this leakage area directly proportional to our estimated Carbon benefits.
Therefore, mean crown diameter was taken for sample agroforestry tree species, showing a mean area under shade (AUS) per tree of 114.78m^2. Assuming this area evenly receives a literature-basd yield reduction factor (YRF) of 34.46%, and that this shifts agricultural activity to wooded areas that are then cleared, the resulting leakage estimation of 1,342.18 tCO_2e total across the project. Full calculations can be seen in Annex X.

G6.2 Uncertainty

The main sources of uncertainty in estimates of expected carbon benefits, and measures in place to minimise uncertainty are:

- Baseline and leakage assumptions (see Sections G4 and G6) – minimised through the applicability conditions, that all Project Regions must conform to (see Section G1.2);
- Parameter values applied for estimating project removals from woody biomass (see Table G5.1) – minimised by selecting appropriate default factors and periodic review and updating; and
- Tree growth and biomass allometric models (see Table G4.2 and G4.3) - minimised by selecting the most appropriate models available and periodic review and updating.

Parameter values, tree growth and biomass allometric models will be reviewed and updated

every 5 years prior to the project period verification. The review will take into consideration both field data generated from Tree Aid's portfolio of projects as well as any available online reports and papers from academic journals. A log of changes to parameters and/or models will be generated and included as a separate sheet in the excel workbooks of Annexes 13, 14, 16, and 17.

It is not possible to eliminate all sources of uncertainty, or to quantify the uncertainty of expected carbon benefits. To reduce the likelihood that carbon benefits are overestimated, an uncertainty adjustment factor of 75% is applied in the calculation of carbon benefits (see Equation 1) to reduce carbon benefits for which ex-ante certificates are claimed by 25%.

Part H: Risk Management

H1 Identification of risk areas

The project recognizes the importance of permanence of its activities so that activities to generate climate, biodiversity and community benefits are not only initiated but are maintained in order to maintain the benefits. To this end, risks that could threaten permanence of the project are identified, with risk management measures designed accordingly.

A key threat to permanence of project activities is the mere lack of sense of ownership of the project by the targeted communities. To minimize this threat, the project ensures that communities are actively involved in project management processes affecting them while on the other hand, building their management capacity through training. The other potential risks, risk level and associated risk management measures are summarised in Table 14 below.

Table 14: Identification of Risks and Measures to address them

Identification of Risks and Measures to address them			
Risk Type	**Risk Level**	**Frequency of assessment**	**Management Measures**
Permanence risk			
Changes to land tenure, land-use and carbon rights	High	Frequent	• Working across stakeholders from national through to local government and local chiefs to ensure that land identified is agreed for long term use. • Creating clear agreements that are backed up by a process of engagement that clearly explains the expectations
Termites	Medium/High	Frequent	• Community mobilisation and breaking up of termite colonies that are close to planted trees • Capacity building on approaches to manage termites with natural remedies, where possible
Grazing and or fuelwood extraction caused by migrants	Medium/High	Frequent (in dry season)	• Community mobilisation to monitor planting sites. • Inclusion of transhumance groups in awareness raising of the planting sites, management plans and byelaws
Land clearance in the enrichment sites and small-holder farms for cultivation	Low	Annually	• Community mobilisation and participation in planning processes • Capacity building (on improved land use management systems, agriculture and silviculture, tree planting and management activities) • Awareness (benefits that may be derived from tree planting and protection)

			• Training to enable long term sustainability of programme through participatory monitoring and evaluation • Agreements for change in land use system in place for 30 years • Only farmers that follow technical specifications are eligible for carbon benefits • Staged payments • Annual internal verification
Fire	Medium	Frequent	• Community mobilisation and participation in planning processes • Adoption of recommended fire protection measures including establishment of fire breaks around planting sites • Civic education to communities and their leaders on the dangers of bush fires to the environment and their livelihoods • Formation of community-based committees in villages, tasked to monitor fire outbreaks and incidents
Drought	Medium	Annually	• Early planting of strong healthy seedlings • Good silvicultural practices like deep pitting and use of organic manure for increased soil moisture retention. • Promotion of complementary irrigation where applicable and possible through purpose built waterpoints.
Grazing/ livestock damage	Medium	Frequent	• Exclude grazing from tree planting areas • Education of communities on recommended livestock management practices like tethering and zero grazing during periods when trees are vulnerable to livestock damage. • Placement of protective structures (normally thorny trees) around planted sites or individual trees, where feasible. • Enforcement of community-by-laws by traditional leaders that regulate movement of livestock in communities. • Introduction of fodder trees and bushes in pasture areas to improve fodder production
Overreliance on external support	Low	Annual	• Capacity building on all technical aspects of tree establishment and management including community-based seedling production • Broadening income streams to producers through additional activities, such as the development of NTFPs value chains, over and above carbon finance payment
Water pollution from mining activities	Low	Once	• Testing the water quality at relevant sources of water (nurseries, water for planted trees)
Leakage risk			
Displacement of agricultural activity including grazing	Medium	Annually	• Signatories to Plan Vivo activities are contractually obliged not to displace their activities as a result of trees planting • Community-based committees monitor that leakage resulting from displaced activities does not occur

H2 Risk buffer

Based on risks and associated risk level outlined above and following the guidance provided in the Plan Vivo Approved[21] for setting the risk buffer for an ex-ante project, the project will

[21] https://www.planvivo.org/Handlers/Download.ashx?IDMF=e4ce17d4-4283-4409-b8e4-7a1d4b101271

withhold **20%** of carbon services generated from sale to form a carbon risk buffer. Records of all buffer stock should be maintained in the database.

Part I: Project Coordination & Management

I1 Project Organisational Structure

Tree Aid is a registered charity in the UK (Registered Charity No. 1135156), and a registered NGO in Burkina Faso and Mali.

The project will be implemented in collaboration with the targeted communities, and local and national government agencies in charge of the environment and the effects of climate change. Communities organised into management committees will implement the restoration activities, and develop management plans and local bylaws. The management committees will be provided with the necessary tools and management practices to sustainably manage natural resources. The decentralized government authorities, in particular the rural/ municipal councils at the commune level, under the patronage of the national agencies will support project activities. Tree Aid and their technical partner The Landscapes and Livelihoods Group (TLLG), bring technical support and facilitation of operations and processes.

Table 15: Roles of project coordinator (Tree Aid and Tree Aid Mali), technical partner and local partner (La Lumière)

Role	Tree Aid UK	TLLG	Tree Aid Mali	La Lumière
Administration				
Registration and recording of management plans and sale agreements	P			
Managing the use of project finance in the Plan Vivo and making payments to producers	P			
Coordinating and recording monitoring	P			
Negotiating sales of Plan Vivo Certificates	P			
Reporting to the Plan Vivo Foundation	P			
Contracting project validation and verification		P		
Managing project data	P	P		
Technical				
Providing technical support and training to producers in planning and implementing project activities	P	P	P	P
Developing, reviewing, and updating technical specifications	P	P	P	P
Evaluating management plans	P	P	P	P
Monitoring carbon, livelihoods, biodiversity, and ecosystem services	P	P	P	P
Social				
Conducting preliminary discussions and continued workshops with communities			P	P
Gathering socio-economic information for project registration and reporting purposes			P	P
Helping groups/individuals to demonstrate land-tenure			P	P
Advising on issues such as mobilization, setting up bank accounts, dispute resolution, etc.			P	P

Tree Aid

Tree Aid has been working towards poverty alleviation and environmental protection in the drylands of Africa since 1987. During this time, Tree Aid has grown over 27 million trees and directly supported more than one million people out of poverty in Mali, Ghana, Burkina Faso,

Ethiopia and Niger. Between 2014 and 2017, Tree Aid supported the creation of over 500 Village Tree Enterprises based on NTFPs and worked directly with almost 500,000 people. Over 50% of those beneficiaries are women who have seen their incomes increase by at least 25%. Tree Aid is currently managing a project portfolio worth over $29 million including substantial grants from a diverse group of government donors including The Swedish International Development Cooperation Agency (SIDA), the Swiss Agency for Development Cooperation (SDC), UK Foreign Commonwealth and Development Office (Aid match and Aid Direct), UK Department for Food and Rural Affairs (Darwin Initiative), Jersey Overseas Aid (JOA) as well as numerous trusts and foundations and corporates. Interventions include enterprise development based on sustainably sourced NTFPs, forest governance to ensure rights are held by communities who rely on the resources, natural resource management and food and nutritional security.
Tree Aid monitors progress across all projects through transparent, clear and simple reporting systems and ensures that issues around resources, risk and change across programmes are highlighted and dealt with throughout the project life cycle. Tree Aid uses a cloud-based, multi-currency consolidation system, IRIS Financials (formerly PS Financials), to manage all aspects of financial management across our countries of operation. This enables production and ownership of budgets and management information at a local level, where there are local finance teams, as well as at a consolidated level, where finances are managed by a small team of finance specialists in the UK.

TLLG

TLLG was established in 2017 by a group of environmental and social experts with an interest in supporting development of nature-based solutions to global environmental and humanitarian challenges. They support projects and programmes at all stages of their development including design, implementation, evaluation, and applying lessons learned. Services provided to a range of national and international NGOs include:

- Feasibility assessments of potential projects, and due diligence assessments for potential project investors.
- Baseline surveys of carbon stocks, ecosystem status, and socio-economic conditions using a combination of remote sensing, secondary data, and local surveys and measurements.
- Design of project activities to improve ecosystem management, address drivers of deforestation and forest degradation, and restore degraded ecosystems.
- Development of methods, or application of existing methodologies, for assessment and monitoring of carbon benefits, and biodiversity and livelihood impacts of project activities.
- Development of project documents required for certification by international carbon standards.
- Environmental and social impact assessment, and development of safeguard tools, stakeholder engagement plans, and environmental and social management systems.

La Lumiere

The NGO "La Lumière" is a support structure for decentralisation and local development created in 1999. It was established as an NGO in September 2006 by ministerial decree with its overall mission to contribute to the harmonious socio-economic development of vulnerable and disadvantaged groups.

Since 2012, La Lumière has been developing rural resilience projects as part of the fight against the shocks induced by climate change. It implements this through adaptation-linked actions such as:

creation of sustainable assets as a component of disaster risk reduction
improved management of natural resources (water structures to harvest and control water resources (levees and dikes), de-silting river beds, soil and water conservation, water reservoirs, reforestation, promotion of agroforestry systems, market gardening, rice cultivation, installation of bio-digesters for the promotion of bio-fertilisers, distribution of electricity through biogas);
risk transfer through agricultural insurance;
rural entrepreneurship (capacity building of small-scale rural producers, village savings and loan schemes, "warrantage").

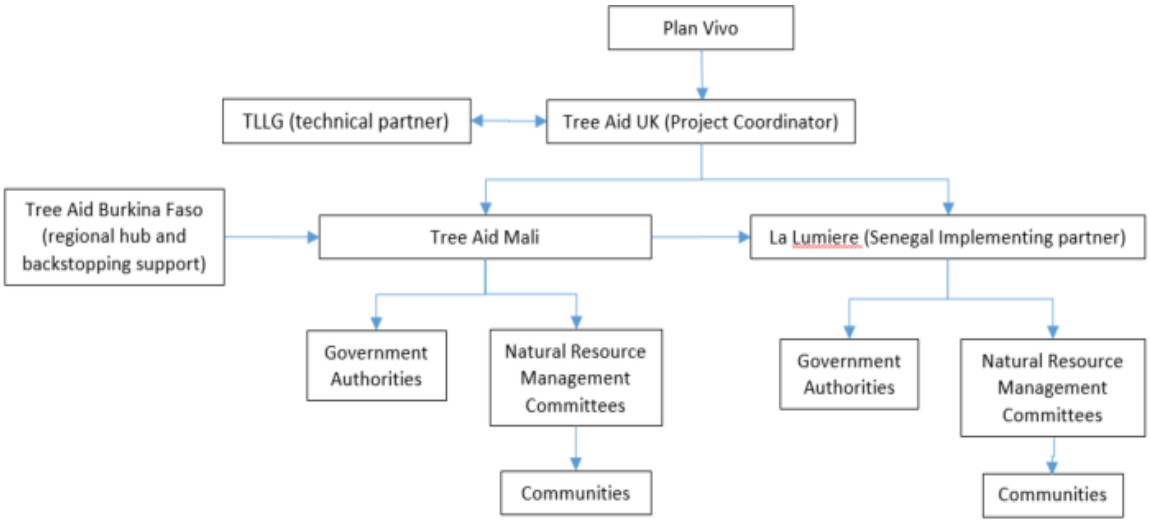

Figure 21: The Main Project Stakeholders

Stakeholder analysis has been completed in both Mali and Senegal highlighting national, regional and local stakeholders and their potential impact and influence on the project. – see Annex 18a and 18b.

A number of stakeholder engagements have contributed to confirming the Project Region and developing the project design:

- In June 2021, consultation was undertaken by the project with the Agence de l'Environnement et du Développement Durable (AEDD) in Mali as the focal structure and Designated National Authority (DNA) for the Climate Fund, the Great Green Wall (GGW) and the Forest Information System (SIFOR). The result of this confirmed the overall suitability of developing afforestation and agroforestry interventions at sites within the Project Region.

- In January 2022, meetings were held with elected officials in five communes in Mali: Falémé, Samé Diomgoma, Kéméné Tambo, Tafacirga and Sony during 5 days (January 25-29, 2022). The general purpose of these meetings was to present the content and logic of the project intervention, the main activities in the project and the expected results and to share and validate the project intervention mechanisms with the authorities.

- In Senegal, between February and March 2022, consultations were carried out with the *Gouverneur* de la Région de Tambacounda, the *Commandant des Eaux et*

Forêts, the *Directeur de l'Agence Régional de Developpement* (ARD) and the *Sous-prefets* of Kéniéba and Bélé. The meetings were a great opportunity to receive feedback from the authorities on areas where the project goal and activities could complement the ongoing efforts to support the wellbeing of the communities in the region of Tambacounda. At the end of these meetings, certain zones were designated by the elected officials as conducive to the objectives and expected results of the project.

- In both countries, village-level consultation took place and data was collected using digital forms. In Mali, the data was collected from 51 villages in the communes of Diboli, Falemé, Fégui, Kemene Tambo, Same Diongoma, Sony and Tafacirga between the 20th and 30th of March, 2022. In Senegal, the data was collected from 78 villages in 5 communes (Sinthiou Fissa, Bélé, Gathiary, Medina Foulbé and Tomboura). The questions asked covered themes such as land use, livelihoods options, levels of conflict and levels of degradation. This information was used to help identify suitable villages for the project, and to gain insight into the current situation. (Stakeholder consultations and engagement to date in Annex 18a and 18b).

I2 Relationships to national organisations

The project does not tie in with any government schemes (carbon or otherwise), though national and local government has been consulted on the project since the beginning of the project development.

The project has engaged in Mali: services of water and forest of Kayes (cantonment forest, regional direction, communes of intervention of the project: Samé diongoma, Falémé, Keméné tambo, Tafacirga and Sony. Commune-level staff have been involved in regional workshops that have discussed the project governance structure, grievance mechanism and benefit-sharing mechanism.

In Senegal, the project has engaged the Ministry of Environment and Sustainable Development (MEDD) Climate Change Division, including the Sustainable Development Unit of the MEDD, the Regional Directorate for the Environment and Classified Establishments (DREEC) as well as the regional, departmental and municipal authorities during the FPIC process.

In both countries, the project has been in contact with the Great Green Wall Initiative (GGWI) focal points. The Great Green Wall Initiative is an Africa-led (African Union) campaign to grow trees across the Sahelian belt of Africa. Both Senegal and Mali are recognised participating countries, with their own GGWI focal points.

I3 Legal compliance

The project has received a letter of non-objection from the Malian *Ministere de l'environnmenet, de l'assainissement et du developpement durable* (Annex 3).

In Senegal, the project has contacted the Ministry of Water, Forests, Hunting and Soil Conservation but is yet to receive a formal response. An agreement is in the process of being signed with Great Green Wall directorate (Agence sénégalaise de la Reforestation et de la Grande Muraille verte) that constitutes a tripartite agreement between Tree Aid, La Lumière and the Directorate.

Tree Aid's policies (see Annexes 19 to 22) ensure that recruitment processes are aligned with UK law and best practice. Policies are also in place to cover safeguarding, anti-bribery and

corruption, and anti-fraud. Procurement processes are also clearly outlined in a policy to help provide value for money and avoid any risk of fraud. These policies are available in English and French and are shared with partners as part of any contract that is entered into. Training is also provided to partners in the policies to help ensure adherence.

I4 Project management

The funding for the first 243,500 tonnes CO2e has already been committed by the International Olympic Committee (IOC) to cover four years of their carbon footprint. The project is already in the implementation phase as of 2022. Villages have been identified and are engaged for planting in 2022, 2023 and 2024, with the objective of planting sufficient trees to cover 243,500 tonnes CO2e. Monitoring is being established in 2023.

All Plan Vivo agreements will be signed and digitally stored, and there will be a register of all agreements containing the parties involved, the requirements, results and any payments disbursed (and signed for) against each plan vivo agreement (mechanism for sending these is to be determined, but likely bank transfer for enrichment sites, and direct via cash or mobile money for individuals). Signed receipts for payments made will be digitally stored. New agreements will be added to the register, as and when funding becomes available to do so. It is expected that additional funding will be available to extend the project into Phase 2 new sites in the same regions of Mali and Senegal in 2024, in a bid to start the process of sequestering the other 600,000 tonnes CO2e.

Currently, there is no business development function for the project as the IOC has already committed the funds to sequester the first 243,500 tonnes CO2e. Tree Aid will retire the certificates for the 243,500 tonnes CO2e on behalf of IOC. The IOC is also seeking funds from affiliates in the sport community to extend the work. Furthermore, the IOC may seek to cover its own carbon footprint for the subsequent 4 years.

I5 Project financial management

Budget has already been set aside for the purpose of PES. These will be distributed to individual participants (agroforestry) and relevant committees (enrichment planting sites) according to the Plan Vivo Agreements. Payments will be signed for and recorded in the Plan Vivo register. While the mechanism for the disbursal of funds has not been decided, some consultation has taken place discussing the matter, including options for using mobile money, bank transfers, or cash.

These initial discussions conclude that disbursal of funds to agroforestry participants is likely to be a cash transfer, with 3 signatures on receipt, and to communities involved in enrichment planting disbursal is likely to be a bank payment made to cooperatives established at the village level and with their own bank account. The establishment of cooperatives and bank accounts is ongoing.

Digital records of receipt of funds will be stored, see also Part J.

The project budget has been developed to cover a 10-year project life cycle, with communities taking on responsibility for the protection of trees thereafter. A summary of the planned budget for this is provided in Table 16 and Table 17 below. Monitoring will continue throughout the quantification period of 30 years.

Table 16: Budget split by actors

Tree Aid	$166,070
Tree Aid Mali	$141,319

La Lumière	$185,490
Verification costs	$155,043
Community	$1,002,136

Table 17: Community budget split by nature of support

Support	Mali	Senegal
Provision of trees	$43,964	$173,127
Provision of equipment	$45,300	$45,375
Training	$27,047	$42,769
Support-in-kind	$149,858	$114,682
Cash for work	$30,956	$48,985
Cash for reporting and PES	$140,036	$140,036

As mentioned, funding has already been made available for the first phase implementation for the sequestration of 243,500 tonnes CO2e. The IOC and Tree Aid are seeking opportunities to attract funding from other pertinent partners (given the 'Olympic Forest' branding and nature of the project).

I6 Marketing

The plan is that for all Plan vivo certificates realised under this project, a buyer will already be identified and the certificates immediately retired by Tree Aid for them. The IOC have already contracted the first 243,500 tonnes CO2e. The project expects any future funding to also be committed to retire certificates immediately. Therefore, marketing of the certificates has not yet been considered.

I7 Technical Support

The project plans to build capacity for project participants to grow and manage trees on their private and communal land. The techniques that participants will be trained in will enable them to continue to protect and nurture planted trees, as well as understand how to benefit from them in the longer term.

The current budget allows for staff to continue to support the project throughout the 10-year project life cycle. This will enable annual data collection and reporting to be completed, and for support to be provided to agroforestry participants and committees charged with managing enrichment sites. Government agencies will be engaged at the local level to ensure that support is provided to the project in the longer-term too. Tree Aid will continue to monitor sites during the quantification period of 30 years.

A system for monitoring and evaluating activities has been set up by the project and is based on the participation of the various stakeholders. For field monitoring, the facilitators will ensure the supervision and monitoring of activities at the project zone level. At the community level, the members of the natural resource management cooperatives will ensure the mobilisation and effective participation of all sections of society. Finally, at the institutional level, the consultation frameworks will enable the territorial and administrative authorities to monitor the activities.

As part of the monitoring, in each village benefiting from the agroforestry activities, a producer is been designated as a relay. The relays chosen in the various villages have been trained and equipped with tools for monitoring agroforestry producers (notebook for monitoring activities in the plots and monitoring and counting seedlings in the agroforestry

plots. As part of forest governance, forest management cooperatives and village committees will be set up, as well as monitoring brigades to carry out management activities in the villages. These entities must be trained and provided with tools on their roles and responsibilities in the context of cooperative and forest management, as well as on the standards and requirements of carbon certification.

Part J: Benefit sharing

J1 PES agreements

Procedures for entering into PES agreements

Throughout the project development process, consultation with village representatives and individuals has helped identify motivated people to support planting and protection on available land, with minimal risk of conflict. PES agreements for individuals (agroforestry) and communities (enrichment planting) will be developed in consultation with the communities and regional stakeholders. These templates (Annex 23 for enrichment planting) will be translated into local languages and used for all agreements, allowing for the context at specific sites. The PES agreement will outline the total number of trees received by an individual/community, with the relevant contribution of carbon. It will also provide the payment plan, which can only be realised if the obligations therein are met.

Ensuring that obligations are met

The project team, as well as the local structures established by the project (inter-village and agroforestry committees), will assess the progress at each Plan Vivo site to ensure that obligations over a 10-year period are being met. These will include the planting on the site, target survival rates and the DBH of planted trees.
Monitoring visits by the project will be made as per monitoring plan (see Part K below). Payments to be made to participants will only be made on the verification that the obligations have been met – or at least a % of payment will be made, based on the % complete against the expected targets.

Risks and associated mitigation measures regarding PES agreements

PES agreements will outline the need to keep the project informed of any unforeseen issues that impact a participant's ability to deliver on the PES agreement for reasons outside of their control. As funds are already committed, the amount available for each ton of carbon makes estimating the amount available for each planting site easier to manage.

For communal sites, a clear plan for benefit-sharing has been proposed, which will enable members of the participating villages will be able to benefit from the funds. This is to mitigate the potential conflict that the income could have.

Complaints about non-payment of participants will be mitigated through ensuring that there is signed documentation for each payment made to participants. All payments to be made will be recorded in the Plan Vivo register, which will track planned and actual payments as per each Plan Vivo agreement.

Being able to visit and verify progress on the hundreds of sites will require a robust and consistent monitoring approach. Digital (ODK) forms will be developed, which enable consistent collection of data, which includes photographs at Plan Vivo sites.

J2 Payments & Benefit Sharing

Payments to participants will be made on the verification of progress against agreed objectives laid out in the Plan Vivo agreements. These will be based on the status of planting on the site, the survival rates of trees and the growth of the trees, over a 10-year period. The verification may be done for a specific site or across a sample of sites – to check that self-reporting is accurate. All payments will be recorded with signed documentation and tracked in a Plan Vivo register. Payments to individuals will be made in cash, and for communal enrichment planting, village cooperatives will be created and required to open a bank account. Payments will be made to these bank accounts. For enrichment planting sites, the payments made will be accessible to village members through agreed benefit-sharing. This will provide investments in community resources or a fund from which village members could take a loan.

If activities are partially achieved, a partial payment may be made. If unforeseen and uncontrollable challenges prevent targets being achieved, payments could still be made for work carried out up to that point as all sites will take into account the required % risk buffer for the project. If targets are not being met due to poor management, remediation plans will be put into place and annexed to the Plan Vivo agreement to track improvements and the realisation of targets. For enrichment sites, these activities will be added to the Forest Management plans.

Part K Monitoring

The indicator framework is developed to align with the activities, outputs and outcomes in the Theory of Change (Section D1.2). Table 18 below summarises the indicators. The proceeding text outlines the monitoring approach, which will take place over a 10-year monitoring period. Thereafter, a reduced monitoring approach will be adopted to ensure that project sites are maintained throughout the 30-year quantification period.

Table 18: Indicator Framework

	Description	Indicator	Means of verification	Frequency	Roles/Responsibility
Outcomes					
Carbon Benefit	243,500 tCO2e sequestered	Tonnes of Carbon Sequestered	Re-calculation of climate benefits at the site level based on planting density, species and recorded growth rates.Data collection includes: **Enrichment planting sites:** Project records: tree species, # trees planted Forest sample plots: mortality rate, tree growth (dbh by species) **Agroforestry plots:** Project records: tree species, # trees planted	Annual	Implementing organisations will lead on the monitoring activities. Community members will support data collection.
Livelihood Benefit	Increase in revenues for 1,880 households	HH Income associated with NTFPs from community forests HH income associated with increased yield and or NTFPs from agroforestry species	HH Survey	5-year (2023,2028,2032)	Implementing organisations will lead on the monitoring activities. Community members will support data collection.
Ecosystem Benefit	Restoration/improvement of 2,120 hectares of land with associated ecosystem benefits including habitat creation, improved air quality, water supply, soil quality	Land (Ha) benefiting from restoration activities - Increase species diversity - Increased above-ground biomass	Enrichment planting sites: Forest sample plots: mortality rate, tree growth (dbh by species), species presence, regeneration rates	Annual	Implementing organisations will lead on the monitoring activities. Community members will support data collection.
Outputs and activities					
Output 1	Sustainably managed trees with high survival rate on 1,885 hectares of community land	# hectares afforested stocking density survival rate tree growth	Forest plots (# hectares afforested, stocking density, mortality rate, tree growth, species)	Annual	Implementing organisations will lead on the monitoring activities. Community members will support data collection.
Activity 1.1	Enrichment Planting sites established in a participatory manner	# of hectares of enrichment site delineated	GPS datasets of enrichment planting site boundaries	On-going	Implementing organisations
Activity	Participatory	# of land management plans	Project records	On-going	Implementing organisations

1.2	development of land management plans				
Activity 1.3	Soil water conservation/ Firebreak	Total length (m) of firebreaks established # of land undergoing soil water conservation	Project records	On-going	Implementing organisations
Output 2	High-value tree species planted and managed on farmers' land	# hectares of farmland under agroforestry	Farm-level monitoring: # trees, species planted dbh of trees survival rate	Annual	Implementing organisations will lead on the monitoring activities. Community members will support data collection.
Activity 2.1	Access to trees for agroforestry plantations	Total nursery capacity	Records from nurseries	On-going	Implementing organisations
Activity 2.2	Capacity building for land management (CES, plantations)	# farmers trained in improved land management/agro-forestry	Training records	On-going	Implementing organisations

K1.2 Ecosystem services benefitsmonitoring

K1.2.1 Monitoring resolution

The project employs an activity-based (ex ante) system where models are used to conservatively estimate the expected carbon benefits. These models are described in the project's
technical specifications, which also contain the environmental services expected to be generated by
the project activities, such as the number of trees planted, the stocking density, the area of land
managed and type of tree species planted. The technical specifications also contain guidelines on the monitoring of the performance of each individual farmer throughout the project lifecycle. For the enrichment planting intervention, carbon monitoring is completed at the level of each enrichment planting site. When a new enrichment planting site is established, the number of ex-ante certificates that the site is eligible to receive is conservatively estimated based on planting data (species, number of trees), species-specific modelled growth rates and allometric equations and SOC models, as outlined in section G6.4 to estimate project removals.

For the agroforestry intervention, carbon monitoring is completed at the site level. The number of ex-ante certificates that the agroforestry intervention is eligible to receive is based on conservative estimates based on planting data at the country level, species-specific modelled growth rates, allometric equations and SOC models, as outlined in section G6.4 to estimate project removals. Each
participating farmer has an individual contract with a monitoring plan specifying the expected milestones based on the growth rates of the carbon model used in specific the technical specifications that he/she implements. Each of these milestones is relevant to the achievement of the estimated sequestration potential.

Every year, throughout the 10-year project period annual reports are submitted to Plan Vivo describing the progress towards achieving the expected carbon benefits. A 10 year monitoring period is in line with other similar projects and is considered sufficient to ensure that the trees obtain a sufficient maturity and offer benefit to the community that they will survive to the 30-year mark. The carbon benefits achieved by the project will then be verified by an independent auditor at least every 5-years. Verification is completed at the same resolution as ex-ante certificate estimation. For afforestation, verification is completed for each enrichment planting site, and for agroforestry, verification is completed at the country-level. After year 10, low-level monitoring will continue throughout the rest of the 30-year quantification period.

K1.2.2 Annual Reporting

There are three sets of monitoring:
Parameters recorded for new enrichment planting and agroforestry sites
Monitoring of progress indicators (Table 19)
Monitoring of performance indicators (Table 19)

Parameters Recorded for New Enrichment Planting Sites

When a new enrichment planting site is added to the project the following details are recorded:

- Extent of enrichment planting site (in hectares)
- Planting year

- Number of trees of each species planted

Parameters Recorded for New Agroforestry sites

When a new agroforestry site (farm) is added to the project the following details are recorded:

- Extent of farm undergoing agroforestry (in hectares)
- Planting year
- Number of trees of each species planted

Progress Monitoring

The Progress indicators in Table 19 are collected annually from each enrichment planting site and agroforestry site during the 10-year monitoring period.

Table 19: Monitoring indicators

Indicator	Details	Target	Corrective Action
Progress Indicators			
% survival of each species planted	For Enrichment planting sites: Calculated from plotless sampling For Agroforestry sites: Calculated from a complete census of planted trees by project participant	90% of planted trees	Inquiry into tree loss to identify causes of loss, and supportive action with community members/farmers to address these.
% of dead trees of each species that have been replanted	Reported by project participants	90%	Provision of support to assist with replanting.
Performance Indicators			
Average DBH of planted trees	For Enrichment planting sites: Calculated from plotless sampling For Agroforestry sites: Calculated from a complete census of planted trees by project participant	80% of value expected from growth models in Annex 17 growth_AGB	Evaluation of growth challenges for trees, and actions such as increased watering, removing of grazers or other actions to be developed and implemented with farmers. Specific training on production and use of liquid fertiliser.

K1.2.3 Verification of Carbon Benefits

The Performance Indicators in Table 19 will be measured in a random stratified sample of enrichment sites and agroforestry sites, at least every 5-years throughout the project period. Enrichment sites and agroforestry sites will be stratified on the basis of year of planting, pre-project land cover, and species mixture planted.

If a Performance Indicator target is not met for any enrichment planting site or agroforestry site, the corrective action in Table 19 must be implemented in that project area. If more than 10% of the sampled sites in any stratum fail to meet the target for any indicator the sample size within that stratum must be increased until either: i) all indicator targets are met in more than 90% of the sampled project areas; or ii) all sites in the stratum have been sampled.

The total carbon benefits achieved in each verification period for each enrichment planting site and agroforestry site must be calculated using parameters recorded for new sites in

combination with monitoring results for the indicators listed in Table 19, from at least 10% of sites in each stratum[1], and compared to the carbon benefits expected for that site in that period. If the difference between the expected carbon benefits and those calculated using monitoring data exceeds 10% of estimated value for the monitored project areas, the following parameters must be reviewed and updated if monitoring results differ substantially from the values used for estimation:

- Tree growth models (see Tables G6.3 and G6.4 TBC in SECTION G)
- Mortality rates (see Table G6.2 TBC in SECTION G)

At the end of each verification period, the following parameters must be reviewed and replaced with updated or more appropriate values if these are available:

- Parameter values for estimating removals from woody biomass (see Section G6.4.1 TBC in SECTION G) and for estimating project removals from soil organic carbon (see Section G6.4.2 TBC in SECTION G)
- Allometric models for estimating tree biomass (see Section G6.4.1 TBC in SECTION G)

K1.3 Socio-economic monitoring

Socio-economic data has been collected from the project region (Senegal) in 2022 that has informed the baseline. A further study will be conducted of a sample of project participants, in 2023. This will be collected at the start of the 2023 using RHoMIS (Rural Household Multi-Indicator Survey) to establish a baseline on participant incomes and value of activities.

The survey includes details of household sizes, education, access to resources, dietary diversity, income sources and values of income, Natural Resource Management (NRM) approaches known and adopted (see Annex 24).

The survey will be repeated at in years 1, 5 and 10 with a representative sample from all participating villages throughout the project period to assess, amongst other things:
• HH Income
• Total Value of Activities
• HH Income associated with NTFPs from community forests
• HH income associated with increased yield and/or NTFPs from agroforestry species

The project aims to achieve the following:

Table 20: Target incomes over the 10 year monitoring period

Target	Year 5	Year 10 target	Assumptions
HH Income	Increase of 50% for at least 75% of participants	Increase of 100% for at least 90% of participants	Benefits of planting impact crop yields and income from PES support development of livelihoods
Total Value of activities	Increase of 100% for at least 75% of participants	Increase of 150% for at least 90% of participants	Benefits of planting impact crop yields and income from PES support development of livelihoods
Income from NTFPs	Increase of 100% for at least 20% of participants	Increase of 175% for at least 40% of participants	40% of participants receive support in NTFP value chains

Slow progress in meeting these targets is recorded in year 5, in consultation with the communities, the project will work to support participants that are showing increases to act as examples in peer-to-peer learning. Furthermore, the project coordinator will encourage communities to utilise some PES funding for the development of livelihood opportunities.

K1.4 Environmental and biodiversity impacts

In year 5 and year 10, the project coordinator will look at data coming from the monitoring plots to assess the positive environmental and biodiversity effects associated with the project. The project will look for example at the regeneration potential (abundance and composition) of indigenous trees thanks to project intervention.

In collaboration with RSPB the project will also look at running bird surveys to assess the potential increase in bird counts through tree planting.

K1.5 Other monitoring

Women's involvement in all activities will be encouraged by addressing barriers around their perceived traditional roles. Barriers exist to women accessing livelihood, including limited access to information, training and land. Our M&E Voice, Choice and Control (VCC) tool and Forest Governance tool track the gendered control of household income, consumption of resources and voice, choice and control at household and community levels.

It's essential to provide the means for women to improve their livelihoods and increase resilience to climate change. Empowering women can make a big difference in increasing community resilience and reduce food insecurity. Women will be supported to participate in governance structures, increasing capacity and their sense of ownership over natural resources, increasing their voice and decision-making power. Women's capacity will be built in business skills, who will be empowered by contributing directly to household income, alongside improved skills and confidence. Activities will be adapted to women's schedules.

Annexes:

Annex 1. Avifauna survey, Senegal .docx
Annex 2. land cover classifications.docx
Annex 3. Lettre Non Object. AEDD_VF.pdf
Annex 4. Agroforestry sites 2022.xlsx
Annex 5. IOC Participatory Project Design & Free, Prior and Informed Consent.docx
Annex 6. Accord CLIP Arigabo.pdf
Annex 7. Rapport Atélier régional Projet MC1 Kayes.docx
Annex 8. evidence of community participation.docx
Annex 9. ES Screening_final.docx
Annex 10. Olympic Forests Project Grievance-Mechanism.docx
Annex 11.
A. PAGF_Arigabo_Senegal_foret olympique.docx
B. Charte fonciere locale_Arigabo_Senegal_Foret Olympique.docx
C. Decharge transmission PAG et charte fonciere de Arigabo.pdf
Annex 12.
Mali_G2.3 Environmental_Integrity.docx
Senegal_Environmental_Integrity.docx
Annex 13.
Woody_Tech_spec.xlsx

Annex 14. Woody_Tech_spec_AF.xlsx
Annex 15. TreeAid_TLLG_données de base_biomasse.docx
Annex 16. biomass_baseline_survey.docx
Annex 17. growth_AGB.xlsx
Annex 18.
18a Stakeholder engagement plan Mali v2.xlsx
18b Stakeholder engagement plan Senegal v2.xlsx
Annex 19. Safeguarding Policy - Oct 2020 - EN - FINAL (1).pdf
Annex 20. Anti-Bribery and Corruption Policy-EN-Jul 6,2021-FINAL.pdf
Annex 21. Anti-fraud policy Nov 20 - EN - FINAL.pdf

Annex 22. Equal-Opportunities-Policy Section-FINAL - Dec 30, 2020.pdf
Annex 23. Accord Plan Vivo.docx
Annex 24. Section K SE survey.xlsx
Annex 25. Information on funding sources.docx
Annex 26. shapefiles.zip
Annex 27. List of contacts.docx
Annex 28. Tech Explanation for CAR10 - Modified April