



KIJANI FORESTRY SMALLHOLDER FARMER FORESTRY PROJECT

Document prepared by



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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 plant income-generating trees and combat climate change through the establishment of sustainable woodlots for fuelwood, timber, and boundary planting. 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 builds capacity and establishes a foundation for sustainable development in Uganda through growing trees that provide income-generating opportunities for farmers.

Kijani works through its network of thousands of organized small groups across Uganda to establish small-scale nurseries, train farmers in nursery management, and mobilize farmers to establish intercropped woodlots on their private lands, referred to as the farmer's Gardens. 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, construction materials for nursery infrastructure, equipment and the necessary training and tools for seedling maintenance.

Kijani's team structure relies on their field staff, called Parish Coordinators (PC), and their close working relationship with these groups. The PCs are living 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 and they often interact with each of their groups on a weekly basis at the group meetings alongside additional field visits between the group sessions. Kijani's continuous presence, and strong relationships, in the community are critical to the long-term success of the project. In addition to its tree planting 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, assisted natural regeneration, and preparing goods for marketable forest products. This is especially focused on sustainable charcoal to displace the unsustainably produced charcoal currently saturating the marketplace.

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 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. Kijani consults with the local and national government before considering any species and does not introduce any new and exotic species into the Ugandan ecosystem. Kijani only plants species that are

promoted by the National Forest Authority and receives local buy-in from each district's District Forest Officer to ensure there is no net harm. Kijani's criteria for selection of species depends on the use for each tree. Trees that are planted for fuelwood usage are required to grow quickly, coppice after harvesting, and produce quality charcoal, timber species must have a marketable product for the farmer once mature and are either native or nativized. Kijani does not promote the planting of Pine or Eucalyptus trees.

Before Kijani makes a species available for farmers, the species is first tested at their farm and with a select group of farmers in different regions. If a species does not survive well, has slow growth rates, or is not desired by enough farmers, the species will not be added to the species list. In the case where there is success of the species in the pilot, then the species may be made available to a wider subset of farmers, still taking into account each individual ecological zone the farmers will be planting in.

Species are added to Kijani's selection all the time as the geographical area continues to expand and new species are tested, but the most common species planted in 2022 include *Melia volkensii* (Melia), *Acacia polyacantha* (Ongono), *Maesopsis eminii* (Muzisi), *Gmelina arborea* (Gmelina), *Albizia lebbek* (Lebek), *Faidherbia albida* (Fahideribia) *Senna siamea* (Senna), *Terminalia glaucescens* (Opok) and a variety of other indigenous 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 owning land 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). Kijani's intervention preserves Uganda's natural forest by reducing the pressure on the native ecosystem by providing alternate sources for fuelwood and timber. Moreover, those trees that Kijani plants for fuelwood can be perpetually regenerated and harvested from the same rootstock, providing a long-term alternative supply that reduces demand from native forests.

Each farmer will sign a contract with Kijani that will give Kijani the right to purchase the charcoal produced and provide access to urban markets where the charcoal can be sold. Kijani aggregates and sells the carbon credits on behalf of the farmer, providing a profit share and payment structure to allow the farmers to mutually benefit in the carbon markets.

The first instance will involve 790 gardens planted in 2022 which comprise a total area of 138.715 ha where 174,111 trees have been planted.

A case study of a 2022 garden will be presented in section of 1.11 as an example of Kijani's approach. 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 approx. 19.8 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.

Audit Type	Period	Program	VWB Name	Number of years
Validation	22-08-2022 to 21-08-2062	VCS Program	Earthood Services Limited	40
Verification	22-08-2022 to 28-08-2023	VCS Program	Earthood Services Limited	1
Total	-	-	-	-

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 (v4.5, December 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.

Kijani Forestry Smallholder Farmer Forestry Project is developed as a grouped project. All new instances to be incorporated must meet the technical land eligibility criteria for carbon forest projects. Therefore, any project area that wants to be part of the grouped 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 activity must be located within the boundaries of Uganda. The first PAIs fall under project boundary as given in project KML file. Geographic boundaries (kml polygons or shp) of all future PAIs will be assessed to confirm the area is located within the boundaries of Uganda.
3. The activities are in line with the local laws and regulations for afforestation activities, with the necessary documentation up to date. Before onboarding new farmers, the PP makes sure there are no legal issues or unresolved conflicts in the new PAIs.
4. The activities must include the reforestation with woody species and must be part of the Kijani’s Forest program.
5. Compliance with the requirements of the VCS Standard, therefore:

- a. Planting must not have happened before the project start date (2022 – 08 – 22). This is ensured by looking at the site plantation records, nursery registers, geotagged pictures, among others.
 - 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).
6. 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
 7. 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.
 8. The area must have characteristics regarding additionality that are consistent with the initial project instances (sections 3.4 and 3.5).
 9. New project activity instances shall follow criteria 2 and 3 from section 3.6.16 of VCS standard 4.5:
 - Criteria 2: Use technologies/measures specified in the PD: no till, use of species provided by Kijani in agroforestry systems.
 - Criteria 3: Apply technologies/measures in the same way as specified in the PD. Plantations following charcoal, boundary or timber systems.

To ensure new project instances do not take place on wetlands or in areas cleared of previous non-degraded native ecosystems, the following steps are taken:

- IPCC Soils are overlaid with the project area to discard any project instance that falls under wetland category;
- FAO 2012 layer is overlapped with the project area to primarily assess land cover 10 years ago;
- Primary forests layer (Global Forest Watch) is overlapped to identify if there is any project instance which falls under this category (if any, these are excluded from the project).
- Earth Observation from historic satellite images (2012 or previous)

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 the evaluation of 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 and FAO layers, 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."

The protocol followed to determine that there is no destruction of non-degraded natural ecosystems and the possible outcomes, is provided below:

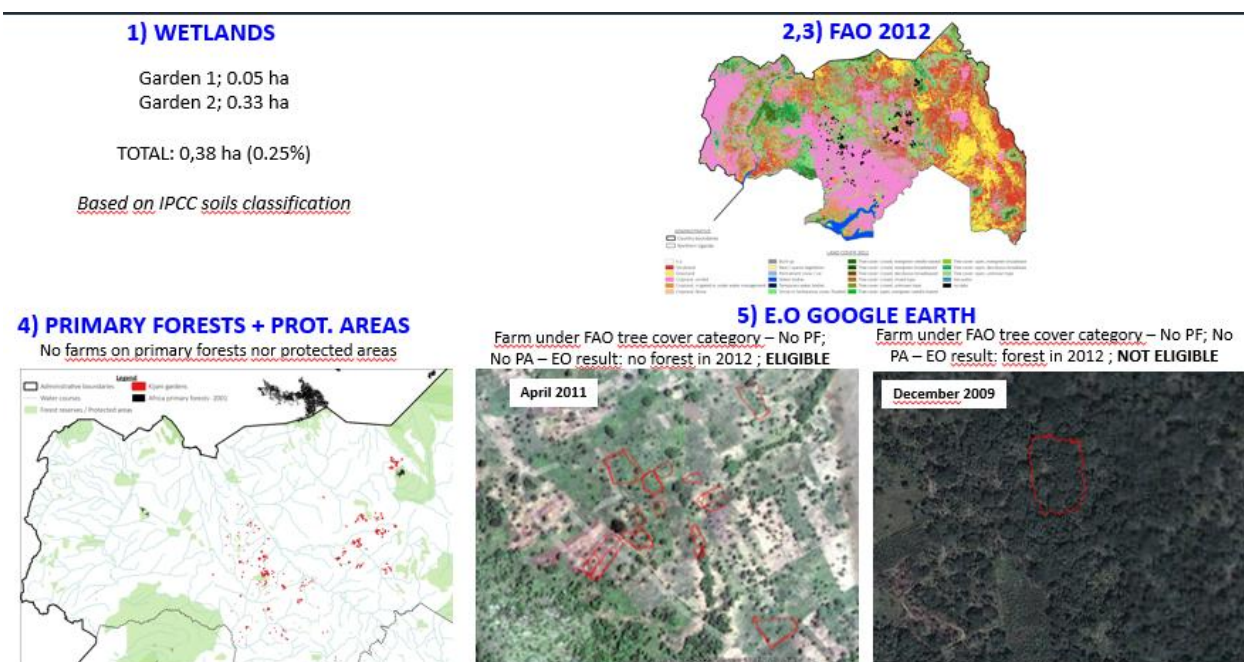


Figure 1. Land eligibility protocol – example of possible outcomes for 2022 gardens

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.

The project is designed in a way that complies with each and every VCS Standard requirement in section 2.1, 3.1 and 3.2.

The scope of the project includes three of the seven Kyoto Protocol greenhouse gases, and the project activity is supported by a methodology approved under an approved GHG program (CDM). The project is not under Jurisdictional REDD+ programs and nested REDD+. As it can be seen throughout the PD, the the scope of the project is not involving generation of GHG emissions primarily for the purpose of

their subsequent reduction, removal, or destruction and the project is not under the circumstances indicated in Table 1 of the Standard.

The project and the implementation of it does not lead to the violation of any applicable law, as it can be seen in the PD when citing all the memorandum of understanding with the government agencies of every district where working.

In relation to 3.2 paragraph of the Standard, every point has been checked and the project is confirming all the applicable requirements are complied, as seen throughout the PD.

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 - 08 - 22)
 - 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.
9. New project activity instances shall follow criteria 2 and 3 from section 3.6.16 of VCS standard:

- Criteria 2: Use technologies/measures specified in the PD: no till, use of species provided by Kijani in agroforestry systems.
- Criteria 3: Apply technologies/measures in the same way as specified in the PD. Plantations following charcoal, boundary or timber systems.

1.5 Project Proponent

Organization name	ONE CARBON WORLD
Contact person	Andrew Bowen
Title	CEO
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Telephone	(+44) 191 432 6322
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Organization name	Kijani Forestry
Contact person	Beau Milliken
Title	Co-CEO
Address	3500 S DuPont Highway, Dover, DE 19901
Telephone	+1 858 245 4393
Email	beau@kijaniforestry.com

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
Title	CEO
Address	Avenida de las Américas 8200

Telephone	+598 94 527 788
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1.7 Ownership

The farmer who is the landowner of the project's gardens, who participate in tree nursery activities and oversee planting, maintaining, and harvesting the trees assign the ownership and rights of the carbon credits to Kijani Forestry through Kijani's partnership and commercial contract.

Kijani's commercial contract with the smallholder farmers has been collaboratively developed with farmers, local district government, federal government, local and international council. The farmers are informed of all the clauses of the agreement prior to planting the trees with Kijani and no property rights are being affected by this agreement. The farmers provide their free, prior, and informed consent when working with Kijani and signing the contract.

The contract clearly states that Kijani has no interest in owning their land or pursuing ownership their land in any formal legal process through signing of the agreement. This agreement provides an outline of the overarching working relationship between the parties. In these contracts, farmers assign all carbon rights to Kijani, and in return farmers receive free training on seedling production, plantation management, agroforestry, intercropping pairings, tree management, improved charcoal production methodology, pruning for timber, and all other requirements to implement a successful woodlot and agroforestry model. Beyond knowledge and skills, farmers also receive incentives from carbon revenue and guaranteed offtake of charcoal and timber at farm gate price, which is determined by a third-party.

The contract with farmers is key to the success of Kijani's Nursery Hub model, as the guaranteed market for the goods they are producing is the most motivating factor of their involvement in the project. Kijani's contract with the farmer outlines a strong working relationship with fair terms which the farmer becomes comfortable with after many months of discussion between themselves and Kijani's staff. The decision to sign the contract is made along with the farmer's families, heads of households, clan leaders, and other relevant people in the communities.

These contracts are established with the farmers on an ongoing basis after the farmer has planted the trees, but the terms of the contract are agreed upon before working planting the trees. The date of signing will vary depending on the comfort level of each group or farmer but will be signed before the farmer has been added to the grouped project. Kijani ensures that the farmer has full understanding and acceptance of the terms of the contract before signing. The contracts will have the signature of the Local Councilman 1, which is the elected official that is required to sign off on all land deals and ensures ownership of the land.

As is outlined in "Customary Land Ownership and Underdevelopment in Northern Uganda" (Amon and Lakwo 2014 p.117),

"Customary land tenure is the most dominant land tenure in Uganda. This refers to system whereby land is owned and disposed of in accordance with customary regulations. Specific rules of customary tenure vary according to each ethnic groups and regions"

Amon and Lakwo further speak to the legality of the landholding (p.117, p.120)

“The 1998 Land Act of Uganda gives recognition to those who hold land under customary tenure... The 1998 land act states that customary land tenure shall be governed by rules generally accepted as binding by a particular community. Most land in Uganda is held under customary tenure. This is when the owners have no papers of land, but they are still the legal owners of the land. The law of Uganda says that this kind of land must be run according to whatever rules people have always accepted locally. This means that land under customary tenure is still subjected to customary laws, as well as being recognized officially.”

Customary land is the case with the tens of thousands of plots Kijani’s Nursery Hubs operate. Amongst and Lakwo state “In northern Uganda, land has been owned communally right from the time the Acholi settled in.” The Acholi clans would then subdivide the land to the male family heads, who would then continue to subdivide the land to their children, most commonly the men of the family.

The patriarch of the family would be the member responsible for the further subdivision of the land to children. The children would have access to work on the patriarch’s land throughout their lifetimes. And at the point where the men would get married, they would be provided a land that is theirs to develop, build their homes, cultivate, and have ownership into the future. Trees would be planted to demarcate the boundaries. When they would have children, they could apportion part of the land to their children, and the pattern would continue thereafter.

The children reserve the right to perform activities on the land as they wish, as they own the land after it is apportioned to them. In order to ensure the farmers have the legal rights to their land, Kijani engage with the traditional and governmental leaders in the area. There are two roles who are able to speak to the question of land ownership in these rural communities – the Local Councilperson 1 (LC1) and the Rwot Kweri or Adwong Wang Tic. Any issue involving land ownership would involve these two leaders in the communities.

The Local Councilperson 1, or LC1, is the elected official in charge of land ownership in each parish within Uganda, amongst other responsibilities. This is the person who has the legal right to sign off on any land deals and is consulted in case of any land dispute.

The Rwot Kweri in the Acholi subregion or Adwong Wang Tic in Lango, is the cultural land right elder who is a known and trusted member of the community and speaks to the customary land ownership, although it is not an elected government representative. Consultation of this person would be required in case of land dispute but is not required for all contract documents in order to have land rights confirmed, as the LC1 retains the power to confirm that.

The farmer contracts that Kijani signs are done with a Kijani representative, the LC1, the farmer themselves, and then a witness. In case of any question about land ownership, the witness lines would be signed by the Rwot-Kweri/Adwong Wang Tic, but otherwise may be signed by any third party to the transaction.

Because Kijani’s contracts are not land sale agreements, the entire family is not required to sign the agreement. But, in the case where one of the children would want to sell the land, the entire family would be required to be a part of the agreement to subdivide the patriarch’s land further. In this scenario, the family would bring in the village and clan leaders to ensure the land is legally theirs to sell, and that the entire family agrees on the ownership. If all the family members do not agree to the

land sale, it would not go through. While the land is still owned by the family member looking to sell, the sale of the land must be agreed upon by the whole family.

Land titles are quite rare in rural settings outside a large land agreement. There are several reasons for this. First, land ownership is not viewed in the same way as other cultures, where Northern Uganda relies on the family and clan to dictate land ownership, not the government. Secondly is that most of the time the land titling process exceeds the value of the land and thereby no one pursues it. For example, an acre may cost 1/10th of the price of the land title itself. Thirdly, due to the aforementioned issues, the land office is not set up for processing small title claims as it is a very small office that processes few applications each year. Because this is not something prioritized by the general population, the land office size is small to reflect the demand.

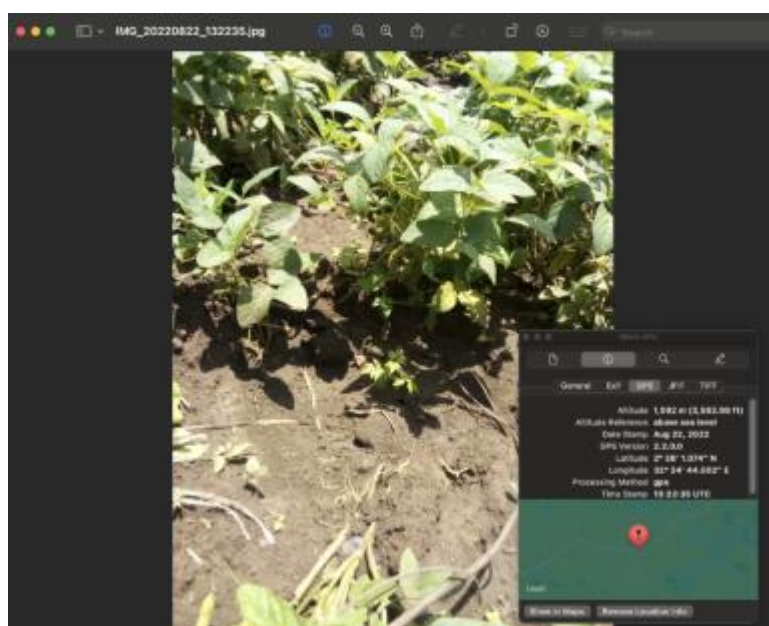
In the general case where land is purchased instead of inherited, a land sale agreement will be created between the two parties. This will require the signature(s) of the previous land owner, whether that is an individual or family. Land that is closer to peri-urban centers are more likely to be purchased than land in the village. This scenario is uncommon in the context of Kijani’s farmers and was not seen in the sample of farmers for 2022. This agreement will likely be hand-written and shall be signed by the LC1 and witnessed by the Rwot Kweri.

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. On the other hand, Kijani has a legal agreement with One Carbon World, the other project proponent, in which VCU are shared among companies as an internal arrangement that has no impact on the farmers. The contract was revised and executed as of Feb 9th, 2024.

1.8 Project Start Date

The project start date is on August 22nd, 2022.

This is the earliest date in which the first trees of this project have been planted.



1.9 Project Crediting Period

The project crediting period lasts for 40 years, from the August 22nd 2022 to August 21st, 2062.

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})
22-Aug-2022 to 31-Dec-2022	362
01-Jan-2023 to 31-Dec-2023	17,677
01-Jan-2024 to 31-Dec-2024	108,709
01-Jan-2025 to 31-Dec-2025	343,267
01-Jan-2026 to 31-Dec-2026	805,164
01-Jan-2027 to 31-Dec-2027	1,615,412
01-Jan-2028 to 31-Dec-2028	2,916,296
01-Jan-2029 to 31-Dec-2029	4,898,759
01-Jan-2030 to 31-Dec-2030	7,605,642
01-Jan-2031 to 31-Dec-2031	10,883,373
01-Jan-2032 to 31-Dec-2032	14,781,549
01-Jan-2033 to 31-Dec-2033	19,177,463

01-Jan-2034 to 31-Dec-2034	23,464,451
01-Jan-2035 to 31-Dec-2035	26,465,926,
01-Jan-2036 to 31-Dec-2036	28,403,666
01-Jan-2037 to 31-Dec-2037	29,156,180
01-Jan-2038 to 31-Dec-2038	28,893,844
01-Jan-2039 to 31-Dec-2039	27,025,159
01-Jan-2040 to 31-Dec-2040	24,186,905
01-Jan-2041 to 31-Dec-2041	21,014,361
01-Jan-2042 to 31-Dec-2042	21,993,101
01-Jan-2043 to 31-Dec-2043	22,732,801
01-Jan-2044 to 31-Dec-2044	23,941,342
01-Jan-2045 to 31-Dec-2045	24,822,721
01-Jan-2046 to 31-Dec-2046	26,388,466
01-Jan-2047 to 31-Dec-2047	27,421,094
01-Jan-2048 to 31-Dec-2048	27,419,335
01-Jan-2049 to 31-Dec-2049	26,104,484
01-Jan-2050 to 31-Dec-2050	24,442,431
01-Jan-2051 to 31-Dec-2051	22,833,752
01-Jan-2052 to 31-Dec-2052	21,009,651
01-Jan-2053 to 31-Dec-2053	24,040,938
01-Jan-2054 to 31-Dec-2054	26,699,361
01-Jan-2055 to 31-Dec-2055	29,498,531
01-Jan-2056 to 31-Dec-2056	31,848,056
01-Jan-2057 to 31-Dec-2057	32,018,052
01-Jan-2058 to 31-Dec-2058	31,129,708
01-Jan-2059 to 31-Dec-2059	28,987,690
01-Jan-2060 to 31-Dec-2060	25,090,727
01-Jan-2061 to 31-Dec-2061	23,012,972
Total estimated ERs	793,199,375
Total number of crediting years	40

Average annual ERs	19,829,984
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As presented in the table above, the project total estimated Long Term Average (LTA) removals (ERR) is 19,829,984tCO₂..

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. Much of the forest loss is due to unsustainable production of charcoal throughout the country.

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. Kijani’s approach to engaging with communities and establishing nurseries is a community-driven process, beginning with a deep understanding of local needs and a commitment to sustainable socio-economic development and environmental stewardship. The process begins with Kijani approaching the government to be given permission to engage with farmers. At the subcounty level, Kijani engages with the Community Development Officer to get a list of organized groups within the sub-county. The groups that are registered at the subcounty level are often Village Savings and Loans Associations (VSLA). A VSLA is a micro-finance model under which savings groups are formed at community level to reduce poverty by financially and socially empowering poor and vulnerable people. These groups are self-organized, and Kijani provides the full Nursery Hub model intervention to them at no cost and aligns incentives together with farmer’s livelihoods.

Once potential partner farmer groups are identified, Kijani proceeds to establish rural, low-cost “Nursery Hubs”, which serve as the focal point for their tree-planting activities. These nurseries are not merely sites for seedling cultivation; they are integrated centers for learning, community engagement, and environmental conservation. The establishment of these nurseries begins with the selection of suitable sites, considering factors such as land availability, soil quality, water access, and the overall suitability for growing a diverse range of tree species. The groups locate the land for these nurseries by finding locations with healthy topsoil, access to water, sufficient space, and ease of access for each farmer within the group to ensure the nurseries’ success for that planting season.

These sites are then developed with a mixture of Kijani-provided hardware and other locally procured materials for the infrastructure necessary to support that year's seedling production.

Kijani has its own seed supply chain by working alongside local seed collectors that are trained to collect the right species of tree with desirable characteristics. These seeds are collected throughout Northern Uganda and centralized in Kijani's headquarters, where they operate their own seedbank that is led by one of Uganda's foremost seed banking experts. The seeds are brought in and undergo a series of tests to get the viability and germination rates of each batch to ensure they are of sufficient quality to be sent to the field. The majority of the seeds are sent out within 6 months and do not require cold storage for the period of time they are stored. Each seed will have varying viability, germination, and survival rates that will depend on several factors, including, but not limited to, the amount of time stored before being sent out, the seed source, the species, and the region the seeds are collected. All this data is collected meticulously by the Kijani team, thereby ensuring that the PCs and the farmers will receive the correct number of seeds that will correspond to the correct number of seedlings to be produced.

After the farmer groups are established and sensitized on the opportunity and appropriateness of each species in their local context, they decide on the species breakdown they are interested in planting and maintaining. The PC will then send a request to the seed bank for the number of trees that each group wishes to plant. The correct quantity of seeds will then be provided from the seedbank to the PC through the PC's supervisor, the Branch Coordinator (BC). The PC will oversee the seedbeds for each species that requires the seed bed. For species where the seeds have a high enough germination rate, they can be placed directly into the pots and the germination is monitored and additional seeds are placed in pots where no seedling germinated. The PCs will continue their ongoing nursery involvement until the seedlings are ready to be planted.

Once the seedlings have gone through the entire growing and hardening process, the farmers will transport their seedlings to their own gardens using wheelbarrows, basins, or with help from a seedling carrier provided by Kijani if there is a special requirement from the farmer. Because the Nursery Hub model focuses on nursery locations that are accessible by each member of the group, the need to assist in seedling transport is limited, and the seedlings don't go through the same transport shock that is often experienced by other transportation methods. This allows the initial survival rate to be higher after planting compared to other models with centralized nurseries.

Through the training provided by Kijani, the farmers will then plant the trees, following the guidance of their PC. Generally, fuelwood species are planted at a two-meter spacing while timber trees are planted at four-meter spacing. Exact spacing will depend on the local ecosystem, farmer's goals, intercropping choices, and other factors. Kijani farmers intercrop their usual food or cash crops between the trees, ensuring that no land is displaced during the first years before income can be generated from the trees.

The training of farmers is a critical component of Kijani's model, designed to empower communities with the knowledge and skills needed for successful tree planting and nursery management. This training covers a broad spectrum of topics, from seed collection and germination techniques to pest management and tree planting and maintenance methodologies. Kijani's training programs are tailored to the specific ecological conditions and needs of each community, ensuring that farmers are equipped to manage their nurseries effectively and sustainably. These training sessions are

conducted by experienced agronomists and forestry experts, who provide both theoretical knowledge and practical, hands-on experience. Moreover, the training is designed to be iterative, with continuous learning and adaptation based on feedback from the farmers and the evolving challenges and opportunities within each community. By avoiding an entirely prescriptive model and allowing for ecological and social nuances, the Nursery Hub model can adapt to a wide variety of situations according to the conditions on the ground.

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 natural forests to be harvested in the process.

Kijani's Nursery Hub model starts by hiring local community members to be trained through a two-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, the PCs, 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 more 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 sustainable development goals by promoting 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. The project 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.

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. This method, while allowing the farmers to make a consistent income through the trees, also provides a standing amount of biomass for the Long Term Average carbon sequestered on each garden, providing the basis for the emission reductions claimed.

When the fuelwood trees are ready to be produced into charcoal, Kijani partners with farmers 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 four years of growth. After harvest, the coppices are expected to regrow after three years, at which point they can be harvested again. Kijani will utilize the same Nursery Hub network in order to create a sustainable charcoal production network, providing trainings and tools for any interested farmer. The Nursery Hub model relies on the group cooperation and division of duties in producing the seedlings and planting the trees. This group mentality will continue through the charcoal production phase of the project where if farmers within the groups or communities have the experience, ability, or willingness to produce the charcoal sustainably, they can partner with other farmers who may not be physically able to produce the charcoal themselves. Through this cooperation, Kijani will help ensure there is income-generation opportunity for all farmers, regardless of their age, gender, or physical capabilities.

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. There were no instances of large-scale fire outbreaks in the project area that affected the trees in the first year of the project. 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 highly-impactful and long-term solution to environmental degradation and climate change. The project combines reforestation and agroforestry initiatives with the use of sustainable forest management practices to improve the livelihoods of local communities while protecting and restoring the environment.

Gardens planted in 2022 will be included in this document. In 2022, there were 790 gardens and 174,111 trees planted.

Species	Year	Total number of trees
Musizi (<i>Maesopsis eminii</i>)	2022	14,874
Melia (<i>Melia volkensii</i>)	2022	79,027
Lebek (<i>Albizia lebbek</i>)	2022	974
Fahideribia (<i>Faidherbia albida</i>)	2022	8,602
Gmelina (<i>Gmelina arborea</i>)	2022	30,758
Ongono (<i>Acacia polycantha</i>)	2022	27,437
Senna (<i>Senna siamea</i>)	2022	11,980
Opok (<i>Terminalia glaucescens</i>)	2022	459
TOTAL		174,111

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 2022 gardens.

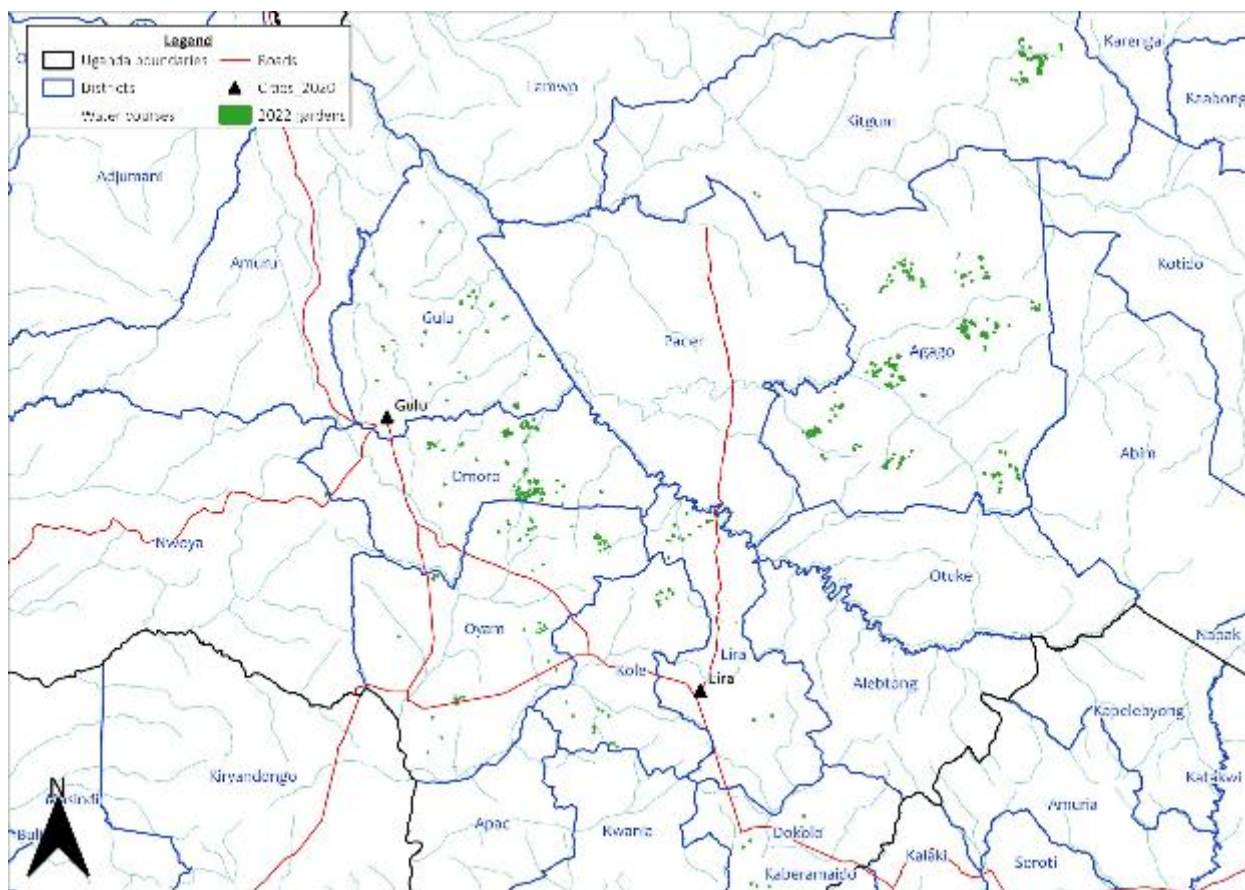


Figure 2. Location of gardens planted in 2022.

Spacing of each species depends on several factors, including the use-case of the tree, species, and crops planned on intercropping. Generally, timber trees are planted at 4x4m spacing while fuelwood species are planted more densely at 2x2 or 3x3m spacing. Boundary trees are encouraged to be planted at an offset 1x1m spacing to keep livestock from entering into the gardens while the trees are young. The farmers do not plow the gardens before doing the spot planting and are trained to only dig a 0,5m diameter pit for planting to reduce soil disturbance.

Kijani works with thousands of farmers in the Nursery Hub model, each with their own individual backgrounds, financial goals, and climate-resilience strategies. One example farmer and their garden from the project which was planted in 2022 will be presented below to show what a representative farmer could look like for Kijani.

Kinyera Paul

Kinyera Paul is a farmer that has partnered with Kijani and planted a diverse set of trees in 2022. He made the species selection based on the soil type of his farm and the rainfall patterns in his area. In order to diversify his income streams and climate resilience, he has planted multiple species with multiple uses on his land.

A boundary of *Senegalia polyacantha* is planted surrounding his garden, which provide protection to his garden as well as nitrogen enrichment from the tree. The *Faidherbia albida*, *Senna siamae*, alongside the *Senegalia polyacantha* can all provide medium-term income through sustainable charcoal production, as they have the ability to coppice after the roots have established themselves. Then the *Melia volkensii* and *Gmelina arborea* will provide the long-term wealth generation through the marketing of the timber.

Kijani’s Monitoring, Evaluation, and Learning team has collected the necessary bio-data on the farmer allowing the team to follow the farmer throughout the garden’s future, ensuring long-term success.

The garden is located in Kitgum district, Northern Uganda and the number of each tree species planted is presented in the following table:

ID	Species	Initial number planted	
Kinyera Paul - Kitgum Orom East Atek ki lwak - Gardener - Garden 1 Database Unique ID: recpie4xf4UJjhoNb	Melia <i>Melia volkensii</i>	100	33.3%
	Gmelina <i>Gmelina arborea</i>	50	16.7%
	Senna <i>Senna siamea</i>	50	16.7%
	Faidherbia <i>Faidherbia albida</i>	50	16.7%
	Ongono <i>Senegalia polyacantha</i>	50	16.7%

Table 1. Kinyera Paul – planted species and number of trees

1.12 Project Location

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

grasslands and open tree cover. The following map shows the land cover in Uganda’s northern region in 2012¹.

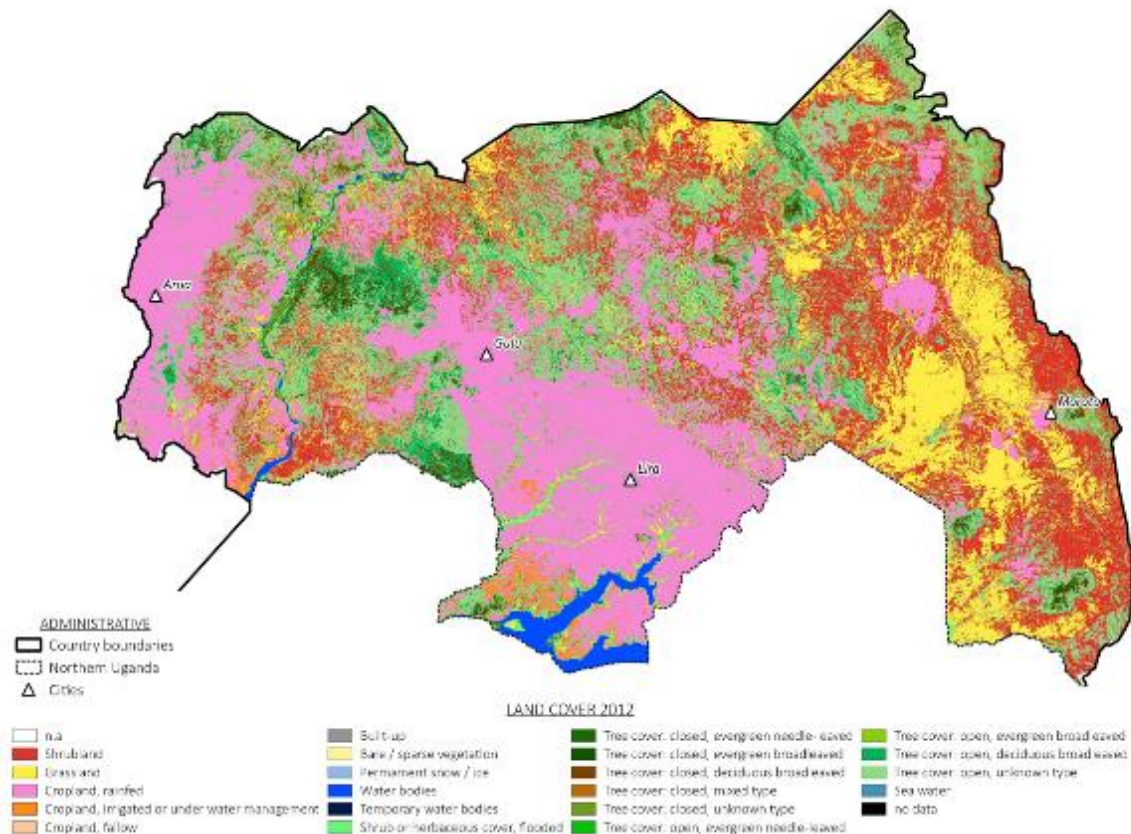


Figure 4. Land Cover Northern Uganda, year 2012.

Kijani Forestry aims to address these challenges by introducing agroforestry techniques into farmer’s agriculture practices, thereby enhancing biodiversity, improving water quality, and promoting sustainable livelihoods for local communities. By planting trees and implementing sustainable agroforestry 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 may include other income-generating activities to increase their household income and climate resiliency²

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

² Other income-generating activities will not be accounted for in the carbon removals for the purposes of this project in case any of these activities are eventually implemented by Kijani.

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."

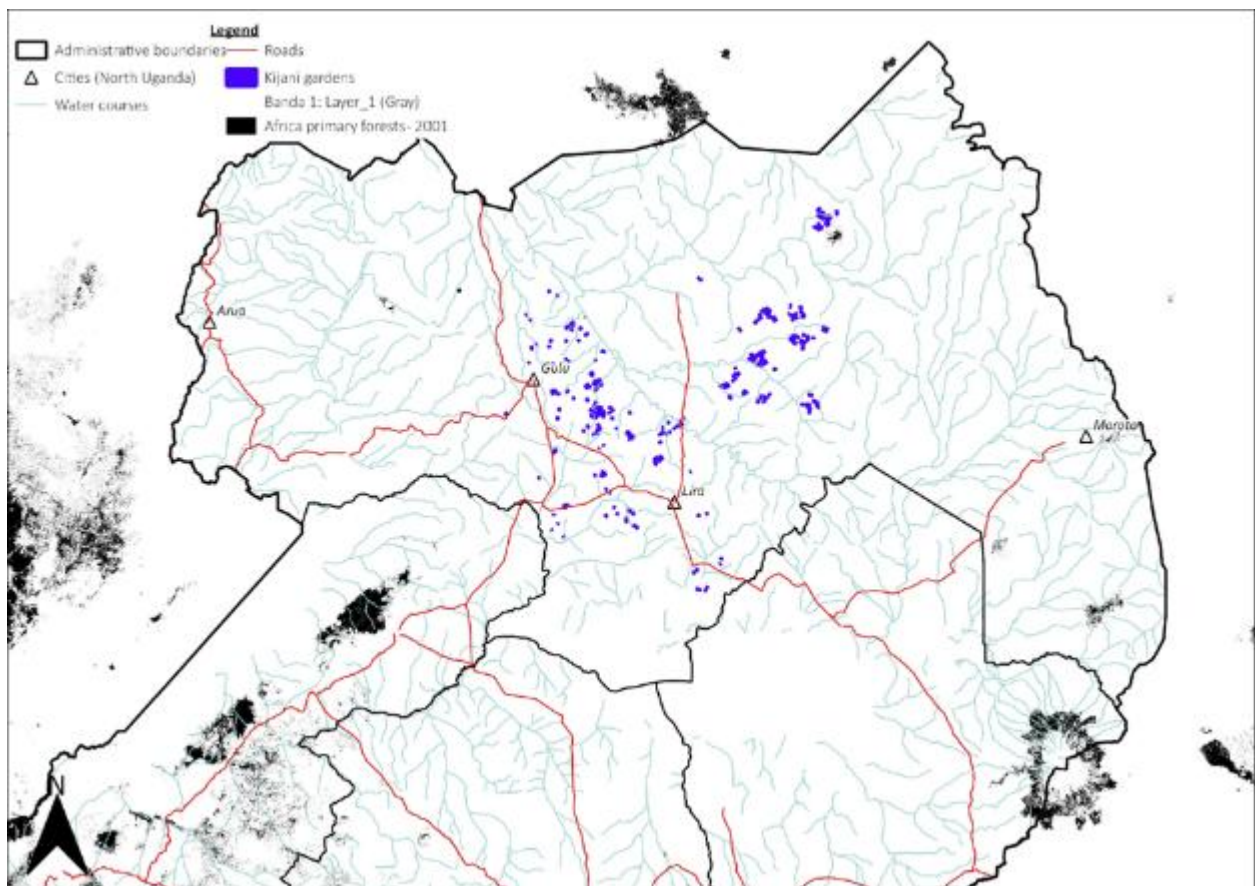


Figure 5. Primary forests (2001) – Global Forest Watch

The protocol followed to determine that there is no destruction of non-degraded natural ecosystems and the possible outcomes, is provided below:

Figure 6. Land eligibility protocol – example of possible outcomes for 2022 gardens

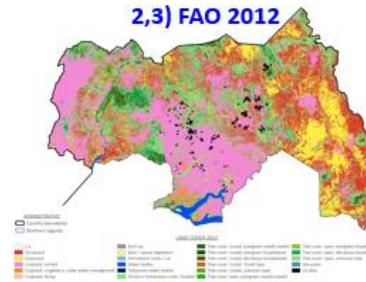
1) WETLANDS

Garden 1; 0.05 ha
Garden 2; 0.33 ha

TOTAL: 0,38 ha (0.25%)

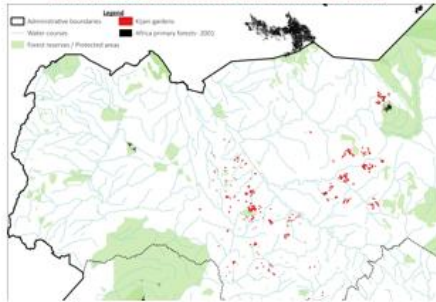
Based on IPCC soils classification

2,3) FAO 2012



4) PRIMARY FORESTS + PROT. AREAS

No farms on primary forests nor protected areas



5) E.O GOOGLE EARTH

Farm under FAO tree cover category – No PF;
No PA – EO result: no forest in 2012 ; **ELIGIBLE**

Farm under FAO tree cover category – No PF; No
PA – EO result: forest in 2012 ; **NOT ELIGIBLE**



- 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 3°N and 1° S. The bordering countries are Tanzania to the South, Kenya to the east, South Sudan to the north, Democratic Republic of Congo to the west and Rwanda to the southwest.

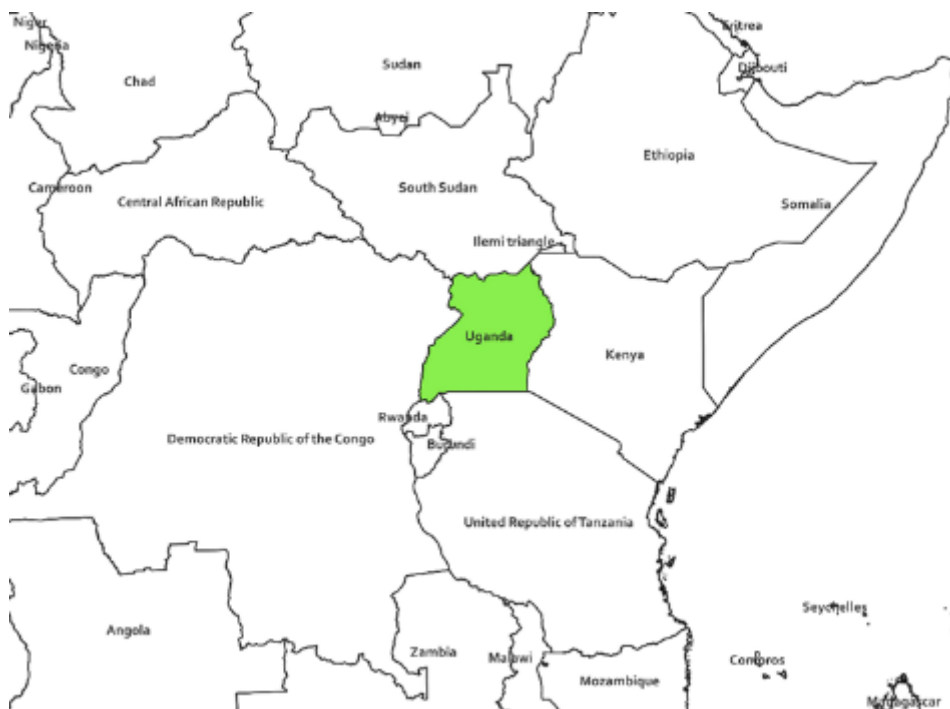


Figure 7. General location of Uganda

Most of the trees planted in 2022 were located in the districts of Gulu, Omoro, Kitgum and Agago, in Northern Uganda.

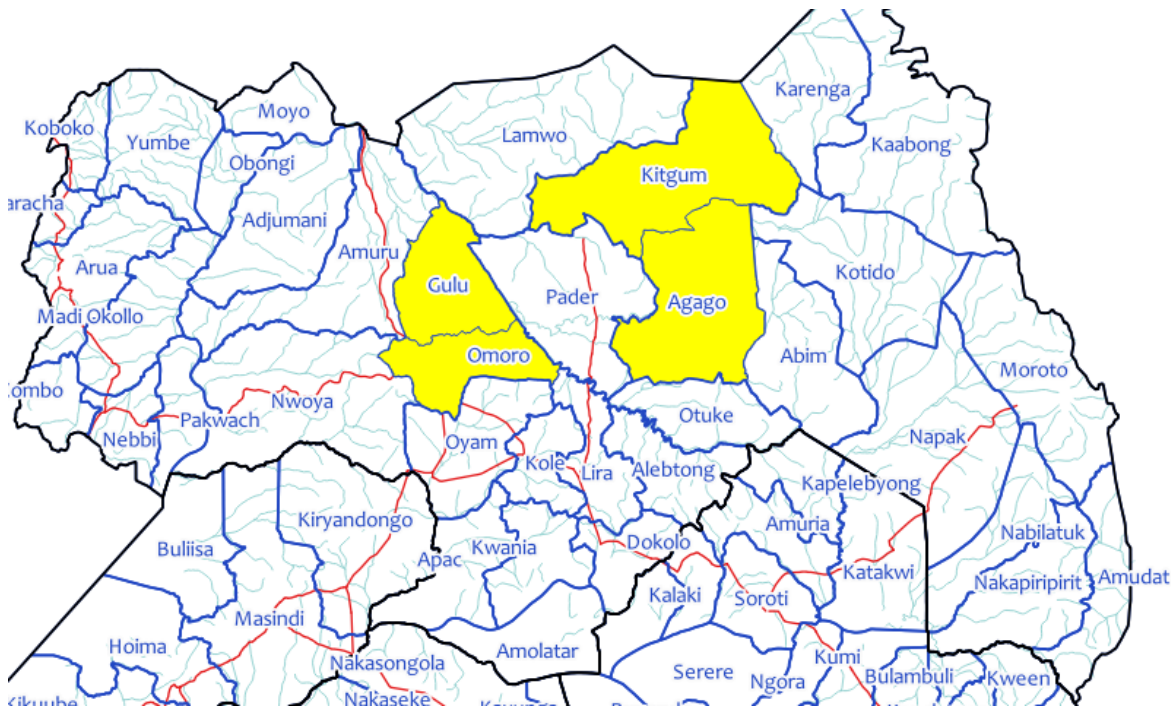
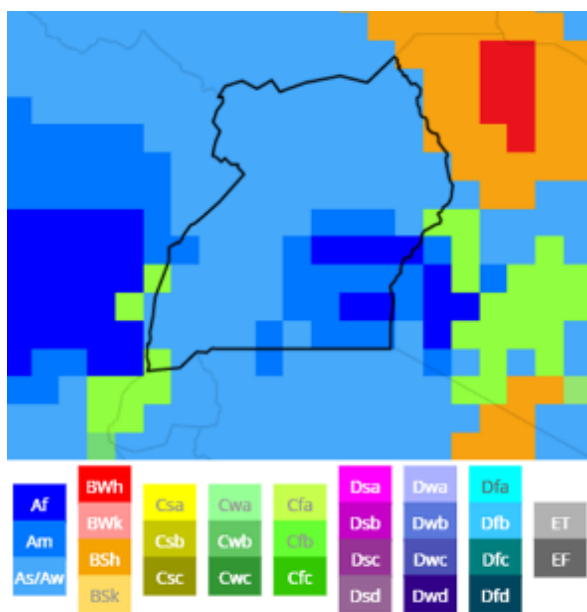


Figure 8. General location of 2022 plantations.

CLIMATE

Uganda has a tropical climate, typically with two rainy seasons per year: from March to May and from September to December. However, the northern region (where the project instances are located) has only one rainy season 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. ³

³ 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 7): 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).

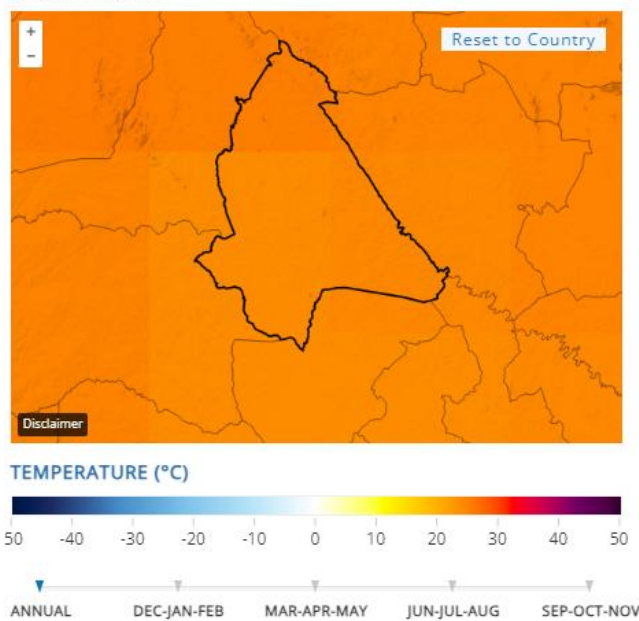
Gulu, Omoro, Kitgum and Agago districts are Tropical Savannah (As/Aw) according to Köppen Geiger.

Figure 9. Köpper-Geiger Climate Classification 1991 – 2020 in Uganda. Source: Climate Change Knowledge Portal

The following figures show the mean temperature and precipitation in Gulu, Omoro, Kitgum and Agago from 1991 to 2020.⁴

⁴ These maps show Omoro as part of Gulu District: Before 2016, Omoro was a county and was part of Gulu District.

Observed Climatology of Average Mean Surface Air Temperature 1991-2020; Gulu, Uganda



Monthly Climatology of Average Minimum Surface Air Temperature, Average Mean Surface Air Temperature, Average Maximum Surface Air Temperature & Precipitation 1991-2020; Gulu, Uganda

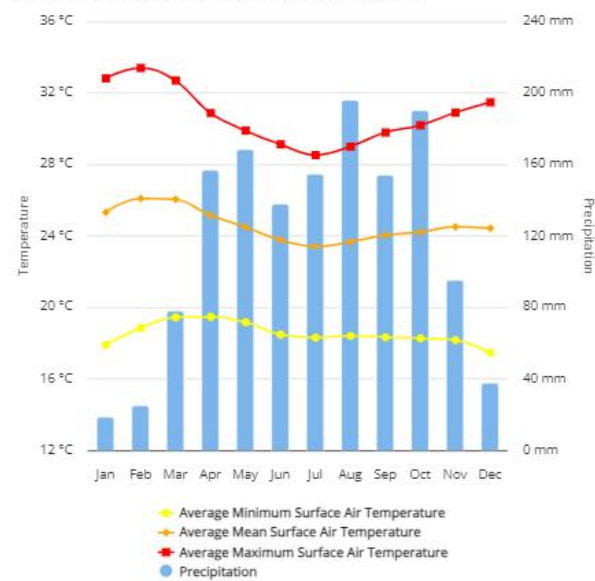


Figure 10. Average annual temperature and average monthly temperature and precipitation in Gulu (& Omoro) from 1991-2020. Source: Climate Change Knowledge Portal

Observed Climatology of Precipitation 1991-2020; Gulu, Uganda

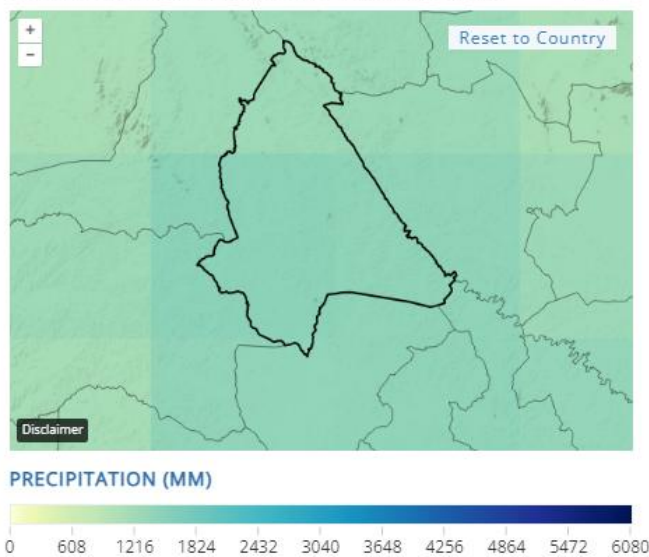
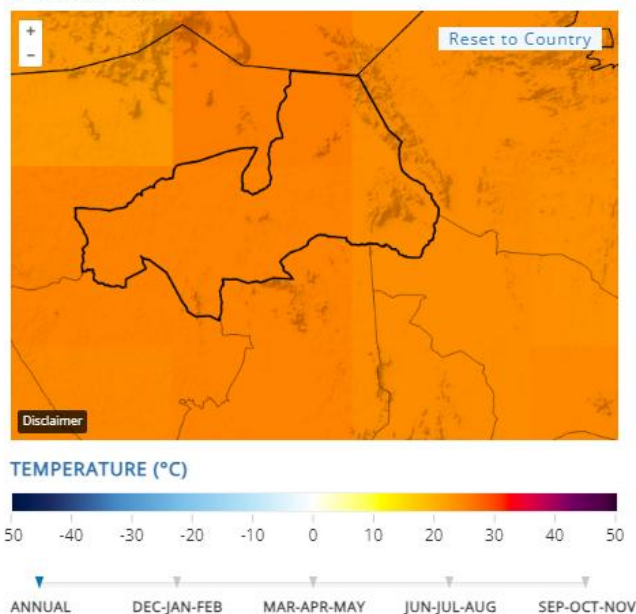


Figure 11. Observed Climatology of Annual Precipitation (mm) from 1991-2020 in Gulu (& Omoro). Source: Climate Change Knowledge Portal.

Observed Climatology of Average Mean Surface Air Temperature 1991-2020; Kitgum, Uganda



Monthly Climatology of Average Minimum Surface Air Temperature, Average Mean Surface Air Temperature, Average Maximum Surface Air Temperature & Precipitation 1991-2020; Kitgum, Uganda

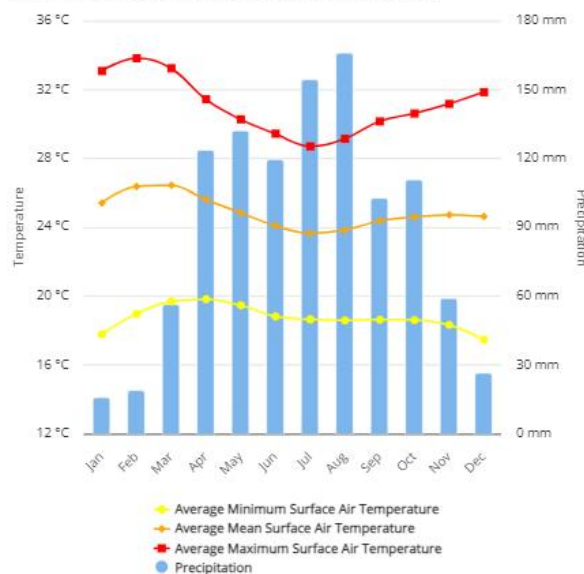


Figure 12. Average annual temperature and average monthly temperature and precipitation Temperature in Kitgum from 1991-2020

Observed Climatology of Precipitation 1991-2020; Kitgum, Uganda

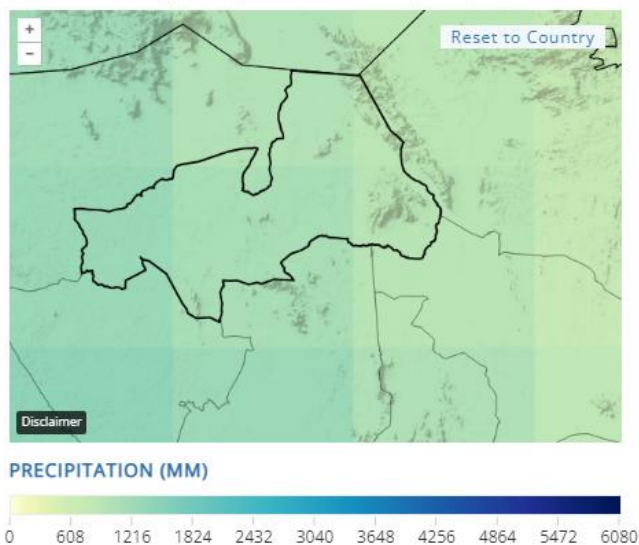
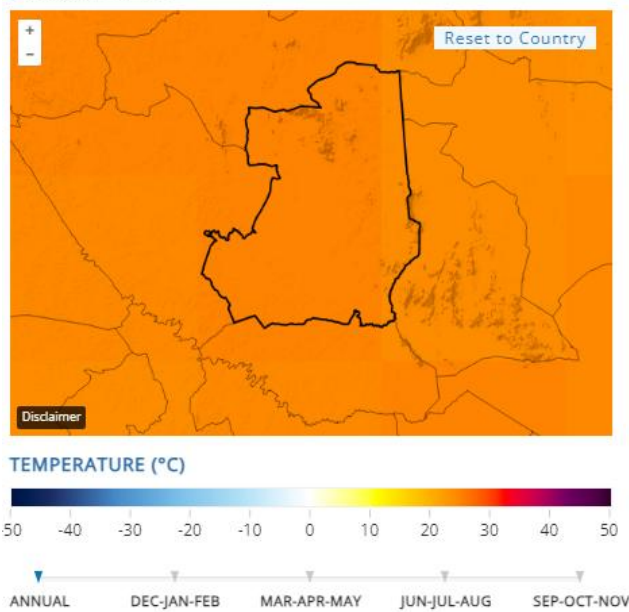


Figure 13. Observed Climatology of Annual Precipitation (mm) from 1991-2020 in Kitgum. Source: Climate Change Knowledge Portal.

Observed Climatology of Average Mean Surface Air Temperature 1991-2020; Agago, Uganda



Monthly Climatology of Average Minimum Surface Air Temperature, Average Mean Surface Air Temperature, Average Maximum Surface Air Temperature & Precipitation 1991-2020; Agago, Uganda

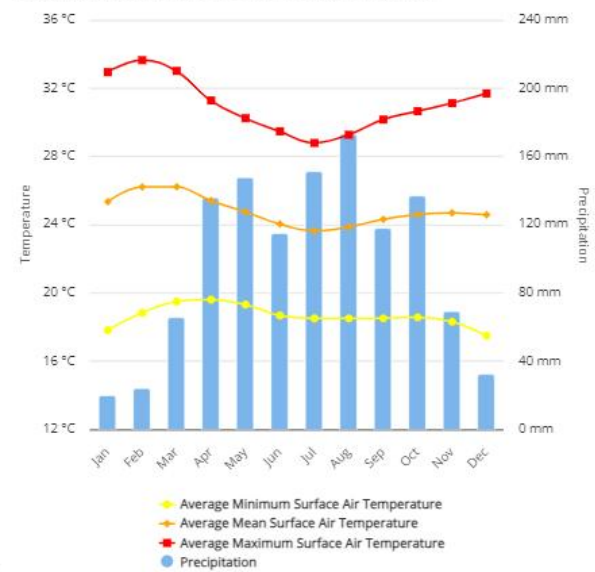


Figure 14. Average annual temperature and average monthly temperature and precipitation Temperature in Agago from 1991-2020.

Observed Climatology of Precipitation 1991-2020; Agago, Uganda

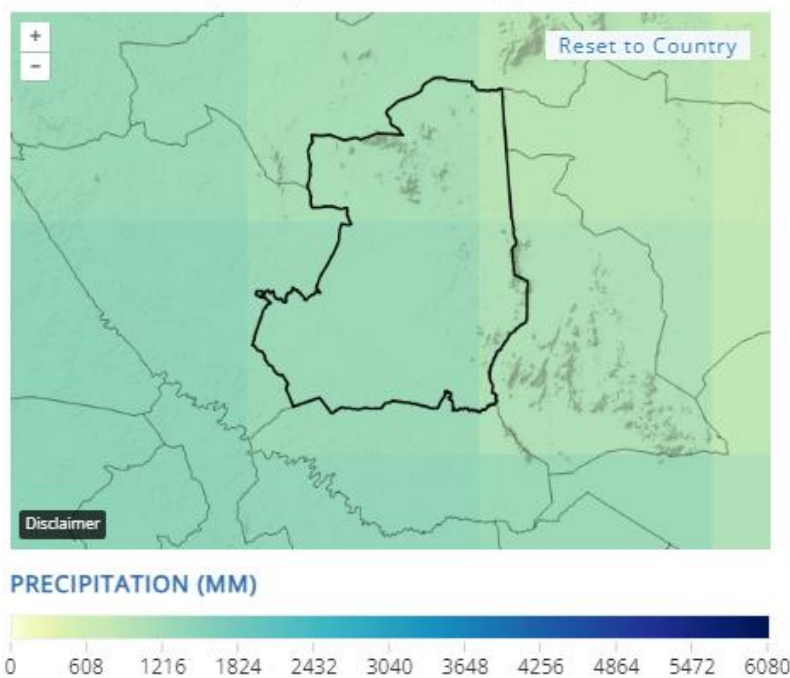


Figure 15. Observed Climatology of Annual Precipitation (mm) from 1991-2020 in Agago. Source: Climate Change Knowledge Portal.

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.⁵

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).

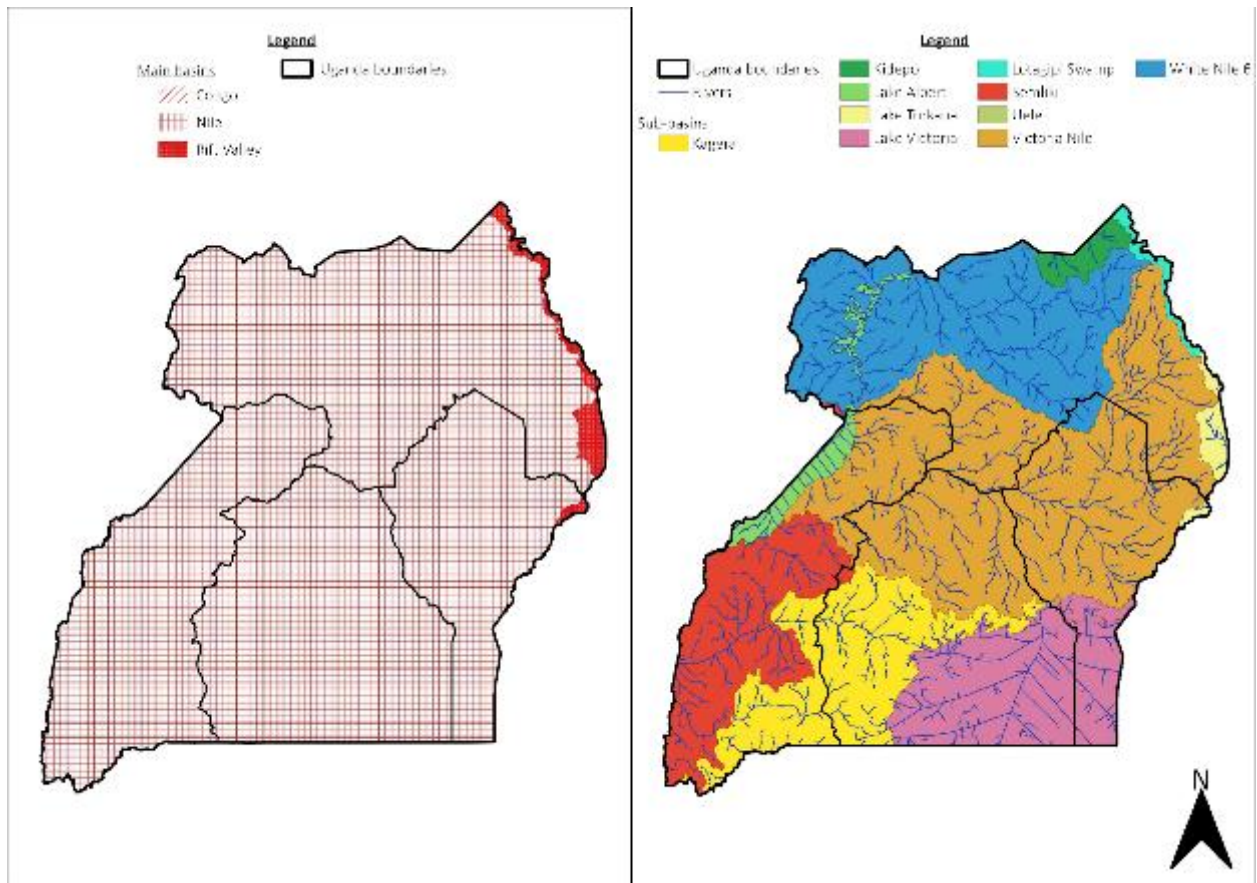


Figure 16. Hydrobasins in Uganda

The project area is in the Nile basin. Three sub-basins are identified in the project districts (Gulu, Omoro, Kitgum and Agago), being the White Nile the most expanded one. Refer to Figure 15.

⁵ 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

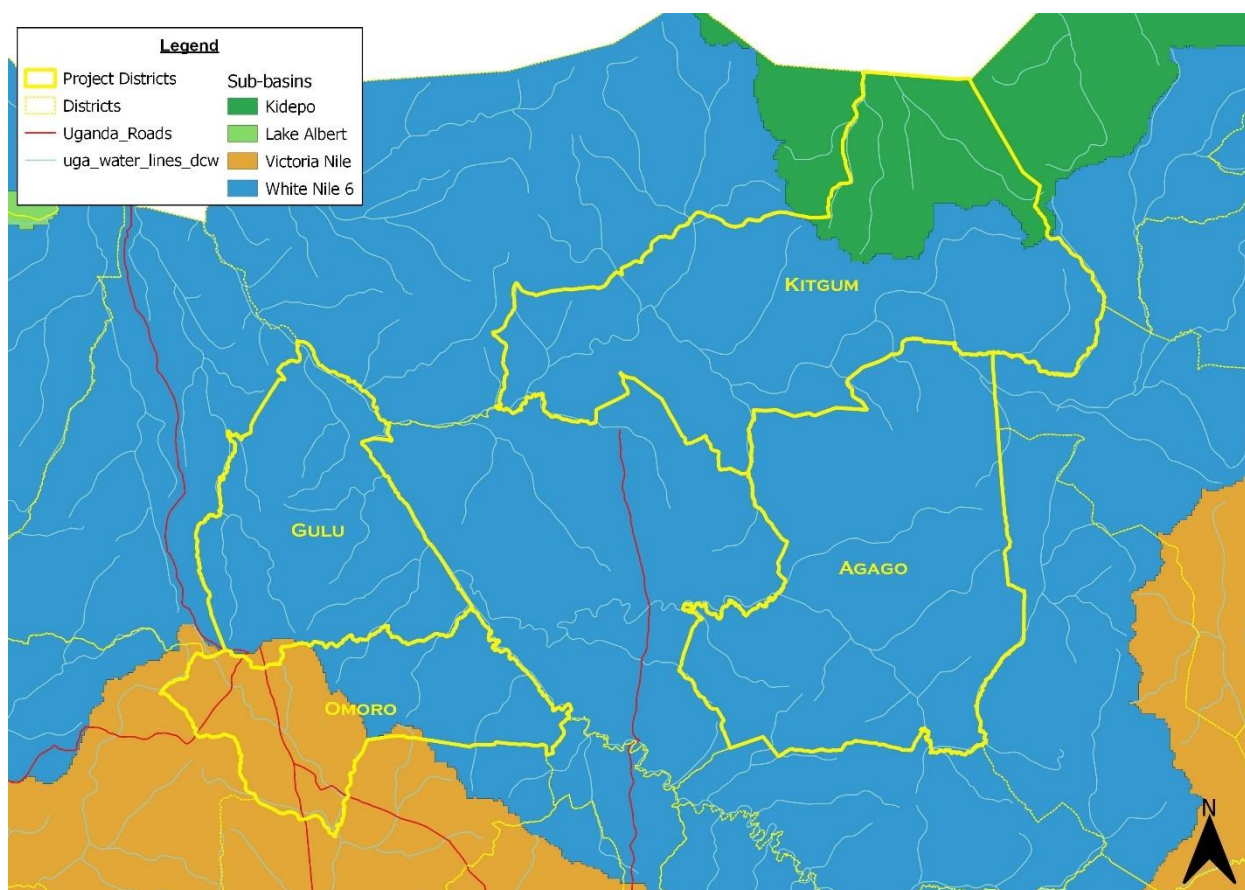


Figure 17. Sub basins in project districts.

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).

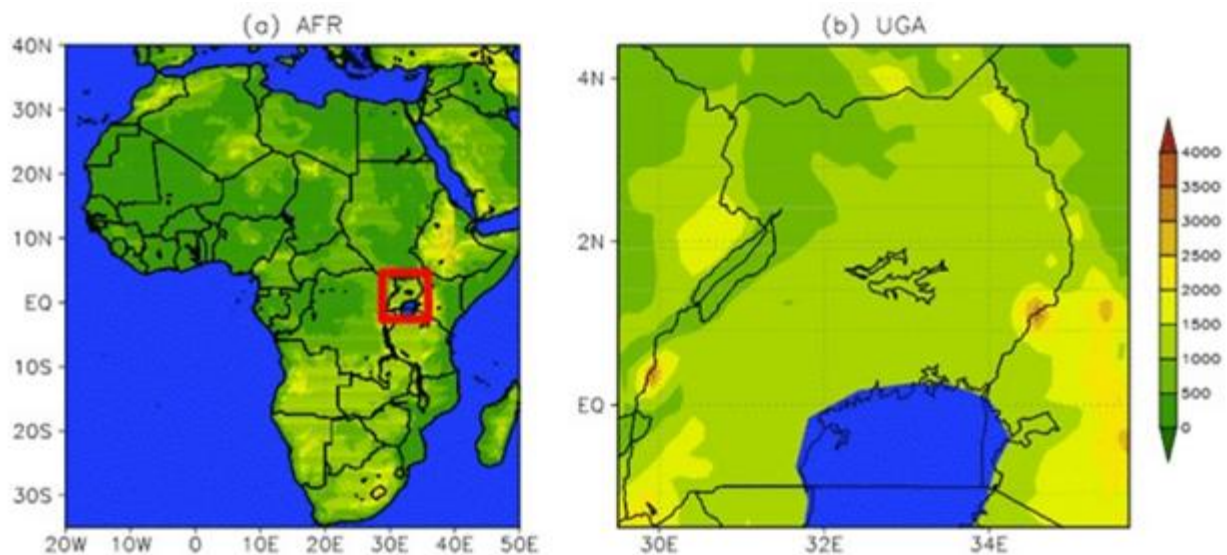
TOPOGRAPHY

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 18. 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).

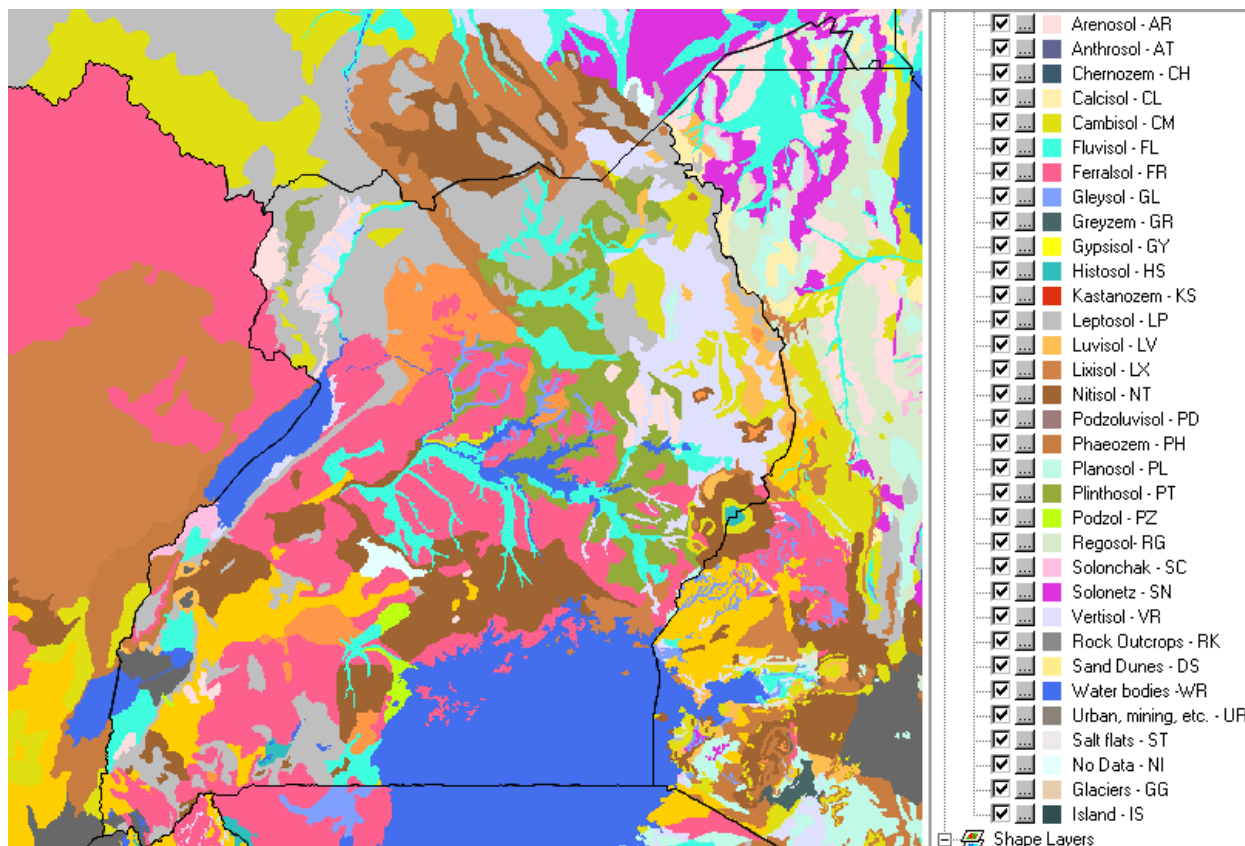
The following figure shows the different soil classes in Uganda.

Figure 19. Uganda soil classes. Source: Harmonized World Soil Database

VEGETATION

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).

The project has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal, or destruction. Web search of registered projects has been conducted and no projects were found to be implemented in the project zone of other project developers. Additionally, Kijani works with local smallholders which produce grain for subsistence, there is no forest production in their farms. Apart from that, before Kijani, farmers were not aware of the possibility of generating carbon credits, so there is no way they have generated GHG emissions for the purpose of the subsequent removal.



1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project activities comply with Uganda's laws and regulations.

Kijani ensures that the Nursery Hub project adheres to all local laws and regulations in Uganda and that it follows all nationally accepted best practices for sustainable plantation management. In accordance with Uganda's 2003 Forest Act, Section 27 and the National Forestry and Tree Planting Regulations of 2016, the trees Kijani plants with farmers are considered the farmers' property and the laws and regulations concerning this private property will continue to be followed throughout the 100+ year engagement with each farmer. The plans within the Forest Management Plan were prepared with advice and assistance from Uganda's Ministry of the Water and Environment personnel and in accordance with the following national policies and guidelines:

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
6. National Forestry and Tree Planting Regulations, 2016
7. SPGS Tree Planting Guidelines for Uganda

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 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 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.

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.

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.

Many of the 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 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	1.1	1.1.1 Proportion of the population living below the international poverty line by sex, age, employment status and geographical location (urban/rural)	Hired and trained local community members and provided full-time employment.	Kijani works with households that have a self-reported average income of \$1.14 per household of 7 members. Over 200 members of the communities have been trained and hired, including 168 youths. The full-time employment of one member of a household will increase a household’s income by average by 96%.	By the end of the project implementation, Kijani expects to provide direct employment to over 1,000 full time staff.

3)	8.3	8.3.1 Proportion of informal employment in total employment, by sector and sex	Implemented activities to decrease increase employment.	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)	15.2	15.2.1 Progress towards sustainable forest management	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 174,111 trees.	Project aims to plant 247,000,000 trees by 2030 for an estimated planting size of 217,000 hectares.

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's Training program

Kijani has a 400-acre farm in Gulu District 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. Through Kijani's Training of Trainer's curriculum, we are able to effectively train the parish coordinators through the paid 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 two-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.

Adaptive Management Plan

Finally, Kijani has an adaptive management plan which includes:

Planning

Detailed plans for project activities will be developed for each garden, including forest planting, conservation measures, stakeholder engagement initiatives, and monitoring activities.

Implementation

Planned activities will be implemented according to established timelines and protocols.

Monitoring

Key indicators will be regularly monitored to assess the effectiveness of implemented activities and their impact on project objectives.

Evaluation

Monitoring data will be evaluated to determine if the objectives are being met and to identify any challenges or improvement areas.

Learning

Learn from monitoring and evaluation results, as well as stakeholder feedback, and use this information to adjust project strategies and activities as needed.

Adaptation

Make necessary adjustments to project plans, activities, and strategies based on lessons learned during the monitoring and evaluation process.

Risk Management

Identify potential risks and uncertainties that may affect project success, such as changes in government policies, climate change impacts, or social conflicts, and develop strategies to mitigate these risks.

Training

Provide training and capacity-building support to local communities and project staff to enhance their skills and knowledge in forest management, carbon monitoring, biodiversity conservation, and other relevant areas.

Communication and Reporting

Maintain transparent communication with stakeholders through regular updates, reports, and meetings to keep them informed about project progress, challenges, and successes.

Continuous improvement

Continuously review and refine the adaptive management plan based on ongoing monitoring, evaluation, and stakeholder feedback to ensure its effectiveness and relevance over time.

By following this approach to adaptive management, the project can better navigate uncertainties and changes, maximize its carbon sequestration and conservation, and ultimately contribute to sustainable development in the project area.

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.

The most common species planted in 2022 are *Melia volkensis* (Melia), *Acacia polyacantha* (Ongono), *Maesopsis eminii* (Muzisi) and *Gmelina arborea* (Gmelina). These species are native or naturalized to Uganda. As an example, the report "Financial incentives promoting afforestation in Uganda's drylands" elaborated by FAO Program officer and Program manager, states that FAO SPGS project (Sawlog Production Grant Scheme) supports research in dryland silviculture, working closely with the National Forestry Resources Research Institute. Research trials for dryland species – including *Melia volkensis*, *Gmelina arborea*, *Terminalia brownii* (...) – have been established. This is an example of the existing support of FAO and National Forestry Resource Institute towards the species used by Kijani.

Kijani conducts a due diligence before the species selection in each region. 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. Kijani consults with the local and national government before considering any species and does not introduce any new and exotic species into the Ugandan ecosystem. Kijani only plants species that are promoted by the National Forest Authority and receives local buy-in from each district's District Forest Officer to ensure there is no net harm. No scientific literature has been found which identifies any of the species used by Kijani as invasive in Uganda. For instance, there is a document⁶ which identifies useful trees and shrubs in Uganda and, while some species were reported as having risk of becoming invasive (e.g. *Aleurites moluccana* or *Artocarpus heterophyllus*), nothing is said on this regard about the species planted by Kijani.

Also, there are some other databases⁷ where *Gmelina* is identified as invasive in other parts of Africa but not in Uganda. When looking at the Global Invasive Species Database none of Kijani species appear as an invasive species in Uganda.

Additionally, consultations were made to the Makerere University about the possible invasiveness of the tree species used by Kijani. In this sense, Professor Philip Nyeko has signed a letter concluding that *“Based on the literature and contextual reviews, I can say that Gmelina arborea and Senna siamea are not empirically shown to be invasive species in Uganda. These species are highly beneficial, supporting environmental sustainability and providing significant economic advantages to local farmers. I strongly recommend the continued use and planting of these species as part of Kijani Forestry's commendable efforts to promote sustainable forestry and community development.”* The letter is provided as an appendix.

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.

⁶ <https://apps.worldagroforestry.org/downloads/Publications/PDFS/b09383.pdf>

⁷ <https://www.cabidigitallibrary.org/doi/10.1079/cabicompendium.25465>

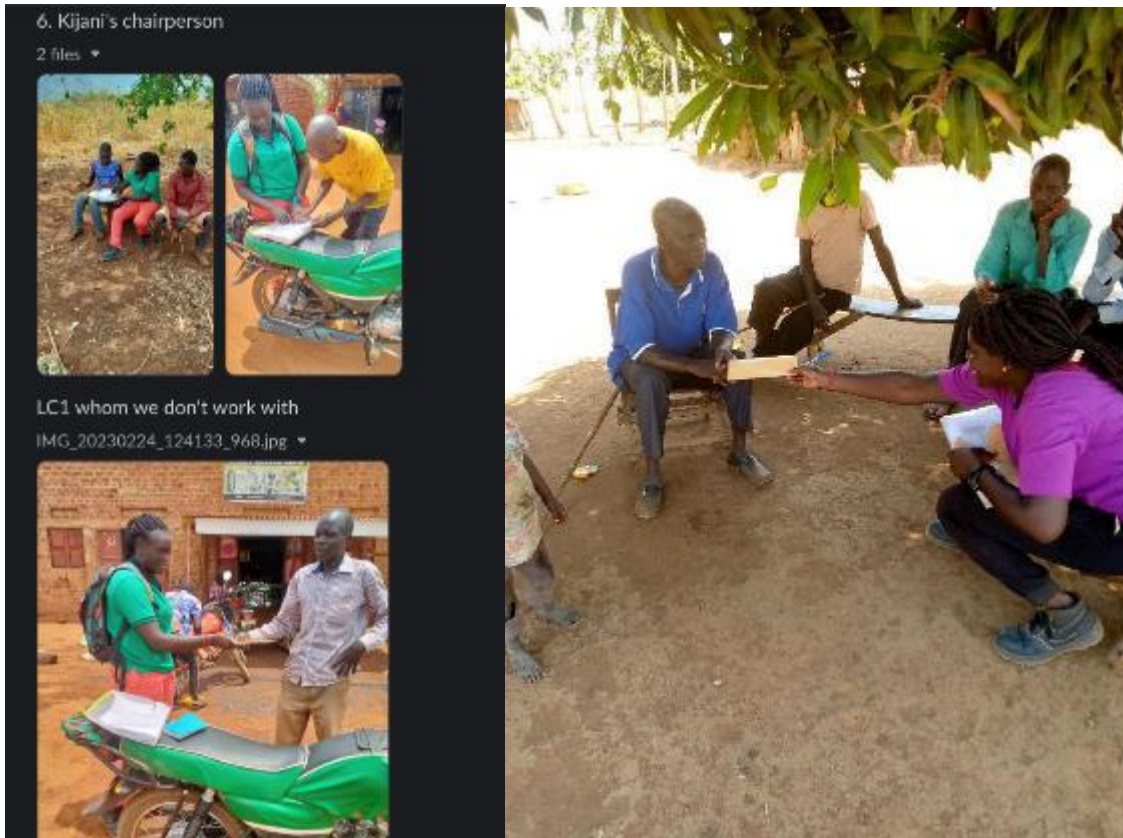


Figure 20. Stakeholders consultation invitation delivered

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 21. Stakeholders event agenda



Figure 22. 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.

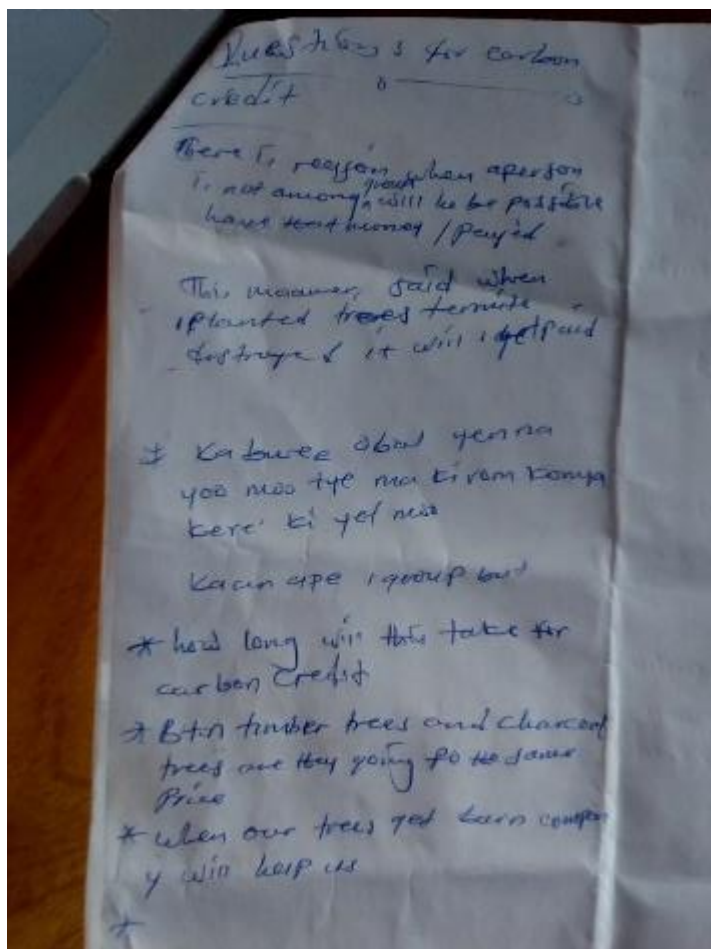


Figure 23. Part of the questions raised during the event.

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 and the Parish Coordinators. 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.

An additional set of questions raised during communication and the answers are presented below:

Q: If the trees planted are affected by water logging is there any way the company can help?

A: Kijani will discuss this issue with our trainers to make sure that farmers have selected correct sites for their planting that will avoid water logging issues. For trees that are already in water logged areas, Kijani advised to dig some drainage to provide the water another location to drain versus drowning the trees.

Program changes: Kijani has reviewed the site selection training in the ToT curriculum to see if additional information needs to be provided.

Q: After harvest for charcoal trees will the payment continue?

A: Kijani is considering the best pathway forward to compensate the regeneration of trees after harvesting, but there is likely to be some payment in the meantime.

Program changes: Kijani has discussed different methods of ongoing incentives to regeneration after harvesting the trees.

Q: Assuming the M&E team came and counted/measured my trees then after wildfire burnt the trees down will I still be paid?

A: If the trees were counted alive at the time of monitoring, yes, they will be paid for that year, but not for following years. The trees must be replanted.

Program changes: None.

Ongoing consultation and identification protocol and the outcomes of the addressed questions are presented in the appendix.

Kijani actively engages stakeholders in participatory planning by holding direct meetings with legally recognized associations and community groups representing local households. At the heart of Kijani's approach is meaningful consultation with farmers and partner groups, which is facilitated through a decentralized model that offers multiple ways to keep stakeholders informed about the project, its activities, and its impacts. Prior to starting work in any area, Kijani consults with local government and cultural leaders to secure community buy-in. Because the project involves private landholdings, Kijani ensures that each family fully understands and agrees to the contract terms before signing. These discussions occur regularly in community group meetings, in which Kijani participates weekly or as frequently as meetings are held, allowing for ongoing feedback from a broad range of community members, whether or not they are directly collaborating with Kijani.

In addition to these local meetings, Kijani frequently appears on regional radio shows to share information about the project and its benefits for farmers. These hour-long programs, broadcast in both national and local languages, are an effective way to reach rural communities across Uganda and have proven to be the most far-reaching medium.

Kijani places high importance on the perspectives of farmers as key stakeholders. The model is designed to foster constant communication, giving all stakeholders a direct line to Parish Coordinators who maintain open channels with every level of the company. Through weekly meetings attended by Parish Coordinators, farmers have the opportunity to voice their concerns, receive support, and provide input. Kijani's model aims to be accessible and rewarding, supporting farmers across multiple regions and offering them a fair share of the project's benefits. The company also transparently explains the benefits and risks of tree planting and the carbon credit profit-sharing model. During community meetings, Kijani has engaged with dozens of members to understand their preferences for carbon credit revenue distribution, discussing issues like payment frequency, reward methods, and the benefits of cash versus non-monetary support. Kijani strives to create a representative group of community members that includes both current partners and those who have not yet joined the project. "Kijani Forestry Smallholder Farmer Forestry Project" has an open and permanent consultation process with local stakeholders through their weekly group meetings. 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. For the identification a thorough assessment of the impacted local stakeholders is conducted by the project proponent. The identification process is based in the following list:

- 1) Farmers: – The Nursery Hub model focuses on smallholder farmers, who are organized in small groups, often Village Savings and Loan Associations (VSLAs) who choose to work with Kijani by establishing small-scale nurseries to raise and plant trees on their private land in an agroforestry ecosystem.
- 2) District Forest Offices - These offices represent the local federal authorities with regards to tree planting and forest establishment outside of National Forest.

- 3) Local Leadership in charge of Land Tenure- The Local Council person 1 (LC1) is the elected official in charge of land ownership in each parish within Uganda, amongst other responsibilities. This is the person who has the legal right to sign off on any land deals and is consulted in case of any land dispute. And the Rwot Kweri in the Acholi subregion or Adwong Wang Tic in Lango, is the cultural land right elder who is a known and trusted member of the community and speaks to the customary land ownership, although it is not an elected government representative.

In every change in the makeup of local stakeholders over time, this procedure will be done again, and the new information will be provided in the PD.

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
- 4) Email: 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.

Staff members receiving verbal complaints are required to document them in writing for proper consideration. Recognizing that many complaints can be resolved informally and immediately by project staff, there is an encouragement to log these informal resolutions on Kijani's database. All grievances will be documented in writing and stored in a database. Each complaint received will be assigned a unique identifier to facilitate tracking of progress by the complainant. Upon filing a complaint, individuals will receive a receipt and informational pamphlet outlining the procedures and expected timelines. Staff members will be trained to verbally communicate this information for complainants who may be illiterate.

Establishing eligibility serves as a procedural measure to ensure the relevance of the issue raised to the project. Kijani aims to maintain a relatively low barrier to entry with swift turnaround times, prioritizing the consideration of users' concerns rather than impeding their access.

Complaints that cannot be immediately resolved will be referred to the grievance focal point, who will have a designated timeframe (one week or less) to assess the issue and provide a response to the complainant. This response will acknowledge receipt and outline the subsequent steps to be taken. Staff members exercise judgment in determining whether the issue can be addressed immediately or needs to be escalated.

Grievances will be categorized based on the nature of the issue raised and the potential environmental or individual impact if the concerns outlined in the complaint were to materialize. This categorization enables prioritization of complaints according to risk, facilitating appropriate follow-up actions.

Kijani's key factors to consider in grievance resolution are:

- Every grievance must be given due respect and considered important.
 - A grievance should not be postponed with the hope that people will "see the light" themselves.
 - A grievance should be put in writing.
 - Relevant facts about a grievance should be gathered by the focal person and their proper records should be maintained.
 - Management should take a list of all solutions and later evaluate them one by one in terms of their total effect on the Company.
 - Decisions once reached should be communicated to the employee and acted upon by the management.
- 5) Follow-up must be done by the management to determine whether the action taken has favorably changed the farmer partner/stakeholder's attitude or not.

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 from 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 two public comments received in the period are as follows, along with their responses are below:

1. Did the project considered the non-native tree species impact on the local ecology, further as per the latest VCS standard 4.5, the ARR projects are restricted to plant the non-native tree species, will the PP satisfy this clause in the next PDD update? Also, the PP mentioned that the project will support the goal of "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)", will this reforestation activities also be double counted under NDCs?
 - a. Response: Most of the species used by Kijani are native or naturalized species. A few of them are non native but prove to be highly adapted to the project’s area. In any case, the project does not include monoculture plantations. On the contrary, different species are combined within and between gardens. Regardless, according to VCS standard 4.5: Section 3.19.27(3) does not apply to projects with a start date prior to

- 1 March 2024, which means that this requirement is not mandatory for Kijani's project as the start date is prior to March 1st, 2024.
2. Kindly accredit the Kijani project for the benefit of out planet and jobs to the youths of Uganda.
 - a. Response: Thank you for your kind suggestion.

2.5 AFOLU-Specific Safeguards

Stakeholder identification

A thorough assessment of the impacted local stakeholders is conducted by the project proponent.

The project description includes information on local stakeholders at the start of the project. The identification process will be based in the following list:

- 6) Farmers – The Nursery Hub model focuses on smallholder farmers, who are organized in small groups, often Village Savings and Loan Associations (VSLAs) who choose to work with Kijani by establishing small-scale nurseries to raise and plant trees on their private lands in an agroforestry ecosystem.
- 7) District Forest Offices – These offices represent the local federal with regards to tree planting and forest establishment outside of National Forest.
- 8) Local Leadership in charge of Land Tenure- The Local Council person 1 (LC1) is the elected official in charge of land ownership in each parish within Uganda, amongst other responsibilities. This is the person who has the legal right to sign off on any land deals and is consulted in case of any land dispute. And the Rwot Kweri in the Acholi subregion or Adwong Wang Tic in Lango, is the cultural land right elder who is a known and trusted member of the community and speaks to the customary land ownership, although it is not an elected government representative.

In every change in the makeup of local stakeholders over time, this procedure will be done again, and the new information will be provided in the PD.

Stakeholder's background

A brief description of the social, economic and cultural diversity (if there is so) within local stakeholder groups and the differences and interactions between the stakeholder's groups will be elaborated in the PD.

For the description and the identification of the initial status of the background of the stakeholders at the beginning of the project, secondary sources of information (for example: government and other official registries) will be used.

The project proponent will analyze the expected changes in well-being and other stakeholder characteristics under the baseline scenario, including changes to ecosystem services identified as important to local stakeholders.

The implementation of this is through Kijani's team structure that relies on their field staff, called Parish Coordinators (PC), and their close working relationship with these groups. The PCs are living in the communities full-time and provide regular training and assistance to groups regarding nursery establishment and maintenance, seedling care, pest management, agroforestry practices, and fuelwood lot establishment and management.

Kijani staff member are no more than a bicycle ride away from a Kijani nursery, and they permanently interact with each of their groups on a weekly basis at the group meetings alongside additional field visits between the group sessions.

Kijani's continuous presence, and strong relationships, in the community are critical to the long-term success of the project. In addition to its tree planting 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, assisted natural regeneration, and preparing goods for marketable forest products. This is especially focused on sustainable charcoal to displace the unsustainably produced charcoal currently saturating the marketplace.

Identification of risks

In theory, risks include trade-offs with food security, land loss, loss of yields and climate change adaptation. During the consultation there will be time for stakeholders to identify and raise their concerns about the potential risks that this project may arise. Kijani's model is centered around ensuring that the project provides a significant net-gain in socio-economic status of the farmers and provides a pathway to breaking the cycle of poverty through planting trees. Kijani addresses the issue of food security by ensuring that the trees are planted alongside the crops for the years before the canopy closes. Kijani also ensures that the farmers have adequate land for all their sustenance crop activities on an ongoing basis, even after the trees have grown up. This is done by identifying total land available for cultivation and ensuring the farmer's goals for the project activities do not utilize land that would otherwise be allocated for crops.

Kijani's Human Resources manual defines sexual harassment as “ any conduct, comment, gesture, or contact of a sexual nature that is unwanted or unwelcome by the individual to which it is directed. Sexual harassment is strictly forbidden within Kijani Forestry whether it is directed at a fellow staff, or other parties within the organization such as interns, volunteers, community members, clients, or any other stakeholder, and if caught may amount to serious imprisonment of the harassed. The manual outlines the required reporting for many violations including sexual and non-sexual violence, abuse, and harassment to any colleague, partner, or community member. Kijani considers a serious offense if a farmer “Engaging in inappropriate sexual relationships with interns, fellow staff, or any relationships where there is a power differential”. Further, Kijani considers it a grave offense if there is any “Sexual harassment, coercion or abuse of any nature of another staff, client, or community members.” Kijani is in permanent contact with the farmers and no discrimination or sexual harassment events have been identified or reported to local authorities.

Ongoing consultation mechanism

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. These consultations are not one-time activities, but occur through the weekly interventions of each group at their group meetings. Farmers are aware that they are able to ask any question to the trained Parish Coordinator, and that they will receive either a direct response, or the PC will get the correct answer and respond to them.

The stakeholders are able to raise concerns, ask questions, and address all potential negative impacts during project implementation on an ongoing communication channel where the project proponent will communicate.

- 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 time period, taking into account culturally-appropriate conflict resolution methods.

The process of the ongoing communication will be based in:

- 9) Directly to a Kijani staff member who will add it to the feedback database
- 10) Submitted anytime on our online database at this link (or by scanning the QR Code):
<https://airtable.com/app9qLHOWBPHBWGF1/shr7qEfUBBZ4XyQd7>



- 11)
- 12) Emailed to feedback@kijaniforestry.com
- 13) Information of the project will be found in the webpage of the project proponent link: <https://www.onecarbonworld.com/stakeholder-forms/uganda-stakeholder-form> and www.kijaniforestry.com/nursery-hubs and this link will also guide interested persons to the project link at Verra.
- 14) 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.

Feedback management

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.

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.

As a way of conclusion, 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.

Respect to property rights and local stakeholders resources

Local stakeholders' property rights will be recognized, respected and supported, and where feasible, measures will be taken to help secure these rights. The project proponent will provide a project boundary shapefile where the project activities will be carried out, including the contract ensuring the land belongs to the farmers and they have the right to plant the trees and sign over the carbon rights to Kijani. To reduce damage to the ecosystem on which the local stakeholders rely:

- Tree species will be planted, are recommended for use in the region and are not considered invasive in Uganda or in Kijani's planting context.
- In case non-native species are used, the project will justify the use as well as the possible adverse effects they may have
- The project is not using synthetic fertilizers, chemical pesticides, biological control agents, or any other inputs used by the project with possible adverse.

On the other hand, 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.

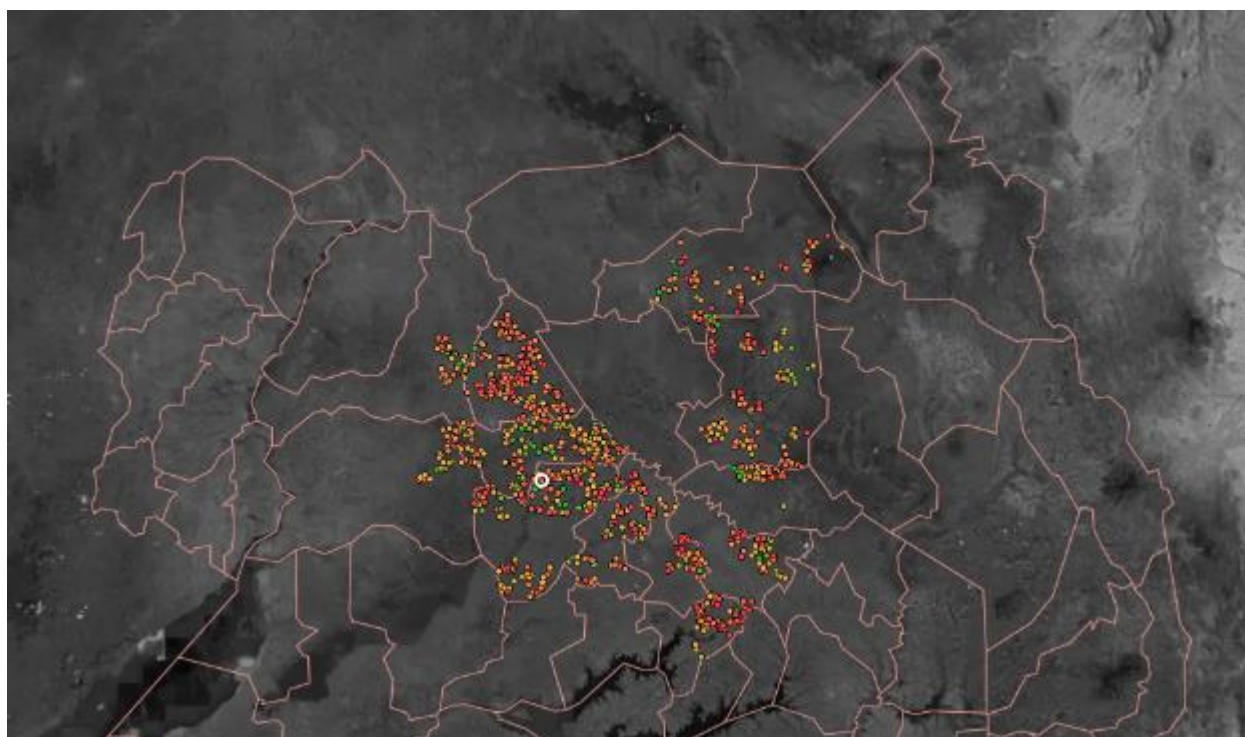


Figure 24. 2023 Nursery Hub Locations

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. Kijani'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 or reforestation in an agroforestry system.

(ii) 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 planted. 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.

There is no burning of biomass considered for site preparation or any other activities in the forest management plan. However, any accidental occurrence of fire within the project boundary will be considered.

- Non-CO₂ 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 $\geq 5\%$ 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 the agroforestry implementation. The implementation of agroforestry techniques 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 2. Project boundaries

Source		Gas	Included?	Justification/Explanation
	Above and below	CO ₂	Yes	Carbon stocks in tree biomass is the main carbon pool affected by project activity. It is

Source	Gas	Included?	Justification/Explanation	
Baseline scenario	ground biomass		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	No	CO ₂ emissions due to burning of biomass are accounted as a change in carbon stock
		CH ₄	No	Burning of woody biomass for site preparation is not part of the baseline activities. Considered as zero in baseline scenario.
		N ₂ O	No	Burning of woody biomass for site preparation is not part of the baseline activities. Considered as zero in baseline scenario.
	Harvested wood products	CO ₂	No	This carbon pool is not eligible under selected methodology.
	Combustion in fossil fuel in vehicles and machinery	CO ₂	No	Potential emissions are negligibly small and are not included as a source of GHG emissions
		CH ₄	No	Potential emissions are negligibly small and are not included as a source of GHG emissions
		N ₂ O	No	Potential emissions are negligibly small and are not included as a source of GHG emissions
	Nitrogen based fertilizers	N ₂ O	No	Potential emissions are negligibly small and are not included as a source of GHG emissions
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.

Source	Gas	Included?	Justification/Explanation
			It is considered in the baseline scenario and project activity.
Burning of woody biomass	CO ₂	No	CO ₂ emissions due to burning of biomass are accounted as a change in carbon stock.
	CH ₄	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. Forest fires are considered under applicability conditions of the tool "Estimation of non-CO ₂ GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity" (Version 04.0.0).
	N ₂ O	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. Forest fires are considered under applicability conditions of the tool "Estimation of non-CO ₂ GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity" (Version 04.0.0).
Harvested wood products	CO ₂	No	This carbon pool is not eligible under selected methodology.
Combustion in fossil fuel in vehicles and machinery	CO ₂	No	Potential emissions are negligibly small and are not included as a source of GHG emissions
	CH ₄	No	Potential emissions are negligibly small and are not included as a source of GHG emissions
	N ₂ O	No	Potential emissions are negligibly small and are not included as a source of GHG emissions

Source	Gas	Included?	Justification/Explanation
Nitrogen based fertilizers	N ₂ O	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, 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.

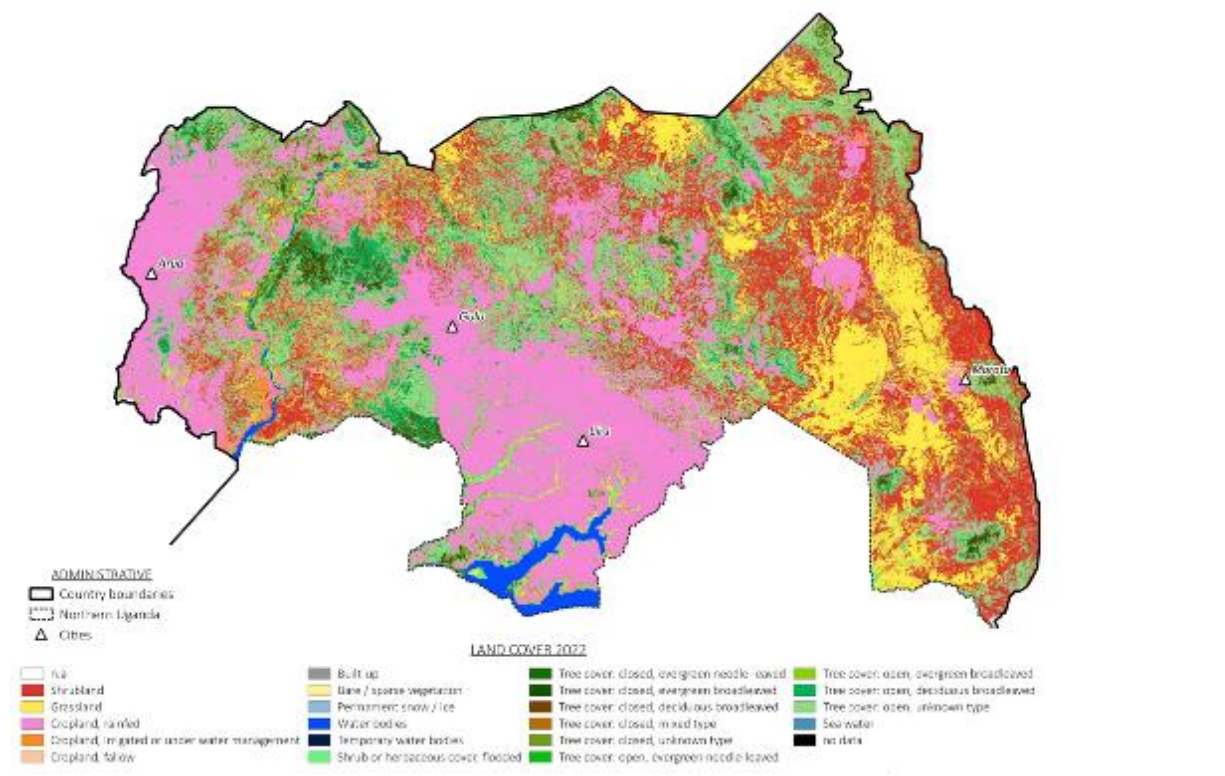


Figure 25. Land Cover Northern Uganda, 2022.

The methodological tool does also request to provide evidence that the incentive from the planned sale of VCUs was seriously considered in the decision to proceed with the project activity. Despite the project developer understands this requirement does only apply to CDM projects, it is considered a good practice to bring respond it. Kijani Forestry Smallholder farmer forestry project has always been thought with the sale of carbon credits. The evidence is a “Kijani Investment Summary” document prepared to raise capital from investors to launch the project. The document has been shared with various potential and actual angel investors prior to the start of the project activity, in which it’s said: “We will pursue carbon credit certification for this project which will allow the entire project to receive payment for removing carbon from the atmosphere. This is not guaranteed at this type point and therefore we have mitigated this with a low success rate and low per-acre price.

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

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.⁸



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

⁸ 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.

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 spp.; 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. 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.

Outcome of sub-step 1a: 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. 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.

Sub-step 2a. Identification of barriers that would prevent the implementation of at least one alternative land use scenarios.

- Investment barriers
- Institutional barriers
- Technological barriers
- Barriers related to local tradition
- Barriers due to prevailing practice
- Barriers due to local ecological conditions, among others

Outcome of Step 2a: List of barriers that may prevent one or more land use scenarios identified in the Step 1b: investment barrier, market barrier and technological barrier.

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

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

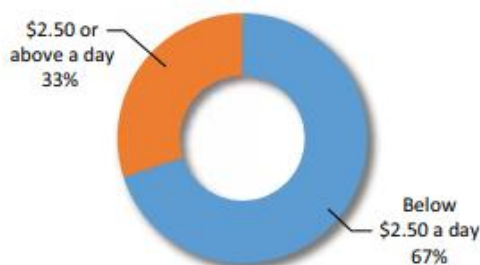
Smallholder farmers have very little access to capital in order to develop their land, especially when it comes to trees. In order to plant half a hectare of trees, a farmer would need between 2-4x their self reported income to purchase the trees, leaving out any transport costs. Due to the land holding 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)⁹ 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 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/>

According to Anderson et al. (2016)¹⁰, most of the smallholder households in Uganda live at or below the poverty line, and many live in extreme poverty. 67% fall below the poverty line of USD 2.5/day as presented in the following figure:

FIGURE 11. Poverty status of household



⁹ <https://www.vsla.net/>

¹⁰

<https://www.cgap.org/sites/default/files/publications/Uganda%20CGAP%20Smallholder%20Household%20Survey%20Report.pdf>

Figure 26. Anderson et al, 2016

Another challenge they face is the lack of financial and agriculture infrastructure: Anderson et al., indicate that smallholders have limited integration into formal value chains or access to reliable suppliers for their agricultural activities. Their interactions with buyers or resellers typically occur in loose value chains, where transactions are informal and without contracts. Additionally, poor transportation options restrict their market access, making it difficult for farmers to secure competitive prices for their products.

Also, most smallholders do not use financial services and lack of experience in working or relating with banks or other financial institutions. According to Anderson et al, most of them have never been into a bank and can even lack of national identification documents (figure 27). 90% of the people do not even have a bank account. The reasons why they don't have one are presented in figure 28.

FIGURE 87. Have you ever been inside a bank?

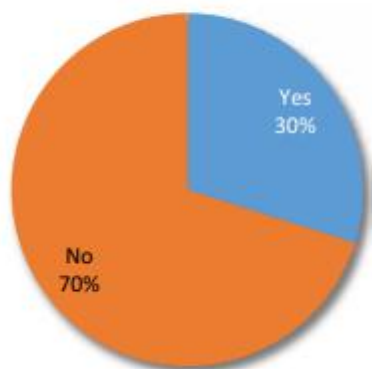


Figure 27. Percentage of people who have been inside a bank



Figure 28. Reasons why people do not have a bank account.

Institutional barriers.

Uganda’s Forestry Policy of 2001 and the National Forestry and Tree Planting Act of 2003 provide the country’s main frameworks for forest conservation, combating illegal logging, and regulating the timber trade. The National Forestry Authority (NFA), established under the 2003 Act, is tasked with

creating and implementing management plans that involve both the private sector and local communities in forest protection and trade regulation.

While these plans were intended to promote sustainable forest management and better control of the logging trade, the reality has been different. Approximately 80% of Uganda's timber trade is illegal, and the country loses 200,000 hectares of forest annually, with illegal logging being a significant contributor. Much of this illegally harvested timber, including logs, plywood, and other wood products, is smuggled into Kenya and Rwanda. However, innovative and coordinated prevention efforts are emerging, showing that addressing the problem at its source is crucial for effective solutions.

Despite the government's sincere efforts, deforestation still prevails in Uganda to support the needs of the citizens and to supply the fuel needs of the country.

As stated by Turyahabwe N., Kakuru W., Asiimwe M., and Byakagaba P.¹¹ , *"In the past, the main sources of timber supply were the government-owned forest plantations and natural forests in the Central and Local Forest Reserves. But due to overharvesting of the natural forests and the lack of enrichment planting and implementation of silvicultural practices, the supply of timber from these sources is declining rapidly. Currently, timber trade is increasingly relying on production from trees and forests on private lands."* The paper also emphasizes on the poor regulations on timber trade from the District Forest Departments indicating that: *"Most of this timber is illegal as it does not comply with official procedures and regulations of Uganda. Regulations are not adhered to due to a combination of factors such as lack of institutional capacity in the District Forest Departments at the local government level and lack of adequate technical support and guidance from the Forest Sector Support Department (FSSD) at the national level. With the increasing proliferation of districts, many district governments in Uganda are recruiting forestry staff that are inexperienced, ill-equipped and are not well grounded in the official processes and procedures for regulating timber harvesting from private forests."*

Turyahabwe et al., also indicate that the regulations are inconsistently applied, with varying fees and taxes across districts. They state that the absence of sustainable harvesting guidance from the FSSD further undermines proper regulation. Consequently, most timber from private lands is harvested illegally, threatening forest sustainability.

On the other hand, public institutions such as National Forest Authority subsidize (with national and internal funds) the afforestation with exotic species. The Report "Financial incentives promoting afforestation in Uganda's drylands" clearly states that "the most commonly grown commercial tree species in Uganda, notably *Eucalyptus grandis* and *Pinus caribaea*"

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.

¹¹ Proximate and Underlying Causes of Illegal Timber Trade in Uganda, 2015

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. As it is said in the Report “Financial incentives promoting afforestation in Uganda’s drylands”, some recent afforestation promotion (exotics mainly) needed support of all kinds to make the project a reality: “... a campaign to promote afforestation in the region, raising awareness through mass media, targeted training courses, and establishing demonstration and learning sites to show good practices. Capacity building was further supported through the certification of service providers such as tree nursery managers to ensure the production of quality planting material”

The same report does provide evidence to support the concept that planting native trees faces multiple technological barriers: “Research trials for dryland species – including *Melia volkensii*, *Gmelina arborea*, *Terminalia brownie* (...)— have been established.”

Barriers related to local tradition.

The tradition of local people is to have subsisting crops in their lands. 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. As presented below, 58% of the farmers have been in agricultural activities for more than 10 years:

FIGURE 26. How many years have you been farming?

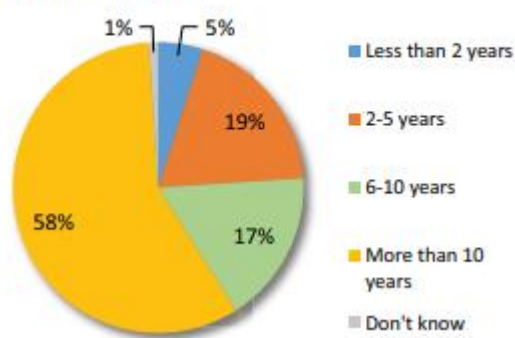


Figure 29. Years of farming

According to the Family Farming Knowledge Platform from the FAO, the % of income from crop production in smallholders in Uganda is 54%. The agricultural land for subsistence represented 44% of the total land area in Uganda (2015)¹²

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.

In addition to the fact that planting eucalyptus and pine is the prevailing practice, the most common source for seedlings is the National Forest Authority (NFA). NFA does not act as a conduit for smallholder farmers to plant trees for the following reasons:

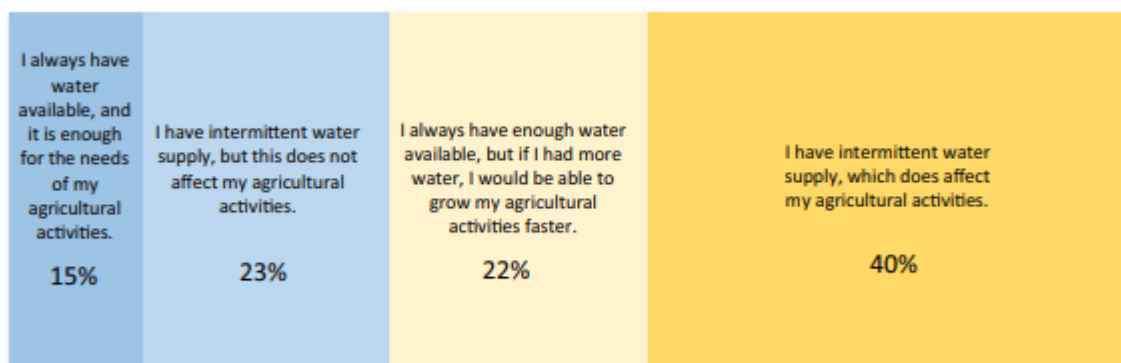
1. NFA has a relatively small nursery that raises seedlings in order for large, wealthier landowners for those who have the funds to pay for the seedlings.
2. Costs are prohibitive to farmers entertaining the idea of purchasing seedlings. Not only the seedling costs, but the transportation costs could 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. The figure below shows the most common water situations for farmers, confirming that water supply can become an issue for most of the farmers risking their production :

¹² <https://www.mdpi.com/2073-445X/7/4/132>

FIGURE 54. Which of the following best describes your water situation?


Sample: Smallholder farmers who participate in household's agricultural activities, n=5,203

Source: Anderson et al., 2016

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.

Outcome of Sub-step 2b:

Determine which land use scenarios identified in the Sub-step 1b are prevented by at least one of the barriers listed in sub-step 2a:

The land use scenario which is prevented by at least one of the barriers is Afforestation with exotic or native species intended to be harvested **without carbon credits generation**. This is conclusively supported by the following facts: smallholders have very limited access to finance institutions or other forms of financing, and most of them live in the poverty line. This was clearly demonstrated in the barrier analysis. Also, there are cultural and prevailing practices barriers as most of them have a long history of farming activities, and they have very few or no knowledge at all about forestry activities, not to mention the fact of them having very limited access to technologies.

List of land use scenarios that are not prevented by any barrier: scenario 1 "continuation of the pre-project activity"

STEP 3. Investment analysis (if needed)

Sub-step 2c. Determination of baseline scenario (if allowed by the barrier analysis)

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 2020¹³.

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 3. 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 drylands¹⁴” 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 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

¹³ FAO: To establish the forest area time series, linear interpolation and extrapolation was applied to the data from 2000 and 2015.

¹⁴ Written by Zainabu Kakungulu & Leonidas Hitimana

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.

While the SPGS was successful, the goals of the scheme were much different than those of Kijani Forestry's Nursery Hubs as is shown in Table 4, comparing and contrasting the two models.

Table 4. SPGS vs Kijani Forestry

	SPGS	Kijani Forestry
Land Size	Minimum of 25 hectares over two years	No minimum (Kijani's largest farmer in Verification is 1.6 ha)
Species	Exotic & Native - Pine, Teak, Eucalyptus, Maesopsis Eminii	Native & Nativized
Fuelwood Species Funded	No	Yes
Land Ownership	Requires title or long-term leases to qualify	Works with the local landownership bodies to verify cultural land ownership
Farmers Enrolled	700	25,000+
Program Timeline	2015-2020	2022 - Ongoing
Training Provided	Yes	Yes
Financial Assistance	Yes - 50% of Costs	Yes - 100% of inputs
Income from Carbon Credits	No	Yes
Timber Offtake Guaranteed	No	Yes
Agroforestry Allowed	No	Yes

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.

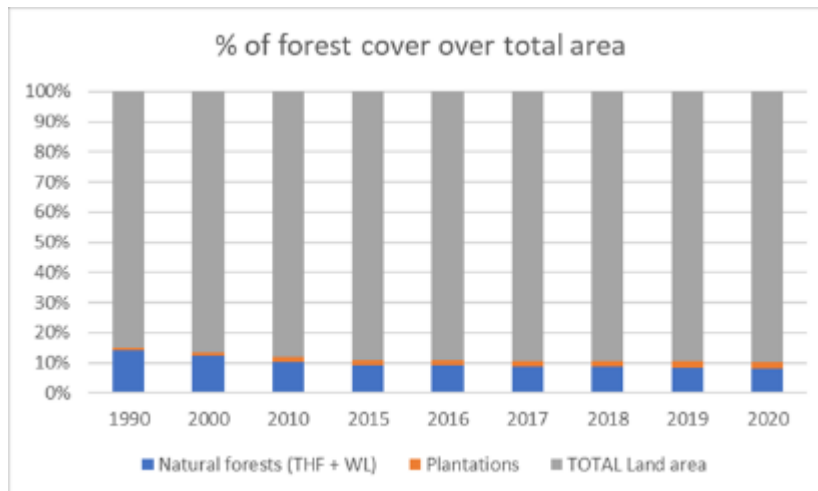


Figure 30. Forest cover Uganda. Source: project proponent based on information from FRA 2020 (FAO).

Despite the intervention of the SPGS I, II, and III, international funding, and the government of Uganda, the trends show that deforestation is continuing on an unsustainable pace and that the only assistance in commercial plantations has been through the SPGS. The SPGS has been criticized for being exclusive of farmers who have the required capital to implement the intervention before the grant repayment, and farmers who have less than 25 hectares available to plant, which represents the majority of smallholder farmers in Uganda.

Without grant funding from SPGS, farmers must bear the full cost of tree planting, which is prohibitively expensive. For instance, in a generic scenario, purchasing and transporting seedlings from NFA to plant 1,000 trees (around 1 acre) might cost approximately \$938 USD, far exceeding the average annual household income of \$401 USD. In contrast, Kijani provides all necessary inputs and training at no cost, requiring farmers to contribute only about \$10 in labor to raise the seedlings. Additionally, farmers are expected to earn a minimum of \$83 in carbon revenue for their planting efforts, with potential variations based on investment and offtake agreements. Furthermore, income from timber and charcoal production through Kijani can increase household income by 400% in just one year of planting.

Table 5. Cost estimates of growing 1,000 seedlings.

Cost Estimates of Growing 1,000 seedlings*			
	No Assistance	Nursery Hubs	
Tree Costs	815,139	0	UGX
Procurement Costs	76,000	0	UGX
Cost Per Seedling Planted	891	0	UGX
Estimated Survival Rates	25%	63%	UGX
Cost Per Seedling Grown	3,565	0	UGX

Estimated Value of Time Input	0	24,000	UGX
Cost to Grow 1 Acre	3,564,555	38,095	Years
Percent of Annual Income	230%	2%	%
Expected Income from Carbon	0	315,000	UGX

*The above table is created using expert local knowledge from self-reported information from farmers, pricing from National Forest Authority, and estimations of transport cost, seedling survival rates, and other factors from Kijani's field team's experience.

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

3.6 Methodology Deviations

I) Tree-based sample size

The size of each stratum (A_i) and inventory plots was defined in number of trees instead of hectares (as it is usually established). Explanation and further clarification are presented as follows:

Why the actual methodology requirement cannot be applied in this project?: This is because 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. The area planted is very well know, but the number of trees per ha (density) varies in each garden. Doing certain number of plots and extrapolating to the rest of the area (as normally done in forest inventories) is not correct in this case.

Which parameters are changed/updated in the project? Planted area per species is substituted by number of planted trees per species. The parameter which was modified was the size of stratum (A) which is usually expressed in hectares and is here expressed in number of trees.

What change is introduced as deviation? Forest inventory was designed on a tree basis instead of area based. Based on statistical analysis which were conducted prior to the forest inventory, the sample size inventory was determined to be 5 trees/plot. The total size of the project is measured in number of trees instead of number of hectares.

However, it is noted that Kijani keeps clear record on the total planted area per garden as this is part of their management and site registration. But these registers do not distinguish the area per species and instead, the number of trees planted per garden is registered (e.g. most of the gardens have more than one species and the area per species remains unknown, even though the total planted area is available as a whole).

Does this change impact other aspects of project? Biomass carbon removal was estimated based on the number of trees per species instead of area per species.

II) Allometric equation for ex-post estimations.

A methodological deviation will be applied to ex-post estimations given the lack of species-specific allometric equations for agroforestry systems in the project area.

Chave et al (2014) equation will be applied for ex-post estimations. This equation was developed for similar edapho-climatic conditions as the ones in the project area, and it complies with conditions (a) and (c) of paragraph 6 of AR Tool 17 (see below). However, the equation was developed based on trees growing in natural forests, and not in planted ones. This is the main reason why it wouldn't be fully applicable to the project conditions and why a methodological deviation is now applied.

According to the methodology used (AR ACM0003), there is a tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" there is a paragraph stating that "for ex-post estimation, the allometric equation used must be demonstrated to be appropriate for the purpose of estimation of tree biomass by applying the tool "Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities". In paragraph 6 of such tool (AR Tool 17), to use an allometric equation in ex-post estimation of tree biomass the following conditions must be met:

A species-specific or group-of-species-specific allometric equation derived from trees growing in edapho-climatic conditions similar to those in the project area is considered appropriate, and hence can be used for ex post estimation of tree biomass, if at least one of the following conditions is satisfied:

- (a) The equation is used in the national forest inventory, or the national GHG inventory, of the host Party;
- (b) The equation has been used in commercial forestry sector of the host Party for ten years or more;
- (c) The equation was derived from a data set of at least 30 sample trees, and the value of coefficient of determination (R^2) obtained was not less than 0.85.

The availability of species-specific allometric equations applicable to the project region and forest management which, additionally, comply with the methodological tool AR 17 requirements is very scarce.

Some reasons of why species-specific allometric equations for Uganda or similar regions is limited are explained below:

1. Limited Empirical Data: Few field studies have been conducted to develop and validate equations for native Ugandan species.
2. Reliance on Pan-Tropical Equations: Many studies and carbon assessment projects use Chave et al. (2005) due to the absence of localized models.
3. Focus on Commercial Species: Research efforts have prioritized exotic or plantation species like Pinus, Eucalyptus and Tectona, rather than indigenous species. (e.g. Forest Plantations and Woodlots in Uganda, Kaboggoza, J., Africa Forest Forum, December 2011 or Shem Kuyah, Johannes Dietz, Catherine Muthuri, Meine van Noordwijk, Henry Neufeldt, Allometry and partitioning of above- and below-ground biomass in farmed eucalyptus species dominant in Western Kenyan agricultural landscapes, Biomass and Bioenergy, Volume 55, 2013, Pages 276-284, ISSN 0961-9534, <https://doi.org/10.1016/j.biombioe.2013.02.011>.)

4. **Lack of Standardized Forestry Inventories:** While Uganda has national forest inventories, they often lack detailed biomass assessments tailored to specific native species. The national forest inventory in Uganda, uses Chave et al (2014) allometric equation to estimate the forests AGB.
5. **Funding and Research Gaps:** As seen in the studies presented in appendix 1, many of them require biomass studies require destructive sampling, which is costly and labour-intensive, limiting their application to a few species. (e.g. Allometric models for estimation of aboveground biomass of *Gmelina arborea* Roxb. in pulpwood plantations or Allometric models for estimating aboveground biomass and carbon in *Faidherbia albida* and *Prosopis africana* under agroforestry parklands in drylands of Niger)

Thorough research was conducted to identify scientifically based studies relevant to Kijani's project. The investigations considered were not limited to Uganda's national boundaries but also included studies from Africa and other similar regions worldwide. More than ten allometric equations were analysed against the species being used, the project location and appropriateness according to the tool conditions (a detailed report on the research and equations which were assessed was provided to VVB).

During the research, it was observed that many studies, including FAO investigations and national inventories, frequently referenced the allometric equations of Chave et al. (2005) and Brown (1997). These two models are widely applied in tropical forest research. Notably, these equations have been used in ARR carbon projects registered with Verra, such as a smallholder farmer project in Kenya, which utilized Brown (1997).

Also, GlobAllomTree from FAO was used to find any suitable allometric equation and one equation was found to be partially compliant with Verra's requirements (Mugasha, W. A., Eid, T., et al. (2013) complied with sample size of 40 and a $R^2=0.95$.)

The assessment concludes in Chave being the most suitable equation considering the limited available information due to:

1. **Incorporation of wood density**, making it adaptable to various plantation species.
2. **Flexibility in estimates**, allowing for calculations with or without height data.
3. **Validation with a broad dataset**, covering diverse tropical forest types

Although both Brown (1997) and Chave et al. (2005) meet the minimum sample size and R^2 coefficient requirements, Chave's model was also used in Uganda's forest inventory, making it more appropriate for biomass estimation in tropical species plantations.

Chave's allometric equation was developed using an extensive dataset from tropical forests and is designed to estimate aboveground biomass (AGB) at the individual tree level rather than at an area-based scale. The equation was derived from destructive sampling of trees across different tropical regions and accounts for key variables such as tree diameter at breast height (DBH), wood density (ρ), and tree height (H). These parameters improve biomass estimation by incorporating species-specific wood properties and structural differences among trees.

The flexibility of Chave's equation comes from its ability to estimate AGB with or without tree height data, making it particularly useful in field conditions where height measurements can be challenging. Additionally, the equation has been validated with a broad dataset that includes wet, dry, and moist tropical forests, ensuring its applicability across different ecological conditions (Chave et al., 2014).

For afforestation projects involving native trees, extrapolating Chave's equation is a logical approach since the underlying model was built to estimate individual tree biomass, which can then be aggregated at the stand level.

Chave et al. (2005, 2014) stands out not only for its scientific robustness and flexibility but also for its **institutional recognition and practical application in national-level carbon accounting**. This model has been officially utilized in **Uganda’s National Greenhouse Gas (GHG) Inventory** and in the **Forest Reference Emission Level (FREL) submitted to the UNFCCC in 2017 as part of the Tropical High Forest (THF) and woodlands carbon estimations**. Its adoption at these levels fulfills the requirement a) *The equation is used in the national forest inventory, or the national GHG inventory of “Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities...”*.

Institutional Validation in Uganda

1. Use in the National GHG Inventory
 - Uganda, like many tropical countries, follows the IPCC 2006 Guidelines for GHG reporting, which recommend the use of regionally validated allometric equations for estimating aboveground biomass (AGB).
 - In its national reporting, Uganda has explicitly referenced Chave et al. as a reliable method for estimating biomass stocks in its forests, reinforcing its applicability for afforestation projects.
 - The methodology’s integration into the inventory demonstrates that national experts and policymakers consider it robust enough for official carbon accounting.
2. Use in the Forest Reference Emission Level (FREL) – Uganda 2017
 - Uganda’s FREL submission to the UNFCCC in 2017 outlines how the country estimates carbon stocks and emissions reductions from deforestation and forest degradation.
 - Chave’s model was incorporated into the FREL methodology due to its broad applicability to tropical forests and strong empirical foundation.
 - By selecting Chave et al. over other models, Uganda demonstrated that this equation provides consistent, scientifically sound biomass estimates aligned with international reporting standards.

In cases where **species-specific equations are unavailable**, Chave’s equation provides a **scientifically defensible default method**, ensuring that biomass estimates are grounded in **peer-reviewed research and national-level validation**.

Furthermore, Chave was found to have the most conservative results compared to other equations. The comparative – which shows the total C Tree for this monitoring period for the three different equations - is presented below:

Source	C tree (t CO2)	Total C (t CO2)
Mugasha et al	919.07	1,137.54
Chave	637.46	850.30
Brown	1,183.68	1,407.45
Average	913.40	1,131.76

Chave was found to have the most conservative approach, to avoid overestimating the project removals.

Lastly, as a next step to support future verifications, Kijani will aim to develop its own allometric equations in collaboration with independent scientists. This effort seeks to enhance scientific understanding of native species.

The researchers will pursue a peer-reviewed publication to support the development of these equations. Kijani envisions that the outcomes could be shared to benefit similar projects and national inventories, promoting the use of native species over the exotic species commonly used in most initiatives.

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 824 households to plant 178,792 trees. Out of this total, 790 are included in this carbon project totalizing in 174,111 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.

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

In line with Tool 14, carbon stock in trees in the baseline are accounted as zero because the following conditions are met:

- Requirement: The pre-project trees are neither harvested, nor cleared, nor removed throughout the crediting period of the project activity;
- Compliance: Before including new gardens in the project, Kijani staff visit each field to identify if there are any pre-project trees. In case there are, they are kept unchanged the way they are never removed from their place.
- Requirement: The pre-project trees do not suffer mortality because of competition from trees planted in the project, or damage because of implementation of the project activity, at any time during the crediting period of the project activity.
- Compliance: Before including new gardens in the project, Kijani staff visit each field to identify if there are any pre-project trees. In case any pre-project tree is identified, the project layout is designed to minimize competition for resources (light, water, nutrients) between pre-project trees and newly planted trees. Also, under Kijani forest management, there is no tillage or interventions in the whole area as each tree is spot planted. The farmers do not plow the gardens before doing the spot planting and are trained to only dig a 0,5m diameter pit for planting to reduce soil disturbance. This conservative practice also reduces the risk of damaging the ecosystem and the existing biodiversity.
- Requirement: The pre-project trees are not inventoried along with the project trees in monitoring of carbon stocks but their continued existence, consistent with the baseline scenario, is monitored throughout the crediting period of the project activity.
- Compliance: Before including new gardens in the project, Kijani staff visit each field to identify if there are any pre-project trees. In case there are, these are then excluded from the inventory and carbon stocks calculations.

Apart from the above reasons, since the continuation of an activity that has been applied without changes for more than 20 years has been selected as the reference scenario, according to the IPCC Good Practice Guide for Land Use, Land Use Change and Forestry (2003) the net GHG removals by sinks in the baseline can be accounted as 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:

$$\Delta\text{CAR-CDM},t = \Delta\text{CACTUAL},t - \Delta\text{CBSL},t - \text{LK}_t$$

Where:

$\Delta\text{CAR-CDM},t$	Net anthropogenic GHG removals by sinks; t CO ₂ -e
$\Delta\text{CACTUAL},t$	Actual net GHG removals by sinks; t CO ₂ -e
$\Delta\text{CBSL},t$	Baseline net GHG removals by sinks; t CO ₂ -e
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):

$$\Delta\text{CACTUAL},t = \Delta\text{CP},t - \text{GHGE},t$$

$\Delta\text{CACTUAL},t$	Actual net GHG removals by sinks; t CO ₂ -e
$\Delta\text{CP},t$	Change in the carbon stocks in project, occurring in the selected carbon pools, in year t; t CO ₂ -e
GHGE,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:

$$\text{GHGE} = \sum_{t=1}^{t^*} \text{GHGE},t$$

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-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.

$$\Delta\text{CP},t = \Delta\text{CTREE_PROJ},t + \Delta\text{CSTRUB_PROJ},t + \Delta\text{CDW_PROJ},t + \Delta\text{CLI_PROJ},t + \Delta\text{SOCAL},t$$

Where:

$\Delta C_{P,t}$	Change in the carbon stock in project, occurring in the selected carbon pools, in year t; t CO ₂ e-
$\Delta C_{TREE_PROJ,t}$	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 CO ₂ -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 CO ₂ -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 CO ₂ -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 CO ₂ -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 CO ₂ -e

Biomass carbon pools

The aboveground biomass corresponds to tree biomass, no shrubs are considered.

Under this method, the change in carbon stock in tree biomass in two successive points in time is calculated as the difference between the two estimated stocks following equation 12 of Tool 14:

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

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.

Tree biomass for *Gmelina arborea* (B_{TREE}) was estimated based on the scientific research "Growth, biomass, carbon storage and nutrient distribution in *Gmelina arborea* Roxb." (Swamy, Puri, Singh 2002) which estimates the biomass growth rates for *Gmelina arborea*. The estimation of forest growth for the project species and area resulted in the utilization the scientific publication referred above, which was the best available information which was obtained. This publication provides individual tree biomass growth (above and below ground).

Exante Biomass estimations with the use of MYRLIN

For the case of *Acacia polyacantha* (boundaries), *Melia volkensii* (timber), *Maesopsis eminii* (timber) and Charcoal mix of species, the Methods of Yield Regulation with Limited Information (MYRLIN) model was used: <https://airimpact.co/myrlin-documentation/>. MYRLIN is a forest growth model

designed for mixed natural forests which has been developed and extended for more than 20 years. It uses the widely accepted system of WWF global biomes and ecoregions.

The model is a tool designed to provide an alternative method to estimate ex-ante carbon sequestration in situations with limited data available. Unlike traditional methods that rely on a single species or generalized growth curves, MYRLIN leverages advanced forest growth modeling to simulate diverse ecological scenarios. The model integrates a comprehensive database of species-specific growth parameters, regional climatic data, and geographic information. By doing so, it enables precise carbon estimations across all major IPCC carbon pools, including above-ground biomass, below-ground biomass, alongside deadwood and litter.

Developed and refined since 2001, MYRLIN has been successfully implemented in various tropical regions to evaluate forest growth and carbon dynamics. Its flexibility stems from its ability to incorporate species growth models and adapt to different ecoregions which are represented by Kijani's diverse planting areas. The model's architecture includes an extensive database with species and ecoregional data. This supports robust simulations of growth, mortality, natural regeneration, and carbon pool changes. For Kijani's purposes, these calculations are being accessed through an API with AirImpact.

Confidence in MYRLIN is bolstered by its use of globally recognized frameworks, such as WWF biomes and ecoregions, and its compliance with IPCC carbon accounting methodologies. The model integrates customizable parameters, such as planting density, species selection, site quality and management practices, ensuring that it meets the specific needs of Kijani's different planting designs.

What is a model? A model is a computational or mathematical representation of a real-world system or process. Its purpose is to simplify complex interactions between variables and provide an estimate or prediction based on available inputs. In many cases, the internal workings of the model are not fully traceable or reducible to a single formula. For example, in our case, the model generates annual estimates of above- and below-ground carbon in tCO₂/ha as an output based on a set of input variables. The carbon estimates are not derived through a single equation but rather emerges from the underlying logic and data patterns embedded within the model. That's precisely the role of a model: to simulate reality based on empirical data and underlying assumptions. Although models do not provide a single formula to trace all outputs back to the final ex-ante results, the project participant has prepared a PDF document titled "MYRLIN – Step by Step", which outlines all the steps taken and the results obtained. This was developed specifically to support the VVB's review and understanding of the modeling process.

To improve methodological rigor, and after in-depth research, the project adopted the MYRLIN model (Methods of Yield Regulation with Limited Information), which was identified as the best available tool under the data-scarce context. MYRLIN uses species, site location, and planting density to generate annual estimates of above- and below-ground carbon in tCO₂/ha.

However, the outputs presented two key constraints:

- Biomass was given in tCO₂ rather than dry matter (requiring conversions using methodological factors).

- Results were provided per hectare, without tree-level mortality curves.

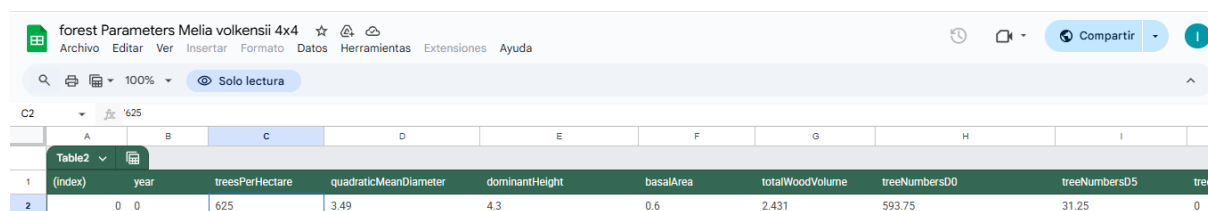
Given these two constraints, the PP chose to directly contact the model developer and start working with them to understand the underlying equations and information which the model uses to obtain the results in tCO₂.

The interaction with AirImpact is backed up with different emails and a report called “MYRLIN model response to Carbon certification questions”, where they say, among other things, that the MYRLIN forest growth model implements scientifically rigorous, peer-reviewed methodologies for forest carbon accounting that comply with IPCC Tier 2/3 standards. This response addresses specific technical questions regarding site quality adjustments, height metrics, and mortality calculations as implemented in MYRLIN version 0.7.9, based on the actual user interface and parameter implementation.

The assumptions requested by the project developer to be used by the model developer to generate the different growth curves were as follows:

- 15) Optimal soil (then adjusted to reflect a Normal site, as this is the model’s default value for all conditions. The initial forest inventory results showed growth rates that lined up with “Optimal -” so the “Normal” site quality will be conservative in comparison to the field measurements.).
- 16) No natural regeneration (in order to isolate the species)
- No mortality: since for the purpose of the information of getting down to a per-tree level. Mortality rates are then applied to the total number of trees planted per species.

Based on these assumptions, the results from the model were shared by AirImpact in an email received on May 13th, 2025. The results were provided in Google Docs form (links to each species were included in the email) and included information on DBH, height, number of trees, among others as an output to the model. A screenshot of the results as an example for one of the species is provided below.



(Index)	year	treesPerHectare	quadraticMeanDiameter	dominantHeight	basalArea	totalWoodVolume	treeNumbersD0	treeNumbersD5	treeNumbersD10	
2	0	0	625	3.49	4.3	0.6	2.431	593.75	31.25	0

As values were provided for an optimal site quality, conversions were needed to obtain the information for a normal quality site. The model developer was again engaged to understand how this conversion should be done and what the model implications were. Responses were received on June 11th, in a PDF report which stated the following (evidence has been provided to VVB):

*MYRLIN implements site quality through a user-friendly slider interface with **three discrete categories** that translate to linear multipliers applied to diameter increment calculations:*

User Interface Implementation

- **Poor** → Site quality = -0.3 (70% of normal growth)
- **Normal** → Site quality = 0.0 (100% of normal growth - default)

- **Optimal** → Site quality = +0.3 (130% of normal growth)

Mathematical Implementation

// Site quality adjustment applied to diameter increment

diameter_increment *= (1 + site_quality_value)

As part of the supporting information, the model developer indicated (as part of the same report) that the "Normal" represents average regional conditions for the ecoregion.

Following these guidelines, the DBH values were adjusted to Normal site index. The ex-ante spreadsheet includes a dropdown menu where the site quality index can be selected to assess the impact of this parameter in the total ERR estimations.

Using these parameters, Chave's et al (2014) was applied to obtain the individual tree biomass, which was then multiplied times the number of trees per use. Chave's et al (2014) has also been used for ex-post estimations, maintaining consistency between ex-ante and ex-post estimations. These estimations are based on the assumption that each species is 100% allocated for one only usage as follows¹⁵:

Timber:

- Muzisi
- Melia
- Gmelina

Charcoal:

- Lebek
- Opok
- Senna
- Senegal
- Seyal
- Calliandra

Boundary:

- Ongono
- Faidherbia
- Others

Depending on the species allocation, the forest management and cycles show variations. For instance, while timber plantations are harvested every 7-15 years (depending on the species and management), boundary trees are expected to remain standing in place to demarcate the boundaries,

¹⁵ The list includes species which were planted in 2022 as well as some species which will/could be included in the following years. However, this list does not exclude other new native species (not currently considered) to be eventually included in the project.

while reaching a growth plateau due to tree spacing and any branch pruning may be used for home consumption. On the other hand, charcoal plantations are managed in a coppicing rotation, where a tree is cut and regenerated using assisted natural regeneration techniques that the farmers are trained with. Through this, a tree will be coppiced multiple times throughout the life cycle and will be expected to be in rotation for 20 years before replanting, although research would suggest this may be done for a significantly longer period.

The following figures are the results of these various steps taken to estimate the ex-ante growth curves and removals.

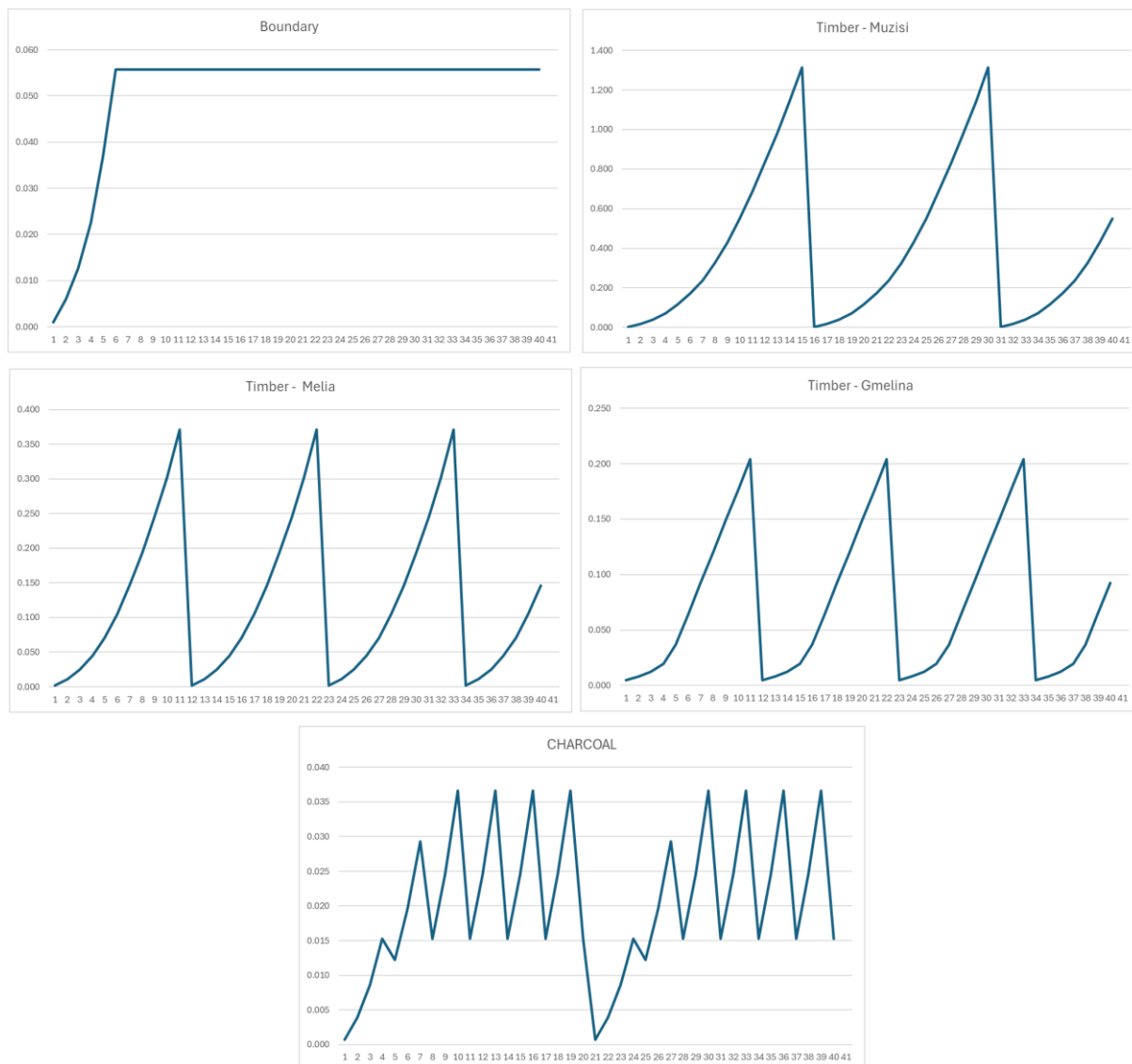


Figure 31. Tree growth curves

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.

The following figure - shows the IPCC soils categories in the project's area.

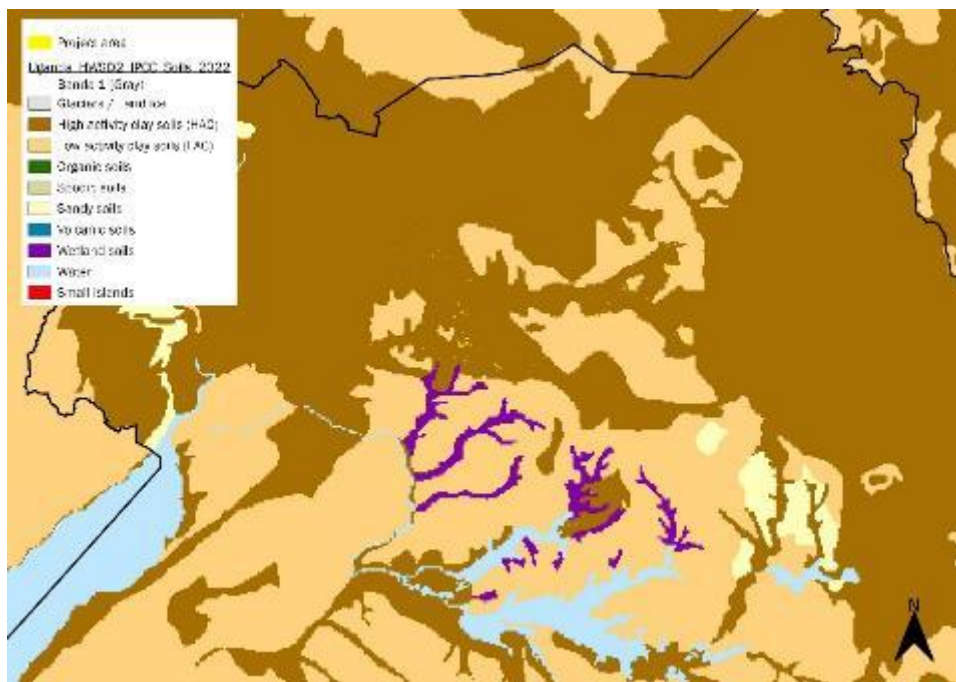


Figure 32. IPCC Soils in the project's area

Parameter	Symbol	Value	Source (SOC estimation tool, V01.1.0)
Reference SOC (tC/ha)	SOC _{REF,i}	42.78	FAO Global Soil Organic Carbon Map for Kijani Gardens located in HAC Soils and Tropical Montane climatic region
		37.71	FAO Global Soil Organic Carbon Map for Kijani Gardens located in HAC Soils and Tropical Moist climatic region
		40.73	FAO Global Soil Organic Carbon Map for Kijani Gardens located in LAC soils and Tropical Montane climatic region
Land use factor	f _{LU,i}	0.88	Table 4. Short term cultivated, tropical montane

		0.82	Table 4. Short term cultivated, tropical moist
Management factor	$f_{MG,i}$	1.09	Table 4. Reduced Tillage, tropical montane.
		1.15	Table 4. Reduced Tillage, tropical moist
Input factor	$f_{IN,i}$	0.94	Table 5. Low level of inputs, tropical montane.
		0.92	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

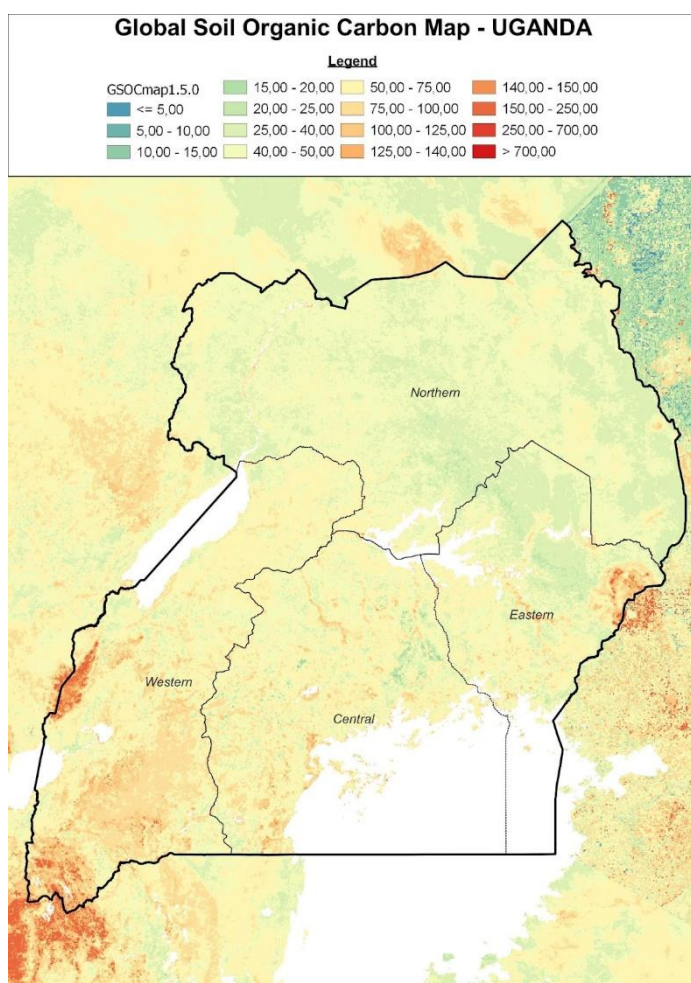
i 1,2,3 strata areas of land; dimensionless.

SOC_{REF} : Instead of using the default values given by the tool which may be more prone to less accurate information, the calculations utilize the “Global Soil Organic Carbon Map (GSOC map)” from FAO. The soil layer for Uganda was downloaded and using GIS tools each garden was classified to a significantly more accurate SOCstock value, which was then aggregated to find a weighted-average value based on the land size. Below is the table summarizing the changes in SOCstock values from the generic default values given by the tool and the more site-specific value from GSOC map:

Land Type	Initial Annual Change in SOC (tC/ha/year)	Revised Change in SOC (tC/ha/year)

Tropical Montane + HAC	88.0	42.8
Tropical Moist + HAC	65	37.7
Tropical Montane + LAC	63	40.73

The below map shows the soil organic carbon map for Uganda giving estimates for the region. Kijani is operating majorly in the northern region, showing the revised SOC aligning the with above table.



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:

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

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

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

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 zero.

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 zero.

The procedure for quantification of leakage emissions follows the “A/R methodological tool Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity” (version 02.0). The following methodological formula (equation 4 of AR-ACM0003) is used for calculating the GHG emissions due to leakage:

$$LK_t = LK_{AGRIC,t}$$

Where:

LK_t	=	GHG emissions due to leakage, in year t ; t CO ₂ -e
$LK_{AGRIC,t}$	=	Leakage due to the displacement of agricultural activities in year t , as estimated in the tool “Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity”; t CO ₂ -e

As per section 6.1 will be followed to estimate the leakage, in which leakage emission resulting from displacement of the activities is estimated as follows:

$$LK_{AGRIC,t} = \frac{44}{12} \times \Delta C_{BIOMASS,t} + \Delta SOC_{LUC,t}$$

$$\Delta C_{BIOMASS,t} = [1.1 \times b_{TREE} \times (1 + R_{TREE}) + b_{SHRUB} \times (1 + R_S)] \times CF \times A_{DISP,t}$$

$$\Delta SOC_{LUC,t} = SOC_{REF} \times (f_{LUP} \times f_{MGP} \times f_{INP} - f_{LUD} \times f_{MGD} \times f_{IND}) \times A_{DISP,t}$$

Where:

LK_t	=	Leakage emission resulting from displacement of agricultural activities in year t ; t CO ₂ -e
$\Delta C_{BIOMASS,t}$	=	Decrease in carbon stock in the carbon pools of the land receiving the activity displaced in year t ; t d.m.
CF	=	Carbon fraction of woody biomass; dimensionless.
$A_{DISP,t}$	=	Area of land from which agricultural activity is being displaced in year t ; ha
b_{TREE}	=	Mean above-ground tree biomass in land receiving the displaced activity; t d.m. ha ⁻¹
R_{TREE}	=	Root-shoot ratio for trees in the land receiving the displaced activity; dimensionless.
b_{SHRUB}	=	Mean above-ground shrub biomass in land receiving the displaced activity; t d.m. ha ⁻¹

R_S	=	Root-shoot ratio for shrubs in the land receiving the displaced activity; dimensionless.
$\Delta SOC_{LUC,t}$	=	Change in soil organic carbon (SOC) stock due to land-use change in the land receiving the displaced activity in year t ; tC ha ⁻¹
SOC_{REF}	=	SOC stock corresponding to the reference condition in native lands by climate region and soil type applicable to the land receiving the displaced activity; t C ha ⁻¹
$f_{LUP}, f_{MGP}, f_{INP}$	=	Relative SOC stock change factors for land-use, management practices, and inputs respectively, applicable to the receiving land before the displaced activity is received; dimensionless.
$f_{LUD}, f_{MGD}, f_{IND}$	=	Relative SOC stock change factors for land-use, management practices, and inputs respectively, applicable to the receiving land after the displaced activity has been received; dimensionless.
t	=	1, 2, 3, ...years elapsed since the start of the A/R CDM project activity.

As there is no displacement of activities:

$$A_{DISP,t} = 0$$

If the value of displaced area is substituted in each equation, it can be seen that the result of agricultural leakage will be equal to 0, because there is no area of land from which agricultural activity being displaced.

$$\Delta C_{BIOMASS,t} = [1.1 \times b_{TREE} \times (1 + R_{TREE}) + b_{SHRUB} \times (1 + R_S)] \times CF \times 0 = 0$$

$$\Delta SOC_{LUC,t} = SOC_{REF} \times (f_{LUP} \times f_{MGP} \times f_{INP} - f_{LUD} \times f_{MGD} \times f_{IND}) \times 0 = 0$$

$$LK_{AGRIC,t} = \frac{44}{12} \times 0 + 0 = 0$$

Thus,

$$LK_t = 0$$

5.4 Estimated Net GHG Emission Reductions and Removals

Year	Estimated baseline emissions or	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
------	---------------------------------	--	--	--

	removals (tCO _{2e})			
22-Aug-2022 to 31-Dec-2022	0	362	0	362
01-Jan-2023 to 31-Dec-2023	0	17,677	0	17,677
01-Jan-2024 to 31-Dec-2024	0	108,709	0	108,709
01-Jan-2025 to 31-Dec-2025	0	343,267	0	343,267
01-Jan-2026 to 31-Dec-2026	0	805,164	0	805,164
01-Jan-2027 to 31-Dec-2027	0	1,615,412	0	1,615,412
01-Jan-2028 to 31-Dec-2028	0	2,916,296	0	2,916,296
01-Jan-2029 to 31-Dec-2029	0	4,898,759	0	4,898,759
01-Jan-2030 to 31-Dec-2030	0	7,605,642	0	7,605,642
01-Jan-2031 to 31-Dec-2031	0	10,883,373	0	10,883,373
01-Jan-2032 to 31-Dec-2032	0	14,781,549	0	14,781,549
01-Jan-2033 to 31-Dec-2033	0	19,177,463	0	19,177,463
01-Jan-2034 to 31-Dec-2034	0	23,464,451	0	23,464,451
01-Jan-2035 to 31-Dec-2035	0	26,465,926	0	26,465,926
01-Jan-2036 to 31-Dec-2036	0	28,403,666	0	28,403,666
01-Jan-2037 to 31-Dec-2037	0	29,156,180	0	29,156,180
01-Jan-2038 to 31-Dec-2038	0	28,893,844	0	28,893,844
01-Jan-2039 to 31-Dec-2039	0	27,025,159	0	27,025,159

01-Jan-2040 to 31-Dec-2040	0	24,186,905	0	24,186,905
01-Jan-2041 to 31-Dec-2041	0	21,014,361	0	21,014,361
01-Jan-2042 to 31-Dec-2042	0	21,993,101	0	21,993,101
01-Jan-2043 to 31-Dec-2043	0	22,732,801	0	22,732,801
01-Jan-2044 to 31-Dec-2044	0	23,941,342	0	23,941,342
01-Jan-2045 to 31-Dec-2045	0	24,822,721	0	24,822,721
01-Jan-2046 to 31-Dec-2046	0	26,388,466	0	26,388,466
01-Jan-2047 to 31-Dec-2047	0	27,421,094	0	27,421,094
01-Jan-2048 to 31-Dec-2048	0	27,419,335	0	27,419,335
01-Jan-2049 to 31-Dec-2049	0	26,104,484	0	26,104,484
01-Jan-2050 to 31-Dec-2050	0	24,442,431	0	24,442,431
01-Jan-2051 to 31-Dec-2051	0	22,833,752	0	22,833,752
01-Jan-2052 to 31-Dec-2052	0	21,009,651	0	21,009,651
01-Jan-2053 to 31-Dec-2053	0	24,040,938	0	24,040,938
01-Jan-2054 to 31-Dec-2054	0	26,699,361	0	26,699,361
01-Jan-2055 to 31-Dec-2055	0	29,498,531	0	29,498,531
01-Jan-2056 to 31-Dec-2056	0	31,848,056	0	31,848,056
01-Jan-2057 to 31-Dec-2057	0	32,018,052	0	32,018,052

01-Jan-2058 to 31-Dec-2058	0	31,129,708	0	31,129,708
01-Jan-2059 to 31-Dec-2059	0	28,987,690	0	28,987,690
01-Jan-2060 to 31-Dec-2060	0	25,090,727	0	25,090,727
01-Jan-2061 to 31-Dec-2061	0	23,012,972	0	23,012,972
Total (LTA)	0	19,829,984	0	19,829,984

The ex ante buffer contributions has been established at 14% as per the AFOLU Non-permanence risk tool, which is 2,776,198 tCO₂. By subtracting out this to the total LTA of the project, it results in a total GHG credits issued to the project of 17,053,787 tCO₂.

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>i</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	CF _j
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 CO ₂ -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 $R_j = e^{(-1.085 + 0.9256 \times \ln(b))} / b$ where b is the above ground biomass.
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	f_j
Data unit	T d.m
Description	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
Source of data	Chave et al., 2014
Value applied:	$AGB = 0.0673 * (WD * DBH^2 * h)^{0.976}$
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 is used in Uganda's National Forest Inventory.
Purpose of Data	Calculation of project emissions
Comments	N/A

Data / Parameter	BTREE
Data unit	T d.m
Description	Tree biomass within the biomass estimation strata; t d.m
Source of data	Equation 4 of Appendix 1 of Methodological Tool 14 “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”.
Value applied:	Estimated as $BTREE = f_j \times (1 + R_j)$
Justification of choice of data or description of measurement methods and procedures applied	In accordance to paragraph 38 of Tool 14.
Purpose of Data	Calculation of project emissions
Comments	N/A
Data / Parameter	WD
Data unit	t/m ³
Description	Wood Density
Source of data	World Agroforestry Database
Value applied:	Variable according to species. When information is not available, a default value of 0.615 is applied.
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	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	FAO Global Soil Organic Carbon Map
Value applied:	Variable according to strata: <ul style="list-style-type: none"> - HAC, tropical montane: 42.78 - HAC, tropical moist: 37.71 - LAC, tropical montane: 40.73
Justification of choice of data or description of measurement methods and procedures applied	GSOC layer was overlaid with Kijani's garden and classified according to each IPCC climatic zones and IPCC soil classes for project area. An mean average value was assigned to each class as presented above.
Purpose of Data	Calculation of project emissions
Comments	<ul style="list-style-type: none"> - HAC, tropical montane: 64.1975 ha - HAC, tropical moist: 2.4874 ha - LAC, tropical montane: 72.0297 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: <ul style="list-style-type: none"> - 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	IPCC climatic zones for project area

measurement methods and procedures applied	
Purpose of Data	Calculation of project emissions
Comments	<ul style="list-style-type: none"> - Tropical montane: 136.23 ha - Tropical moist: 2.49 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:	<p>Reduced tillage, tropical montane: 1.09</p> <p>Reduced tillage, tropical moist: 1.15</p>
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:	<p>Variable according to strata:</p> <ul style="list-style-type: none"> - Short term cultivated, tropical montane: 0.088

	- Short term cultivated, tropical moist: 0.82
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	<ul style="list-style-type: none"> - Long term cultivated, tropical montane: 136.23 ha - Long term cultivated, tropical moist: 2.49 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

Data / Parameter	Leakage (LK _{AGRIC,t})
Data unit	t CO _{2e}
Description	Leakage emission due to the displacement of agricultural activities in year t
Source of data	Tool “Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity”
Value applied:	Zero
Justification of choice of data or description of measurement methods and procedures applied	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 zero.
Purpose of Data	Calculation of leakage 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	<p>Measurement methods according to Kijani's Work Manual. All the individuals within the sample plot will be measured.</p> <p>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). Caliper and measuring tape will be the monitoring equipment.</p>
Frequency of monitoring/recording	Before every verification event
Value applied:	N/A
Monitoring equipment	Caliper
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 of three were implemented 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	Height
Data unit	meters
Description	Height
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.

	<p>Since the trees measured were below 5 metres in height, a graduated height-bamboo-pole was used.</p> <p>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.</p>
Frequency of monitoring/recording	Before every verification event
Value applied:	N/A
Monitoring equipment	<p>Graduated pole for this verification event since the trees were below 5m.</p> <p>For future verification events, a clinometer will be used.</p>
QA/QC procedures applied	<p>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 of three were implemented to avoid errors.</p>
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	N/A

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	n_i
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
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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	$A_{p,i}$
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

Data / Parameter	$A_{disp,t}$
Data unit	ha
Description	Area of land from which agricultural activity is being displaced in year t

Source of data	Tool “Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity”
Description of measurement methods and procedures applied	Kijani has a vast track record of all the gardens working with them and is in permanent contact with all the farmers, so they would be informed if any agricultural land was displaced.
Frequency of monitoring/recording	In every verification event
Value applied:	N/A
Monitoring equipment	N/A
QA/QC procedures applied	N/A
Purpose of data	Calculation of leakage emissions
Calculation method	GPS area measurement
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.

Monitoring period goes from 22nd August 2022 to 28th August 2023.

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 polyacantha* 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 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 plots¹⁶
- *Gmelina arborea* 2022: 44 plots
- *Senegalia polyacantha* 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:

¹⁶ all the trees were lower than DBH (1.3m) so no trees could be measured

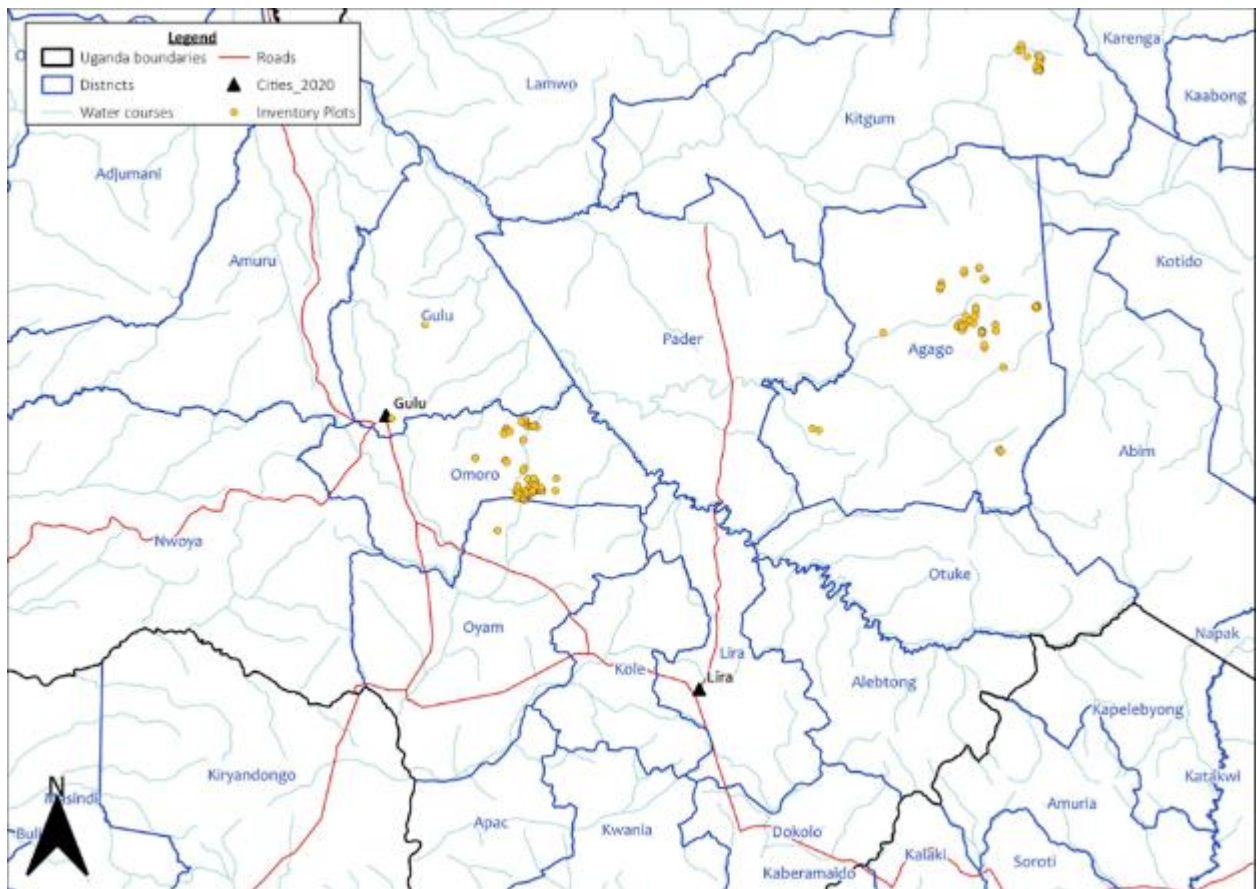


Figure 33. Location of forest inventory plots

Kijani has a protocol for the measurement of trees detailed. The protocol is identified as “Garden Inventory Guide” . An excerpt of that guide is below:

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 selection process of trees in both plot and hedgerow alignment is explained. What there is to do in 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 staff to fill out with the results of the tree measurements.

Tools and materials for field worker:

- Caliper
- Graduated height pole
- Measuring tape for DBH
- Pen
- Data collection form
- App for recording data and taking photos of physical forms

- Smartphone with GPS capability
- Paint and brush
- Clinometer, either manual or digital

Diameter at breast height (DBH)

The diameter at breast height (DBH) is taken to help us estimate the overall volume of the tree. Breast height is defined as 1.3m above the ground. The diameter of a tree stem is a length taken from the outside of the stem through the center to the opposite side of it. The prongs of the caliper are placed on opposite sides of the stem at breast-height, and adjusted until the diameter (1) is found. After recording this first diameter, the prongs are swung around 90 degrees to the perpendicular faces from those first measured, and this DBH is also recorded (2). Both diameters are recorded and an average is later taken using this equation: $(DBH1+DBH2)/2$ (this calculation is not the responsibility of field staff).

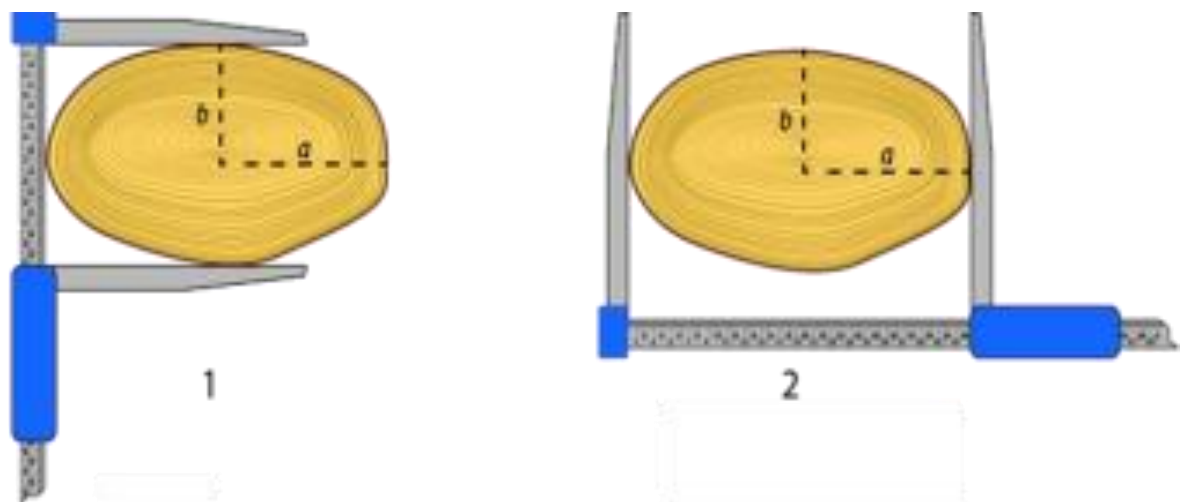


Figure 4: Diagram of the two calliper measurements to be taken

Figure 34.How to measure DBH for each tree starting with the shortest width (1) and taking its perpendicular width (2).

Not all trees grow in the same way, some will have multiple stems, crooked stems, grow at an angle or will grow on sloping land, all of these can make measuring DBH more challenging. See Figure 4 for approaches to measuring different tree shapes and orientations. For instance, trees which have a fork below breast height and have double-leaders, each stem can be measured separately and counted as an individual tree. For trees growing on slopes, measure from the highest point where the tree touches the ground. For slanted trees, measure from the underside of the stem. For trees with unusual swelling or scar tissue around the 1.3 meter level, measurements may be taken from

the nearest normal bore location, to a maximum of 30cm of the original 1.3m stem to a more representative location for the true diameter of the tree.

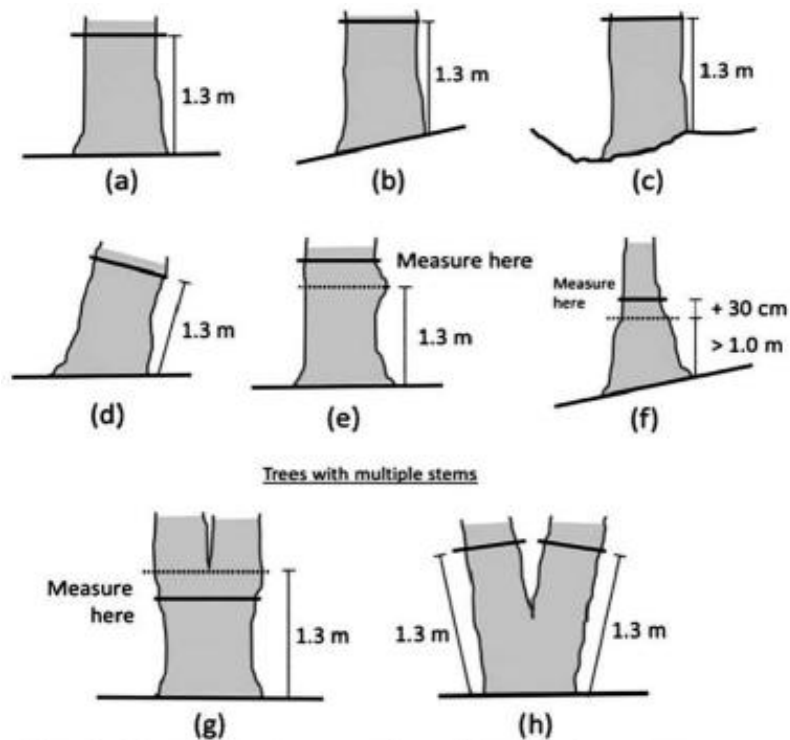


Figure 6: Diagrams showing measuring techniques for irregular trees

Figure 35. Measuring DBH on different tree-shapes and configurations.

Data recording

Data should be recorded in the field, as measurements are being taken. All of the necessary information should be filled out for each sample plot and any data gaps avoided. Make notes of newly dead or missing trees are encountered within a sample plot. A Forest Inventory visit is an opportunity to make additional observations. Record any notable changes to tree health, cover or farm management that may be helpful for Kijani's broader understanding of the progress of the garden. One form will be filled out per plot. A geotagged photo of each tree should be taken using Kijani's app or ODK app and uploaded at the end of each field session.

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:

KIJANI  FORESTRY

Forest Inventory Measurement

Measuring Date:	Data Collector's Name:
Planting Year:	Planting Season:
Farmer's Name	Sub-County:
Latitude:	Longitude:
Group Name:	Species Measured:

- Have you painted the trees (first visit)?
- Did you record the location?
- Did you take photos of each tree?
- Have you recorded any newly dead or missing trees (since last visit)?
- Have you noted any diseases or other concerns for the health of the garden?
- Did you note any major changes to how the garden is being managed?
- Did you complete all DBH and height measurements according to Kijani's procedures

Species 1: _____ Boundary or Grid: _____

Tree No.	DBH 1 (cm)	DBH 2 (cm)	Pole method: Height (m)	Angle method: Angle	Angle method: Distance to tree	Angle method: Eye height	Notes
1							
2							
3							
4							
5							
6							
7							
8							

General Notes

Figure 36. Forest Inventory Measurement Form

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



Quality Assurance and Quality Control Measures

Kijani places a strong emphasis on being a data-driven organization with an ambition to lead the industry in best practices, creating tools to operationally excel utilizing our data, while simultaneously emphasizing transparency to external stakeholders. This document outlines some of the theory and practices around data quality and control throughout our operations.

Training and Certification

To ensure the highest quality of data collection, Kijani emphasizes extensive training and certification for all field staff. This training encompasses understanding the principles of data collection, management, ethical considerations, GPS handling, and the creation and verification of KML files. Beyond initial training, Kijani implements ongoing mentorship and periodic refresher courses to align with the latest methodologies and standard operating procedures (SOPs). These educational initiatives are designed to ensure that staff not only understand the technical aspects of their roles but also the importance of accuracy and integrity in environmental data collection. Certification tests post-training assess comprehension and readiness, reinforcing Kijani's commitment to quality from the outset.

Data Collection Protocols

Kijani's data collection protocols are meticulously designed to ensure uniformity and accuracy across various data points. These protocols detail the process for accurately measuring tree heights and diameters, using GPS devices for mapping, and generating KML files for farmer plots. By adopting Open Data Kit (ODK) tools and the Kijani application, data collectors are equipped with efficient, standardized tools for data entry, minimizing human error. The protocols also include procedures for the ethical handling of data, ensuring privacy and respect for the farmers' information. This comprehensive approach ensures that data collected is reliable, timely, and directly applicable to Kijani's monitoring and evaluation needs.

Preparation Phase

- **Equipment Check:** Before heading to the field, ensure all necessary equipment, including GPS devices, mobile phones with the Kijani app and ODK tools, notebooks, and pens, are in working order. Verify that all devices are fully charged and that spare batteries or power banks are available.
- **Review of Garden Details:** Familiarize yourself with the specific garden you will be tracing. This includes reviewing any previous data collected, understanding the species of trees planted, and noting any specific instructions or observations recorded during prior visits. For a new garden registration, ensure you have all the required bio-data for the farmer before registration. For any existing farmers in the database, ensure the farmer data matches up with the information in the database before recording a new garden visit.
- **Coordination with Farmers:** Arrange a visit with the farmer or garden owner ahead of time. Confirm the best time for the visit, ensuring it does not disrupt their daily activities. Inform them about the purpose of the visit, emphasizing the focus on areas with planted trees.

On-Site Data Collection

- **Initial Meeting with the Farmer:** Upon arrival, meet with the farmer to discuss the day's activities, confirming the boundaries of the garden.

- **Preliminary Walkthrough:** Conduct a preliminary walkthrough of the garden with the farmer. Identify and mark the starting point for the data collection. Pay close attention to the layout of the garden, noting any paths, villages, or non-planted areas that should be excluded from the tracing.
- **Setting Up the GPS Device:** Configure the GPS device to begin data collection, ensuring it is set to the highest accuracy available. If using the Kijani app or ODK tools on a mobile phone, ensure the app is ready to record and that the GPS signal is strong.

Tracing the Planted Areas

- **Start at the Designated Point:** Begin tracing from the starting point identified during the walkthrough.
- **Follow the Tree Line:** Carefully walk along the edge of the area where trees have been planted. Maintain a steady pace to ensure the GPS device accurately records the garden's perimeter.
- **Avoid Non-Tree Areas:** Be vigilant to exclude paths, villages, and any sections of the garden not containing planted trees from your tracing. If you encounter such areas, pause the GPS tracking until you've navigated past the non-planted area, then resume tracking once you're back among planted trees.
- **Close the Loop:** Ensure that you complete the perimeter by returning to the starting point, creating a continuous boundary of the planted area.
- **Boundary Planting:** In the case of a boundary planting, you must only enclose the trees around the polygon drawn, not around the entire boundary. Maintain all the same procedures for beginning by tracing around the outside of the boundary, but when you reach the starting point do not stop the gps track. Continue the GPS tracking for the inside of the tree boundary as well, making sure to end in the same spot where you began the tracing.
- **Data Saving and Labeling:** Save the traced data using a unique identifier for the garden, incorporating the farmer's name, garden ID, and date of collection. This ensures easy retrieval and identification in the database. For any farmers who are already in the database, selecting the correct farmer based on the name, group ID, and gps coordinates is essential to ensure there is no duplication or double tracking of any farmers.
- **Photographic Documentation:** Take photographs of the garden, focusing on the planted areas. Make sure the photo is taken enabling GPS in the metadata. Label these photos accordingly and link them to the garden's record in the database. If a photo has been taken of the garden previously, attempt to stand in the same position for the next photo for historical comparison as the garden matures.

Post-Fieldwork Data Processing

- **Data Upload:** Once back in the office or at a location with internet access, upload the GPS data and photographs to the Kijani database. Ensure that all files are correctly linked to the garden's record.
- **Quality Check:** Perform a preliminary quality check of the data to ensure accuracy and completeness. Confirm that the mapped area accurately reflects the planted sections of the garden and that all documentation is correctly labeled and uploaded.

- **Report Submission:** Compile a brief report summarizing the garden visit, including observations, the farmer's feedback, and any recommendations for future visits. Submit this report to the MEL department for review and integration into Kijani's monitoring and evaluation framework.
- By following this detailed protocol, Kijani's field staff can ensure accurate, efficient, and respectful data collection, contributing to the organization's mission of sustainable forestry and community empowerment.

Equipment Calibration and Maintenance

Reliable data collection depends on the proper functioning of field equipment. Kijani maintains a strict regimen for the calibration and maintenance of all GPS devices and measurement tools. Regular calibration ensures the accuracy of geographical data and measurements critical for the mapping of farmer plots and the assessment of tree growth. Kijani's field staff are trained in basic equipment maintenance and troubleshooting, reducing downtime and ensuring that data collection activities proceed smoothly. This systematic care and maintenance protocol underscore the importance of precision in Kijani's environmental impact assessment.

Data Collection and Validation

- Following data collection, Kijani employs a rigorous process for data entry and validation. This involves careful input of field data into Kijani's relational database, Airtable, and subsequent validation against original forms and KML files. Automated screening processes help identify and correct discrepancies, ensuring the integrity of the dataset. The validation process is critical for maintaining the accuracy of Kijani's extensive database, enabling effective monitoring, evaluation, and strategic decision-making based on reliable data.
- Kijani's MEL system is distinguished by its integration with cutting-edge technologies, including Geographic Information Systems (GIS) and mobile data collection tools. The GIS framework enables precise tracking and mapping of project progress, enhancing the visualization of M&E results. This integration facilitates data-driven decision-making, optimizing program effectiveness based on geographic insights.
- The utilization of the Kijani application and Open Data Kit (ODK) tools for mobile data collection streamlines the process, allowing for real-time data submission. Quantum GIS (QGIS) further complements these efforts, providing a robust platform for geospatial data analysis and editing. This technological ecosystem ensures that Kijani's M&E activities are not only efficient but also grounded in accurate, spatially-referenced data.

Quality Checks on KML Files

- KML files are essential for the accurate geographical representation of farmer plots. Kijani conducts regular quality checks on these files, comparing them against satellite imagery and on-the-ground verification to ensure their accuracy. This involves cross-referencing the

geographical data with physical measurements and observations made by field teams. Regular audits of KML files ensure that the geographical data accurately represents the ground realities, facilitating precise resource allocation and impact analysis.

- Kijani has invested in developing a visualization software called Restoration Scope that is used to view and modify the shapefiles. An office-based team will review each of the kml after submission performing an internal quality check on all the kml after they have been submitted, ensuring the boundaries are accurate.

Regular Audits and Field Verification

Kijani's approach to quality control includes periodic audits and field verification, where a subset of data is re-evaluated by an independent internal team. This process not only validates the accuracy of the data collected but also assesses the adherence to Kijani's SOPs and data collection protocols. These audits are essential for identifying areas for improvement, ensuring that Kijani's data collection efforts are continually refined and optimized for accuracy and reliability.

Feedback Loops and Continuous Improvement

Kijani has established robust feedback mechanisms between field staff, data management teams, and the MEL department. This feedback is instrumental in identifying challenges, opportunities for improvement, and best practices in data collection and management. Insights gained from the field are systematically analyzed and used to refine training materials, update protocols, and introduce new tools or methods. This culture of continuous improvement ensures that Kijani's data collection processes remain at the forefront of technological and methodological advancements.

Reporting and Documentation

Comprehensive reporting and documentation are central to Kijani's QA/QC procedures. This includes detailed documentation of training sessions, audit findings, and corrective actions undertaken. By maintaining transparent and accessible records, Kijani ensures accountability and facilitates knowledge sharing among stakeholders. This documentation serves as a valuable resource for learning, enabling Kijani to build upon its successes and address any shortcomings effectively.

Through these QA/QC procedures, Kijani Forestry not only ensures the quality and integrity of its data but also reaffirms its commitment to environmental stewardship and the empowerment of farming communities through sustainable forestry practices.

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 1,215 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	H
Data unit	meters
Description	Height of the trees
Value applied:	2.7 m
Comments	Average height for 1,215 trees measured

Data / Parameter	N
Data unit	units
Description	Number of plots per strata
Value applied:	<i>Maesopsis eminii</i> : 6 plots <i>Melia vokensii</i> : 118 plots <i>Albizia lebbek</i> : 1 plot <i>Gmelina arborea</i> : 44 plots <i>Senegalia polyacantha</i> : 43 plots <i>Senna siamae</i> : 30 plots <i>Terminalia glaucescens</i> : 2 plots
Comments	244 plots were measured in total

Data / Parameter	$A_{disp,t}$
Data unit	ha
Description	Area of land from which agricultural activity is being displaced in year t
Source of data	Field measurement
Value applied:	Zero
Justification of choice of data or description of measurement methods and procedures applied	No activities were displaced during the monitoring period due to the implementation of the project.
Purpose of Data	Calculation of leakage emissions
Comments	n/a

7.2 Baseline Emissions

In line with Tool 14, carbon stock in trees in the baseline are accounted as zero because the following conditions are met:

- The pre-project trees are neither harvested, nor cleared, nor removed throughout the crediting period of the project activity;
- The pre-project trees do not suffer mortality because of competition from trees planted in the project, or damage because of implementation of the project activity, at any time during the crediting period of the project activity.
- The pre-project trees are not inventoried along with the project trees in monitoring of carbon stocks but their continued existence, consistent with the baseline scenario, is monitored throughout the crediting period of the project activity.

Before including new gardens in the project, Kijani staff visit each field to identify if there are any pre-project trees. In case there are, this are then excluded from the inventory and carbon stocks calculations.

Apart from the above reasons, since the continuation of an activity that has been applied without changes for more than 20 years has been selected as the reference scenario, according to the IPCC Good Practice Guide for Land Use, Land Use Change and Forestry (2003) the net GHG removals by sinks in the baseline can be accounted as 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:

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

Where:

$\Delta_{CAR-CDM,t}$	Net anthropogenic GHG removals by sinks; t CO ₂ -e
$\Delta_{ACTUAL,t}$	Actual net GHG removals by sinks; t CO ₂ -e
$\Delta_{BSL,t}$	Baseline net GHG removals by sinks; t CO ₂ -e
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):

$$\Delta_{ACTUAL,t} = \Delta_{CP,t} - GHG_{E,t}$$

$\Delta_{ACTUAL,t}$	Actual net GHG removals by sinks; t CO ₂ -e
$\Delta_{CP,t}$	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:

$$GHGE = \sum_{t=1}^{t^*} GHGE_{t}$$

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:

ΔC _{P,t}	Change in the carbon stock in project, occurring in the selected carbon pools, in year t; t CO2e-
ΔC _{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
ΔC _{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
ΔC _{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
ΔC _{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
ΔSOC _{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 14 version 04.2: “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. To estimate the change in carbon stock in trees between two points of time, the method used was the estimation by measurement of sample plots.

Under this method, the change in carbon stock in tree biomass in two successive points in time is calculated as the difference between the two estimated stocks following equation 12 of Tool 14:

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

Where

C_{TREE}	Carbon Stock in tree biomass within the project boundary; t CO ₂ -e.
B_{TREE}	Biomass of trees within the project boundaries
C_{FTREE}	Carbon fraction of tree biomass; tool default value 0.47 t C td.m ⁻³ .

Following the tool instructions, tree biomass (B_{TREE}) in a sample plot was estimated by applying one of the equations provided in appendix 1 of tool 14. In this case, as in ex-ante estimations, the following equation was used to estimate above and below ground biomass ex-post measurements (Appendix 1 – equation 4):

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

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

$f_j(x_{1,l}, x_{2,l}, x_{3,l}, \dots)$ 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.

R_j Root-shoot ratio for tree species j. The value was estimated as $R_j = \frac{e^{(-1.085 + 0.9256 \times \ln b)}}{b}$ where b is the above ground biomass.

The applied allometric equation for the calculation of above ground biomass (f_j) is the one proposed by Chave et al (2014) to estimate the aboveground biomass of tropical trees¹⁷. This equation is based on DBH values, height and wood density values and it estimates individual tree biomass. The equation is presented below:

$$AGB = 0.0673 (WD * DBH^2 * H)^{0.976}$$

Where

AGB: Above ground biomass (kg)

¹⁷ Chave, Jérôme & Réjou-Méchain, Maxime & Burquez, Alberto & Chidumayo, Emmanuel & Colgan, Matthew & Delitti, Wellington & Duque, Alvaro & Eid, Tron & Fearnside, Philip & Goodman, Rosa & Henry, Matieu & Martinez-Yrizar, Angelina & Mugasha, Wilson & Muller-Landau, Helene & Mencuccini, Maurizio & Nelson, Bruce & Ngomanda, Alfred & Nogueira, Euler & Ortiz, Edgar & Vieilledent, Ghislain. (2014). Improved allometric models to estimate the aboveground biomass of tropical trees. *Global Change Biology*. 20. 3177-3190. 10.1111/gcb.12629.

DBH: Diameter at Breast Height (cm)

WD: Wood Density (t/m³)

H: Height (m)

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 used for the National Forest Inventory in Uganda (2019).

The wood density values were taken from the World Agroforestry Database. For the species for which no information was available, a default value of 0.615 is applied.

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}	42.78	FAO Global Soil Organic Carbon Map for Kijani Gardens located in HAC Soils and Tropical Montane climatic region
		37.71	FAO Global Soil Organic Carbon Map for Kijani Gardens located in HAC Soils and Tropical Moist climatic region
		40.73	FAO Global Soil Organic Carbon Map for Kijani Gardens located in LAC soils and Tropical Montane climatic region
Land use factor	f _{LU,i}	0.88	Table 4. Short term cultivated, tropical montane
		0.82	Table 4. Short term cultivated, tropical moist
Management factor	f _{MG,i}	1.09	Table 4. Reduced Tillage, tropical montane.
		1.15	Table 4. Reduced Tillage, tropical moist

Input factor	$f_{IN,i}$	0.94	Table 5. Low level of inputs, tropical montane.
		0.92	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
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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
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According to the tool, the value of dSOC is not accounted as more than 0.8 tC/ha/year, so:

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

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

$$\Delta\text{SOC}_{\text{AL},t} = 44/12 * \sum A_i * d\text{SOC}_{t,i} * 1\text{year}$$

Where

$\Delta\text{SOC}_{\text{AL},t}$ 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

$d\text{SOC}_{t,i}$ 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 zero.

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.

In other words, -according to the A/R methodological tool 15 (-Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity) the displacement of an agricultural activity by itself does not result in leakage emission. Note 2 of paragraph 9 of the tool, states that leakage emissions occur when the displacement leads to an increase in GHG emissions relative to the GHG emissions attributable to the pre-project activity within the project boundary, which is not the case of the project activity as it does not displace agricultural production and instead, the activity is implemented in the same areas without risking the production of crops for domestic consumption.

To understand the non-existence of leakage emissions is needed to explain the agriculture sector in Uganda. The gardens in which the project is implemented, belongs to farmers that usually have no

more than 1 or 2 ha of land. In that land, they live with their family and produce mainly crops to be sold in the market. Their way of doing agriculture is of subsistence. Beef or dairy cattle is rarely seen as it means a large immobilized capital. But when existent, the herd is permanently moving around (there are no fences) together with the farmer in its own land or sometimes common village areas. Sometimes the herd is kept around the farmer's huts (houses) and the forage is taken from the surroundings.

Paragraph 10 of methodological tool 15 is accomplished as there is no displacement of animals because of the project activities as animals are rarely seen in the project area and in case there are any, animals remain being part of the ecosystem.

When doing the project:

- The project area does never occupy more than 15 to 25% of farmer area
- The rest of the farmers area is available for forage consumption if needed
- The project area is agroforestry, which means the animals will still have forage in it

Thus, the animals will never leave the area and there will always be forage available.

Therefore and based on the above mentioned reasons leakage emissions are estimated as zero.

7.5 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)	Buffer pool allocation	VCUs eligible for Issuance
Year 2022 (22/08/2022 - 31/12/2022)	0	301	0	301	42	259
Year 2023 (01/01/2023 - 28/08/2023)	0	549	0	549	77	472
Total	0	850	0	850	119	731

As it is presented in the table above, the project total achieved removals (ERR) for the first monitoring period is 850 tCO₂. As per the monitoring period of 1 year and 6 days, the total achieved ERR annual for the first monitoring period is 850 tCO₂ per year.

The total buffer credits is also presented above and equals to 119 tCO₂.

<u>Year</u>	<u>Ex-ante emissions reduction/removals</u>	<u>Achieved emissions reductions/removals</u>	<u>Percent difference</u>	<u>Justification for the difference</u>
2022 (22/08/2022 - 31/12/2022)	362	301	- 17 %	<p>The difference between exante and ex-post carbon estimations is primarily due to discrepancies between the projected growth model parameters used at the ex-ante stage and the actual field measurements obtained during the ex-post forest inventory.</p> <p>Ex-ante estimations are based on expected growth patterns derived from species-specific models and assumptions available at the time of project design.</p> <p>In this case, the ex-post inventory was conducted on trees that were only one year old, which is a very early stage in the growth cycle. At this stage, growth patterns are not yet fully stabilized, and early measurements may not fully reflect the trends anticipated by the model over the long term.</p> <p>Specifically, while the average diameter at breast height (DBH) recorded in the ex-post inventory was 16% higher than the ex-ante estimates, the tree height was on average 35% lower than projected. This discrepancy in growth dynamics—particularly height, which significantly influences volume and biomass calculations— resulted in a net 17% difference in total estimated carbon stocks.</p>
2023 (01/01/2023- 28/08/2023)	647	549	-15 %	Idem above
TOTAL	1,009	850	- 16 %	Idem above.