Verified Carbon Standard

KIJANI FORESTRY SMALLHOLDER FARMER FORESTRY PROJECT

Document prepared by

ONE CARBON WORLD

and

CLIMIT SUSTAINABLE DEVELOPMENT

Project Title	*Kijani Forestry Smallholder Farmer Forestry Project*
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1 PROJECT DETAILS

1.1 Summary Description of the Project

Kijani Forestry is a social enterprise founded in 2019, located in Uganda. Kijani's mission is to empower smallholder farmers to generate income and combat climate change through the establishment of sustainable wood lots. As of 2022, Kijani has planted over 2 million trees with over 5,000 farmers throughout northern Uganda. Kijani works in partnership with local communities, government agencies, international non-governmental agencies, universities, and other stakeholders to implement sustainable land use practices and agroforestry management systems. Through these partnerships, Kijani aims to build capacity and establish a foundation for sustainable development in Uganda through growing trees that provide income-generating opportunities for farmers.

Kijani works through a network of thousands of organized small groups across Uganda to establish small-scale nurseries, train farmers in nursery management, and mobilize farmers to establish fuelwood lots on their private land. Kijani's unique approach addresses many of the barriers faced by rural farmers who wish to plant trees; Kijani provides all inputs needed for a productive tree nursery, including properly sourced seeds, potting bags, equipment for maintenance, and materials needed to care for seedlings. Kijani's field staff are stationed in the communities full-time and provide regular training to groups on nursery establishment and maintenance, seedling care, pest management, agroforestry practices, and fuelwood lot establishment and management. At any given moment, a Kijani staff member is no more than a bicycle ride away from a Kijani nursery. Kiiani's continuous presence, and strong relationships, in the community are critical to the long-term success of the project. In addition to its reforestation efforts, Kijani provides training and support to communities to help them establish sustainable forest management practices and create economic opportunities through various forest products. This includes training in sustainable harvesting techniques including coppicing, pollarding, FMNR, and the development of markets for forest products.

Kijani's planting efforts are focused on planting primarily indigenous and a small proportion of nativized, non-indigenous tree species on degraded land, which helps to restore soil fertility, prevent soil erosion, and promote biodiversity. By planting trees, Kijani aims to sequester carbon and mitigate the impacts of climate change by partnering with the people who are most affected by it.

Kijani emphasizes fast-growing species that coppice well for regeneration and biomass accumulation after being harvested for fuelwood. This ensures that a fuelwood lot will be able to sustainably produce fuelwood on a rotational basis for decades to come, if properly managed according to Kijani's standards. Kijani partners with farmers in the production of sustainable charcoal by providing the necessary training and access to improved kilns to produce charcoal more efficiently. This will be done when the planted trees are grown to a large enough size to coppice, which is expected to happen after 4 years of growth. After harvest, the coppices are expected to regrow after 3 years, at which point they can be harvested again.

Kijani places careful consideration on species selection, only planting species that have no known negative impacts on the local environment and have multiple benefits for the smallholder farmers. Species are added to Kijani's selection all the time, but currently the most common species include *Melia volkensii*, *Gmelina arborea, Maesopsis eminii, Terminalia glaucensis, Senegalia polyacantha*, and a variety of indigenous acacia species. Smallholder farmers possess a huge amount of land in Uganda, and collectively represent enormous potential to combat deforestation and drawdown carbon. The only requirement for a smallholder farmer to participate in Kijani's program is a willingness to learn and land available for them to legally plant trees on - no cash investment is needed, and all technical training and inputs are provided by Kijani.

Additionally, this project is aligned with the National Development Plan which aims to increase Uganda's forestland to 15% by 2025 (from 1986 to 2020, the forest areas in Uganda went from 20% to 9.5% of the total area).

The project area will include Kijani's planting areas throughout Uganda.

The first instance will involve 865 gardens planted in 2022 which comprise a total area of 151.24 ha where 182,987 trees have been planted and 7,545 gardens planted in 2023 which compound 2,287 ha with 1,686,676 planted trees as of August 31st, 2023.

Three 2022 gardens will be presented as an example of Kijani's approach. These are in Kitgum and Agago districts and compound 0.49 hectares in total:

Anyeko Monica; 0.23 ha – 171 trees planted.

Opira Bosco: 0.16 ha – 350 trees planted.

Kinyera Paul: 0.1 ha – 300 trees planted.

These farms have planted 821 trees in 2022 using different species: *Gmelina arborea, Senegalia polycantha, Faidherbia albida, Melia volkensii*, among others.

However, this is developed as a grouped project with the target of planting a total of 247 million trees by 2062 (approximately 217,000 ha) which represent 9.0 million tCO2eq.

The project is seeking verification under Verified Carbon Standard (VCS), which ensures that Kijani's reforestation efforts meet rigorous environmental and social standards. Verification under VCS will provide Kijani with a valuable tool to demonstrate the environmental and social benefits of its project and access the voluntary carbon market to support its continued growth and impact.

1.2 Sectoral Scope and Project Type

The activity implemented by the project participant consists in the establishment of forests on land that had previously been grassland for hundreds of years, and therefore corresponds to the VCS scope 14: "Agriculture, Forestry and Other Land Use (AFOLU)" as an Afforestation, Reforestation and Revegetation (ARR)".

The project is developed as a grouped project.

1.3 Project Eligibility

The present project is eligible under the latest version of the VCS Standard (v4.4, January 2023). The project is an Afforestation and Reforestation and Revegetation (ARR) activity that corresponds to the sectoral scope AFOLU. This ARR activity increases carbon sequestration by establishing forest cover through the planting of woody species. This project includes timber harvesting and selective harvesting and regeneration for fuelwood in its management plan.

1.4 Project Design

☐ The project includes a single location or installation only

☐ The project includes multiple locations or project activity instances, but is not being developed as a grouped project

☒ The project is a grouped project

The project is designed as a grouped project with multiple locations within the limits of Uganda.

Eligibility Criteria

All new projects instances that want to join the grouped project must comply with the eligibility criteria defined here, additionality demonstration and baseline conditions.

All areas to be incorporated into the grouped project must meet the technical land eligibility criteria for carbon forest projects. Therefore, any project that wants to be part of the group project must meet the following conditions.

1. Must apply for AFLOU activity as an Afforestation, Reforestation and Revegetation (ARR). The methodology used is AR-ACM 0003 'Afforestation and reforestation of lands except wetlands'.
2. The project must comply with the conditions of eligibility, additionality and baseline scenario of the grouped project.
3. The activity must be located within the boundaries of Uganda.
4. The activities must be in line with the local laws and regulations for afforestation activities, with the necessary documentation up to date.
5. The activities must include the reforestation with woody species and must be part of the Kijani's Forest program.
6. Compliance with the requirements of the VCS Standard, therefore:
    a. Planting must not have happened before the project start date (2022 – 01 – 01)
    b. The baseline must be continuation of the pre-existent activity which does not include the presence of planted forests.

c. No destruction of the previous native ecosystem for the purposes of this project (at least in the 10 years before the project's start date).

7. Meet the requirements of the project methodology and tools (see Sections 3.1 and 3.2):

    a. The project area cannot include wetlands or take place over organic soils as per the definition given in the methodology.

    b. The level of inputs at baseline must be low or null

8. The area must not be already involved in another GHG program or receive another form of credit for these activities that would end in a redundancy or double accounting of the carbon removals.

1.5 Project Proponent

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1.6 Other Entities Involved in the Project

Organization name	CLIMIT

Role in the project	Climit is a consultancy firm in Uruguay, specialized in climate change mitigation projects. CLIMIT is responsible for the carbon estimation, project documentation preparation and acting as the consultant to Kijani Forestry in relation to the carbon credit generation project.
Contact person	Agustín Inthamoussu
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1.7 Ownership

The landowners of the project's gardens, who participate in tree nursery activities and oversee planting, maintaining, and harvesting the trees, have the ownership of the carbon credits.

Land ownership in Uganda is generally culturally determined rather than legally determined through land titles. The elected officials of the local government generally determine land ownership in conjunction with cultural leaders. Kijani ensures that landowners have the traditional rights to the lands and therefore the carbon credits when signing the contracts.

All instances of this project are developed on private land and through direct involvement of the landowner. Due to data privacy concerns the original documents supporting this are not presented in this public document, however they will be available for the auditor responsible for the validation and verification of the project.

1.8 Project Start Date

The project start date is on January 1st, 2022.

1.9 Project Crediting Period

The project crediting period lasts for 40 years, from the January 1st, 2022 to December 31st, 2061.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The estimated annual GHG emission reductions/removals of the project are:

☐ <20,000 tCO_2e/year

☐ 20,000 – 100,000 tCO_2e/year

☒ 100,001 – 1,000,000 tCO_2e/year

☐ >1,000,000 tCO_2e/year

Project Scale	
Project	
Large project	x

Year	Estimated GHG emission reductions or removals (tCO_2e)
2022	757
2023	673
2024	31,361
2025	155,961
2026	462,910
2027	1,218,413
2028	2,878,317
2029	4,330,867
2030	6,145,533
2031	8,410,142
2032	10,171,697
2033	12,418,604

2034	15,118,085
2035	17,696,968
2036	19,710,991
2037	20,666,648
2038	20,233,308
2039	19,171,640
2040	17,137,852
2041	14,289,501
2042	11,820,895
2043	12,927,475
2044	13,860,948
2045	15,718,333
2046	17,251,425
2047	18,098,512
2048	18,629,911
2049	17,974,674
2050	15,982,560
2051	14,053,691
2052	12,132,488
2053	10,154,116

2054	12,034,363
2055	14,072,268
2056	16,489,457
2057	18,641,695
2058	19,614,258
2059	20,058,293
2060	19,298,159
2061	17,006,399
Total estimated ERs	**12,651,754**
Total number of crediting years	**40**
Average annual ERs	**316,294**

1.11 Description of the Project Activity

According to Uganda's Ministry of Water and Environment, from 2010 to 2015 Uganda lost 1.8 million ha of forests which represents an average annual loss of 4%. Between 1986/87 and 2017/18, forests in Uganda went from representing 20% of the total area of Uganda to 9.5% in 2017/18. The loss in forest cover has had a negative impact on Uganda's economic activities such as tourism and agriculture. Uganda's government has committed to increase the forest cover to 15% by 2025.

Kijani Forestry operates in different regions of Uganda, focusing on planting income-generating trees with smallholder farmers through Kijani's Nursery Hub model. The Nursery Hub model establishes nurseries with rural communities and provides inputs and training to grow seedlings in partnership with farmers. The project provides ongoing training and follow up for smallholder farmers to grow trees on their own land, which will not be purchased or leased by Kijani. Seedlings, if available, are unaffordable to the rural households that Kijani targets. Seedlings are often in shortage throughout the region, so even if farmers wished to have seedlings delivered from urban centers, there would not be a sufficient supply of seedlings available.

To address this issue, Kijani establishes thousands of nurseries in these rural communities in partnership with farmer groups to address the inability for rural farmers to afford and access seedlings. Farmers will grow and plant trees that they will be able to harvest in the future to use as fuelwood, charcoal production, or timber production. All fuelwood species planted will coppice after harvesting and farmers will be trained and equipped to do the necessary intervention to accomplish this technique. Free training and access to improved kilns will be provided and overseen by Kijani to ensure only planted species are carbonized in the kilns, not allowing old growth forests to be harvested in the process.

Kijani's Nursery Hub model starts by hiring local community members to be trained through a three-month paid internship. This training focuses on the tree planting process through a hands-on approach. Kijani's training is unique for Uganda, as it focuses primarily on indigenous tree species, rather than commercial exotics. Kijani's Community Mobilization team introduces Kijani's work to all the local communities and gives them the chance to ask questions and decide if they want to participate in Kijani's Nursery Hub training.

After the internship program, those extension workers, named Parish Coordinators, are assigned to work with farmer groups that comprise roughly of 10-35 farmers, each who expressed interest in partnering with Kijani Forestry to plant trees. These Parish Coordinators will then move into the parishes assigned to them, become a permanent part of the communities, and partake in the groups' meetings on a weekly basis. This helps ensure every aspect of the partnership goes smoothly, from raising the seedlings from seedbed, to planting the trees in the ground. While Kijani provides all the inputs for free in this model, the smallholder farmers provide 'sweat equity' to ensure buy-in from the farmers for maintaining the seedlings after planting.

In addition to the smallholder farmer model, Kijani also engages with landowners that have larger plots of land and financial means to hire external labor to plant the trees. These landowners are not required to go through the same training as the smallholder farmers and instead will purchase seedlings at a subsidized cost in lieu of contributing their own labor to the seedlings production process. The follow-up and ongoing tracking and engagement with these farmers will be similar to that of the smallholder farmers after the trees have been planted.

Kijani has a robust data collection system, implemented by the Monitoring and Evaluation team that conducts audits and oversight visits of nurseries to ensure that standards are being met and that production is meeting targets. Additionally, this team will visit each individual farmer's garden after planting to collect GPS polygons and attribute data points about the variety and quantity of tree species planted. After this initial visit, every garden is visited after a maximum period of 24 months to conduct a thorough survival check and provide support to the farmer in plantation management, such as pruning.

The project has a significant impact on the environment by reducing greenhouse gas emissions, mitigating climate change, regenerating microclimates, improving soil health, protecting native, old-growth forests, and increasing biodiversity. The core of this project is to ensure that the smallholder farmer's needs are met holistically.

Moreover, the project is aligned with the objectives stated by Uganda's Third National Development Plan (NDP III) which aims to promote economic growth and strengthen the country's regional and international competitiveness by creating new skilled labor positions and increasing capacity and opportunity for local villages by supporting the sustainable forestry industry. One of the NDP III Programs is Natural Resources, Environment, Climate Change, Land and Water Management which 'aims to stop, reduce and reverse environmental degradation and the adverse effects of climate change as well as improve utilization of natural resources for sustainable economic growth and livelihood security'. One of the objectives of this program is to increase the forest cover which is aligned with Kijani's objective.

Kijani selects tree species that are suitable for each region based on their adaptability to the local climate, soil type, and landscape. The project team works closely with local communities and stakeholders to identify the most appropriate tree species to plant. The project primarily promotes the use of indigenous tree species in lieu of exotic pine and eucalyptus.

Kijani ensures the success of the tree planting activities by providing training and follow up for farmers to carry out site preparation, which involves removing weeds and debris, constructing firebreaks, and digging planting pits. The training includes details regarding tree planting techniques, including proper planting depth, watering, and mulching. This approach ensures that the trees are planted correctly and have the best chance of survival. Uganda typically has two planting seasons with priority placed on the first planting season. Then, any trees that don't survive the first season have the opportunity to be spot planted with a new seedling in the second planting season. This ensures a higher tree density than if a single season of planting has occurred, thereby maximizing land utilization.

After planting the trees, Kijani monitors their growth and works with the farmers to provide ongoing maintenance, including weeding, pruning, mulching, and watering during the critical first period of tree growth. Kijani also trains local communities on tree care and management practices to ensure that the trees continue to thrive.

Kijani understands that the success of the forestry project depends on the involvement and engagement of local communities. The project collaborates with local communities to develop forest products including fuelwood for home consumption, biomass for charcoal production, timber for sale, fruit for consumption, and fodder trees for livestock feed. The project helps local communities to establish sustainable livelihoods through the production and sale of these forest products.

The project's focus on involving local communities in the management and care of the trees is an essential aspect of its success. By providing training and workshops on sustainable tree management techniques, Kijani empowers local communities to become active participants in decision-making, ensuring the long-term success and sustainability of the project. The income-generation activities help ensure that there is buy-in for the long term through a variety of income streams for the farmers including, but not limited to, sustainable charcoal production, timber, intercrops, and other potential additions.

In conclusion, the Kijani Forestry project is a sustainable solution to environmental degradation and climate change. The project combines reforestation and afforestation initiatives with the use of sustainable forest management practices to improve the livelihoods of local communities while protecting and preserving the environment.

Gardens planted in 2022 and up through August 31st of 2023 will be included in this document.

In 2022, there were 865 gardens and 182,987 trees planted.

Species	Year	Total number of trees
Musizi	2022	15,276
Melia	2022	83,429
Lebek	2022	986
Fahideribia	2022	8,782
Gmelina	2022	32,842
Ongono	2022	28,008
Senna	2022	13,113
Opok	2022	551
TOTAL		**182,987**

The following figure shows the location of 2022 gardens.

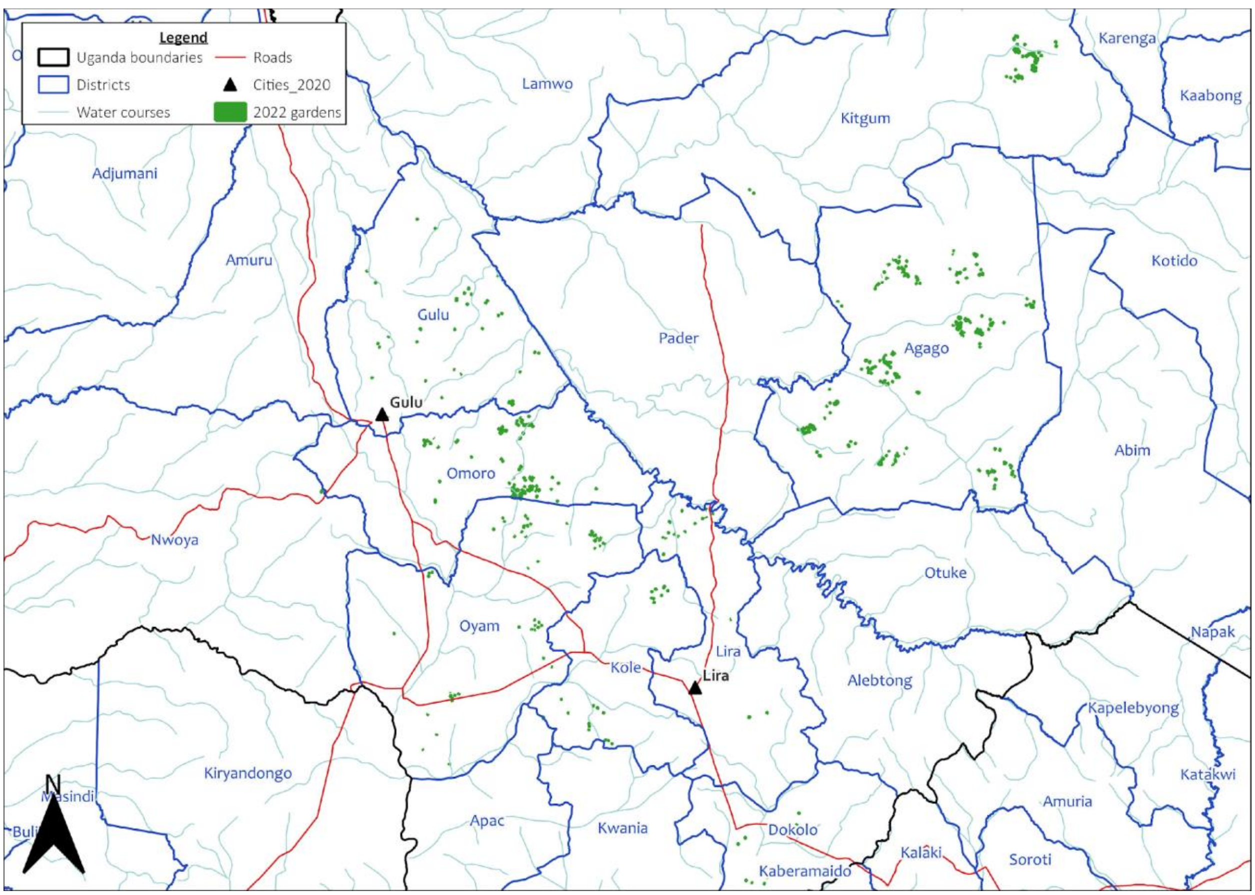


Figure 1. Location of gardens planted in 2022.

By August 31st,2023, 7,545 farms were planted with over 1.6 million trees with *Melia volkensii*, *Sengalia polycantha* and *Gmelina arborea* the most prevalent species. Some species were added to the ones planted in 2022 such as *Acacia senegal, Acacia seyal,* amongst others. New species will continue to be added to the project as Kijani expands to new regions and adapts to changing weather patterns.

The following figure shows the location of 2023 gardens included by August 31st.

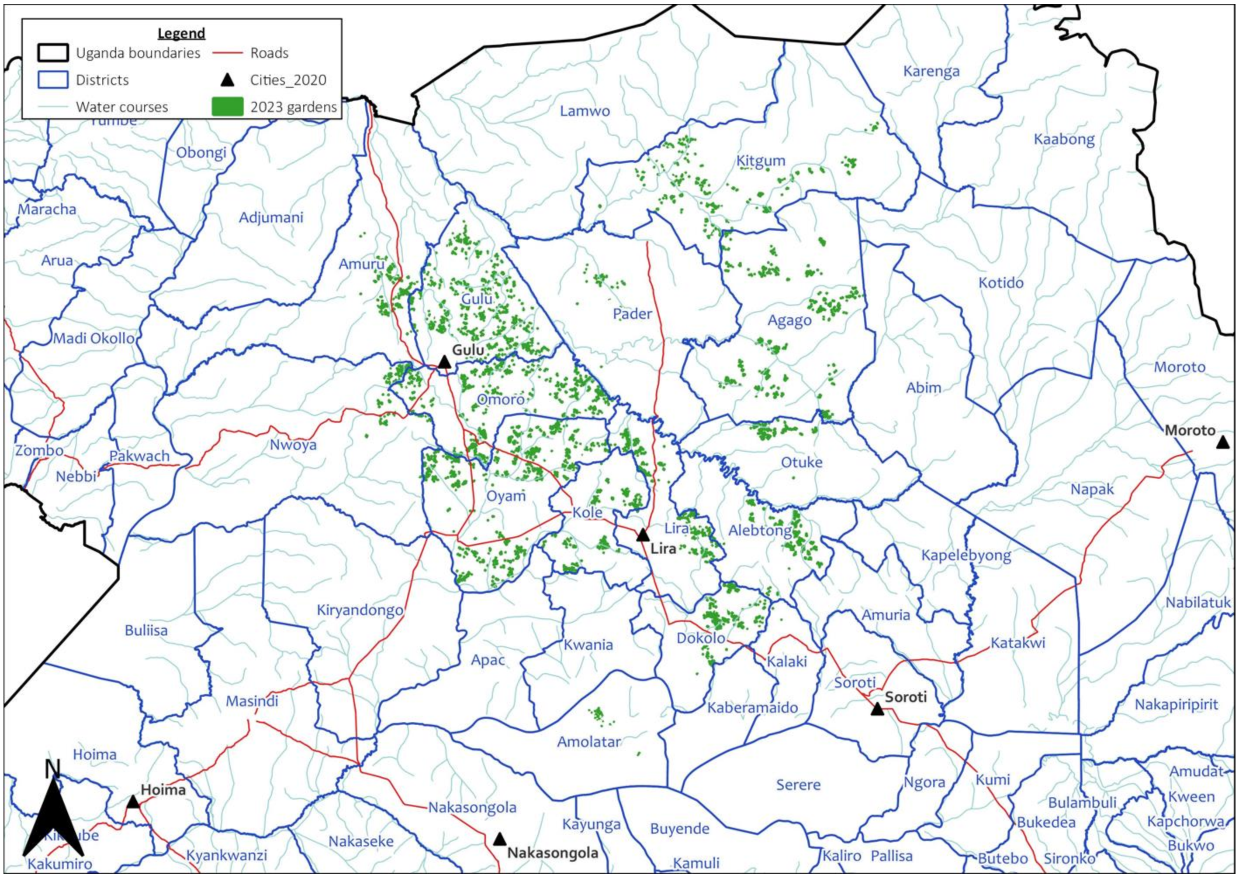


Figure 2. Location of gardens planted in 2023.

Three sample gardens from the project which were planted in 2022 will be presented below. One of them is located in Kitgum and the other two in Agago.

Instance 1) Anyeko Monica

The first instance of the project involves a garden of 0.23 ha where 171 trees have already been planted in 2022.

The garden is located in Agago district, Northern Uganda.

The number of trees per species is presented in the following table:

ID	Species	Initial number planted

Anyeko monica - Agago | Lapono | Wagwoko lim - Gardener - Garden 1	Musizi | *Maesopsis eminii*	12	7.0%
	Melia | *Melia volkensii*	50	29.2%
	Gmelina | *Gmelina arborea*	109	63.7%

Table 1. Anyeko Monica – planted species and number of trees

Instance 2) Opira Bosco

The second instance of the project involves a garden of 0.16 ha where 350 trees have already been planted in 2022.

The garden is located in Agago district, Northern Uganda.

The number of trees per species is presented in the following table:

ID	Species	Initial number planted	
Opira bosco - Agago | Lapono | Wagwoko lim - Gardener - Garden 1	Musizi | *Maesopsis eminii*	38	10.9%
	Melia | *Melia volkensii*	100	28.6%
	Gmelina | *Gmelina arborea*	212	60.6%

Table 2. Opira Bosco – planted species and number of trees

Instance 3) Kinyera Paul

The third instance of the project involves a garden of 0.1 ha where 300 trees have already been planted in 2022.

The garden is located in Kitgum district, Northern Uganda.

The number of trees per species is presented in the following table:

ID	Species	Initial number planted	
Kinyera Paul - Kitgum | Orom East | Atek ki Iwak - Gardener - Garden 1	Melia | *Melia volkensii*	100	33.3%
	Gmelina | *Gmelina arborea*	50	16.7%
	Senna | *Senna siamea*	50	16.7%
	Faidherbia | *Faidherbia albida*	50	16.7%

	Ongono | *Senegalia polycantha*	50	16.7%

Table 3. Kinyera Paul – planted species and number of trees

These species present a wide variety of uses: from structural timber for construction to fuelwood uses and animal fodder.

The following map show the general location of these three gardens.

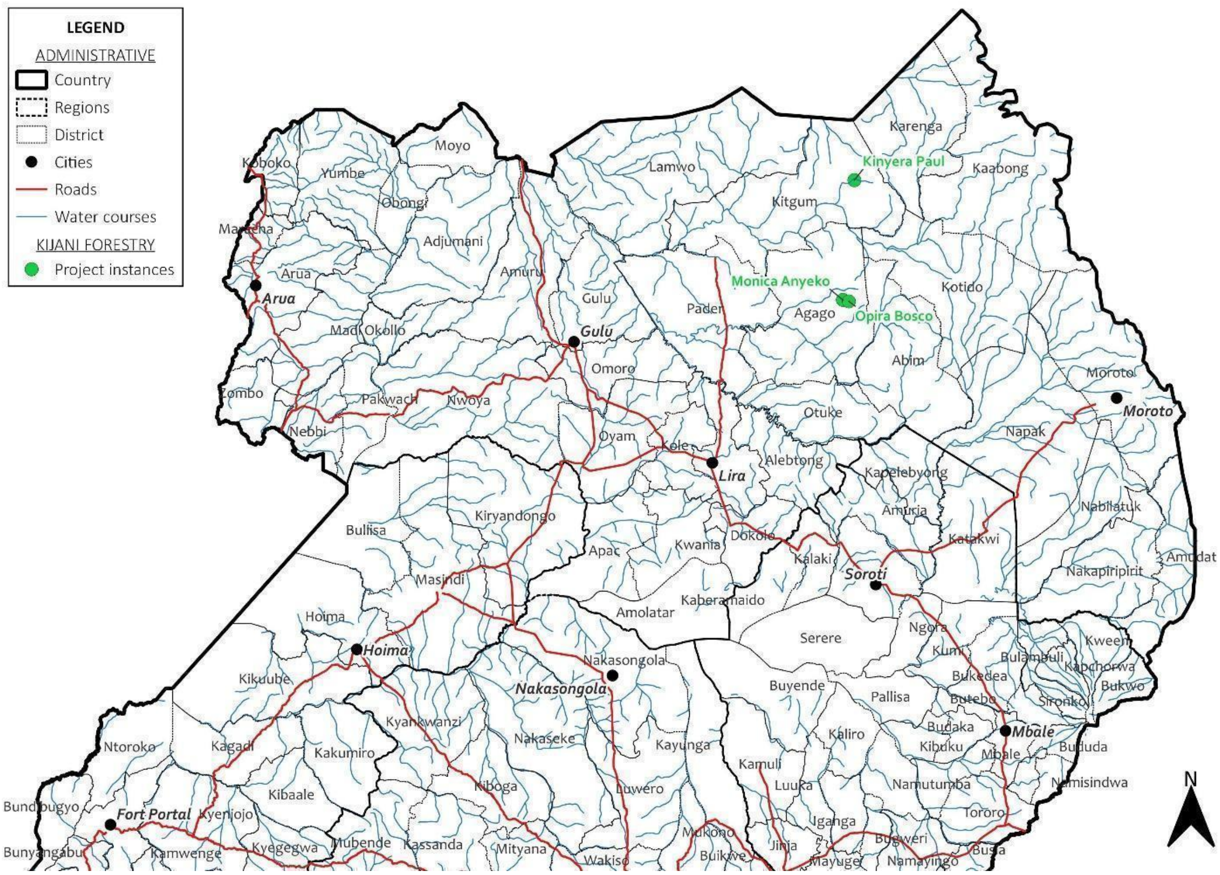


Figure 3. Location of Kijani gardens: Anyeko Monica, Opira Bosco and Kinyera Paul.

1.12 Project Location

The project will be located within the boundaries of Uganda. The following figure shows the location of 2022 and 2023 farms.

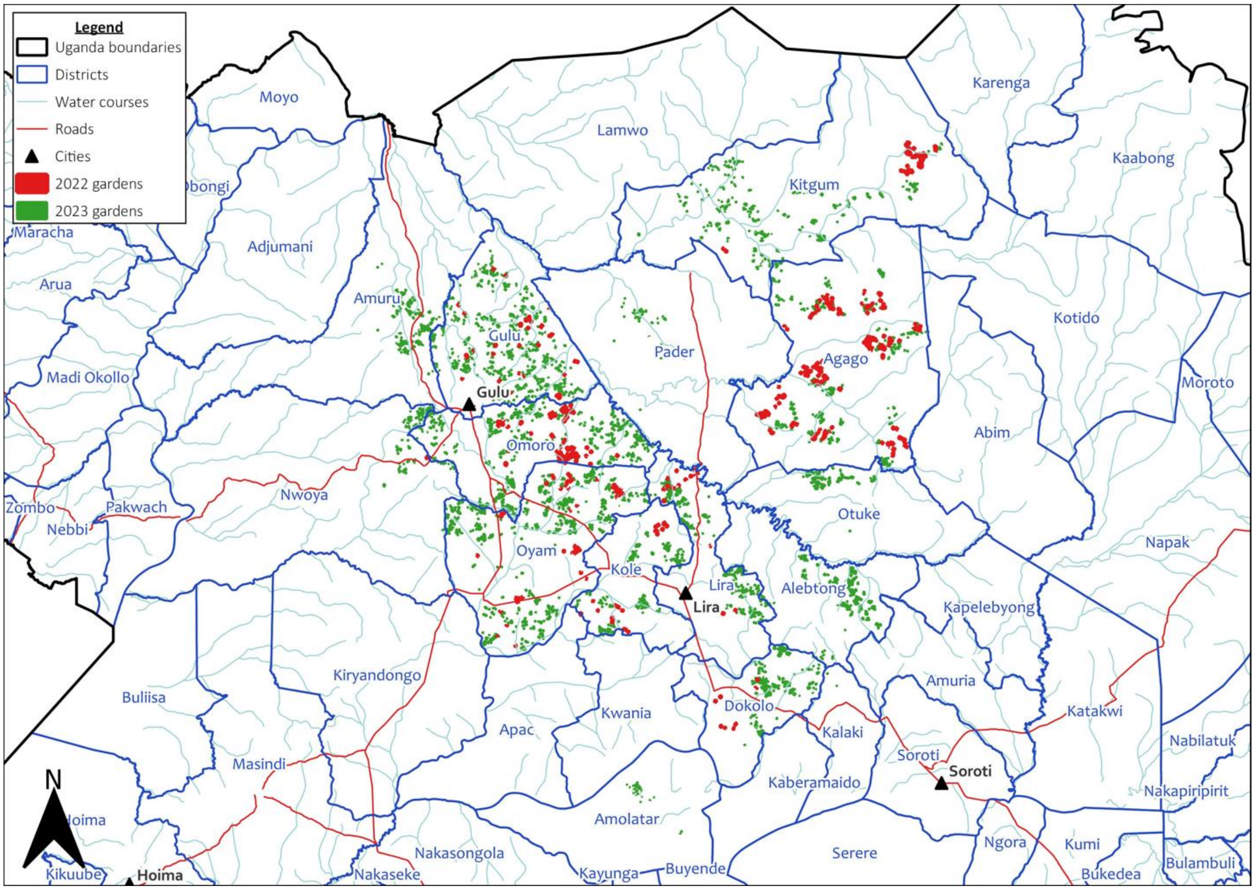


Figure 4. Location of Kijani's gardens (2022 and 2023) in Northern Uganda.

1.13 Conditions Prior to Project Initiation

- **Ecosystem type:**

Before the initiation of the project, the areas were degraded land primarily used for agriculture. When non-agricultural land was cleared, it was typically cleared entirely of trees, including stumps, which were then used for charcoal production.

- **Current and historical land-use:**

Before the Kijani Forestry project, the land where the project is currently located was heavily degraded due to deforestation, overgrazing, and unsustainable agricultural practices. After clearing trees and removing stumps for charcoal production, farmers typically cultivated monocrops of various cereals, grains, and legumes on the land for subsistence and cash crops. Regenerations of any remaining stumps are not typically managed and are continuously cut back to prevent regrowth. The areas suffered from severe soil erosion, loss of biodiversity, and decreased water quality and availability. The local communities, who rely on natural resources for their livelihoods, faced challenges such as food insecurity, low income, and limited access to basic services such as healthcare and education.

Most of Uganda's northern region was cleared many years ago to produce food, charcoal, and generate income from cash crops. Ten years ago, most of the area was under croplands, shrublands, grasslands and open tree cover. The following map shows the land cover in Uganda's northern region in 2012[1].

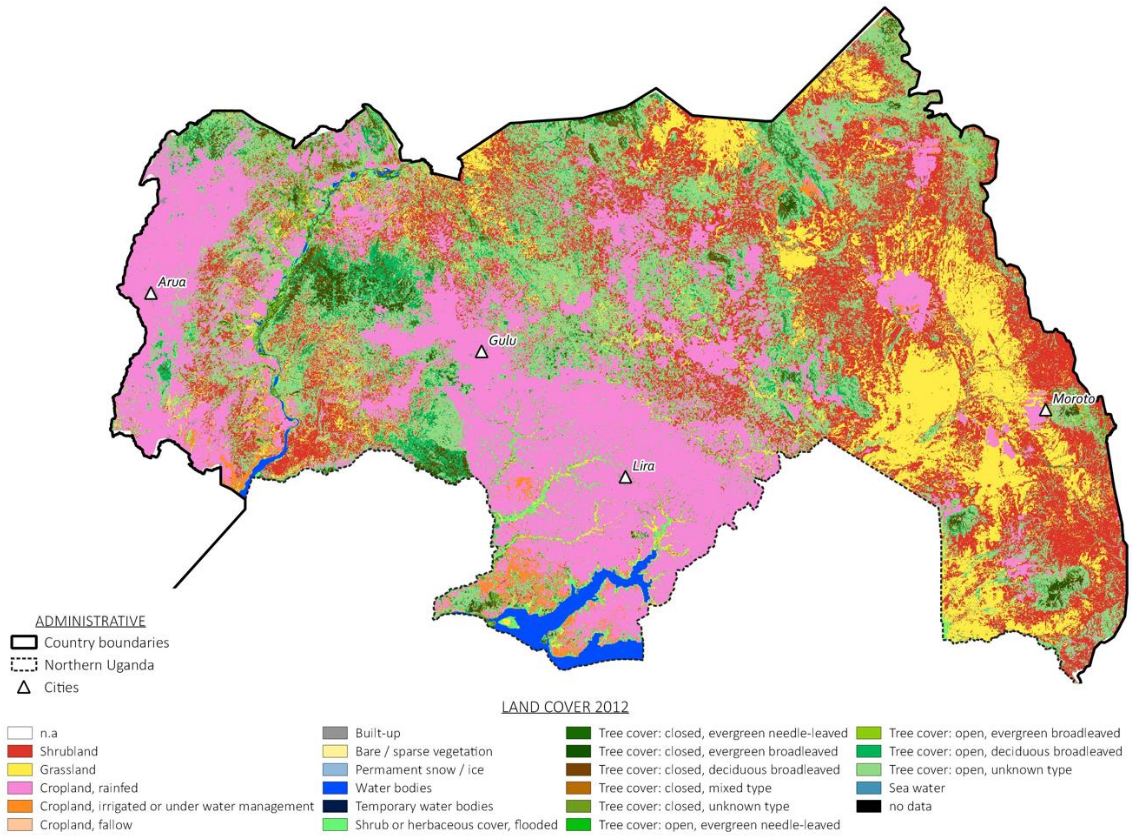


Figure 5. Land Cover Northern Uganda, year 2012.

Kijani Forestry aims to address these challenges by restoring degraded land and forests, enhancing biodiversity, improving water quality, and promoting sustainable livelihoods for local communities. By planting trees and implementing sustainable land use practices, the project is helping to restore the degraded ecosystem and enhance its resilience. Additionally, the project is providing alternative sources of income for local communities through activities such as sustainable charcoal production, timber growing, and livestock enhancement through fodder availability during dry seasons. In the future, Kijani Forestry looks to include other income-generating activities such as beekeeping, fruit farming, or biochar production, which increase their household income and climate resiliency.

[1] Source: FAO; Land Cover Classification Africa and Near East 100m resolution, from January 2009 to present. https://wapor.apps.fao.org/catalog/WaPOR_2/2/L2_LCC_A

A baseline survey is conducted at a sample of planned gardens in each region to ensure that eligibility criteria are met, including the non-destruction of native ecosystems. The survey includes creating a register of each garden before planting, which states the situation of the land prior to the project, land usage, etc. Geotagged photos of the garden are taken to show the state of the landscape before intervention. The garden boundary polygon is analyzed using GIS tools to determine prior land use and eligibility. Finally, a local expert is consulted to provide contextualized local knowledge. Any existing trees in the landscape are noted and excluded from future calculations.

Moreover, using the Global Forest Watch platform, the primary forests in Uganda were located. According to the definition, these are virgin forests which have never been cleared. They cover very few areas in Uganda, and none of them are within Kijani's project boundaries. Primary forest definition states: "Primary forests are among the most biodiverse forests, providing a multitude of ecosystem services, making them crucial to monitor for national land use planning and carbon accounting. This data set defines primary forests as "mature natural humid tropical forest cover that has not been completely cleared and regrown in recent history."

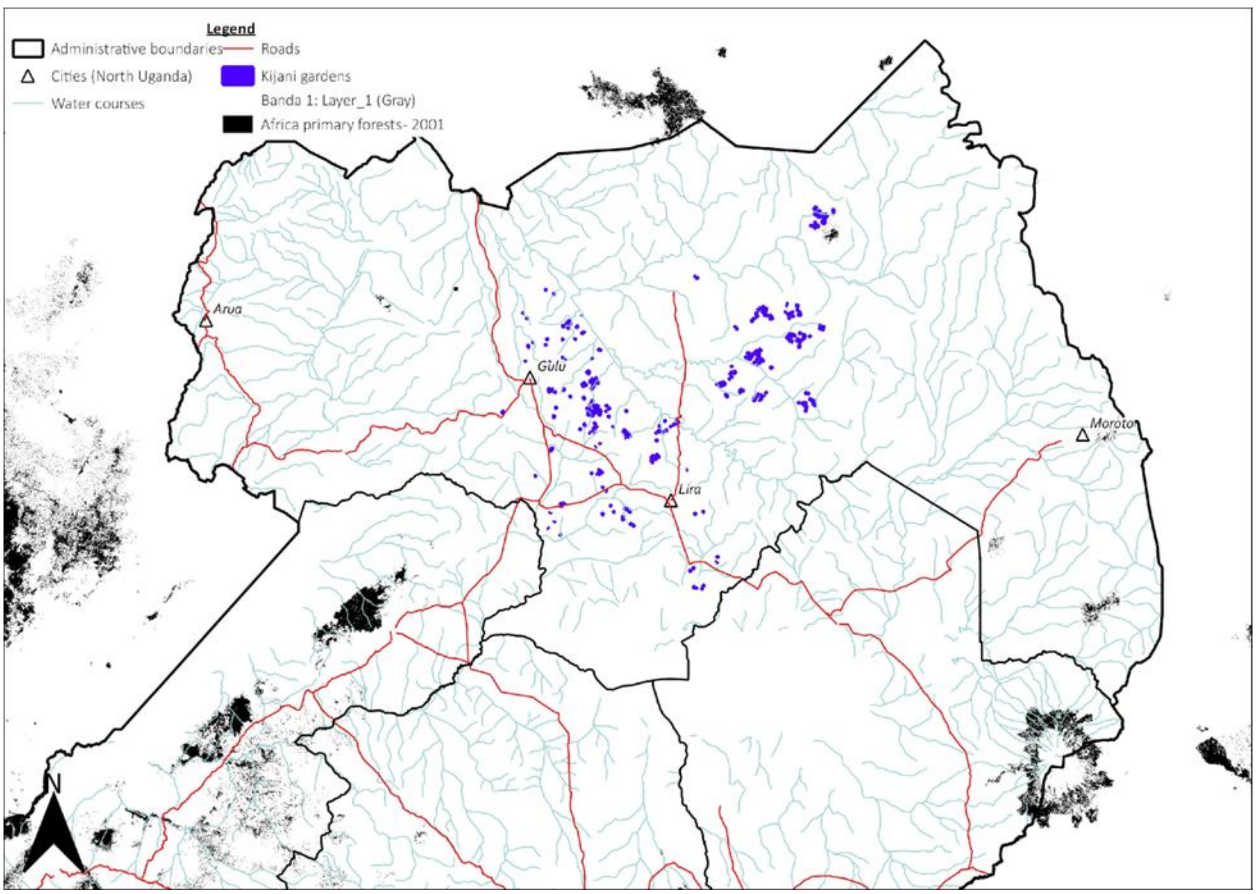


Figure 6. Primary forests (2001) – Global Forest Watch

- Has the land been cleared of native ecosystems within 10 years of the project start date?

☐ Yes ☒ No

GEOGRAPHY

Uganda is in East Africa, between longitudes 31°E and 34°E and latitudes 1°N and 1° S. The bordering countries are Tanzania to the South, Kenya to the east, Sudan to the north, Democratic Republic of Congo to the west and Rwanda to the southwest.

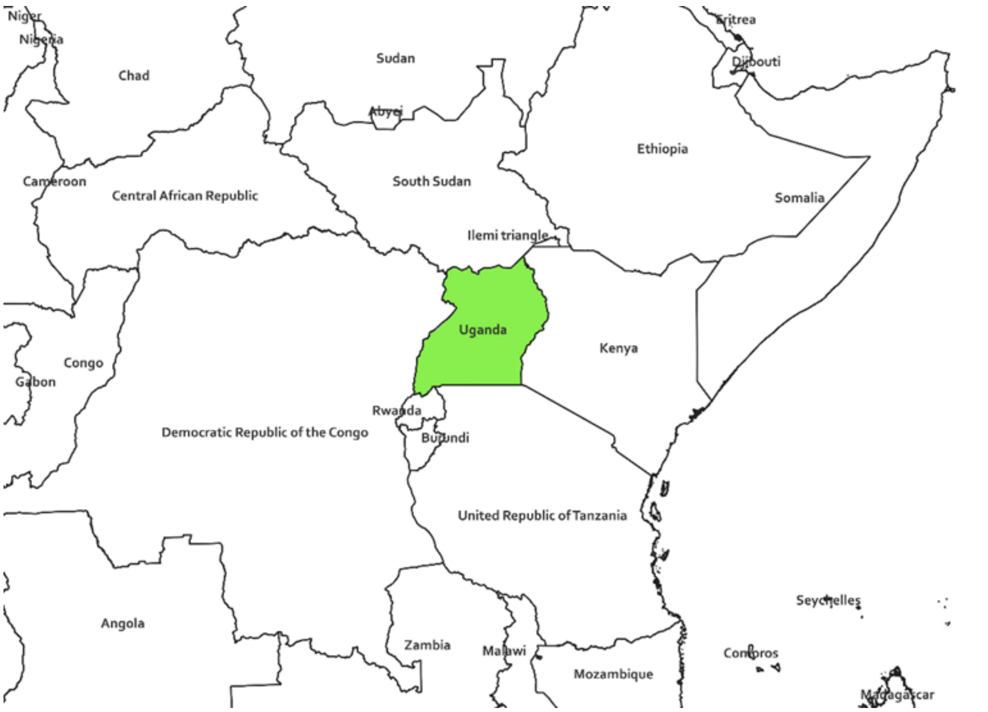
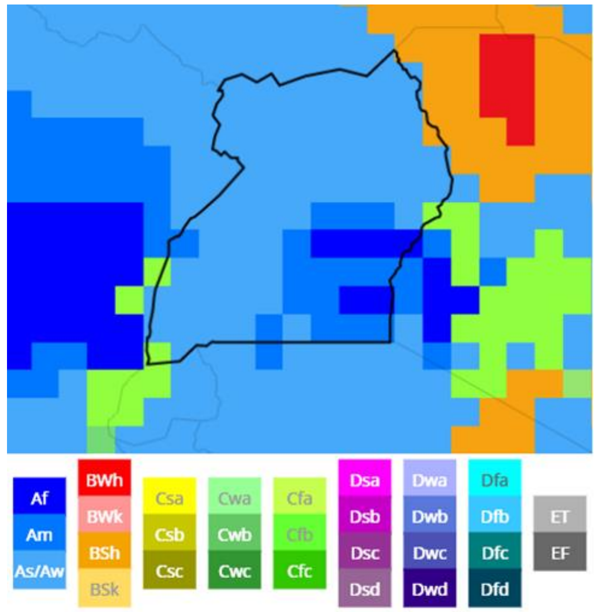


Figure 7. General location of Uganda

CLIMATE

Uganda has a tropical climate, with two rainy seasons per year: from March to May and from September to December. However Northern Uganda, where the project is located, has only one rainy season per year which goes from March to October. The mean temperature in Uganda is around 22.8°C with monthly temperatures going from 21.7°C in July and 23.9°C in February. The total annual rainfall is 1,197 mm ranging from 39.4 mm in January and 152.7 mm in April. [2]

[2] Source: Climate Change Knowledge Portal for Development Practitioners and Policy Makers; https://climateknowledgeportal.worldbank.org/country/uganda/climate-data-historical#:~:text=Uganda's%20climate%20is%20largely%20tropical,rainy%20season%2C%20March%20to%20October.



According to Köppen-Geiger Climate Classification, all of Uganda's territory is classified as Tropical (A) with different subclasses (see figure 4): most of the area is classified as Tropical Savannah (As/Aw) while a lesser extent is classified as Tropical Monsoon (Am) and Tropical Rainforest (Af).

Figure 8. Köpper-Geiger Climate Classification 1991 – 2020 in Uganda. Source: Climate Change Knowledge Portal

The following figures show the mean temperature and precipitation in Uganda from 1991 to 2020.

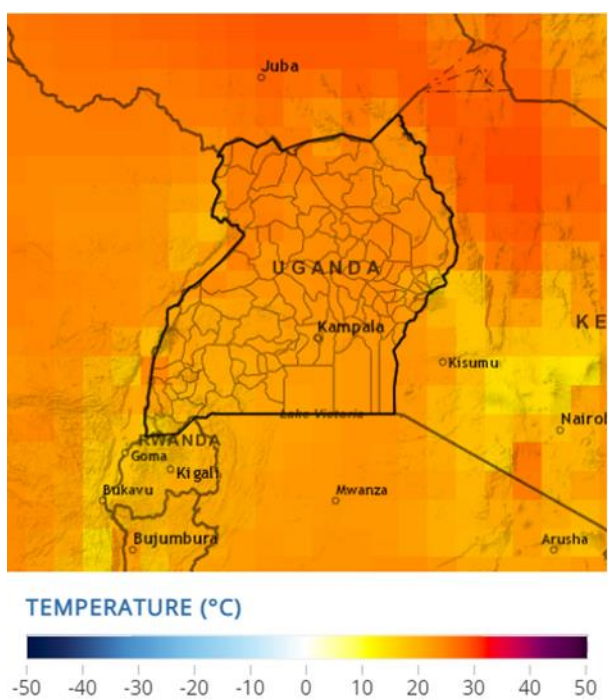


Figure 9. Observed Climatology of Mean-Temperature from 1991-2020 in Uganda. Source: Climate Change Knowledge Portal

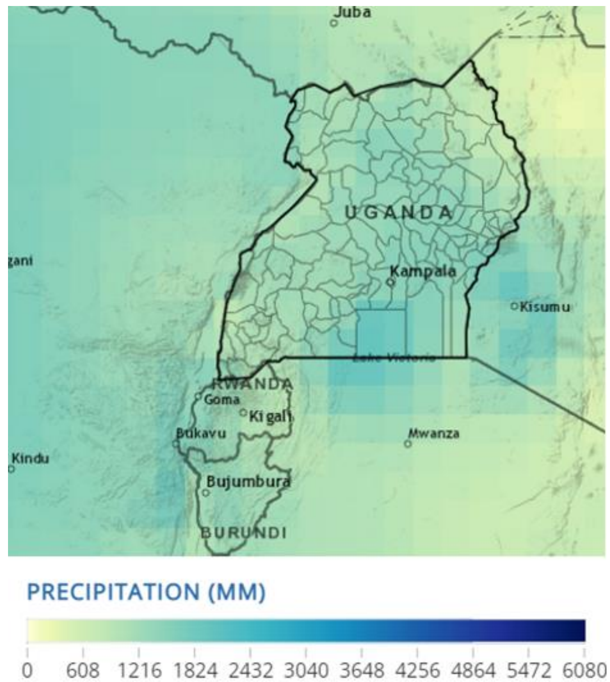


Figure 10. Observed Climatology of Annual Precipitation (mm) from 1991-2020 in Uganda. Source: Climate Change Knowledge Portal.

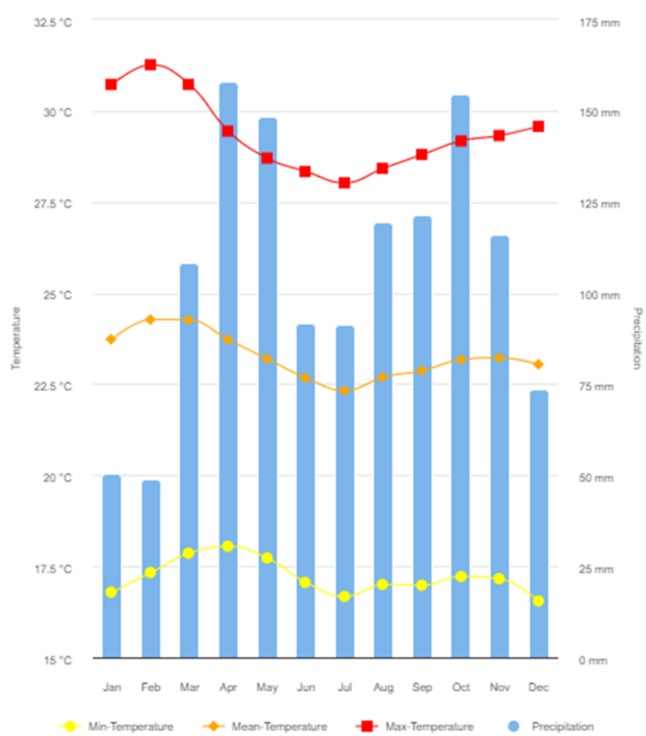


Figure 11. Monthly climatology of minimum, mean and maximum temperature and precipitation in Uganda. Source: Climate Change Knowledge Portal.

HYDROLOGY

Uganda has a wide hydrological net which expands throughout the whole country. The hydrology of Uganda is associated to the hydrology of river Nile. It is characterized by seasonal and inter-annual variations in river flows. Tectonic movements linked with the formation of the rift valley complicate the drainage network. The major drainage of Uganda today is to the north into the river Nile.[3]

The major hydro basin in Uganda is the River Nile basin. At the east, some area is covered by the Rift Valley basin. Within this major basins, 10 sub-basins are identified according to the figure presented below (on the left: basins; on the right: sub-basins).

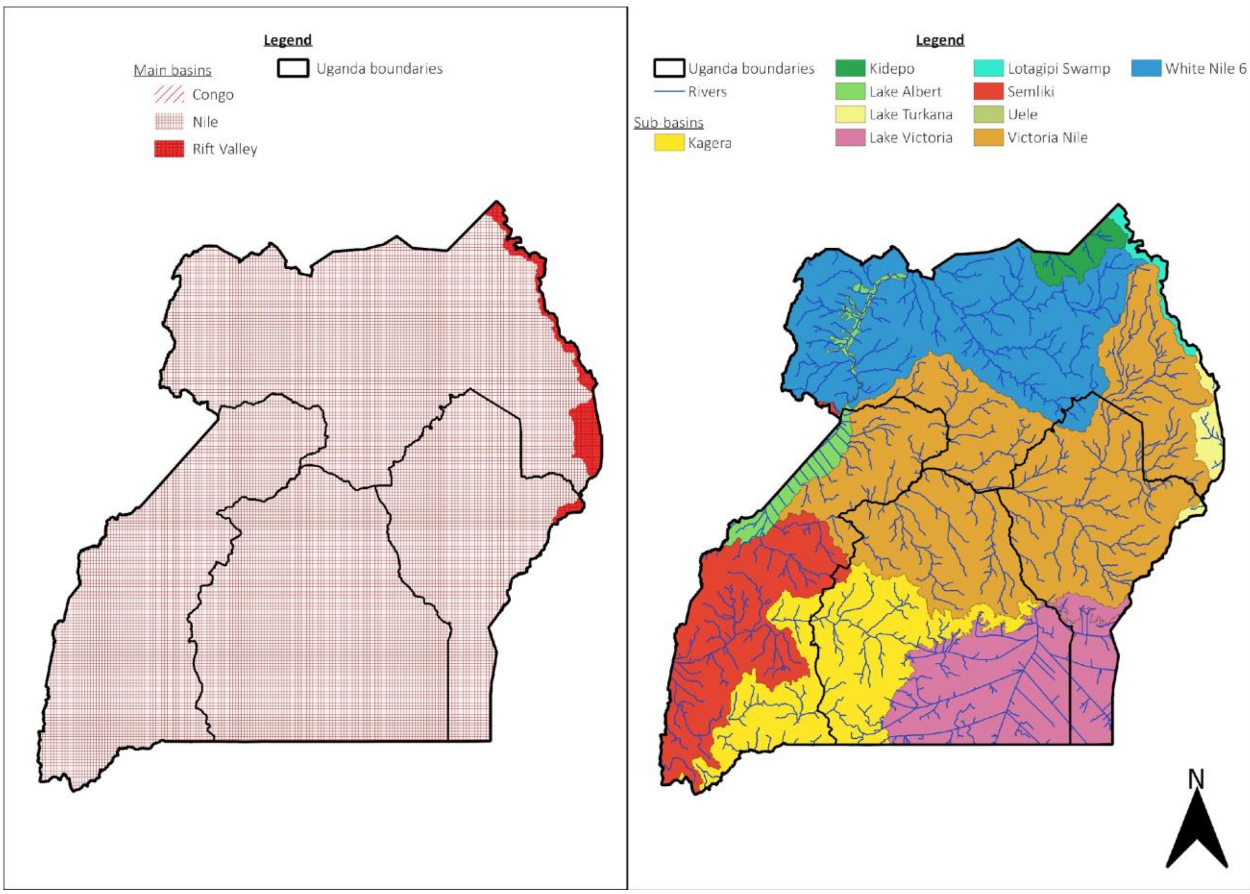


Figure 12. Hydrobasins in Uganda

[3] Pavelic, P.; Giordano, M.; Keraita, B.; Ramesh, V; Rao, T. (Eds.). 2012. Groundwater availability and use in Sub-Saharan Africa: A review of 15 countries. Colombo, Sri Lanka: International Water Management Institute (IWMI). 274 p. doi: 10.5337/2012.213

In Uganda, significant water resources originate from precipitation as well as inflows from the upstream countries of Burundi, Congo, Kenya, Rwanda, and Tanzania. Uganda is therefore both a downstream and upstream country in the Nile system and almost all its water resources are shared with other countries. The main surface water bodies in Uganda are: Lake Victoria, Lake Kyoga, Lake George, Lake Edward and Lake Albert. Surface water bodies and seasonally flooded areas account for 20 percent of the land area of Uganda (Pavelic P. et al).

TOPOGRAPHY

Uganda is characterized by an undulating topography formed by flat topped hills with wide concave valleys (Tindimugaya, 2000). Topographic elevations vary between 600 m AMSL in the western rift valley and 4,800 m AMSL at the top of Mount Rwenzori. The average elevation of Uganda is 1,200 m AMSL (Pavelic, P. et al).

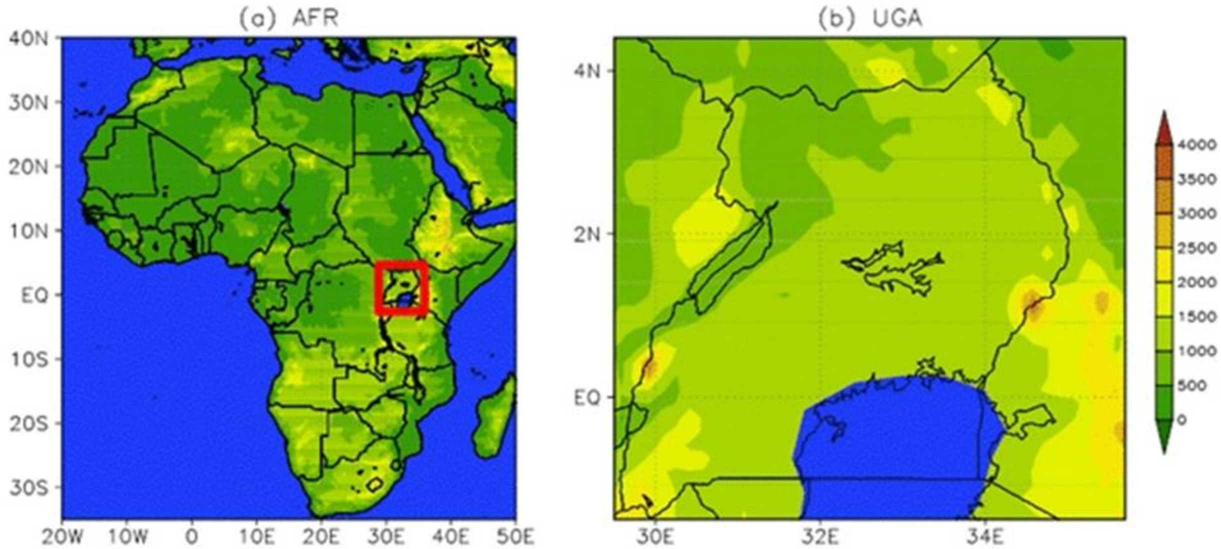


Figure 13. Figure showing (a) the position of Uganda in the African continent; the red rectangle (b) Map of Uganda indicating that most areas are 1000 m above sea level. Source: Ogwang, B.A., A. Nimusiima, T. Tindamanyire, M.N. Serwanga, G. Ayesiga, M. Ojara, F. Ssebabi, G. Gugwa, Y. Nsubuga, R. Atim, R. Kibwika, J.K. Balikudembe, H. Kikonyogo, A. Kalema, V. Ongoma, A., Taire, A. Kiryhabwe, M. Semujju, F. Einyu, R. Kituusa and L. Aribo. 2016.Characteristics and changes in SON rainfall over Uganda (1901-2013).Journal of Environmental & Agricultural Sciences. 8: 45-53

SOILS

Soils in Uganda are derived from Pre-Cambrian granitic gneiss and associated saprolite, with upland areas underlain by dismantled ferricrete (Brown, 2007). Dark sandy clays are found in the seepage zones at the valley bottoms whereas grey loam sand overlying sandy clays are found in areas of low relief. Yellow sands are found on the sloping wetland margins whereas more weathered, kaolinitic, red sandy loam to clays are characteristic of the topographically raised grounds (Pavelic, P. et al).

The following figure shows the different soil classes in Uganda.

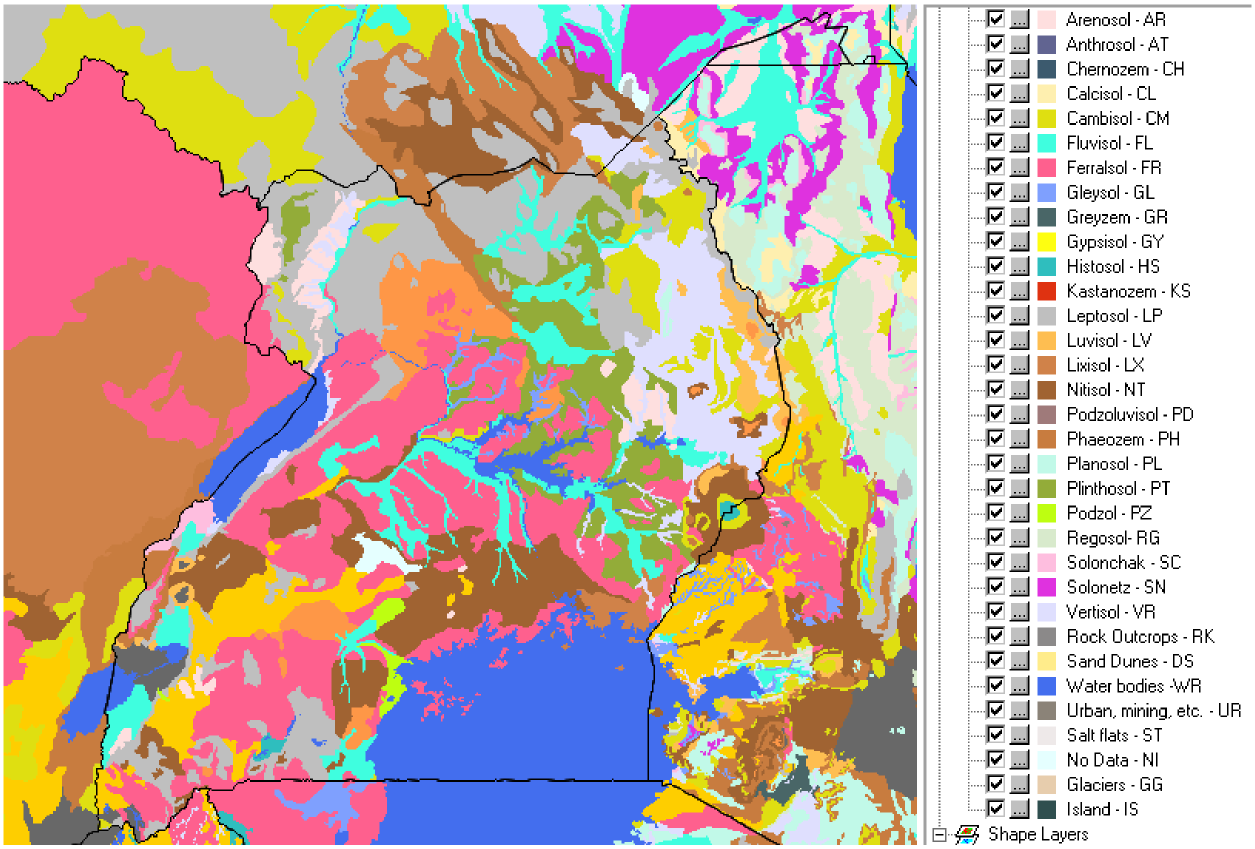


Figure 14. Uganda soil classes. Source: Harmonized World Soil Database

<u>VEGETATION</u>

Vegetation in Uganda varies greatly due to human influence. Apart from the protected forests, natural vegetation in many places have been modified due to high population density, need for agricultural land and other economically driven land use practices (Marchant and Taylor, 1997). In most of Uganda, vegetation is dominated by grass, banana plantations, maize, coffee plantation and eucalyptus trees, used for building poles and firewood. Papyrus swamps are found along the river channels but many of these are being drained for agriculture and cattle rearing. Most of the wetlands are natural sponges and reservoirs in which runoff and seepage accumulate. Wetlands in the country are sources of many small rivers and streams and serve to regulate discharges, the result of which is visible in the variations in discharges out of the catchment (Pavelic, P. et al).

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project activities comply with Uganda's laws and regulations. The documents will be available for the VVB auditors as required.

Specifically, Kijani is in compliance with the following laws and regulations;

1. The National Environmental Act of 1996
2. The National Forestry and Tree Planting Act 2003
3. The Employment Act, 2006
4. The National Social Security Fund Act
5. Companies Act

More information on each of these regulations will be provided if required.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project has not been registered or is seeking registration under any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

Does the project reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading?

☐ Yes ☒ No

1.16.2 Other Forms of Environmental Credit

Has the project sought or received another form of GHG-related credit, including renewable energy certificates?

☐ Yes ☒ No

1.16.3 Supply Chain (Scope 3) Emissions

N/A

1.17 Sustainable Development Contributions

1.17.1 Sustainable Development Contributions Activity Description

The Kijani Forestry project contributes to several of the United Nations' Sustainable Development Goals (SDGs).

- **SDG1: End poverty in all forms everywhere.** Kijani partners with rural smallholder farmers to increase their income through market linkage for sustainable forest products. By linking a network of smallholder farmers to the carbon market, Kijani can unlock a new source of income.

- **SDG 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture.** Kijani's work also impacts food security. Kijani pairs trees, many of them nitrogen fixing, with key crops, creating intercropping systems that increase productivity while also improving soil quality. Kijani promotes sustainable agricultural systems, emphasizing systems that improve soil health, reduce erosion, and improve ecosystems.
- **SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all:** Kijani emphasizes lifelong learning opportunities through the training program at Kijani's research and development farm. This training program recruits majorly unemployed youth who are eager for learning and employment opportunities. This training program not only upskills youth in forestry practices, but it also builds capacity in communication, leadership, conflict management, and program management. Hundreds of youths have completed this training program and are now employed full time by Kijani.
- **SDG 5: Achieve Gender Equality and Empower all women and girls:** Women make up almost half of the smallholder agricultural workforce, but usually have much less access to resources like credit and quality inputs. That's why Kijani prioritizes working with female smallholder farmers, with almost 60% of partner farmers being female. Kijani works to improve female farmers' access to training and quality inputs through our work, ensuring that they are at the center of this work.
- **SDG 6: Ensure availability and sustainable management of water and sanitation for all.** The project contributes to the protection of water resources by improving soil quality and preventing erosion, which reduces the risk of sedimentation and contamination of water bodies, thus helping to ensure access to clean water. Forests act as a filter of sediments and polluting substances and help recycle rainfall water. Forests also help prevent floodings. The project also promotes sustainable land use practices, which helps to maintain water quality and quantity and ensures the availability of water resources for local communities. Even when the trees are harvested, root structures will remain in the soils and trees will regenerate, thereby maintaining soil erosion control. Chemical products will be used as least as possible and only when strictly necessary and using the minimum necessary doses for the correct development of the forests (eg. Ants control, weeds control).
- **SDG 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment and decent work for all.** The project promotes sustainable livelihoods and economic growth in local communities by engaging them in tree planting and forest management activities, providing employment opportunities, and enhancing the value of forest resources. Kijani also hires directly from the communities they partner with, creating meaningful employment through dignified jobs for hundreds of youth in Uganda. The project also supports the development of sustainable supply chains for forest products, which promotes local economic growth and contributes to the achievement of sustainable development. Local sources of work are also

generated in the secondary and third sectors because timber must be industrialized/processed and commercialized as well as charcoal produced, transported, and sold. Also, the forests provide other services and secondary products such as honey and medicinal plants which also generate new sources of labor. The project's focus on involving local communities in the management and care of the trees is an essential aspect of its success. By providing training and workshops on sustainable forest management techniques, Kijani empowers local communities to become active participants in decision-making, ensuring the long-term sustainability of the project.

- **SDG 13: Take urgent action to combat climate change and its impacts.** The Kijani Forestry project helps mitigate climate change by sequestering carbon through reforestation and afforestation, reducing greenhouse gas emissions, and contributing to global efforts to limit global temperature rise. The project also promotes sustainable forest management practices, which helps to reduce deforestation and forest degradation and maintain forest carbon stocks. Uganda is the largest refugee hosting country in Africa because of conflict and instability in neighbor countries such as Congo and South Sudan. The presence of refugees has increased the pressure to the environment and generated an increase in deforestation activities and land-use change. [4] The Kijani project will help revert this situation by the restoration of soils and woody ecosystems implementing a sustainable forest management plan. No native forests will be cleared for this purpose.
- **SDG 15: Protect, restore and promote sustainable use of territorial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation and halt biodiversity loss.** The project contributes to the conservation of terrestrial ecosystems and the protection of biodiversity by planting indigenous tree species and restoring habitats for fauna and flora, thereby preserving local ecosystems and promoting biodiversity conservation. The trees harvested in this project will directly be saving other old-growth forests from being cut down to supply the energy needs of Uganda. The project also supports the protection of soils and prevents erosion, which helps to maintain the health of local ecosystems. This is also aligned with Uganda's NDP III which aims to increase the forest cover in the country and halt deforestation and biodiversity loss. Deforestation also has a very important negative impact on Uganda's tourism activities, which are strongly dependent on the country's natural ecosystems. The productive strategy will consider aspects related with biodiversity and the conservation of local ecosystems.
- **SDG 17: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development.** The project fosters partnerships and collaborations among different stakeholders, including local communities, government agencies, NGOs, universities, and private sector actors, to achieve sustainable development and mitigate climate change. The project also promotes knowledge sharing and capacity building activities, which helps to build the capacity of local communities and enhance their participation in sustainable development activities.

Moreover, the Kijani Forestry project is aligned with Uganda's national objectives stated in the NDP III. Kijani has worked closely with and has signed an MOU with the Ministry of Water and Environment with specific support to the Nursery Hub model.

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[4] Investing in forests and protected areas for climate-smart development, 2020 – 2026. Ministry of Water and Environment with support from the World Bank.

Overall, the Kijani Forestry project contributes to multiple SDGs, demonstrating the interconnectedness and complexity of sustainable development and the importance of addressing climate change and biodiversity conservation through integrated and collaborative approaches.

1.17.2 Sustainable Development Contributions Activity Monitoring

During the monitoring period, the project implemented various activities that made significant contributions to achieve SDGs. Native trees were planted, helping to restore degraded areas and addressing biodiversity loss as well as climate change.

Regarding social and economic aspects, more employments were created at a local level to hold all the activities needed for this project: from nursery activities to plantation, monitoring and protection of the trees. To reinforce and complement the creation of new sources of work, Kijani has created training centers in which they offer guidance and support to ensure activities are held in the correct way.

The most direct economic impact of this project is job creation for Kijani's field extension network. Kijani's training center in Gulu, Uganda, has upskilled hundreds of youths in agroforestry and tree plantation management. To date, Kijani has created over 440 full time jobs in the community.

Social and economic impacts for smallholder farmers are yet to be realized, due to the longevity of tree growing cycles that are the source of additional income for the farmers. Therefore, no economic impacts for smallholder farmers have been quantified.

Table 4: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
3)	8.3	8.3.1 Proportion of informal employment in total employment, by sector and sex	Implemented activities to decrease	Kijani has hired over 440 full time employees, 114 part-time employees, and has grown the informal employee network of smallholder farmers to over 20,000 through 2023.	In a region with historically-low formal employment, Kijani has trained and hired over 440 full time employees while giving income-generating opportunities to over 20,000 households. By the end of the project implementation, Kijani expects to hire over 1,000 full time employees while partnering with over 200,000 smallholder farmers.

5)	8.6	8.6.1 Proportion of youth (aged 15–24 years) not in education, employment or training	Implemented activities to decrease unemployment through training and hiring youth.	Kijani hires directly from the communities they partner with, creating meaningful employment through dignified jobs for hundreds of youths in Uganda. As of 2022, 168 youths have been employed by Kijani.	Expected to generate job positions for over 1,000 youths in the long term.
6)	15.1	15.1.1 Forest area as a proportion of total land area	Implemented activities to increase planted area throughout the project lifetime to 217,000 hectares.	Before the project there were almost no trees present on the smallholder farms. In 2022, Kijani has planted 182,987 trees and is on track to have planted over 12,000,000 by the end of 2023, representing over 3,800 hectares.	Project expects to plant 247,000,000 trees by 2030 for an estimated planting size of 217,000 hectares.
7)	15.2	15.2.1 Progress towards sustainable forest management	Implemented activities to increase biodiversity in species planted	Kijani has implemented sustainable forest practices such as no tilling, planting native species and avoiding invasive species avoiding monoculture. Currently, the Nursery Hubs plant 22 species.	The project expects to expand the species list to between 22 and 35 species to be planted throughout Uganda.

1.18 Additional Information Relevant to the Project

Leakage Management

As per VCS Standard, the projects are encouraged to include leakage management zones as part of the overall project design. Leakage management zones are part of a leakage management plan, they can minimize the displacement of land use activities to areas outside the project area by maintaining the production of goods and services, such as agricultural products, within areas under the control of the project proponent or by addressing the socio-economic factors that drive land use change. Kijani Forestry carbon project has no need to include a leakage management plan or zone, since the pre-existing activity (mostly croplands) is a common activity in Uganda and does not generate leakage emissions when the project starts.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Further Information

Kijani has a 400-acre research and development facility in Gulu District, Uganda, that serves as both a testing ground for new tree species, nursery management advances, planting techniques, and agroforestry systems improvements, and as a training center for Kijani's internship program.

Kijani's internship program is unique to Kijani, and a critical component of Kijani's ability to scale while maintaining strong relationships in partner communities. Kijani's parish coordinators identify unemployed youth in partner communities and recommend them for Kijani's internship program. This program brings these youth to Kijani's training center farm and implements a three-month intensive training program. During this program, interns are trained and upskilled in tree nursery establishment and management, community mobilization, tree planting, intercropping, monitoring and evaluation, communication skills, and leadership. Kijani exclusively hires for its Parish Coordinator roles, who are the core of the decentralized nursery model, from this internship program. This process ensures that Kijani is not only creating jobs, but also building the capacity of youth that it works with. This also continually strengthens Kijani's relationships with the farmers that they work with. Besides the MOU with the Ministry of Water and Environment, Kijani also works closely with the local governments at the District Level.

2 SAFEGUARDS

2.1 No Net Harm

The present project in all its components and phases guarantees that there are not or will not be net harm to the environment nor to socio-economic aspects.

The project's species selection takes into consideration the native species in the region and focuses on indigenous species. In the case where a non-indigenous species is planted, it is never a new species introduced to the area but must have a history of growing in the area. Kijani performs extensive due diligence on any species being planted, ensuring it is a species that is available to be purchased through Uganda's National Forest Authority.

Kijani also focuses on ensuring that tree planting on any cropland doesn't displace essential short-term income with the crops. With the introduction of profit share from the carbon credits, Kijani may have the opportunity to provide other short-term income which could be a viable alternative to crop production, allowing for the expansion of trees planted.

2.2 Local Stakeholder Consultation

A formal local stakeholder's consultation took place on the 28th February, 2023, in Orom, Uganda. The invitations were delivered to the stakeholders in different ways, but mostly with letters delivered by hand, as it can be seen in the figures below.

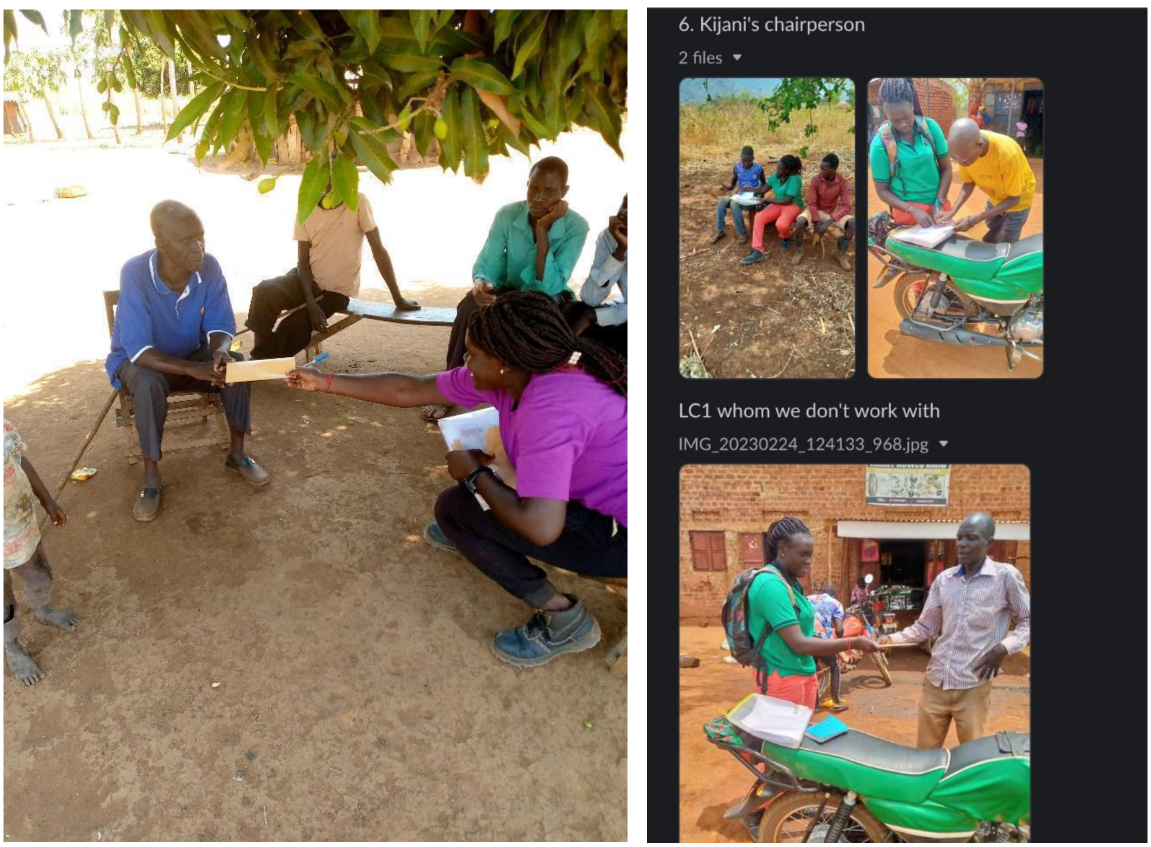


Figure 15. Stakeholders consultation invitation delivered

The stakeholder consultation started at 9am and lasted approximately 4 hours. The following figure presents the agenda of that day's event, a general overview of the event and part of the list of participants.

KIJANI FORESTRY

Stakeholder Consent Meeting

28th February 2023
Orom, Uganda

Agenda

Time	Topic	Responsible
9:00 am	Welcome, sign-in, name tags, allow for late arrival	-
10:00 am	Read agenda, opening prayer, and introduction	Cathy
10:15 am	Opening remarks & introduction	DFO/Cathy
10:30 am	Presentation	Cathy/Other
11:30 am	Tea Break	
11:45 am	Submit Questions	*Staff*
12:00 pm	Question & Response	Cathy/Beau
12:45 pm	Closing Remarks	Cathy
1:00 pm	End of meeting	

Figure 16. Figure 13. Stakeholders event agenda

Figure 17. General overview of the event and part of the list of participants

During the event, and as it can be seen in the agenda, there was room for questions and answers. They could be raised orally or handwriting, as it is shown in the figure below.

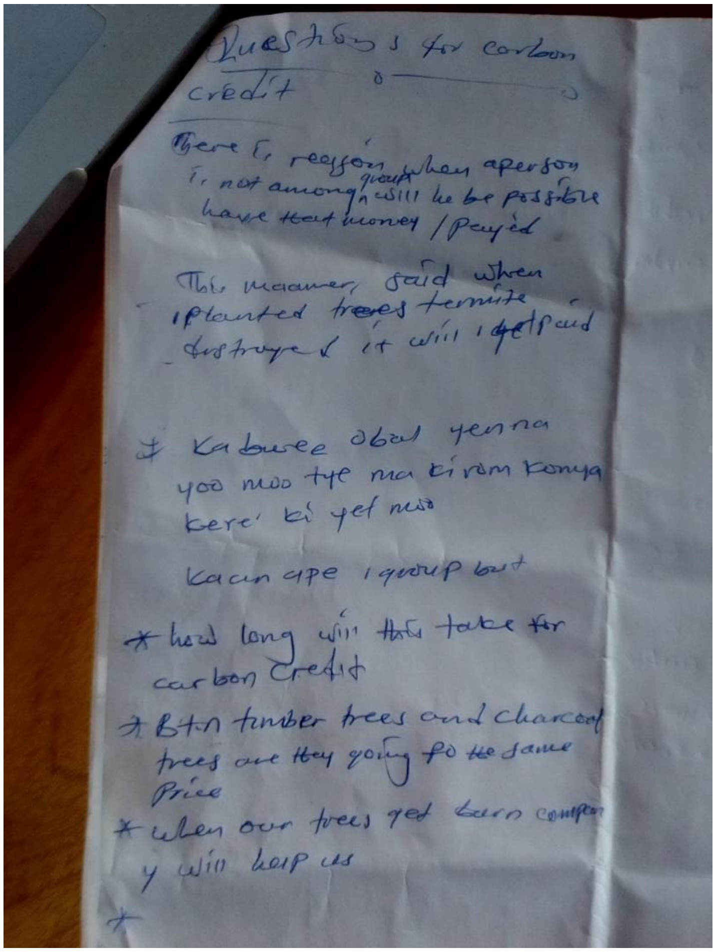


Figure 18. Part of the questions raised during the event.

Stakeholders met in groups and discussed their questions and concerns, which were then raised in plenary. Group discussion allowed for more voices to be heard, especially women who were in attendance. Culturally, women do not speak as much as men in large group settings, so the smaller discussion format created more opportunity for women to share their viewpoints both with one another and with Kijani staff.

Below is a summary of questions that were raised by the groups:

- Is there a limitation of group formation for carbon credits?
- Which specific tree species are fast growing that can help sequester a lot of carbon?
- If I have a big garden/area with lots of trees that I don't want to cut down, am I able to get carbon credits?
- When will payments start for the trees that are already in the garden?
- Is there any contract being signed between Kijani and the farmers to ensure that they're going to get the money?
- During the monitoring time, will there be any training from Kijani for farmers to know if they're due for a carbon credit?

- How many hectares need to be planted with trees to qualify for carbon credits?
- How do they calculate the amount of income to be given to the farmers for carbon credits?
- If we plant trees for charcoal and the elephants destroy them, and the team comes to monitor, how can the farmer benefit out of this?
- What's the timeline for payments, and will payments stop after harvesting?
- How long do the trees take for carbon credits? Is there a difference between timber and charcoal?
- If I am not in a group but I plant trees, can I be part of carbon credits?
- Is it possible for this carbon credit money to be deposited into my account after 2-3 years if I want it to accumulate?
- What if the trees have already been tracked, but they burn in a wildfire?
- If I plant trees this year but I only have 5 surviving stems next year, do I still qualify?
- If I have a forest on my land, will I qualify for carbon credits?

Kijani has a continuous process for local stakeholder consultation, through the Community Mobilization team. This team meets with local leaders, including government officials, cultural leaders, and local chairpersons, on a regular basis to share about Kijani's program and gather feedback. Additional stakeholder consultations are scheduled as Kijani continues to expand to new regions throughout Uganda, to ensure that all community members that partner with Kijani have an opportunity to share their views and provide consultation on the carbon credit process.

"Kijani Forestry Smallholder Farmer Forestry Project" has an open and permanent consultation process with local stakeholders. There is a community relation strategy elaborated. One of the important elements and first step with local stakeholders was the elaboration of the "STAKEHOLDERS IDENTIFICATION AND CONSULTATION PROCESS PROTOCOL". It establishes how to identify a local stakeholder, its background, identification of their risks and respect for local stakeholders' resources.

In the "Communication and consultation mechanism for ongoing communication" section, it is stated that the project proponent will take all appropriate measures to communicate and consult with local stakeholders in an ongoing process for the life of the project. The goal is to allow stakeholders to raise concerns about potential negative impacts during project implementation on an ongoing communication channel where the project proponent will communicate, as far as possible:

- Project design and implementation, including results of monitoring.
- Risks, costs and benefits the project may bring to local stakeholders.
- All relevant laws and regulations covering workers' rights in the host country.
- The process of VCS Program validation and verification and the validation/verification body's site visit.

The process of the ongoing communication between the local stakeholder and the project proponent includes receiving, hearing, responding, and attempting to resolve grievances within a reasonable period of time, taking into account culturally appropriate conflict resolution methods.

The process of the ongoing communication will be based in:

- The dossier "Document for public communication" (electronic or physical format) will be sent to stakeholder with information of the project and will also include an email for consulting. This email will be used in a permanent way to receive comments through the whole life of the project. In case of receiving a negative comment, this will be automatically sent to the grievance redress procedure.
- Information of the project will be found in the webpage of the project proponent link: https://www.onecarbonworld.com/local-stakeholder-consultation and this link will also guide interested persons to the project link at Verra.
- Remote interviews with different stakeholders will be held in meetings (as it is demanded) where comments will be received, and the design of the project will be revised.

There will also be a system of registry of communication of the stakeholders, which will count with the identification of emails received as well as their reply. The concern/comment received will be registered in the System of Registry of communication with stakeholders.

As stated in the VCS Standard, the way of ongoing communication will depend on the culture of the country/region in which the project is being carried out, so as to perform in a culturally appropriate manner.

Some ways of communication that are proposed, in a parallel way, as the best for fluent communication between the two parties are:

- Availability of Kijani's Parish Coordinators to answer and respond to questions
- Email: NH.Feedback@kijaniforestry.com
- Telephone line number available for any questions about the project
- Web page displaying FAQs and responses
- Database for question collection with the link on Kijani's website.

The "feedback management" is established once the concern/comment is received, it will be addressed to the local stakeholder that it has been started to take into consideration. This may result as an update to the project design or as a justification of why this concern is not appropriate. The action that will be considered depending on the local stakeholder consultation will be demonstrated to the validation/verification body.

If a concern raised results in a modification of the project, this will be updated in the project description leading to a new version of the project.

All in all, the project proponent will receive feedback form stakeholders, allowing the evaluation of impacts, their concerns, and elements to be included as part of the project design.

2.3 Environmental Impact

As these activities take place on privately held land, there are limited regulations imposed on private land for Kijani's activities. Those few that are in place, Kijani is compliant. These include the following:

- Employment act, 2006
- Occupational health and safety, 2006
- Workers' compensation Act, cap. 225.
- NSSF Act cap 222 as amended in 2021
- The National Environmental Act, 2019
- The National Forest and Tree Planting act 2003
- Companies Act 2012

Additionally, Kijani's activities have a minimal negative impact on the environment. The largest potential cause for harm is improper disposal of the plastic potting bags that are used for nursery activities. Kijani field staff coordinate the collection of the plastic potting bags for reuse. Those that cannot be reused are donated to a local plastic recycling facility in Gulu.

2.4 Public Comments

The document has not been published so the Public Comments period has not been held yet (no comments to address).

2.5 AFOLU-Specific Safeguards

Kijani has a farmer support plan which provides permanent nurseries, training facilities and technical support for local communities and members of Kijani's project. The following figure shows the Nursery's Hub locations.

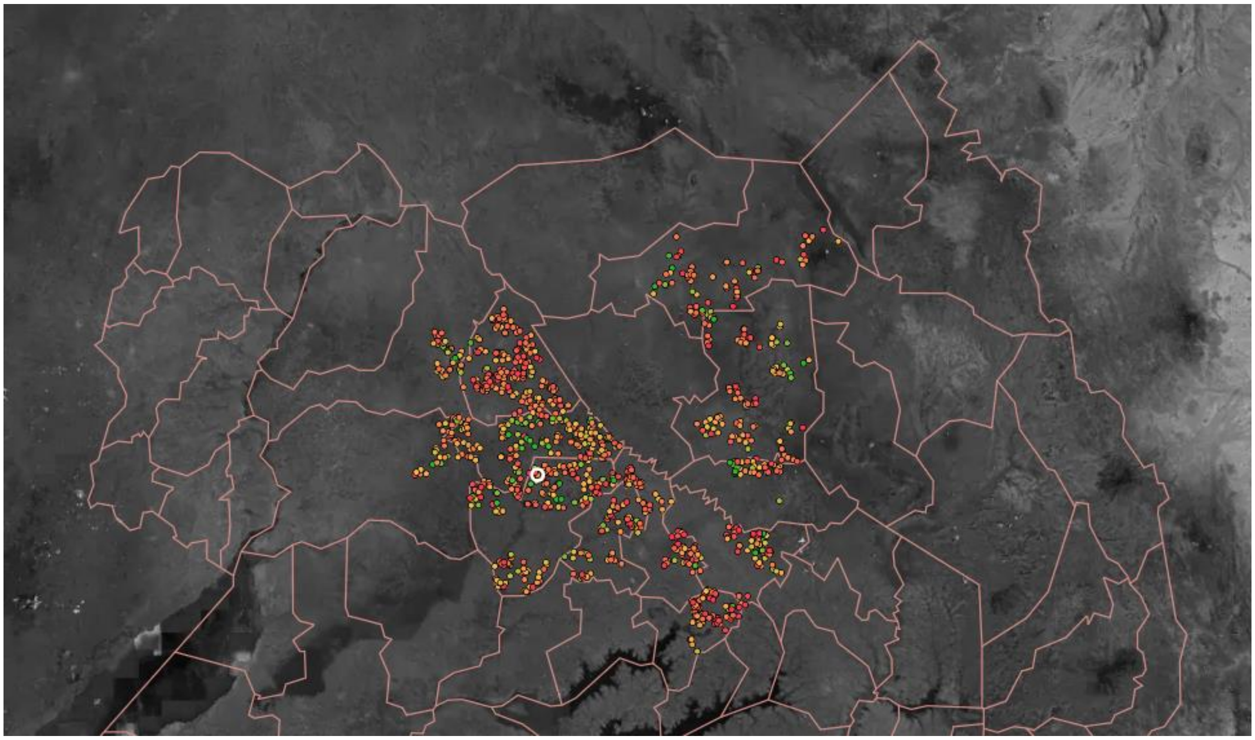


Figure 19. Nursery Hub Locations

Kijani's field staff are based in local communities and have full-time availability. They provide regular training to groups on forest activities such as nursery establishment and maintenance, seedling care, agroforestry practices, etc. Kiiani's continuous presence, and strong relationships, in the community is fundamental to achieve the long-term success of the project. In addition to its reforestation efforts, Kijani provides training and support to communities to help them establish sustainable forest management practices and create economic opportunities through various forest products.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The consolidated CDM methodology AR-ACM0003 "Afforestation and reforestation of lands except wetlands" (version 02.0) was applied. This methodology is applicable to large scale afforestation and reforestation projects, as per the CDM scale definition.

The following methodological tools, to which the selected methodology refers to, are used:

- Version 01 of "Combined tool to identify the baseline scenario and demonstrate the additionality in A/R CDM project activities".
- Version 04.0.0 of "Estimation of non-CO2 GHG emissions from burning of biomass attributable to a CDM A/R project activity".

- Version 02.0 of "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity".
- Version 01.1.0 of "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities".
- Version 02.1.0 of "Calculation of the number of sample plots for measurements within A/R CDM project activities".
- Version 04.2 of "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activity"
- Version 03.1 of "Estimation of carbon stocks and change in carbon stocks in deadwood and litter in A/R CDM project activity"
- Version 01. 1 "Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities"

3.2 Applicability of Methodology

The project activity consists of introducing trees where there were not any trees before. The activity is considered as afforestation.

(a) The land subject to the project activity does not fall in wetland category

According to the information found at national level, there is no presence of wetlands in the current project area.

(b) Soil disturbance attributable to the project activity does not cover more than 10 per cent of area in each of the following types of land, when these lands are included within the project boundary:

(i) Land containing organic soils.

(ii) Land which, in the baseline, is subjected to land-use and management practices and receives inputs listed in appendices 1 and 2 to this methodology.

The land preparation in this project is insignificant. The land preparation involves only the area where the tree will be installed. The farmers prepare the site with a hoe (or similar) by taking out the topsoil of an area of 30cm by 30cm (max) at a two or four meter spacing, depending on the tree type.

Applicability conditions from tool Soil Organic Carbon "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", EB60.

This tool is applicable when the areas of land, the baseline scenario, and the project activity meet the following conditions:

(a) The areas of land to which this tool is applied:

(i) Do not fall into wetland category.

Methodology condition (see applicability of methodology above).

(ii) Do not contain organic soils as defined in Annex A: glossary of the IPCC GPG LULUCF 2003.

Methodology condition (see applicability of methodology above).

(iii) Are not subject to any of the land management practices and application of inputs as listed in the Tables 1 and 2

The areas applied are not subject to any of the land management practices and application of inputs listed in Tables 1 and 2 of the tools. Since the land use prior to project start is cropland, only Table 1 applies. For the tropical wet climate region corresponding to the project activity, none of the three combinations included in Table 1 are applicable, as is demonstrated in 3.4 baseline scenario.

(b) The A/R CDM project activity meets the following conditions:

(i) Litter remains on site and is not removed in the A/R CDM project activity, and

Litter will not be removed from the project site. Litter removal is not part of the list of project activities.

(ii) Soil disturbance attributable to the A/R CDM project activity, if any, is:

• In accordance with appropriate soil conservation practices, e.g. follows the land contours.

• Limited to soil disturbance for site preparation before planting and such disturbance is not repeated in less than twenty years.

Soil disturbance is in accordance with appropriate conservation practices, limited to site preparation and not repeated within 20 years.

Applicability conditions from tool "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities" (EB 35).

The tool is applicable under the following conditions:

- Forestation of the land within the proposed project boundary performed with or without being registered as the A/R CDM project activity shall not lead to violation of any applicable law even if the law is not enforced.

The forest activity is permitted by local and regional governments.

- This tool is not applicable to small - scale afforestation and reforestation project activities.

The project is not a small-scale project, according to the definition of the Clean Development Mechanism.

Applicability conditions from tool "Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity" (EB 65)

- The tool is applicable to all occurrences of fire within the project boundary.

The project will consider any occurrence of fire within the project boundary.

- Non-CO GHG emissions resulting from any occurrence of fire within the project boundary shall be accounted for each incidence of fire which affects an area greater than the minimum threshold area reported by the host Party for the purpose of defining forest, provided that the accumulated area affected by such fires each year is ≥5% of the project area.

Applicability conditions from tool "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity" (AR_TOOL 15).

- This tool is not applicable if the displacement of agricultural activities is expected to cause, directly or indirectly, any drainage of wetlands or peat lands.

The project activity will not cause any displacement of activities, as it will be demonstrated in chapter 4.3.

Finally, there are no applicability conditions for the following tools included in the methodology:

- Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities.
- Calculation of the number of sample plots for measurements within A/R CDM project activities.
- Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities.

3.3 Project Boundary

Five carbon pools are selected in the baseline scenario and project: above-ground and below-ground biomass, dead wood, litter, and soil organic carbon. Harvested wood product (HWP) is not selected since it is not eligible under the selected methodology.

Above-ground and below-ground biomass must be selected according to the methodology. All other carbon pools are optional, and they are also selected because they are expected to increase by the implementation of the proposed project activity. It is very clear in the case of dead wood and litter since these pools do not exist in the pre-project situation and will appear under forest. The establishment of forest is expected to cause an increase in net primary productivity and, therefore, in the turnover of plant residues into the soil, that would lead to a long-term increase in the soil organic carbon pool.

Table 5. Project boundaries

Source		Gas	Included?	Justification/Explanation
Project	Above and below ground biomass	CO_2	Yes	Carbon stocks in tree biomass is the main carbon pool affected by project activity. It is considered in the baseline scenario and project activity.
	Dead wood, litter and SOC	CO_2	Yes	These three forest carbon reservoirs are expected to increase due to project activities. It is considered in the baseline scenario and project activity.
	Burning of woody biomass	CO_2	Yes	Burning of woody biomass for site preparation is not part of forest management. Although there were not forest fires since the beginning of the project, the occurrence of such an event would be accounted indirectly as a change in the carbon stock. It is considered in the baseline scenario and project activity.

Source		Gas	Included?	Justification/Explanation
		CH_4 N_2O	No	Burning of woody biomass for site preparation is not part of forest management. Forest fires are considered under applicability conditions of the tool "Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity" (Version 04.0.0). Neither it is considered in the baseline scenario nor in the project activity.
	Harvested wood products	CO_2	No	This carbon pool in not eligible under selected methodology.
	Combustion in fossil fuel in vehicles and machinery	CO_2 CH_4 N_2O	No	Potential emissions are negligibly small and are not included as a source of GHG emissions
	Nitrogen based fertilizers	N_2O	No	Potential emissions are negligibly small and are not included as a source of GHG emissions

Project boundaries include all the areas of Kijani Forestry project that have been and will be afforested. These areas have been defined based on the criteria discussed below.

Forest planted area is delineated using GPS technology and aerial photographs. Project boundaries are organized in GIS-format polygons. No visible landmarks have been established on the field.

The area included within project boundaries comply with the scope of the methodology, therefore there is no land that falls into the category of wetland. Also, complies with methodology applicability conditions: there is no land containing organic soils, neither land which is subjected to land-use and management practices in the baseline that receives inputs as listed in appendix 2 of the methodology. For an increased transparency and better understanding of the project, the project proponent clarifies there are no other areas to report, such as leakage management areas, or reference areas.

3.4 Baseline Scenario

The baseline scenario and demonstration of additionality (see chapter 3.5) follows the "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities (version 01)". This tool is an indispensable part of the methodology applied: AR-ACM0003 (see chapter 3.1) which is applicable to large-scale projects.

The baseline scenario for the project area was defined as degraded croplands or grasslands. This scenario was defined using the tool "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities". The following five steps are followed to identify the baseline scenario and demonstrate additionality:

- Step 0. Preliminary screening based on the starting date of the A/R project activity
- Step 1. Identification of alternative scenarios
- Step 2. Barrier analysis
- Step 3. Investment analysis (if needed) and
- Step 4. Common practice

The following section presents the description and justification of the procedure followed in relation to these steps.

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

This first step is requested by the methodological tool in the frame of the Clean Development Mechanism of the Kyoto Protocol. This step responds to the CDM request to differentiate afforestation from reforestation. While this step is not necessary for compliance with Verra's standards, it was still followed to comply with the completeness of the study.

The first Kijani's planting activities within this project started in 2022. Before that date, the areas were used to produce crops for domestic use, grasslands for cattle grazing, or previously degraded land not being used for agricultural activities at the time of the project start. Any deforestation that occurred prior to the project start took place at least a decade ago. This practice was and still is very common in Uganda: forest areas are clearcut, with stumps being uprooted in many cases, to create more land for agricultural production and to obtain fuelwood for the production of charcoal. This project aims to reverse this process by planting agroforestry systems on this land to provide a sustainable, cyclical source of timber and charcoal production.

The following figure shows the land cover in Northern Uganda as of 2022 where it can be seen that most of the area is used for cropland.

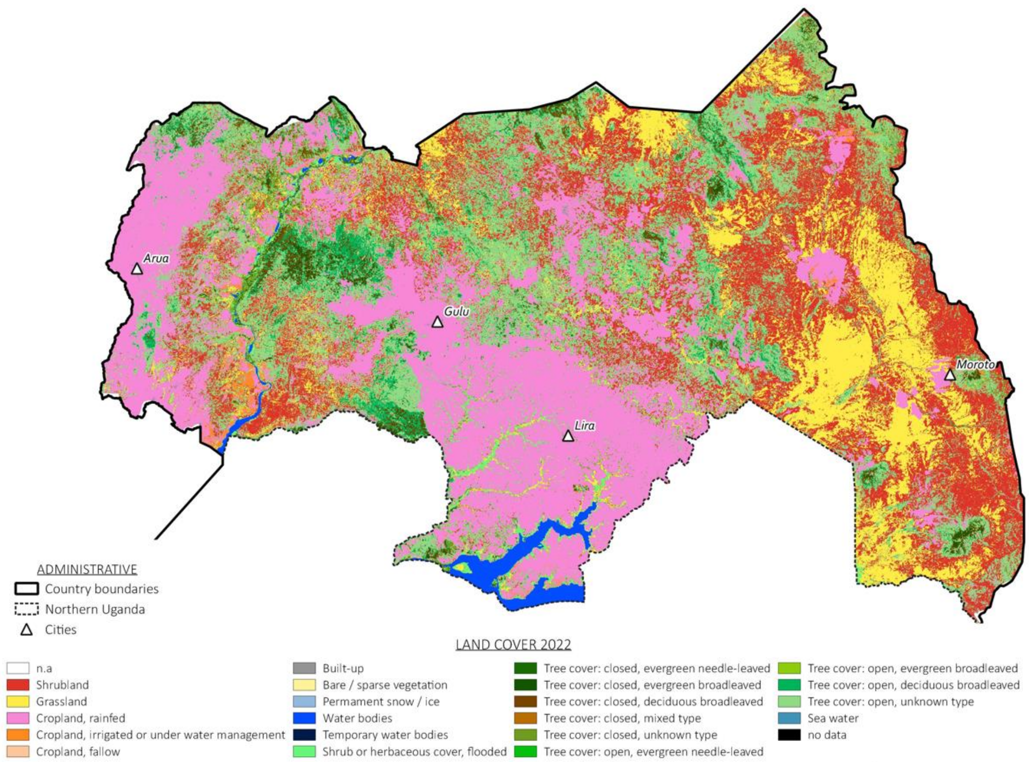


Figure 20. Land Cover Northern Uganda, 2022.

STEP 1. Identification of alternative scenarios

This step serves to identify alternative land use scenarios to the proposed CDM project activity that could be the baseline scenario, through the following sub-steps:

Scenario 1: Continuation of subsistence crop production and cattle grazing

The project areas are currently used to grow subsistence crops for household consumption. These are produced in a small-scale base and are not commercialized. This is important for local families because it represents the household's main food input. Kijani's activities do not displace subsistence food production. Kijani requires that farmer households have enough land to continue with food production while additional agricultural land is transitioned into a multi-purpose agroforestry system. Kijani encourages all farmers to plant their trees with crops, which leads to an overall higher survival rate of the seedlings and creates mutual benefits with the crops through reduced soil erosion, windbreak, and nitrogen-fixation by specific tree species. As the trees start to grow and shade out the crops, farmers transition to crops more suitable for shade cover, like ground beans, or add a cash crop such as coffee that grows well in shade. Sufficient land is always maintained for subsistence crop production, either through additional land just for crop production, or an integrated agroforestry system.[5]

[5] The big trees which are seen in Kijani's project area were already there when the new plantation was established and were left without any intervention. These are not accounted in the forest inventory for the project's monitoring.

This is a realistic, feasible and credible project activity for the landowners. An example of a farmer's intercropped maize is shown above.

Scenario 2: Commercial crop production

In addition to crop production for subsistence household use, farmers in the region also grow 'cash crops' like cotton, albeit in a small capacity. With limited financial resources, households may only be able to dedicate one or two acres to cash crop production.

While the production of commercial crops is extremely limited, there are certain farmers within the region where Kijani works that plant crops for commercial purposes. Almost all are extremely limited when it comes to scale and production techniques, often relying entirely on people within the household for labor. The size of the gardens Kijani works with (less than 1ha in average) disables the possibility of doing large-scale commercial crops.

This is an alternative that is not realistic for the landowners given the small-scale they work with.

Scenario 3: Afforestation with exotic commercial species (Eucalyptus ssp.; Pines)

Plantations of commercial exotic species such as Eucalyptus or Pines are planted as a monoculture. High density plantations (approx. 1,100 trees/ha) with exotic species such as eucalyptus for timber production. This displaces any other activities in the affected area such as crops or cattle grazing. This is a credible and feasible project to develop in Uganda but it is not a realistic option for the farmers that Kijani targets due to a number of factors. The two major issues would be the economic barrier to purchasing, planting, and maintaining these trees. The second would be access to the seedlings, as the nurseries that raise these trees are not located in the same project areas.

Scenario 4: Afforestation with native or exotic species intended to be harvested without carbon credit generation

In this scenario, farmers choose to implement afforestation activities and plant native and some exotic species in their gardens without carbon credit, but to harvest for timber and charcoal in the future. This may be done with a mixture of native and exotic trees depending on the purpose. This scenario would help decrease the rate of deforestation in the region and increase forest cover in Uganda through relieving pressure on the old-growth forests.

This is a possible scenario for the landowners but feasibility is not assured because of multiple barriers. The first barrier would be the availability of finances required of the landowners to purchase the seedlings. The second barrier would be access to the seedlings or nurseries. Since the farmers in the project live in rural communities and the majority don't have any transport means to procure the seedlings and bring them to their homesteads. Amongst other barriers, these two would be the most prohibitive.

Scenario 5: Afforestation or reforestation with native species without carbon credit generation

In this scenario, farmers would be expected to implement afforestation activities with native tree species on their own land to regenerate biodiverse forest cover without any expectation of directly financially benefitting from the activity. They would be expected to be able to raise and source their own trees, as the native trees would not be readily available in nearby nurseries. Landowners would need to provide all the financing for these activities, which would be inaccessible for nearly every landowner in the project.

This scenario is not feasible for the landowners that Kijani is working with. The self-reported income of the landowners is less than $0.50/day per household thereby any altruistic motivation to plant trees would not be realistic.

The list of credible alternative land use scenarios that would have occurred on the land within the project boundary of the A/R CDM project activity according to the previous analysis are:

- Continuation of pre-project land use: domestic agriculture (Scenario 1)
- Afforestation with native or exotic species intended to be harvested without carbon credits generation (Scenario 4).

Sub-step 1.b. Consistency with enforced mandatory applicable laws and regulations.

All land use *alternatives* identified above comply with all mandatory national regulations. No alternatives are eliminated based on this criterion.

Outcome of Sub-step 1b: the list of plausible *alternative* land use scenarios to the carbon credit project activity that comply with mandatory legislation and regulations taking into account their enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations are:

- Continuation of pre-project land use: domestic agriculture (Scenario 1)

- Afforestation with exotic or native species intended to be harvested without carbon credits generation (Scenario 4).

STEP 2. Barrier analysis

This step is formed by two sub-steps: Sub-step 2a. Identification of barriers that would prevent the implementation of at least one alternative land use scenario and sub-step 2b. Elimination of land use scenarios that are prevented by the identified barriers. The correct approach is to elaborate 2a and then proceed with 2b, but for the purpose of simplifying the analysis during this pre-feasibility study, both sub-steps are conducted as one.

For the continuation of pre-project activity (domestic agriculture), no barriers are identified. This activity has been practiced for a long time and its continuation is not prevented by any barrier.

On the contrary, implementation of exotic or native forests face important barriers that prevent the implementation of this activity. Afforestation of this kind generally happens in large areas, which is not the case of Kijani small-holder farmers who are managing a few hectares at most. Moreover, farmers can't afford the investment needed to buy these expensive seedlings; secondly, there is a lack of forest management knowledge; and finally, there is insufficient supply of seedlings available to buy in the communities. Not only does the project has productive barriers, but there is also some uncertainty about the commercial allocation for these products. Most of the plantations will be used for charcoal production which will help in reducing deforestation for this purpose, some others will be used only for services such as boundaries or shadow and in the third place, some species are supposed to be commercialized as timber. The generation of carbon credits as an additional source of income will help to make the project a feasible and more attractive option for farmers and will encourage other farmers too.

Investment barriers

Smallholder farmers have very little access to capital in order to develop their land, especially when it comes to trees. In order to plant half a hectare of trees, a farmer would need between 2-4x their self reported income to purchase the trees, leaving out any transport costs. Due to the land holding and development size of these gardens (average size less than 1 ha), there are very limited outside investment to grow their income potential with such small returns and neither they have the access to credits or other forms of finance. Kijani's role is to aggregate the tens of thousands of farmers into one grouped project to help develop their land while producing carbon credits.

As part of the investment that is needed, farmers will need to put some area aside from their current source of income: agriculture production. That is not an investment cost per se, but it implies an opportunity cost that needs to be covered in a long-term perspective by the timber, charcoal or carbon credits that will be generated.

Moreover, even though there are foundation groups known as Village Savings and Loan Association (VSLA)[6] in local populations among the project's area which aim to help local households manage their money and staying out of debt, the investment needed for afforestation activities exceeds the amount

[6] https://www.vsla.net/

that can be loaned from VSLA. There is no record of any loan provided for forest plantation: https://www.care.org/our-work/education-and-work/microsavings/

Institutional barriers,

The Forestry Policy, 2001, and the National Forestry and Tree Planting Act, 2003, provide Uganda's principal frameworks for forest protection, illegal logging, and the regulation of the timber trade.

The National Forestry Authority (NFA), established through the 2003 act, is mandated to set up and implement management plans to involve the private sector and the community in protecting the forests from illegal logging and unregulated trade.

It was anticipated that these plans would usher in the sustainable management of the forest and also the regulation of the trade in logging. However, this has not been the case: eighty percent of Uganda's timber trade is illegal. Uganda loses 200,000 hectares a year through deforestation, with illegal logging being one of the major causes. The illegal timber from Uganda – mostly logs and plywood and other panels – is smuggled to Kenya and Rwanda. Yet there are innovative, long-term efforts that are showing that coordinated prevention at source is a key element to effective responses.

Regardless of the government's efforts, deforestation still prevails in Uganda to support the needs of the citizens.

Technological barriers

Smallholder farmers have little knowledge about afforestation or agroforestry systems. They do not have sufficient tools to plant, maintain and harvest trees plus they do not have knowledge on nursery management.

Even though they know some of the species used by Kijani, they lack specific knowledge about each of them including: what are the benefits for each species, when and how to plant them, what products/services may be obtained from each of them, etc.

Kijani offers support to smallholders so they can learn about these species and how to grow them; on the contrary, farmers would continue using the land for domestic crops as they used to.

There are also some geographical barriers given by the very few number of local nurseries in the project's area which makes it difficult to get the seedlings and additionally, transport fees cannot be afforded by most smallholder farmers.

Barriers related to local tradition.

The tradition of local people is to have subsisting crops in their lands combined with cattle activities (in overgrazed areas). They are farmers which are used to domestic production for family consumption in annual rotation systems. Therefore, there are barriers related to the lack of knowledge of forestry activities, laws, market conditions and practices, together with a huge change in their production system: from annual crops to long-term productions.

Barriers due to prevailing practice

The most common afforestation activities in Uganda involve planting eucalyptus and pines for timber production. Restoring degraded areas by planting native species is not common practice and needs to compete with eucalyptus and pine afforestation which is much more expanded and well-known. Moreover, the government has historically promoted eucalyptus and pine plantations at the expense of native forest plantations.

Apart from the fact of being eucalyptus and pine the prevailing practice, when doing afforestation/reforestation activities the most common is to get the plants from the National Forest Authority (NFA). NFA does not act as a conduit for smallholder farmers to plant trees for the following reasons.

1. NFA has a relatively small nursery that raises seedlings in order for large, wealthier landowners for those who have the funds to pay for the seedlings.
2. Costs are prohibitive to farmers entertaining the idea of purchasing seedlings. Not only the seedling costs, but the transportation costs could lead to a doubling of the purchase price of any seedlings.
3. Beyond the costs, NFA raises very few seedlings for retail purposes. Of the seedlings they raise, few are native.

Instead, Kijani provides its farmers with seedlings from their own nurseries that are raised in partnership. This reduces the need for transporting seedlings, saving money and decreasing risks of shock during the transport period.

Barriers due to local ecological conditions, *inter alia:* Changing weather patterns

Changing weather patterns in Northern Uganda have made growing crops even riskier than before. With the traditional two seasons no longer being guaranteed, farmers take significant risk with any seeds they plant. This is layered on top of an already low-margin activity. Even when rain patterns were more consistent in the past, farmers were hesitant to utilize too much land for production. That risk has now been increased on an annual basis, and tree planting is not released from that risk.

Moreover, given the overgrazing and continuous crop production, which is normally seen in these gardens, farms usually show degraded and eroded soils. This means that even though it is expected to recover these soils by the implementation of the project, it is also true that the poor conditions in which the trees are first planted can compromise or reduce the growing rate during the first years.

STEP 3. Investment analysis (if needed)

The methodological tool request to apply the following decision tree to the outcome of sub-step 2b:

Is forestation without being registered as an A/R CDM project activity (in our case VCS) included in the list of land use scenarios that are not prevented by any barrier? The answer for KIJANI project is no.

If no, then:

Does the list contain only one land use scenario? The answer for KIJANI project is yes.

If yes, then the remaining land use is the baseline scenario. The pre-project land use is the baseline scenario and the analysis continue with Step 4: Common practice test.

3.5 Additionality

Additionality is demonstrated through the application of steps 0 to 3 above and through Common Practice Analysis in Step 4:

STEP 4. Common practice analysis

According to the National Forest Inventory (NFI) of Uganda (2019) and FAO Global Forest Resources Assessment (FRA) (2020), the total forest cover represents 11,5% of the total national area as of 2020 being 9.2% natural forests and 2.3% planted forests. The following table shows the evolution of the forest cover in Uganda from 1990 to 2020[7].

Area (% over total land area)	1990	2000	2010	2015	2016	2017	2018	2019	2020
Natural forests (THF + WL)	16.7%	14.2%	11.7%	10.4%	10.2%	9.9%	9.7%	9.4%	9.2%
Plantations	0.8%	1.3%	1.8%	2.0%	2.1%	2.1%	2.2%	2.2%	2.3%
TOTAL Forest	17.5%	15.5%	13.5%	12.5%	12.3%	12.1%	11.9%	11.7%	11.5%

Table 6. Forest cover in Uganda: 1990 to 2020. Source: Global Forest Resources Assessment 2020 Report - Uganda; FAO

As presented, forest plantations represent around 2% of the total area from 2015 to 2020 and even less before 2015. From 2015 to 2020, the annual expansion of the planted area was 9,840 ha/year (average). According to the report "Financial incentives promoting afforestation in Uganda's drylands[8]" this increase of planted area is given by The Sawlog Production Grant Scheme. It was conceived within the broader government policy framework of promoting sustainable forest management through a combination of public protection and investment in private forests. In 2002, the Government of Uganda secured €12 million from the European Union to implement the Forest Resource Management and Conservation Programme, of which ¤1.92 million was to pilot the country's first private-sector forestry funding initiative: the Sawlog Production Grant Scheme, implemented by the Food and Agriculture Organization of the United Nations (FAO). The aim was to support private-sector investment in establishing timber plantations to help bridge the gap in national wood supply that was putting increasing pressure on native natural forests. This pilot phase was highly successful; more than 10,000 ha were planted, including demonstration plantations in strategic areas to raise awareness of plantation forestry. Following these initial successes, the EU funded two additional phases. Now in its third phase of implementation, SPGS has supported the establishment of more than 70,000 ha of plantations by farmers and large private-sector entities as well as communities and institutions for the commercial production of timber, poles

[7] FAO: To establish the forest area time series, linear interpolation and extrapolation was applied to the data from 2000 and 2015.

[8] Written by Zainabu Kakungulu & Leonidas Hitimana

and fuelwood. The plantations are located throughout the country, including in drylands, where several tree-planting interventions have in the past had limited success. The difference between SPGS and previous efforts that used environmental protection as their primary objective is that there is a perceived financial benefit from participating in tree planting —a grant payment — in addition to future financial returns from timber sales. A supportive policy and legal framework, through the government's policy on leasing public degraded forest land to private developers and community groups, promotes private-sector involvement in forest management. This was a key factor in the success of the SPGS project because it addressed the lack of access to land that creates a barrier to extensive afforestation. In summary, the planted area was done with extra financial support with exotic species, which were not looking for carbon credits.

Apart from that, the information from the NFI and FRA show that from 1990 to 2020, the natural forests area has been reduced by 1.5 million ha due to the process of deforestation. As of 2020, the total natural forest area was estimated at 1.8 million ha which represents 9.2% of the total national area.

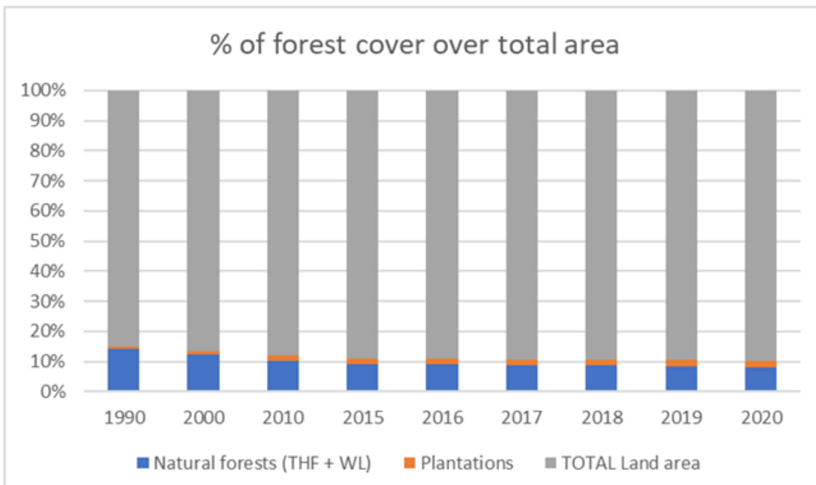


Figure 21. Forest cover Uganda. Source: project proponent based on information from FRA 2020 (FAO).

Based on the previous information, it is demonstrated that afforestation is not common practice in Uganda.

3.6 Methodology Deviations

There are no methodology deviations.

4 IMPLEMENTATION STATUS

4.1 Implementation Status of the Project Activity

Kijani had piloted the smallholder farmer agroforestry program first in 2020, which came with a significant amount of challenges with COVID-19 restrictions. Uganda's lockdown measures did not allow follow-up with farmers, but the proof of concept showed that there was significant interest by the communities to plant trees even without direct involvement from Kijani's staff. With additional preparation and funding, an expanded, revised pilot project was planned in 2021, which proved that this could be successful scaled up to other geographies beyond the initial area.

2022 was the first full year of running the project at a large scale. A training program was created to fully equip Kijani's employees to be out in the field with the smallholder farmers with all of the technical knowledge needed for this to be successful.

In 2022, Kijani worked with 865 households to plant 182,987 trees.

In order to implement this program, the preparation season began in October of 2021 where Kijani staff would meet with the groups, present information about Kijani Forestry and the Nursery Hub Model and how carbon credits will integrate into their payments once the project has been approved and credits have been issued. In the months of November 2021 through February 2022, Kijani partnered with groups to provide all of the inputs to build community-owned nurseries, provide potting bags, soil screens, watering cans, and hardware required to operate a nursery structure. Under the guidance and supervision of Kijani, the farmers helped fill enough pots in preparation for planting.

The next step was raising all the seedlings from the seeds provided by Kijani's seedbank. Training and information were provided to the farmers to know whether they should put the seed directly into the seed pot or to first put the seeds on a seedbed. From seedbed, the farmers would prick the seeds after germination and transplant them to the pots in order to grow into a seedling. For seeds that have a high enough germination rate, or don't provide multiple seedlings per seed, these would go directly into the pots.

Once the seedlings were prepared and hardened, the farmers took these out to their gardens and transplanted them once the rains had arrived for the season.

The model continued its growth late in 2022 where a significant number of farmers joined the program and hundreds more coordinators were trained to prepare for the 2023 planting season. The similar plan was executed with over 1,200 groups, training over 20,000 farmers with a target of planting 11,000,000 trees.

More than 1.6 million additional trees were planted in 2023 (up to August 31st).

Monitoring of the trees has been done by Kijani's internal Monitoring and Evaluation team. The inventory took place in August 2023 and 244 plots were measured.

5 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Since continuation of an activity that has been applied without changes for more than 20 years has been selected as the baseline scenario, it is assumed, in agreement with IPCC Good Practice Guidance for Land Use, Land Use Change and Forestry (2003) that the net GHG removals by sinks in the baseline equals zero.

5.2 Project Emissions

Net anthropogenic GHG removal is estimated as the actual net GHG removals by sinks discounting the baseline net GHG removals and leakage. The following general formula (Equation 5 presented in the methodology) is used to calculate the net anthropogenic GHG removals by sinks of an A/R project activity, in t CO2-e:

$$\Delta C_{AR\text{-}CDM,t} = \Delta C_{ACTUAL,t} - \Delta C_{BSL,t} - LK_t$$

Where:

$\Delta C_{AR\text{-}CDM,t}$	Net anthropogenic GHG removals by sinks; t CO2-e
$\Delta C_{ACTUAL,t}$	Actual net GHG removals by sinks; t CO2-e
$\Delta C_{BSL,t}$	Baseline net GHG removals by sinks; t CO2-e
LK_t	Total GHG emissions due to leakage, t CO2-e

The actual net greenhouse gas removals by sinks were estimated using the following equation (Equation 2 in the methodology):

$$\Delta C_{ACTUAL,t} = \Delta C_{P,t} - GHG_{E,t}$$

$\Delta C_{ACTUAL,t}$	Actual net GHG removals by sinks; t CO2-e
$\Delta C_{P,t}$	Change in the carbon stocks in project, occurring in the selected carbon pools, in year t; t CO2-e
$GHG_{E,t}$	Increase in non-CO2 GHG emissions within the project boundary as a result of the implementation of the A/R CDM project activity, in year t, as estimated in the tool “Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity”; t CO2-e

The following formula described in the methodology is used in order to estimate GHG emission:

$$GHG_E = \Sigma_{t=1}{}^{t^*} GHG_{E,t}$$

GHGE	Increase in GHG emissions as a result of the implementation of the proposed A/R CDM project activity within the project boundary; t CO2-e
GHGE,t	Increase in non-CO2 emissions due to biomass burning of existing vegetation as part of the site preparation in year t; t CO2-e
t	1,2,3,t* years elapsed since the start of the A/R CDM project activity.

The tool for "Estimation of non-CO2 GHG emissions resulting from the burning of biomass attributable to an A/R CDM project activity" has been considered. The use of fire for site preparation and/or to clear the land of harvest residue prior to replanting is specifically excluded from the project management and therefore project emissions are estimated as zero.

Carbon stock changes

ΔC is the sum of the changes in above ground and below ground tree biomass, dead wood, litter and soil organic carbon stocks in the project. Following is presented the equation for the estimation of ΔC (Equation 3 of methodology AR/ACM 00003). Calculations are described below.

$$\Delta C_{P,t} = \Delta C_{TREE\_PROJ,t} + \Delta C_{SHRUB\_PROJ,t} + \Delta C_{DW\_PROJ,t} + \Delta C_{LI\_PROJ,t} + \Delta SOC_{AL,t}$$

Where:

$\Delta C_{P,t}$	Change in the carbon stock in project, occurring in the selected carbon pools, in year t; t CO2e-
$\Delta C_{TREE\_PROJ,t}$	Change in carbon stock in tree biomass in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO2-e
$\Delta C_{SHRUB\_PROJ,t}$	Change in carbon stock in shrub biomass in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO2-e
$\Delta C_{DW\_PROJ,t}$	Change in carbon stock in dead wood in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO2-e
$\Delta C_{LI\_PROJ,t}$	Change in carbon stock in dead wood in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO2-e
$\Delta SOC_{AL,t}$	Change in carbon stock in SOC in project, in year t, in areas of land meeting the applicability conditions of the tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", as estimated in the same tool; t CO2-e

Biomass carbon pools

Above and below ground biomass have been estimated according to the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activity". Carbon estimations in trees are based on field measurements of monitored parameters.

The aboveground biomass corresponds to tree biomass, no shrubs are considered. The method used for estimating change in carbon stock in trees is the "stock change method". Change in carbon stock in trees in two successive points in time is calculated as the difference between the two estimated stocks.

As in ex-ante estimations, the following equation were used to estimate above and below ground biomass ex-post measurements (Appendix 1 – equation 4):

$$B_{TREE,l,j,p,i} = f_j(x_{1,l}, x_{2,l}, x_{3,l},...) \times (1 + R_j)$$

$B_{TREE,l,j,p,l}$ Biomass of tree l of species j in sample plot p of stratum i; t d.m.

$f_j(x_{1,l}, x_{2,l}, x_{3,l},...)$ Above-ground biomass of the tree returned by the allometric equation for species j relating the measurements of tree l to the above-ground biomass of the tree; t d.m.

Rj Root-shoot ratio for tree species j

The applied equation for the calculation of above ground biomass is the one proposed by Mugasha, W.A, Eid, T., et.al for tropical forests and woodlands[9]. This equation is based on DBH values and it estimated individual tree biomass. The equation is applicable since it was derived from a dataset of 40 sample trees and the R^2 value is 0.95. The equation is presented below:

$$AGB = 0.1054 * DBH^{2.489}$$

AGB Above ground biomass (kg)

DBH Diameter at Breast Height (cm)

Finally, the carbon stock in the tree biomass is estimated as follows:

$$C_{TREE} = 44/12 * B_{TREE} * CF_{TREE}$$

Where

C_{TREE} Carbon Stock in tree biomass within the project boundary; t CO2 -e.

B_{TREE} Biomass of trees within the project boundaries

CF_{TREE} Carbon fraction of tree biomass; tool default value 0.47 t C td.m-3.

[9] Mugasha, W. A., Eid, T., Bollandsås, O. M., Malimbwi, R. E., Chamshama, S. A. O., Zahabu, E. and Katani, J. Z. 2013. Allometric models for prediction of above- and belowground biomass of trees in the miombo woodlands of Tanzania. Forest Ecology and Management 310: 87 – 101.

Soil organic carbon

Estimates of soil organic carbon (SOC) stocks were done in accordance with the "Tool for the estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activity". As suggested by the tool, it is assumed that the implementation of the project activity firstly decreases the SOC content of the lands from pre-project level, due to the site preparation.

Afterwards, the SOC increases to the level that is equal to the steady-state SOC content under native vegetation. The increase in SOC content in the project scenario takes place at a constant rate over a period of 20 years from the year of planting. The project meets the applicability conditions of this tool - as demonstrated in validation- since the areas of land to which the tool is applied do not fall into wetland category, do not contain organic soils and are not subject to any of the land management practices and application of inputs listed in the tool.

Litter remains on site and is not removed, and soil disturbance is in accordance with appropriate conservation practices, limited to site preparation and not repeated within 20 years.

Parameter	Symbol	Value	Source (SOC estimation tool, V01.1.0)
Reference SOC (tC/ha)	$SOC_{REF,i}$	88 65 63	Table 3. HAC soils, tropical montane Table 3. HAC soils, tropical moist Table 3. LAC soils, tropical montane
Land use factor	$f_{LU,i}$	0.64 0.48	Table 4. Long term cultivated, tropical montane Table 4. Long term cultivated, tropical moist
Management factor	$f_{MG,i}$	1	Table 4. Full Tillage, all.
Input factor	$f_{IN,i}$	0.94 0.92	Table 5. Low level of inputs, tropical montane. Table 5. Low level of inputs, tropical moist.

The correspondent carbon sequestration calculation is presented to the verification team in the total carbon stock estimation worksheet.

SOC at the beginning of the project ($SOC_{initial,i}$) is estimated by multiplying the factors in Table 5 by the reference SOC:

$$SOC_{INITIAL,i} = SOC_{REF,i} * f_{LU,i} * f_{MG,i} * f_{IN,i}$$

$SOC_{INITIAL,I}$ SOC stock at the beginning of the A/R CDM project activity in stratum i of the areas of land; t C ha-1

$SOC_{REF,i}$ Reference SOC stock corresponding to the reference condition in native lands by climate region and soil type applicable to stratum i of the areas of land; t C ha-1.

$f_{LU,i}$ Relative stock change factor for baseline land-use in stratum i of the areas of land; dimensionless

$f_{MG,i}$ Relative stock change factor for baseline management regime in stratum i of the areas of land; dimensionless

$f_{IN,i}$ Relative stock change factor for baseline input regime (e.g. crop residue returns, manure) in stratum i of the areas of land; dimensionless

i 1,2,3 strata areas of land; dimensionless.

As per the tool, a loss in SOC ($SOC_{LOSS,i}$) is applied in the case that soil disturbance occurs on more than 10 per cent of the land area, which is the case of the project:

$$SOC_{LOSS,I} = SOC_{INITIAL,i} * 0.1$$

where

$SOC_{LOSS,i}$ Loss of SOC caused by soil disturbance attributable the A/R CDM project activity, in stratum i of the areas of land; t C ha-1

The following methodological formula is used for calculating the annual change in SOC stock:

$$dSOC_{t,i} = SOC_{REF,i} - (SOC_{INITIAL,i} - SOC_{LOSS,i})/20 \text{ years}$$

where

$dSOC_{t,i}$ The rate of change in SOC stock in stratum i of the areas of land, in year t; t C ha-1 yr-1

According to the tool, the value of dSOC is not accounted as more than 0.8 tC/ha/year, so:

If $dSOC_{t,i}$>0.8 t/ha/year then $dSOC_{t,i}$=0.8tC/ha/year.

The change in SOC stock for all the strata of the areas of land, in year t, is calculated as:

$\Delta SOC_{AL,t} = 44/12 * \Sigma A_i * dSOC_{t,i} * 1year$

Where

$\Delta SOC_{AL,t}$ change in SOC stock in areas of land meeting the applicability conditions of the tool in year t, tCO2-e.

A_i the area of stratum i of the areas of land; ha

$dSOC_{t,i}$ The rate of change in SOC stocks in stratum i of the areas of land; t C ha-1 y-1

i 1,2,3... strata areas of land; dimensionless.

Litter and Dead Wood

Estimations were done in accordance with the tool “Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities” using a default and conservative value of 1% and 1% of carbon stock in tree biomass for dead wood and litter, respectively.

Leakage

Leakage emission attributable to the displacement of agricultural activities due to implementation of an A/R CDM project activity is estimated as the decrease in carbon stocks in the affected carbon pools of the land receiving the displaced activity.

According to the methodological tool the displacement of an agricultural activity by itself does not result in leakage emission. Leakage emissions occur when the displacement leads to an increase in GHG emissions relative to the GHG emissions attributable to the activity as it exists within the project boundary, which is not the case of Kijani. Therefore, leakage emissions are estimated as z ero.

5.3 Leakage

Leakage emission attributable to the displacement of agricultural activities due to implementation of an A/R CDM project activity is estimated as the decrease in carbon stocks in the affected carbon pools of the land receiving the displaced activity.

According to the methodological tool the displacement of an agricultural activity by itself does not result in leakage emission. Leakage emissions occur when the displacement leads to an increase in GHG emissions relative to the GHG emissions attributable to the activity as it exists within the project boundary, which is not the case of Kijani. Therefore, leakage emissions are estimated as cero.

5.4 Estimated Net GHG Emission Reductions and Removals

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2022		757		757
2023		673		673

2024		31,361		31,361
2025		155,961		155,961
2026		462,910		462,910
2027		1,218,413		1,218,413
2028		2,878,317		2,878,317
2029		4,330,867		4,330,867
2030		6,145,533		6,145,533
2031		8,410,142		8,410,142
2032		10,171,697		10,171,697
2033		12,418,604		12,418,604
2034		15,118,085		15,118,085
2035		17,696,968		17,696,968
2036		19,710,991		19,710,991
2037		20,666,648		20,666,648
2038		20,233,308		20,233,308
2039		19,171,640		19,171,640
2040		17,137,852		17,137,852
2041		14,289,501		14,289,501
2042		11,820,895		11,820,895
2043		12,927,475		12,927,475

2044		13,860,948		13,860,948
2045		15,718,333		15,718,333
2046		17,251,425		17,251,425
2047		18,098,512		18,098,512
2048		18,629,911		18,629,911
2049		17,974,674		17,974,674
2050		15,982,560		15,982,560
2051		14,053,691		14,053,691
2052		12,132,488		12,132,488
2053		10,154,116		10,154,116
2054		12,034,363		12,034,363
2055		14,072,268		14,072,268
2056		16,489,457		16,489,457
2057		18,641,695		18,641,695
2058		19,614,258		19,614,258
2059		20,058,293		20,058,293
2060		19,298,159		19,298,159
2061		17,006,399		17,006,399
Total		**12,651,754**		**12,651,754**

6 MONITORING

6.1 Data and Parameters Available at Validation

The table below are completed for all data and parameters that are determined or available at validation and remain fixed throughout the project crediting period. The values provided are used to estimate the net GHG emissions and removals for the project crediting period in Section 4 above.

Data / Parameter	A_i
Data unit	number of trees
Description	Size of stratum *i*
Source of data	The number of planted trees per species and garden is registered by Kijani.
Value applied:	Variable according to stratum
Justification of choice of data or description of measurement methods and procedures applied	Kijani does not work based on area planted but instead, they have a quite meticulous register of the number of trees planted per species and per garden. This is partly because of their integrated nurseries. So, instead of defining the strata and plot's size in hectares, the number of trees was used.
Purpose of Data	Determination of baseline scenario (AFOLU projects only) Calculation of baseline emissions Calculation of project emissions
Comments	N/A

Data / Parameter	CFj
Data unit	t C t-1 d.m.
Description	Carbon fraction of tree biomass for species or group of species j
Source of data	The IPCC default value of 0.47 t C t-1 d.m.
Value applied:	0.47
Justification of choice of data or description of measurement methods and procedures applied	N/A

Purpose of Data	Calculation of project emissions
Comments	N/A

Data / Parameter	CO_2-e
Data unit	CO_2
Description	The factor of 3.667 (44/12) is applied to convert the tree carbon sequestered to tree CO2-e sequestered.
Source of data	The IPCC default value.
Value applied:	3.667 (44/12)
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Calculation of project emissions
Comments	N/A

Data / Parameter	R_j
Data unit	dimensionless
Description	Root-shoot ratio for species or group of species j
Source of data	Tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs" (Version 04.2)
Value applied:	Variable according to stratum. Estimated as $Rj=e^{(-1.085+0.9256x\ln(b))}/b$ where b is the above ground biomass.
Justification of choice of data or description of	N/A

measurement methods and procedures applied	
Purpose of Data	Calculation of project emissions
Comments	N/A

Data / Parameter	B_{TREE}
Data unit	T d.m
Description	Tree biomass within the biomass estimation strata
Source of data	Mugasha, W. A., Eid, T., et al. (2013)
Value applied:	Variable according to stratum. Estimated as $Rj=e^{(-1.085+0.9256x\ln(b))}/b$ where b is the above ground biomass.
Justification of choice of data or description of measurement methods and procedures applied	The equation is applicable according to the methodological tool "Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities" given the equation was derived from a dataset bigger than 30 samples and the R^2 coefficient is 0.95 (min. required is 0.85).
Purpose of Data	Calculation of project emissions
Comments	N/A

Data / Parameter	SOC REF
Data unit	t C ha-1
Description	Reference SOC stock corresponding to the reference condition in native lands (i.e. non-degraded, unimproved lands under native vegetation. normally forest) by climate region and soil type applicable to stratum i of the areas of land

Source of data	Table 3 of "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM Project" activities.
Value applied:	Variable according to strata: - HAC, tropical montane: 88 - HAC, tropical moist: 65 - LAC, tropical montane: 63
Justification of choice of data or description of measurement methods and procedures applied	IPCC climatic zones and IPCC soil classes for project area
Purpose of Data	Calculation of project emissions
Comments	- HAC, tropical montane: 73.44 ha - HAC, tropical moist: 4.21 ha - LAC, tropical montane: 73.59 ha

Data / Parameter	$f_{IN,i}$
Data unit	dimensionless
Description	Relative stock change factor for baseline input regime (e.g. crop residue returns, manure) in stratum i of the areas of land.
Source of data	Tables 5 of "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM Project" activities.
Value applied:	Variable according to strata: - 0.94 for low level input in tropical montane - 0.92 for low level input in tropical moist
Justification of choice of data or description of measurement methods and procedures applied	IPCC climatic zones for project area

Purpose of Data	Calculation of project emissions
Comments	- Tropical montane: 147.03 ha - Tropical moist: 4.21 ha

Data / Parameter	$f_{MG,i}$
Data unit	dimensionless
Description	Relative stock change factor for baseline management regime in stratum i of the areas of land; dimensionless
Source of data	Table 4 of "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM Project" activities.
Value applied:	1 (full tillage, all climatic regimes)
Justification of choice of data or description of measurement methods and procedures applied	IPCC climatic zones for project area
Purpose of Data	Calculation of project emissions
Comments	n/a

Data / Parameter	$f_{LU,i}$
Data unit	dimensionless
Description	Relative stock change factor for baseline land-use in stratum i of the areas of land; dimensionless
Source of data	Table 4 of "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM Project" activities.
Value applied:	Variable according to strata: - Long term cultivated, tropical montane: 0.64 - Long term cultivated, tropical moist: 0.48

Justification of choice of data or description of measurement methods and procedures applied	IPCC climatic zones for project area
Purpose of Data	Calculation of project emissions
Comments	- Long term cultivated, tropical montane: 147.03 ha - Long term cultivated, tropical moist: 4.21 ha

Data / Parameter	Dead Wood (DF_{DW})
Data unit	t C ha-1
Description	Conservative default factor expressing carbon stock in dead wood as a percentage of carbon stock in tree biomass
Source of data	Tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"
Value applied:	1% of carbon stock in tree biomass
Justification of choice of data or description of measurement methods and procedures applied	Biome: tropical Elevation: <2000 m Precipitation: 1000 – 1600 mm yr-1
Purpose of Data	Calculation of project emissions
Comments	n/a

Data / Parameter	Litter (DF_{LI})
Data unit	t C ha-1
Description	Conservative default factor expressing carbon stock in litter as a percentage of carbon stock in tree biomass
Source of data	Tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"

Value applied:	1% of carbon stock in tree biomass
Justification of choice of data or description of measurement methods and procedures applied	Biome: tropical Elevation: <2000 m Precipitation: 1000 – 1600 mm yr-1
Purpose of Data	Calculation of project emissions
Comments	n/a

6.2 Data and Parameters Monitored

The tables below are completed for all data and parameters to be monitored during the project crediting period.

Data / Parameter	DBH
Data unit	Cm
Description	Diameter at breast height of tree (DBH)
Source of data	Field measurement in sample plots.
Description of measurement methods and procedures applied	Measurement methods according to Kijani's Work Manual. All the individuals within the sample plot will be measured. DBH is measured at a height of 1.3 m from the base of the stem (on the ridge). DBH must be measured where the stem has a normal shape (5cm above in case of deformations). If the individuals find a double arrow (fork), the measurement of this variable will be made based on the length at which the bifurcation occurs (below 1.3 m each stem should be measured and listed as different individuals). Calipper and measuring tape will be the monitoring equipment.
Frequency of monitoring/recording	Before every verification event
Value applied:	N/A
Monitoring equipment	Calipper

QA/QC procedures applied	Before the verification event, trainings were provided to Kijani's staff. Videos and photos were taken and reviewed during and after the training. Moreover, information was reviewed before submitting the registers. Teams were integrated by more 2 or more people to avoid errors. Two parallel DBH measurements were taken from each tree and averaged to obtain more accurate results.
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	H
Data unit	m
Description	Height of trees
Source of data	Field measurement in sample plots.
Description of measurement methods and procedures applied	Measurement methods according to Work Manual. All the individuals within the sample plot will be measured. Trees to be measured must meet the following requirements: have its apex and base visible from the measurement point; belong to the plot; and not be strongly deformed or broken. For this monitoring, given the trees are still below 5m, the height is estimated using a graduated bamboo pole.
Frequency of monitoring/recording	Before every verification event
Value applied:	N/A
Monitoring equipment	5m length bamboo pole. Graduated every 10cm.
QA/QC procedures applied	Before the verification event, trainings were provided to Kijani's staff. Videos and photos were taken and reviewed during and after the training. Moreover, information was reviewed before

	submitting the registers. Teams were integrated by more 2 or more people to avoid errors.
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	Together with DBH (previous parameter), they are used to estimate the biomass of trees of species j in plot p in stratum i.

Data / Parameter	T
Data unit	year
Description	Time period elapsed between two successive estimations of carbon stock in trees and shrubs
Source of data	Recorded time
Description of measurement methods and procedures applied	N/A
Frequency of monitoring/recording	N/A
Value applied:	N/A
Monitoring equipment	N/A
QA/QC procedures applied	N/A
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	If the two successive estimations of carbon stock in trees are carried out at different points of time in year t2 and t1, (e.g., in the month of April in year t1 and in the month of September in year t2), then a fractional value is assigned to T.

Data / Parameter	ni
Data unit	units
Description	Number of sample plots in stratum i
Source of data	Field work and statistical analysis
Description of measurement methods and procedures applied	N/A
Frequency of monitoring/recording	In every verification event
Value applied:	N/A
Monitoring equipment	GPS equipment to record the coordinates of the center of each plot (x,y)
QA/QC procedures applied	N/A
Purpose of data	N/A
Calculation method	N/A
Comments	N/A

Data / Parameter	N
Data unit	units
Description	Number of sample plots to be established in the project area
Source of data	Field work and statistical analysis
Description of measurement methods and procedures applied	N/A
Frequency of monitoring/recording	In every verification event

Value applied:	N/A
Monitoring equipment	GPS equipment to record the coordinates of the center of each plot (x,y)
QA/QC procedures applied	N/A
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	N
Data unit	units
Description	Number of sample plots to be established in the project area
Source of data	Field work and statistical analysis
Description of measurement methods and procedures applied	N/A
Frequency of monitoring/recording	In every verification event
Value applied:	N/A
Monitoring equipment	GPS equipment to record the coordinates of the center of each plot (x,y)
QA/QC procedures applied	N/A
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	Ap,i
Data unit	Number of trees
Description	Area of sample pots
Source of data	Field work and statistical analysis
Description of measurement methods and procedures applied	Each plot includes 5 trees of the same species.
Frequency of monitoring/recording	In every verification event
Value applied:	N/A
Monitoring equipment	GPS equipment to record the coordinates of the center of each plot (x,y)
QA/QC procedures applied	N/A
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

6.3 Monitoring Plan

Monitoring will be done in accordance with the applied methodology AR-ACM0003 "Afforestation and reforestation of lands except wetlands" and the corresponding tools mentioned in it and earlier in this document.

The main aim of the monitoring plan is to corroborate the data presented for the project and measure the growth of tree biomass for the carbon stocks estimation and the corresponding GHG removals related to the project activities. All the data gathered is to be electronically saved.

Following the applied methodology, monitoring covered carbon stock changes for living above-ground biomass, which is the main carbon pool for the project. Below ground biomass was estimated indirectly based on above-ground biomass measurements, while the litter and dead wood pools were estimated as a percentage of carbon stock in tree biomass.

The first monitoring event took place in August 2023. The on-field data collection is done by Kijani's staff which is trained by Kijani and was given beforehand the instructions and methodologies to make the measurements (this protocol is presented below in this section).

The activities were supervised at the start (one training week which took place from August 14th to August 18th) to ensure they are performed correctly, and the necessary safety measures taken. Also, fluid, open communication with the teams was maintained throughout the duration of monitoring activities. Videos and photos were taken during the training week.

The boundaries and project area, as well as the area of each stratum, were verified through GIS, remote sensing, and the site visit. The number of sampling plots was defined by application of the methodological tool "Calculation of the number of sample plots for measurements within A/R CDM project activities". These calculations were saved and are available for reviewing if needed. The recommended values of 10% precision level and 90% confidence were used. The result was 188 plots for the project area allocated as per the following detail:

- *Maesopsis eminii* 2022: 16 plots
- *Melia vokensii* 2022: 85 plots
- *Albizia lebbek* 2022: 1 plot
- *Faidherbia albida* 2022: 9 plots
- *Gmelina arborea* 2022: 34 plots
- *Senegalia polycantha* 2022: 29 plots
- *Senna siamae* 2022: 13 plots
- *Terminalia glaucescens* 2022: 1 plot

Each plot consists of 5 trees of the same strata (each strata defined by homogeneous species and plantation year). Gardens in different districts were selected to do the measurements. Once in the plot, the GPS coordinated were registered. The tree height (m) and diameter at breast height (cm) were to be measured and registered for each tree included in the plot. The trees within each plot were identified using yellow paint for future monitoring activities. The total number of plots measured by Kijani is listed below:

- *Maesopsis eminii* 2022: 6 plots
- *Melia vokensii* 2022: 118 plots
- *Albizia lebbek* 2022: 1 plot

- *Faidherbia albida* 2022: no plots[10]
- *Gmelina arborea* 2022: 44 plots
- *Senegalia polycantha* 2022: 43 plots
- *Senna siamae* 2022: 30 plots
- *Terminalia glaucescens* 2022: 2 plots
- TOTAL: 244 plots

The plots were distributed in the districts of: Omoro, Agago, Kitgum, Oyam and Gulu. The location of the plots is presented in the following map:

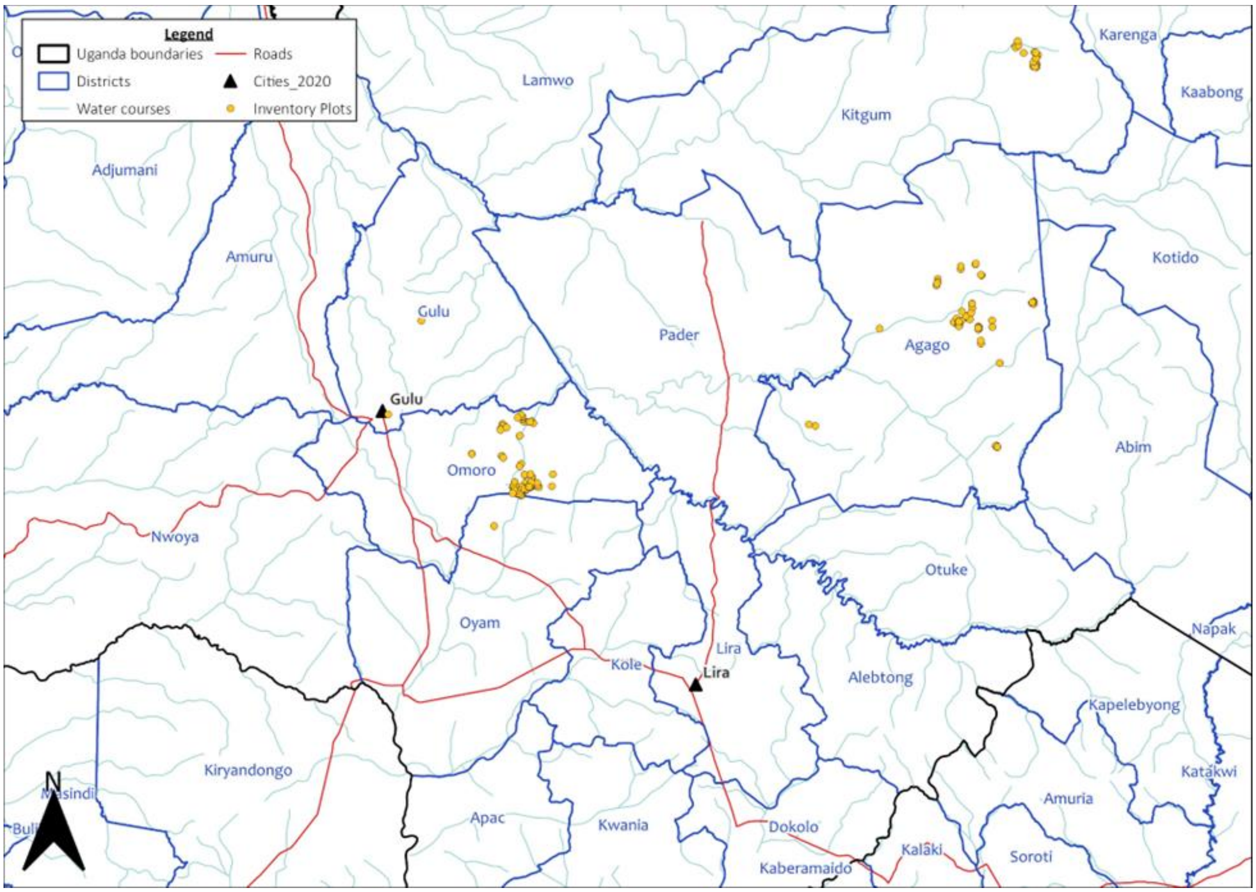


Figure 22. Location of forest inventory plots

Kijani has a protocol for the measurement of trees detailed. The protocol is identified as “Garden Inventory Guide” .

This methodology provides insight about the selection and measurement method of measuring trees for a forest inventory. First, a brief introduction of the project and inventory objective is provided, The, the selection process of trees in both plot and hedgerow alignment is explained. What there is to do in

[10] all the trees were lower than DBH (1.3m) so no trees could be measured

the case of dead or injured trees is then elaborated. In the third place, the parameters to be measured and the methodology to do so are presented. Lastly, the way to record the data and a list of the tools and equipment needed is provided. Moreover, a register form is provided for Kijani stuff to fill out with the results of the tree measurements.

Tools and materials for field worker:

- Caliper
- Graduated height-bamboo pole (5m)
- Pole to indicate Breast Height (1.3 m)
- Pens
- Data collection forms
- Data collection app
- Phone camera
- Paint
- Paint brush

Diameter Breast Height (DBH)

DBH is to be measured at 1.3m above ground level. A caliper is used to measure DBH. Two perpendicular measures are taken and averaged to define DBH. Breast height is defined by using a 1,3 meter pole.

For every plot, a total of 5 trees is to be measured for DBH. The following figure shows the tools used for the DBH measurement.

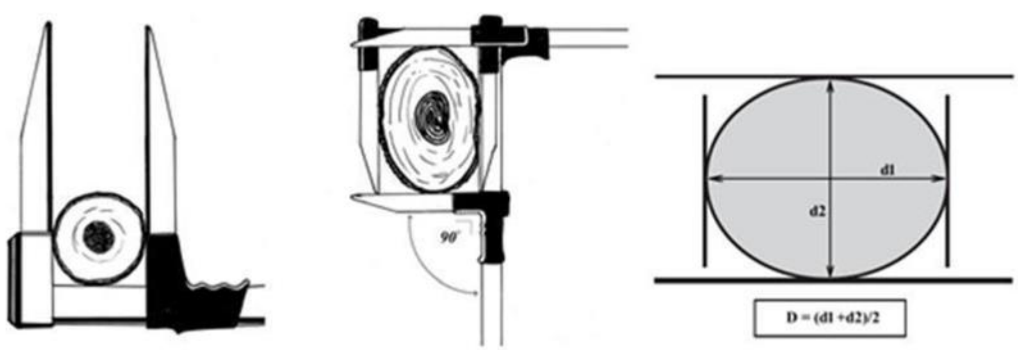


Figure 23. Measuring diameter using a tree caliper

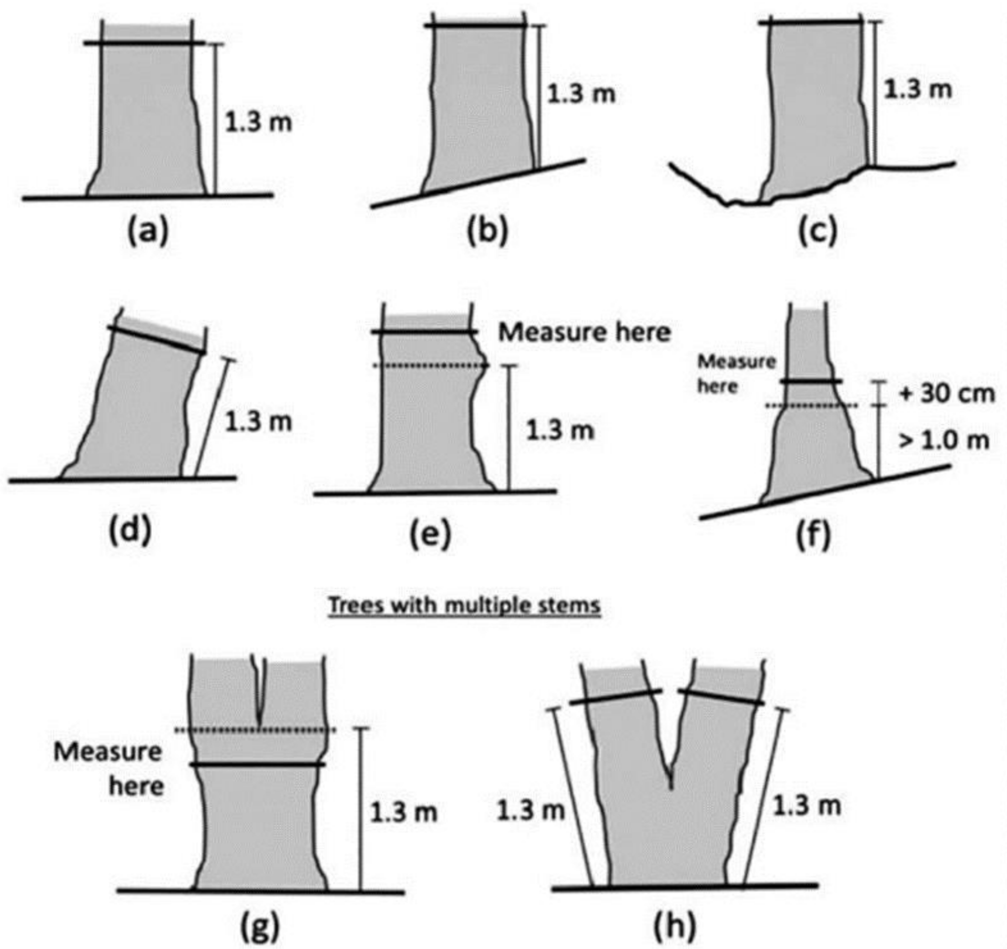


Figure 24. Instructions to measure DBH in different situations.

Height

Since the trees are less than 5m, the height is estimated using a bamboo pole, graduated every 10cm.

Measures were estimated the following way:

- The graduated-pole is held against the tree, with its bottom at the base of the tree and then a reading (m) can be taken – NOTE: it is easier to take a few steps back to getter a better view of the tree top and pole.

Plot and trees identification

In each visited garden, 5 trees per species were measured. For instance, if a farmer has planted 200 *Maesopsis eminii* and 200 *Gmelina arborea*, 5 *Maesopsis eminii* trees and 5 *Gmelina arborea* trees are measured. Each group of 5 trees was defined as a plot.

Since the trees are normally planted in rows, 5 trees can be measured within the same row. But, since the trees on the outside might be growing faster (the edge effect), it is recommended to select a row inside the block to be more representative of the garden. However, if the species is planted on a boundary then these would be the trees to measure.

Every measured tree within the plot will be identified with paint.

Register form

The following form was provided to all the inventory staff to register the measurements per plot:

Tree Data Collection Form

Date | Your Name

Planting Year | Farmer

Sub-County | Group

GPS Coordinates | Lat.: | Long.:

Tree Species Name

Tree No.	DBH A (cm)	DBH B (cm)	Height (m)
1			
2			
3			
4			
5			

Have you taken photos? Have you painted the trees?

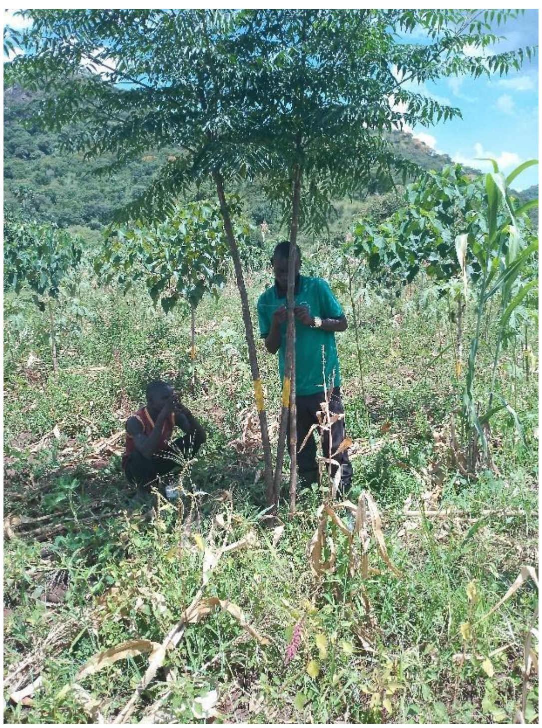
Any comments?

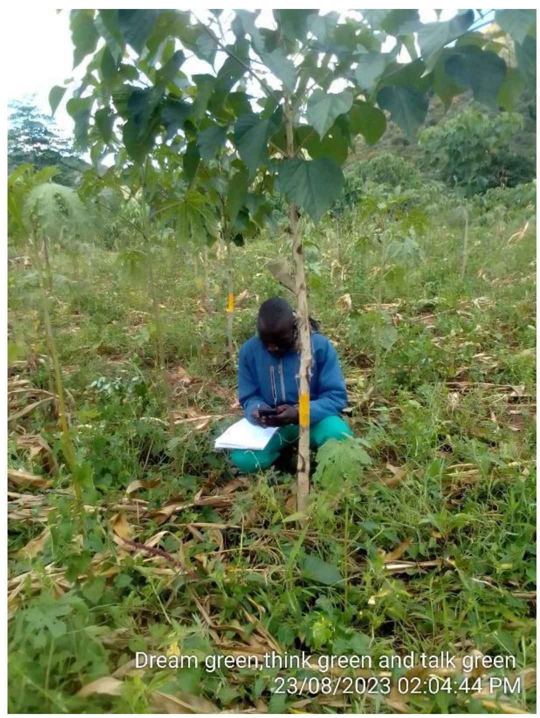
Figure 25. Tree Data Collection Form

Photos and videos were taken during the inventory. Some of these are presented below:


"dreamg geen,think green and talk geen
22/08/2023 10:13:11 AM


ON- MAKE A DIFFERENCE WITH GREEN
23/08/2023 04:37:02 PM

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7 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

7.1 Data and Parameters Monitored

Data / Parameter	DBH
Data unit	cm
Description	Diameter at breast height of tree (DBH)
Value applied:	2.9 cm
Comments	Average DBH from 1,210 trees measured.

Data / Parameter	H
Data unit	m
Description	Height of trees
Value applied:	2.7 m
Comments	Average H from 1,210 trees measured.

Data / Parameter	n_i
Data unit	units
Description	Number of trees per plot
Value applied:	5
Comments	The location of each plot was registered using a GPS (x,y coordinates)

Data / Parameter	N
Data unit	units
Description	Number of plots per strata
Value applied:	*Maesopsis eminii* : 6 plots *Melia vokensii* : 118 plots *Albizia lebbek* : 1 plot *Faidherbia albida* : no plots[11] *Gmelina arborea* : 44 plots *Senegalia polycantha* : 43 plots *Senna siamae* : 30 plots *Terminalia glaucescens* :2 plots
Comments	244 plots were measured in total

7.2 Baseline Emissions

Since the continuation of an activity that has been applied without changes for more than 20 years has been selected as the reference scenario, it is assumed, according to the IPCC Good Practice Guide for Land Use, Land Use Change and Forestry (2003) than the net GHG removals by sinks in the baseline is equal to zero.

7.3 Project Emissions

Net anthropogenic GHG removal is estimated as the actual net GHG removals by sinks discounting the baseline net GHG removals and leakage. The following general formula (Equation 5 presented in the methodology) is used to calculate the net anthropogenic GHG removals by sinks of an A/R project activity, in t CO2-e:

$$\Delta_{CAR\text{-}CDM,t} = \Delta C_{ACTUAL,t} - \Delta C_{BSL,t} - LK_t$$

Where:

$\Delta C_{AR\text{-}CDM,t}$ Net anthropogenic GHG removals by sinks; t CO2-e

$\Delta C_{ACTUAL,t}$ Actual net GHG removals by sinks; t CO2-e

$\Delta C_{BSL,t}$ Baseline net GHG removals by sinks; t CO2-e

[11] all the trees were lower than DBH (1.3m) so no trees could be measured

LK_t	Total GHG emissions due to leakage, t CO_2-e

The actual net greenhouse gas removals by sinks were estimated using the following equation (Equation 2 in the methodology):

$$\Delta C_{ACTUAL,t} = \Delta C_{P,t} - GHG_{E,t}$$

$\Delta C_{ACTUAL,t}$	Actual net GHG removals by sinks; t CO_2-e
$\Delta C_{P,t}$	Change in the carbon stocks in project, occurring in the selected carbon pools, in year t; t CO_2-e
$GHG_{E,t}$	Increase in non-CO_2 GHG emissions within the project boundary as a result of the implementation of the A/R CDM project activity, in year t, as estimated in the tool "Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity"; t CO_2-e

The following formula described in the methodology is used in order to estimate GHG emission:

$$GHG_E = \Sigma_{t=1}{}^{t^*} GHG_{E,t}$$

GHGE	Increase in GHG emissions as a result of the implementation of the proposed A/R CDM project activity within the project boundary; t CO_2-e
GHGE,t	Increase in non-CO_2 emissions due to biomass burning of existing vegetation as part of the site preparation in year t; t CO_2-e
t	1,2,3,t* years elapsed since the start of the A/R CDM project activity.

The tool for "Estimation of non-CO_2 GHG emissions resulting from the burning of biomass attributable to an A/R CDM project activity" has been considered. The use of fire for site preparation and/or to clear the land of harvest residue prior to replanting is specifically excluded from the project management and therefore project emissions are estimated as zero.

<u>Carbon stock changes</u>

ΔC is the sum of the changes in above ground and below ground tree biomass, dead wood, litter and soil organic carbon stocks in the project. Following is presented the equation for the estimation of ΔC (Equation 3 of methodology AR/ACM 00003). Calculations are described below.

$$\Delta C_{P,t} = \Delta C_{TREE\_PROJ,t} + \Delta C_{SHRUB\_PROJ,t} + \Delta C_{DW\_PROJ,t} + \Delta C_{LI\_PROJ,t} + \Delta SOC_{AL,t}$$

Where:

$\Delta C_{P,t}$	Change in the carbon stock in project, occurring in the selected carbon pools, in year t; t CO_2e-

$\Delta C_{TREE\_PROJ,t}$	Change in carbon stock in tree biomass in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO2-e
$\Delta C_{SHRUB\_PROJ,t}$	Change in carbon stock in shrub biomass in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO2-e
$\Delta C_{DW\_PROJ,t}$	Change in carbon stock in dead wood in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO2-e
$\Delta C_{LI\_PROJ,t}$	Change in carbon stock in dead wood in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO2-e
$\Delta SOC_{AL,t}$	Change in carbon stock in SOC in project, in year t, in areas of land meeting the applicability conditions of the tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", as estimated in the same tool; t CO2-e

Biomass carbon pools

Above and below ground biomass have been estimated according to the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activity". Carbon estimations in trees are based on field measurements of monitored parameters.

The aboveground biomass corresponds to tree biomass, no shrubs are considered. The method used for estimating change in carbon stock in trees is the "stock change method". Change in carbon stock in trees in two successive points in time is calculated as the difference between the two estimated stocks.

As in ex-ante estimations, the following equation were used to estimate above and below ground biomass ex-post measurements (Appendix 1 – equation 4):

$$B_{TREE,l,j,p,i} = f_i(x_{1,l}, x_{2,l}, x_{3,l},...) \times (1 + R_j)$$

$B_{TREE,l,j,p,l}$	Biomass of tree l of species j in sample plot p of stratum i; t d.m.
$f_i(x_{1,l}, x_{2,l}, x_{3,l},...)$	Above-ground biomass of the tree returned by the allometric equation for species j relating the measurements of tree l to the above-ground biomass of the tree; t d.m.
Rj	Root-shoot ratio for tree species j

The applied equation for the calculation of above ground biomass is the one proposed by Mugasha, W.A, Eid, T., et.al for tropical forests and woodlands[12]. This equation is based on DBH values and it estimated

[12] Mugasha, W. A., Eid, T., Bollandsås, O. M., Malimbwi, R. E., Chamshama, S. A. O., Zahabu, E. and Katani, J. Z. 2013. Allometric models for prediction of above- and belowground biomass of trees in the miombo woodlands of Tanzania. Forest Ecology and Management 310: 87 – 101.

individual tree biomass. The equation is applicable since it was derived from a dataset of 40 sample trees and the R^2 value is 0.95. The equation is presented below:

$$AGB = 0.1054 * DBH^{2.489}$$

AGB Above ground biomass (kg)

DBH Diameter at Breast Height (cm)

Finally, the carbon stock in the tree biomass is estimated as follows:

$$C_{TREE} = 44/12 * B_{TREE} * CF_{TREE}$$

Where

C_{TREE}	Carbon Stock in tree biomass within the project boundary; t CO2 -e.
B_{TREE}	Biomass of trees within the project boundaries
CF_{TREE}	Carbon fraction of tree biomass; tool default value 0.47 t C td.m-3.

Soil organic carbon

Estimates of soil organic carbon (SOC) stocks were done in accordance with the "Tool for the estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activity". As suggested by the tool, it is assumed that the implementation of the project activity firstly decreases the SOC content of the lands from pre-project level, due to the site preparation.

Afterwards, the SOC increases to the level that is equal to the steady-state SOC content under native vegetation. The increase in SOC content in the project scenario takes place at a constant rate over a period of 20 years from the year of planting. The project meets the applicability conditions of this tool - as demonstrated in validation- since the areas of land to which the tool is applied do not fall into wetland category, do not contain organic soils and are not subject to any of the land management practices and application of inputs listed in the tool.

Litter remains on site and is not removed, and soil disturbance is in accordance with appropriate conservation practices, limited to site preparation and not repeated within 20 years.

Parameter	Symbol	Value	Source (SOC estimation tool, V01.1.0)
Reference SOC (tC/ha)	$SOC_{REF,i}$	88 65 63	Table 3. HAC soils, tropical montane Table 3. HAC soils, tropical moist Table 3. LAC soils, tropical montane
Land use factor	$f_{LU,i}$	0.64	Table 4. Long term cultivated, tropical montane

		0.48	Table 4. Long term cultivated, tropical moist
Management factor	$f_{MG,i}$	1	Table 4. Full Tillage, all.
Input factor	$f_{IN,i}$	0.94 0.92	Table 5. Low level of inputs, tropical montane. Table 5. Low level of inputs, tropical moist.

The correspondent carbon sequestration calculation is presented to the verification team in the total carbon stock estimation worksheet.

SOC at the beginning of the project ($SOC_{initial,i}$) is estimated by multiplying the factors in Table 5 by the reference SOC:

$$SOC_{INITIAL,i} = SOC_{REF,i} * f_{LU,i} * f_{MG,i} * f_{IN,i}$$

$SOC_{INITIAL,I}$ SOC stock at the beginning of the A/R CDM project activity in stratum i of the areas of land; t C ha-1

$SOC_{REF,i}$ Reference SOC stock corresponding to the reference condition in native lands by climate region and soil type applicable to stratum i of the areas of land; t C ha-1.

$f_{LU,i}$ Relative stock change factor for baseline land-use in stratum i of the areas of land; dimensionless

$f_{MG,i}$ Relative stock change factor for baseline management regime in stratum i of the areas of land; dimensionless

$f_{IN,i}$ Relative stock change factor for baseline input regime (e.g. crop residue returns, manure) in stratum i of the areas of land; dimensionless

i 1,2,3 strata areas of land; dimensionless.

As per the tool, a loss in SOC ($SOC_{LOSS,i}$) is applied in the case that soil disturbance occurs on more than 10 per cent of the land area, which is the case of the project:

$$SOC_{LOSS,I} = SOC_{INITIAL,i} * 0.1$$

where

$SOC_{LOSS,i}$ Loss of SOC caused by soil disturbance attributable the A/R CDM project activity, in stratum i of the areas of land; t C ha-1

The following methodological formula is used for calculating the annual change in SOC stock:

$$dSOC_{t,i} = SOC_{REF,i} - (SOC_{INITIAL,i} - SOC_{LOSS,i})/20 \text{ years}$$

where

$dSOC_{t,i}$ The rate of change in SOC stock in stratum i of the areas of land, in year t; t C ha-1 yr-1

According to the tool, the value of dSOC is not accounted as more than 0.8 tC/ha/year, so:

If $dSOC_{t,i}$>0.8 t/ha/year then $dSOC_{t,i}$=0.8tC/ha/year.

The change in SOC stock for all the strata of the areas of land, in year t, is calculated as:

$\Delta SOC_{AL,t} = 44/12 * \Sigma A_i * dSOC_{t,i} * 1year$

Where

$\Delta SOC_{AL,t}$ change in SOC stock in areas of land meeting the applicability conditions of the tool in year t, tCO2-e.

A_i the area of stratum i of the areas of land; ha

$dSOC_{t,i}$ The rate of change in SOC stocks in stratum i of the areas of land; t C ha-1 y-1

i 1,2,3… strata areas of land; dimensionless.

Litter and Dead Wood

Estimations were done in accordance with the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities" using a default and conservative value of 1% and 1% of carbon stock in tree biomass for dead wood and litter, respectively.

Leakage

Leakage emission attributable to the displacement of agricultural activities due to implementation of an A/R CDM project activity is estimated as the decrease in carbon stocks in the affected carbon pools of the land receiving the displaced activity.

According to the methodological tool the displacement of an agricultural activity by itself does not result in leakage emission. Leakage emissions occur when the displacement leads to an increase in GHG emissions relative to the GHG emissions attributable to the activity as it exists within the project boundary, which is not the case of Kijani. Therefore, leakage emissions are estimated as cero.

7.4 Leakage

Leakage emission attributable to the displacement of agricultural activities due to implementation of an A/R CDM project activity is estimated as the decrease in carbon stocks in the affected carbon pools of the land receiving the displaced activity.

According to the methodological tool the displacement of an agricultural activity by itself does not result in leakage emission. Leakage emissions occur when the displacement leads to an increase in GHG

emissions relative to the GHG emissions attributable to the activity as it exists within the project boundary, which is not the case of Kijani. Therefore, leakage emissions are estimated as cero.

7.5 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)	Buffer pool allocation	VCUs eligible for Issuance
Year 2022 (01/04/2022 – 31/12/2022)	0	757	0	757	76	681
Year 2023 (01/01/2023 – 31/08/2023)	0	673	0	673	67	606
Total	**0**	**1,430**	**0**	**1,430**	**143**	**1,287**

Ex-ante emissions reductions/ removals	Achieved emissions reductions/removals	Percent difference	Justification for the difference
2022	757	0%	Not applicable
2023	673	0%	Not applicable
TOTAL	**1,430**	**0%**	