Project Description
for
TIST Program in Kenya
VCS-002

for validation under

The Voluntary Carbon Standard

Template Date: 19 November 2007

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VCS Project Description
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Project Overview

The International Small Group and Tree Planting Program (TIST) empowers Small Groups of subsistence farmers in India, Kenya, Tanzania, Uganda, Nicaragua, and Honduras to combat the devastating effects of deforestation, poverty and drought. Combining sustainable development with carbon sequestration, TIST already supports the reforestation and biodiversity efforts of over 63,000 subsistence farmers. Carbon credit sales generate participant income and provide project funding to address agricultural, HIV/AIDS, nutritional and fuel challenges. As TIST expands to more groups and more areas, it ensures more trees, more biodiversity, more climate change benefit and more income for more people.

Since its inception in 1999, TIST participants organized into over 8,900 TIST Small Groups have planted over 10 million trees on their own and community lands. GhG sequestration is creating a potential long-term income stream and developing sustainable environments and livelihoods. TIST in Kenya began in 2004 and has grown to nearly 50,000 TIST participants in over 6,700 Small Groups.

As a grass roots initiative, Small Groups are provided a structural network of training and communications that allows them to build on their own internal strengths and develop best practices. Small Groups benefit from a new income source; the sale of carbon credits that result from the sequestration of carbon from the atmosphere in the biomass of the trees and soil. These credits are expected to be approved under the Voluntary Carbon Standard and, because they are tied to tree growth, will be sustainable. The carbon credits create a new 'virtual' cash crop for the participants who gain all the direct benefits of growing trees and also receive quarterly cash stipends based on the GhG benefits created by their efforts. The maturing trees and conservation farming will provide additional sustainable benefits that far exceed the carbon payments. These include improved crop yield, improved environment, and marketable commodities such as fruits, nuts, and honey. TIST utilizes a high-tech approach to quantify the benefits and report the results in a method transparent to the whole world, which includes palm computers, GPS, and a dynamic "real time" internet based database.

1.0 Project Description

1.1 Project title

The International Small Group and Tree Planting Program, Kenya, VCS-002

(Version 02)

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1.2 Type of the project

This project is to be registered under the Voluntary Carbon Standard (VCS, 2007.1) as an Afforestation, Reforestation and Revegetation (ARR) project and has been developed in compliance with the VCS Guidance for Agriculture, Forestry and Other Land Use Projects (VCS, 2008). It is not a grouped project.

1.3 Estimated reductions

This is a medium sized project with ex ante estimates of 13,663 t CO_2e per year and 409,891 t CO_2e over the 30-year crediting period.

1.4 Description of the project

Since its inception in 1999, over 63,000 participants organized into over 8,900 TIST Small Groups have planted over ten million trees in Tanzania, India, Kenya, Uganda, Nicaragua, and Honduras - accomplishing GhG sequestration through tree planting, creating a potential long-term income stream, and developing sustainable environments and livelihoods. Replication of TIST in Kenya began in 2004.

Currently over 50,000 TIST participants in over 6,900 Small Groups are registered in the TIST program in Kenya and are working to break their local cycle of deforestation, drought and famine. The trees planted in tens of thousands of discrete groves and land parcels are already beginning to reduce erosion, stabilize and enrich the soil, and will soon be providing shade. In the future, they will provide other benefits, including edible fruits and nuts, medicines, windbreaks, firewood and timber.

This PD is for a subset of the reforestation project in Kenya and applies to 296 of the Small Groups, 2,283 members, 1,051 project areas and 398.1 ha. The main species planted are Eucalyptus spp., Grevillea robusta and Cupressus spp.

As a grassroots initiative, Small Groups are provided a structural network of training and communications that allows them to build on their own internal strengths and develop best practices. Small Groups benefit from a new income source; the sale of carbon credits that result from the sequestration of carbon from the atmosphere, in the biomass of the trees and soil. These credits are expected to be approved under VCS and, because they are tied to tree growth, will be sustainable. The carbon credits create a new 'virtual' cash crop for the participants who gain all the direct benefits of growing trees and also receive quarterly cash stipends based on the GhG benefits created by their efforts. The maturing trees and conservation farming will provide additional sustainable benefits that far exceed the carbon payments. These include improved crop yield, improved environment, and marketable commodities such as fruits, nuts, and honey. TIST utilizes a high-tech approach to quantify the benefits and report the results in a method transparent to the whole world, which includes palm computers, GPS, and a dynamic "real time" internet based database.

TIST contributes to the following indicators for sustainable development – Social well-being, Economic well-being, Technological well-being, and Environmental well-being:

Socio-economic well-being.

- TIST generates employment of local quantifiers and staff who travel to TIST tree groves and woodlots to quantify the number, location, circumference, and species of trees planted as a result of this project activity. The project also provides jobs for an office staff, who oversee the production of the TIST newsletter, the scheduling and coordination of node meetings, the synchronization of palm data from the quantifiers, and the establishment of the voucher payment system.

- TIST reinforces the removal of social disparities by encouraging participation among all members of society regardless of income, religion, or sex. TIST also removes social disparities by training participants to use the concept of rotating leadership within the Small Group format.

- TIST reinforces good practices for human health. TIST provides training on the use of UNFAO conservation farming practices, which, when adopted, have resulted in a doubling of crop output in many cases and helped to secure food, especially during periods of drought. In addition, TIST uses the Small Group node meetings as a delivery mechanism to train participants in health matters including HIV/AIDS awareness and prevention.

Technological well-being.

TIST provides the transfer of environmentally safe and sound technologies, including the use of palm computers, laptop computers, GPS devices, Internet, and UNFAO conservation farming best practices. In addition, the TIST newsletter documents best practices, identified by the participants themselves, for sharing appropriate and adaptive technologies with one another.

Environmental well-being.

- The TIST program improves resource sustainability and reduces resource degradation. Because TIST participants plant trees, and because not all trees survive, the deadfall alone will reduce the need for participants to continue to cut down trees outside TIST project boundaries after just a few years. Once enough trees are planted, they have the potential to provide a sustainable fuel wood supply.

- Resource degradation exists when soils erode. TIST trees directly stabilize soils. They also provide shade that enables grasses to grow under the canopy, which further reduces soil degradation. They produce fruit, nuts, and traditional medicines, which lessen the pressure to obtain these from non-TIST tree stocks.

- By empowering Small Groups to select which tree species to plant and training on benefits of indigenous species, the project reinforces biodiversity friendliness. Because of the diversity of Small Groups, the disparate locations of their groves, the decentralized nature of their decision-making, and the variety of species planted, TIST represents the antithesis of a single, large monoculture plantation.

- The impact of TIST is to reduce the levels of pollution in general. TIST provides an improvement in air quality through the sequestration of carbon. Soil stabilization that results from TIST also has the ability to improve water quality over the long-term. TIST does not own a fossil-fueled vehicle.

1.5 Project location

The TIST Kenya Project is located in central Kenya in the Central, Rift Valley and Eastern Provinces. Most of the project activity is centered around Meru and Nanyuki generally around latitude 0.141100 N, longitude 37.693400 E. See Figure 1.5.

Figure 1.5: General area of the TIST project

The district and village of each project area are in Appendix 04, "Grove Summary" worksheet.[1] The geographic locations and boundaries of each project area have been determined using a GPS and identified with a unique number and geographic coordinate. Appendix 01 shows the single point location of each project area on a 1990 Landsat 4/5 satellite image.[2] Appendix 02 shows the single point location of each project area on a 2000 Landsat 7 satellite image.[3] Appendix 03 is KML file that can be loaded on Google Earth that identifies each project area and plots each boundary.[4] In addition, TIST maintains all of this data in an interactive format on a website that is publicly available to anyone with internet access. Included on the site are GPS tracks of the project areas on a geographic grid. It can be accessed as follows:

1. Go to tist.org
2. At top, select Project Area (example: Kenya). Note Country Profile information showing current tree count, Small Group count and predominate species information for all the TIST activities in the country. This information, as well as the rest of the information on the web site, is updated as much as several times a day as field staff upload their data.

[1] Appendix 04, Excel spreadsheet "TIST KE PD-VCS-002e App04 Data 100826 Kin-Ntu.xls"
[2] Appendix 01, "TIST KE PD-VCS-002b App01 LSat1990 Map.jpg" (1990 Landsat image file) and "TIST KE PDD-VCS-002b App01 LSat1990 Map.jgw" (georeference file).
[3] Appendix 02, "TIST KE PD-VCS-002c App02 LSat2000 Map.jpg" (2000 Landsat image file) and " TIST KE PD-VCS-002c App02 LSat2000 Map.jgw" (georeference file).
[4] Appendix 03, "TIST KE PDD-VCS-002d App03 PA Plots.kml" (Google Earth file with Project Area plots).

3. On the right, below map, select a Project Area (example: select Nanyuki). Note current Area Profile summaries at top showing current tree count, Small Group count and predominate species information for all the TIST activities in the Project Area.
4. Towards bottom, select a Group Center (example: Naro Moru). Note current Group Center Profile data at top showing current tree count, Small Group count and predominate species information for all the TIST activities in the Group Center.
5. Select link "Click Here to View the Quantified Tree Groves in this Group Center Displayed on a Satellite Map." A Google Maps satellite image will appear with red dots showing the location of all the project areas assigned to this Group Center. Placing the cursor and clicking on a dot will display an information balloon about that project area.
6. Use the browser back button to return to the Group Center Profile page.
7. Note the table at bottom of page listing the Small Groups assigned to this Group Center, their tree and seedling counts and the Last Audit Date.
   a) The camera icon next to the group name is a link to pictures of the Small Group and their project areas. Digital photographs are taken with TIST's data acquisition system and are automatically dated and mapped to the Small Group.
   b) The Adobe icon is a link to the Small Groups GhG contract with the Project Participant. It is password protected and not generally available to the public.
   c) Last Audit Date refers to the last time a TIST Quantifier (a staff member trained to collect project area data using TIST's data acquisition system) collected data from this Small Group's project area. It is a link to detailed quantification data.
8. Select one of the dates under Last Audit Date (example: date associated with Group G.A.P).
9. On the Tree Audit page is a list of each project area belonging to the selected Small Group. Under Groves Present are the name, latitude and longitude of the project area.
10. Select a Name in the Groves Present section (example: Kimani) that is a hot link and the GPS perimeter of that project area will appear showing the bounding latitude and longitude, identification and area.
11. On the same page, select the link at the top "Click here to view this grove perimeter plotted on a satellite image." The perimeter of the project area is now displayed on a Google Maps satellite image. If there is a grey screen stating "we are sorry, but we don't have imagery at this zoom level for this region" use the minus button ("-") at the top left to zoom out until the satellite image comes into view. Additional clicking on the minus button will display the project area with a regional perspective.
12. On the satellite page, there are two other options. The first link, "Click Here to View Pictures of the TIST Small Group that has Planted Trees in this Grove" goes to the same set of pictures described in 7.a., above. The second link, "Click Here to View All the Quantified Tree Groves in this Group Center Displayed on a Satellite Map," displays all of the project areas in the Group Center as described in 5., above.
13. Use the browsers back button to navigate back to the Tree Audit page to see more details about each project area including species, tree count and age.

1.6 Duration of the project

The project start date and the crediting period start date is 1 January, 2004. The crediting period is 30 years.

1.7 Conditions prior to project initiation

Climate: The general climate of central Kenya is dry tropical but influenced by the 5,200 meter Mount Kenya. The climate within the general project area is highly heterogeneous, with local conditions being heavily contingent upon elevation, location, and amount of rainfall. The average annual rainfall varies widely by locality, but is roughly around 630mm per year for the entire country.[5] Within the general project area, rainfall can be as little as about 381mm[6] or as much as 2,500 mm per year. The lowest rainfall is in the plains west of Mt Kenya. The highest rainfall is on the southeastern slopes which are exposed to the dominant wind blowing from the Indian Ocean. Most parts of the country experience two wet seasons each year, with long rains from March-June and short rains from October-November.[7] The dry season occurs around June-July and December-January.[8]

The average annual temperature is about 20.0°C, but ranges from 15.5°C to 30.0°C depending on the region.[9] While night frost occurs above 3,000 meters along the flanks of Mt Kenya, the project activities take place between 1,500 and 2,000 meters. The average temperatures around Nanyuki are highs between 20-25°C and lows of about 5°C. Highs in Meru are similar, but the lows are about 5-10°C.

Soils: The Nanyuki area is characterized by tertiary volcanic rocks. In Meru, the rocks are quaternary volcanics with pockets of basement rocks to the east and tertiary volcanics to the south. The grasslands with low rainfall have dark top horizons and high proportions of clay minerals. The main soil types are Phaeozems, Planosols and Vertisols. On the lower slopes of Mt Kenya, where there is plentiful rainfall, the soils are red, with considerable amounts of clay and organic matter. The main soil groups are Nitisols, Cambisols and Andosols. The upper slopes of Mt Kenya (above 2,400) have dark surface horizons and low bulk density. They are also rich in organic matter and are mainly formed from young pyroclastic rocks. These soils include Regosols, Histosols and Andosols.[10]

Watersheds: The area south of a line running northeast from Mt Kenya to beyond Meru is drained by the Tana River. Its tributaries include the Gathita, Thingithu, Kithinu, Nithi, Tungu, Ruguti, Thuci, Rupingazi, Nyamindi, Thiba, Rwamuthambim Ragati, Sagana, and Nairobi Rivers. The area north and west of Mt Kenya is drained by the Ewaso Nyiro. Its tributaries include the Naromoro, Burguret, Liki, Sirimon and Engare Ngare Rivers.

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[5] *Irrigation in Africa in figures – AQUASTAT survey 2005: Kenya*, AQUASTAT, accessed 7 July 2009 at http://www.fao.org/nr/water/aquastat/countries/kenya/index.stm,. (”AQUASTAT”)
[6] Robin Barr and Jacob McGrew, "Landscape-Level Tree Management in Meru Central District, Kenya", Agroforestry In Landscape Mosaics, Working Paper Series, Yale University Tropical Resources Institute, 2004. Accessed November 18, 2010 at http://74.125.155.132/scholar?q=cache:BTqCPiurjbwJ:scholar.google.com/&hl=en&as_sdt=200000000000
[7] AQUASTAT.
[8] *Country Profiles: Kenya*, Food and Agriculture Organization of the United Nations, at http://www.fao.org/countryprofiles/maps.asp?iso3=KEN&lang=en, accessed 7 July 2009.FAO. (“FAO”)
[9] FAO.
[10] NAREDA Consultants, Environmental Audit Report For TIST Project Activities, Final Report, April 2010. Page 16-20. ("NAREDA")

Ecosystems: The project areas that are located on the slopes of Mt Kenya and on the northeast trending highlands that pass through Meru and include the Nyambeni Hills are in the East African montane forest.[11] The lower altitude areas in the vicinity of Nanyuki and Naro Moru are part of the Northern Acacia-Commiphora bushlands and thickets.[12] With the exception of some protected forests, little of the general area that surrounds the project areas is in a natural state. This is due to high level of human activity, primarily for agriculture.

Rare and Endangered Species: A list of rare and endangered species that were potentially present in the project areas was compiled through review of the literature and discussion with local experts. Field observations by TIST staff, discussions with forest department officials and villagers indicate the absence of any endangered or rare species in the project areas.

Kenya is widely known for its abundant and diverse wildlife, especially large mammals. While many of these animals were present in the projects areas in the past, the long history of human habitation and agriculture has pushed them to isolated pockets of protected areas, such as the Mt Kenya National Park, Mt Kenya Forest, Meru Forest, Upper Imenti Forest, Nyambini Forest and Ndare Forest. Human/animal conflicts are present in the general area. For example, there are many long distance fencing systems present in the Meru area to keep elephants away from areas of human habitat. The project areas are lands under the control of subsistence farmers where wildlife has been long removed and replaced by domesticated animals and plants.

Table 1.7 IUCN Red List of Threatened Species

Scientific Name	Common Name	Status
Mammals		
Acinonyx jubatus	Cheetah	VU
Bdeogale jacksoni	Jackson's Mongoose	NT
Caracal aurata	African Golden Cat	NT
Ceratotherium simum	White Rhinoceros	NT
Crocidura allex	East African Highland Shrew	VU
Crocidura fumosa	Smoky White-toothed Shrew	VU
Diceros bicornis	Black Rhinoceros	CR
Eidolon helvum	Straw-coloured Fruit Bat	NT
Equus grevyi	Grevy's Zebra	EN
Eudorcas thomsonii	Thomson's Gazelle	NT
Grammomys gigas	Giant Thicket Rat	EN
Hippopotamus amphibius	Hippopotamus	VU
Hyaena hyaena	Striped Hyaena	NT
Litocranius walleri	Gerenuk	NT
Loxodonta africana	African Elephant	NT
Lycaon pictus	African Wild Dog	EN
Oryx beisa	East African Oryx	NT

[11] World Wildlife Fund, Ecoregion AT0108. Assessed November 19, 2010 at http://www.worldwildlife.org/wildworld/profiles/terrestrial/at/at0108_full.html.
[12] World Wildlife Fund, Ecoregion AT0711. Assessed November 19, 2010 at http://www.worldwildlife.org/wildworld/profiles/terrestrial/at/at0711_full.html.

Table 1.7 IUCN Red List of Threatened Species		
Scientific Name	**Common Name**	**Status**
Otomops martiensseni	Large-eared Free-tailed Bat	NT
Panthera leo	Lion, African Lion	VU
Panthera pardus	Leopard	NT
Surdisorex norae	Aberdare Mole Shrew	VU
Surdisorex polulus	Mt. Kenya Mole Shrew	VU
Taphozous hildegardeae	Hildegarde’s Tomb Bat	VU
Tragelaphus eurycerus	Bongo	NT
Tragelaphus imberbis	Lesser Kudu	NT
Birds		
Acrocephalus griseldis	Basra Reed Warbler	EN
Aquila clanga	Greater Spotted Eagle	VU
Aquila heliaca	Asian Imperial Eagle	VU
Ardeola idae	Madagascar Pond-Heron	EN
Balaeniceps rex	Shoebill	VU
Cinnyricinclus femoralis	Abbott’s Starling	VU
Circus macrourus	Pallid Harrier	NT
Cisticola aberdare	Aberdare Cisticola	EN
Euplectes jacksoni	Jackson’s Widowbird	NT
Falco naumanni	Lesser Kestrel	VU
Francolinus sterptophorus	Ring-necked Francolin	NT
Gallinago media	Great Snipe	NT
Glareola nordmanni	Black-winged Pratincole	NT
Glareola ocularis	Madagascar Pratincole	VU
Gyps africanus	White-backed Vulture	NT
Gyps rueppellii	Rüppell's Vulture	NT
Macronyx sharpei	Sharpe’s Longclaw	EN
Neotis denhami	Denham’s Bustard	NT
Phoeniconaias minor	Lesser Flamingo	NT
Prionops poliolophus	Grey-crested Helmetshrike	NT
Rynchops flavirostris	African Skimmer	NT
Torgos tracheliotos	Lappet-faced Vulture	VU
Trigonoceps occipitalis	White-headed Vulture	VU
Turdoides hindei	Hinde’s Pied Babbler	VU
Fish		
Alcolapia grahami		VU
Aplocheilichthys sp. nov. ‘Baringo’		CR
Barbus sp. nov. ‘Pangani’		VU
Labeo percivali	Ewaso Nyiro Labeo	VU
Labeo trigliceps		VU
Nothobranchius bojiensis	Boji Plains Nothobranch	VU
Other		
Bulinus browni	Gastropod	NT

Table 1.7 IUCN Red List of Threatened Species		
Scientific Name	**Common Name**	**Status**
Burnupia crassistriata	Limpet	VU
Euonyma curtissima	Gastropod	EN
Hyperolius cystocandicans	Frog	VU
Lanistes ciliatus	Gastropod	NT
Malacochersus tornieri	African Pancake Tortoise	VU
Mertensophryne lonnbergi	Toad	NT
Phrynobatrachus irangi	Frog	EN
Pila speciosa	Gastropod	VU
Pisidium artifex	Bivalve	VU
Platycypha amboniensis	Montane Dancing-jewel	CR
Pseudagrion bicoerulans	Afroalpine Sprite	VU
Subuliniscus arambourgi	Gastropod	EN
Tropodiaptomus neumanni	Crustacean	VU
Plants		
Angylocalyx braunii		VU
Baphia keniensis		VU
Brucea macrocarpa		EN
Colpodium chionogeiton		VU
Colpodium hedbergii		VU
Commiphora pseudopaolii		NT
Commiphora unilobata		NT
Croton alienus		EN
Newtonia erlangeri		NT
Pandanus kajui		VU
Polyscias kikuyuensis	Parasol Tree	VU
Premna maxima		VU
Prunus Africana	Red Stinkwood	VU
Uvariodendron anisatum		VU
Vepris glandulosa		EN
Vepris samburuensis		VU
Vitex keniensis	Meru Oak	VU

Notes:

EW = Extinct in the Wild
CR = Critically Endangered
EN = Endangered
VU = Vulnerable
NT = Near Threatened

1.8 How the project will achieve GHG removals

The TIST Kenya project will achieve GHG removals through reforestation and sequester atmospheric CO_2 in live aboveground and belowground biomass.

TIST project areas are located on lands owned or controlled by TIST small hold farmers and that have been used as cropland or grassland. Because the farmers also own the trees that they plant, the species are selected by the Small Groups, based on their needs and the benefits, which they desire to obtain. As a result, numerous species and varieties have been selected. Table 1.8 lists the species and indicates whether they are indigenous to the area. Additional species may be added over the 30-year life of the project as additional planting takes place. The specific species for each project area are shown in the "Strata" worksheet.

Table 1.8 Tree Species Selected

Scientific Name	Common name	Height (m)	Indigenous
Acacia mearnsii	Australian Acacia	25	no
Acacia seyal	Whistling Thorn, White Thorn	17	yes
Acacia spp.	Acacia	7+	yes
Adansonia digitata	Baobab	25	yes
Albizia gummifera	Peacock Flower	30	yes
Anacardium occidentale	Cashew	15	no
Annona senegalensis	Wild Soursop	6	yes
Annona spp.	Annona	6+	yes
Azadirachta indica	Neem	20	no
Bombax ceiba	Silk Cotton	30	no
Brachychiton acerifolium	Flame Tree	20	no
Brachystegia spiciformis	Bean-Pod Tree	25	yes
Brachystegia spp.	Miombo	20+	yes
Bridelia taitensis	Bridelia taitensis	3	yes
Callistemon spp.	Bottlebrush	5+	no
Canarium schweinfurthii	Bush Candle, Gum Resin	50	yes
Casuarina equisetifolia	Casuarina	30	no
Celtis durandii	White Stinkwood	25	yes
Citrus limonum	Lemon	6	no
Citrus sinensis	Orange	13	no
Cordia Africana	East African Cordia	15	yes
Croton megalocarpus	Croton	35	yes
Croton Sylvaticus	Woodland Croton	30	yes
Cussonia holstii	Cabbage Tree	20	yes
Cupressus spp.	Cypress	5+	yes
Dombeya rotundifolia	Wild Pear	6	yes
Ehretia cymosa	Du-Tsho, Murembu	10	yes

Table 1.8 Tree Species Selected			
Scientific Name	**Common name**	**Height (m)**	**Indigenous**
Erythrina abyssinica	Coral Tree	15	yes
Eucalyptus grandis	Flooded Gum	55	no
Euclea divinorum	Magic Gwarra	6	yes
Ficus elastica	Rubber Fig	40	no
Ficus sycomorus	Sycamore Fig	20	yes
Ficus thonningii	Common Wild Fig	20	yes
Fraxinus berlandieriana	Mexican Ash	10	no
Fraxinus pennsylvanica	Green Ash	25	no
Grevillea robusta	Grevillea, River Oak, Silk Oak	25	no
Harungana spp.	Blood Tree, Orange-Milk Tree	25	yes
Jacaranda mimosifolia	Jacaranda	20	no
Leucaena leucocephala	Leucaena	15	no
Lovoa swynnertonii	Brown Mahogany	50	yes
Macadamia spp.	Macadamia Nut	18	no
Maesopsis eminii	Umbrella Tree	30	yes
Mangifera indica	Mango	25	no
Morus alba	Indian Mulberry	35	no
Newtonia buchananii	Newtonia	40	yes
Olea europaea	Olive	10	yes
Persea americana	Avocado	20	no
Phoenix reclinata	Senegal Palm, Coffee Palm	12	yes
Pinus Patula	Patula pine	30	no
Pithecelobium dulce	Blackbead Tree, Madras Thorn	15	no
Podocarpus falcatus	East African Yellow Wood	46	yes
Polyscias fulva	Parasol	30	yes
Prunus africana	Iron Wood, Red Stinkwood	24	yes
Prunus persica	Peach	10	no
Psidium guajava	Guava	15	no
Rubus spp.	Rubus	5	yes
Schinus molle	Pepper tree	15	no
Senna spectabilis	Yellow Shower	10	no
Solanum aculeastrum	Bitter Apple	5	yes
Strychnos henningsii	Walking Stick	12	yes
Strychnos madagascariensis	Black/Spineless Monkey Orange	12	no
Terminalia brownii	mbarao	15	yes
Toddalia asiatica	Forest Pepper	15	yes
Toona ciliata	Red Cedar	25	no
Vangueria infausta	Wild Medlar	8	yes

Table 1.8 Tree Species Selected			
Scientific Name	**Common name**	**Height (m)**	**Indigenous**
Vangueria spp.	Wild Medlar	8	yes
Vitex keniensis	Meru Oak	30	yes
Warburgia ugandensis	East African Green Wood	30	yes

1.9 Project technologies, products, services and activities

The technologies associated with tree planting have been developed through discussions with Kenya Forest Service (KFS, formerly Kenya Forest Department) and use of existing literature. In addition, TIST works with the Small Groups and local experts to develop best practices that are recommended to the members for adoption. The following describes the technologies employed.

General: The project involves direct tree planting of species selected by the individual Small Groups to meet their individual goals and needs. A list of suitable species is prepared based on input from local experts, KFS and TIST members and their benefits are discussed at TIST training meetings.

Nurseries: TIST best practices call for Small Groups to acquire seeds and develop their own nurseries using either seedbeds or pots made from plastic bags. Some Small Groups acquire seedlings from other groups, other individuals and local forest services.

Tree Planting: Tree planting is accomplished by manual methods using hand tools. TIST best practices call for farmers to dig individual holes that are 45 cm wide, 45 cm deep, spaced 2.5 m to 3.5 m apart for each seedling and fertilized using natural fertilizers. TIST does not own any fossil fuel vehicles or equipment to be used for tree planting.

Monitoring: TIST has deployed an innovative data collection system that consists of battery-operated palm computers, GPS receivers, data and image uploads through laptops or internet access points to monitor project activities. The data collection is conducted by trained local representatives, called Quantifiers, that are often Small Group members. They travel to each specific project area by walking, bikes, and local buses. TIST does not own any vehicles.

Internet: TIST uses Internet technology to make program results available transparently to a worldwide audience. It is also used to transfer field data collected with the palm computers to the TIST database server located in the USA.

Pest Management: Small Groups are trained to use local natural techniques to manage pests. For example:

- Neem seeds are ground and added to boiling water. The mixture is left overnight and then applied to seedlings when cool.
- Neem leaves, washing soap, salt and red pepper (chili) are mixed together, then added to water and covered with the pan (this is a dangerous mixture!) and then boiled. The cooled mixture is applied to the seedlings.

- Ash is added to the area with seedlings.
- The area is well weeded to avoid encouraging pests.
- Neem leaves are boiled in water to make 'bitter water' and then applied to the seedlings.

Ongoing management: Long-term management of the trees rests with the Small Groups. However, due to the ongoing tree payment based on live tree counts and the long-term profit sharing arrangement with the Small Groups, there are ample incentives for the groups to maintain healthy long-term stands. All species will be maintained for the 30-year life of the PD. Small Groups have contracted to replant trees that die in the first 20 years.

Management of the trees is dependent on the species. For example:

- *Eucalyptus (spp)*: Branches are trimmed and used for fuel wood. Stands planted closer than 3m x 3m should be thinned to that spacing within two to five years. Additional thinning will take place every year to provide fuel wood and/or a cash crop to the Small Groups.

- *Gravillea robusta: Gravillea* can be planted in rows at a spacing of 2-2.5m or in a wood lot at 2.5m X 2.5m spacing. The first thinning will occur at age 4-5, to thin inferior trees. Stem density can range from less than 800 to 1,200 trees/ha. *Gravillea* is very tolerant to heavy pruning of both its roots and branches. The branches can be used for firewood and as fodder in times of drought. As an effective agro-forestry tree, *Gravillea* competes very little with the cash and food crops of the Small Group members.

- *Cupressus (spp)*: Cypress (common name) can be planted in wood lots at an initial density of 1,100/ha, but should be thinned to 300 trees/ha for saw wood production. Weeding is essential for the first two years to produce maximum growth. Optimal spacing is 2-3m X 2-3m, where thinning inferior trees should occur after 4-5, and pole production can occur after ten years. Trees should be regularly pruned for maximum stem growth and to reduce risk of toppling over in strong wind or storms.

1.10 Compliance with relevant local laws and regulations

As a tree planting program that takes place voluntarily on existing farm land, there are few laws that are relevant to TIST. A review of the potentially applicable laws and regulations was made by CAAC's US staff, the Kenya Staff, local Kenya counsel and the local EIA consultant.[13] The following laws are applicable:

- The employment laws are listed below. CAAC uses Kenya counsel to advise on issues relating to employment. CAAC is not in violation of these laws.
    - The Employment Act, 2007
    - Regulation of Wages and Conditions of Employment Act
    - National Hospital Insurance Fund Act, 1998

[13] Natural Resources Management & Development Agency (NAREDA Consultants), Nanyuki, Kenya

- Companies Act, (Law of Kenya Cap. 486). CAAC is registered as a branch and is in good standing to operate in Kenya.

- Environmental Management and Co-ordination Act, 1999. In conformance with the Act, TIST submitted an EIA to the National Environmental Management Authority (NEMA).[14]

1.11 Risk analysis

The risk analysis has been conducted in accordance with the VCS Tool for AFOLU Non-Permanence Risk dated 18 November 2008 (VCS Non-Permanence Tool) and VCS Program Update 8 September 2010. In accordance with VCS requirements, the analysis is a stand-alone document and is attached as Appendix 05.[15]

1.12 Project was not implemented for subsequent GhG removal

The Project Proponent declares this project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction. The contract with the Small Groups members is long term and does not allow for the harvesting of tree except for thinning to enhance growth. Trees that die are to be replanted.

1.13 Project has not created another form of environmental credit.

The Project Proponent declares this project does not create another form of environmental credit.

1.14 Project not rejected under other GHG programs

The Project Proponent declares this project has not be rejected by any other GhG program, has not been submitted to any other GhG project for crediting and is not claiming credits associated with the trees planted and maintained by this project under any other program.

1.15 Project proponent's roles and responsibilities

The project was designed and implemented by Clean Air Action Corporation. CAAC is the manager and signatory to the Small Groups GhG contracts and has the carbon rights to the trees. The thousands of Small Group members of TIST own the trees and are responsible for maintaining them.

[14] See letter from National Environmental Management Authority June 3, 2010 acknowledging receipt of the EIA. NEMA only sends an acknowledgement if no other EIA steps are necessary.
[15] Appendix 05, TIST KE PD-VCS-002f App05 Risk Analysis 110214.doc

Table 1.15 List of project proponents.			
Project Proponents	**Point of contact**	**Roles/ Responsibility**	**Contact Details**
Clean Air Action Corporation	Charles E. Williams, Vice President	Project developer, implementer, manager	Clean Air Action Corporation 7134 South Yale Ave, Suite 310 Tulsa, Oklahoma 74136 United State of America Phone: +1-918-747-8770

1.16 Eligibility

Eligibility of the small-scale A/R CDM reforestation project activities under this PD is assessed using CDM Executive Board Report 35, Annex 18, "Procedures to define the eligibility of lands for afforestation and reforestation project activities."[16] Kenya defines the minimum area of a "forest" as 0.1 hectares with a minimum tree crown cover of 30%, with trees having the potential to reach a minimum height of two meters at maturity in situ. As a VCS project, this PD includes discrete project areas that are less than the minimum area to allow the inclusion of even the smallest small-hold farmer and requests a deviation from the 30% crown cover requirement to allow continued subsistence farming in the project areas (see Section 2.1).

The demonstrations required by Annex 18 are based on the results of TIST's baseline monitoring of each project areas and are presented on the "Grove Summary" worksheet. The information is collected on site through direct observation and measurement and through direct discussion with the landowner and members of his/her Small Group. Additional evidence is based on information discussed below and demonstrate adherence to these requirements.

(a) *Demonstrate that the land at the moment the project starts does not contain forest by providing transparent information that:*

(i) Vegetation on the land is below the forest thresholds (tree crown cover or equivalent stocking level, tree height at maturity in situ, minimum land area).

The physical survey of each parcel taken during the baseline monitoring indicates the lands were barren, cropland and/or covered with grass, shrub or litter and therefore did not meet the requirements for crown cover or height. Existing trees were identified by species and counted. As shown in the Section 4.2, the average stem density is well below the forest threshold.

(ii) All young natural stands and all plantations on the land are not expected to reach the minimum crown cover and minimum height chosen by the host country to define forest.

[16] UNFCCC, "Procedures to Demonstrate the Eligibility of Lands for Afforestation and Reforestation CDM Project Activities, CDM Executive Board Meeting 35, Annex 18, 2007. Accessed November 17, 2010 at http://cdm.unfccc.int/EB/035/eb35_repan18.pdf.

As shown in Section 4.2, there were relatively few existing trees when project activities began and most were found as isolated trees along the border of individual parcels. Given the history of continued deforestation, as indicated by the maps and satellite images and described in Section 2.4, and continued use of the land by the project members, it is not expected that this area will revert to natural forest without intervention.

(iii) The land is not temporarily unstocked, as a result of human intervention such as harvesting or natural causes.

The baseline monitoring indicates these areas have a history of cultivation ("Grove Summary" worksheet).

(b) Demonstrate that the activity is a reforestation or afforestation project activity:

(i) For reforestation project activities, demonstrate that the land was not forest by demonstrating that the conditions outlined under (a) above also applied to the land on 31 December 1989.

The project areas did not contain a forest on 31 December 1989. This is demonstrated by the "Grove Summary" worksheet. As part of collecting the baseline information, the landowners are questioned about whether their project area was forested in 1990. 100% of them responded that it was not forested. In addition, baseline monitoring was conducted on each individual project area to confirm that there had not been deforestation of a parcel since that time. This generally included looking for stumps or evidence of recent harvest activity and looking at the surrounding lands to see of there were indications that the project areas were cleared of native ecosystems within the ten-year period prior to the proposed Project Start Date. Nothing was observed to indicate there had been deforestation activity.

Historical imagery from 1990[17] and 2000[18] was also looked at. Because the discrete project areas tend to be very small, the resolution is too coarse on both images to conduct a detailed analysis of each project area. However, both images confirm that the project areas are situated on lands that have a history of human occupancy and farming. The protected forests can be seen on both images to contrast with the areas where the project areas are located. These observations support the statements by the landowners and field observations by TIST personnel that the project areas were not deforested since 31 December 1989, or that project areas were cleared of native ecosystems within the ten-year period prior to the proposed Project Start Date.

[17] Landsat 4 and 5 composite circa 1990, 30 meters per pixel resolution. See Appendix 01.
[18] Landsat 7 composite circa 2000, 15 meters per pixel resolution. See Appendix 02.

1.17 Commercially sensitive information

Commercially sensitive information that has been made available to the Validator but is being excluded from the public version is:

- CAAC's proprietary financial model (Table 1.11.B Future Income).
- CAAC's Financial Statements (Table 1.11 B Financial Capacity).
- The International Small Group and Tree Planting Program, Carbon Credit Sale Agreement, TIST SG CO2 contract KE 050418.doc (multiple references)
- The International Small Group and Tree Planting Program, Carbon Credit Sale Agreement, TIST SG CO2 contract Kenya 080428.doc (multiple references)

2.0 VCS Methodology:

2.1 Methodology applied to the project activity

The approved baseline and monitoring methodology applied to the proposed VCS project activity is CDM AR-AMS0001 Version 05: *Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on grasslands or croplands*.[19] Also used were the following tools:

- Procedures for the demonstration of land eligibility, AR-AMS0001, Appendix A.
- Procedures for the assessment of additionality, AR-AMS0001, Appendix B.

The project and project monitoring plan meet all of the requirements of the methodology and does not deviate from the baseline scenario, additionality determination or inclusion of project GhG sources, sinks and reservoirs.

There are two deviations to the methodology that are outside these parameters. The first is because the TIST program was developed to allow the poorest of subsistence farmers to participate, including the opportunity to receive carbon related income. This means that many of the members lack sufficient land to be able to commit the minimum area of 0.1 hectares defined by Kenya's definition of a forest. TIST's monitoring plan was designed with this in mind and treats the smallest project area the same as the larger ones. All of the project areas are well documented, have been baselined, have been reviewed for additionality, have been reviewed for leakage, have defined boundaries, have had their trees counted by strata and they are monitored along the same schedule as the other project areas in this PD. Their inclusion is not a threat to the project and their individual carbon volumes are very small.

The second deviation relates to the 30% crown cover at maturity that is part of Kenya's definition of a forest. TIST farmers do not necessarily plant their trees as plantations or in clusters. Some have chosen to plant along property lines or widely spaced so that they can continue with their subsistence farming. Some have longer-term plans to plant more trees in the future. As a result, there are project areas that do not now, and may not in the future, meet the 30% forest threshold. TIST's monitoring system takes this into account by focusing on tree counts, rather than extrapolating stem density over an individual project area. The 30% crown cover has no impact on the calculation of carbon volumes from the project.

2.2 Applicability of methodology

The proposed project activity fulfills all of the applicability conditions stated by AR-AMS0001:

[19] UNFCCC, "AR-AMS0001, Version 5: Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on grasslands or croplands," CDM Executive Board Meeting 42, 2008. ("AR-AMS0001"). Accessed 04 June 2009 at http://cdm.unfccc.int/methodologies/DB/91OLF4XK2MEDIRIWUQ22X3ZQAOPBWY/view.html

- The simplified baseline and monitoring methodologies are applicable if the conditions (a) - (d) mentioned below are met.
  a) *Project activities are implemented on grasslands or croplands*. As indicated on "Grove Summary" worksheet,[20] project activities are implemented on grasslands and croplands. See Table 4.2.A for a detailed breakdown.
  b) *Project activities are implemented on lands where the area of the cropland within the project boundary displaced due to the project activity is less than 50 per cent of the total project area*. This condition was deemed met through a survey of the individual members that farm the land and through field observations. Landsat imagery was also reviewed, but the resolution was too coarse to provide any meaningful data (see imagery in Appendix 01 and Appendix 02). In the surveys, 100% of the farmers indicated there was no displacement. Field observation show that many of the farmers have chosen to plant trees along property lines and/or to plant their trees widely spaced in their fields and practice agro forestry. There were no observations that indicate that this condition was not met. In addition, all of this is supported by the overriding fact that TIST members are subsistence farmers that rely on their land for household food production. Carbon has little value compared to food so they only plant in areas that will not cause them to displace higher value activities such as farming. Also see Section 3.4, "C. Ex post estimation of leakage."
  c) *Project activities are implemented on lands where the number of displaced grazing animals is less than 50 per cent of the average grazing capacity of the project area*. This condition was deemed met through a survey of the individual members that farm the land and through field observations. Landsat imagery was also reviewed, but the resolution was too coarse to provide any meaningful data (see imagery in Appendix 01 and Appendix 02). In the surveys, 76.1% of the farmers said they rarely or never grazed their land and 100% of the farmers indicated there was no displacement. Field observation showed no evidence that grazing is significant in the project areas or in the entire area in which the project areas are located. Some farmers do keep a few head of cattle, but they are typically confined to pens and fed fodder. There were no observations that indicate that this condition was not met. See "Misc Calc" worksheet for survey calculations.
  d) *Project activities are implemented on lands where 10 per cent of the total surface project area is disturbed as result of soil preparation for planting*. The minimum spacing recommended for the trees is two meters x two meters, or four square meters. The recommended size of the holes is 0.3 meters in diameter, or 0.07 square meters. The calculated area disturbed as a result of soil preparation for planting is less than 2%. See "Misc Calc" worksheet. Plowing does take place for intercropping as part of the baseline activity and is not considered by the CDM AR Working Group to be part of the project activity.

- Carbon pools are above- and below-ground tree and woody perennials biomass. See Section 2.3, this document.

- Project emissions (ex ante and ex post) are considered insignificant and therefore neglected. See Section 2.3, this document.

[20] All worksheets referenced in PD are in Appendix 04, Excel spreadsheet.

- The project areas are eligible for the A/R project activity, using procedures for the demonstration of land eligibility contained in Appendix A of AR-AMS0001. See Section 1.16, this document.

- The project activity is additional, using the procedures for the assessment of additionality contained in Appendix B of AR-AMS0001**.** See Section 2.5, this document.

2.3 GHG sources, sinks and reservoirs

In accordance with the conditions of the approved baseline and monitoring methodology AR-AMS0001, "project emissions are considered insignificant and therefore neglected.[21] While no test or analysis of project emission are required, the following comments are provided:

- **Fertilizers.** The policy of TIST is for the farmers to refrain from using chemical fertilizers and instead to rely on dung and plant material. Neither of these are the result of project activity and need not be considered. However, if considered, the nitrogen emissions from natural fertilizers are estimated to be less than 0.1% of the actual net greenhouse gas removal by sink and may be considered de minimis. See "Misc Calc" worksheet.

- **Nitrogen-fixing species.** Emissions from nitrogen fixing species are also insignificant. Though present, the nitrogen-fixing trees are a minor component of the overall tree inventory. Because any deadwood will be used for domestic fuel, the trees will not be left to rot or decay. The lands where the trees are being planted are degraded and likely have a nitrogen deficit.

- **Fossils Fuels.** There will be no burning of fossil fuels or biomass for site preparation, monitoring, tree harvesting, or wood transportation; nor does TIST involve any industrial processes, as all labor is manual. Thus, no other GHGs are expected to be emitted as a result of the implementation of the proposed project.

The carbon pools to be monitored are listed in Table 2.3.

Table 2.3 Carbon Pools

Carbon pools	**Selected Pools**
Above ground	Yes
Below ground	Yes
Dead wood	No
Litter	No
Soil organic carbon	No

[21] AR-AMS0001, Section I.3, Section II.26 and Section VI.47.

2.4 Baseline scenario

Most Likely Scenario. The methodology requires justification that "the most likely baseline scenario of the small-scale A/R CDM project activity is considered to be the land-use prior to the implementation of the project activity, either grasslands or croplands."[22] The baseline field observation as detailed in the "Grove Summary" worksheet indicates the project areas are grassland and cropland prior to implementation of the project activity. That this is also the most likely use of the project areas without the project activity is supported by:

- The project areas are all private lands owned by subsistence farmers conducting the project activity. They have a history of farming and use of the land other than natural forest or long-term forestry.
- These lands are located in an area populated by subsistence farmers who use wood for their primary fuel. As supported by the references below, wood use, agriculture and increasing population have been key factors in deforestation.
- These factors lead to the conclusion that there is little reason to believe that the project areas will revert to forest without intervention.
- There are no alternative uses of this land that can be reasonably expected.

Literature Regarding Changes in Baseline Carbon Stocks. There is a clear pattern of rural firewood use and forest degradation in Kenya that supports the case that carbon stocks on each individual project area would be expected to decline or, at best, increase at a rate of less than 10% compared to the expected removal by sinks. The lands of and surrounding the project areas have been degrading for decades due to human intervention. Despite a series of forest policies that began in 1957,[23] forests in the TIST areas are in an extremely precarious position.

According to the Kenya environmental group, Green Belt Movement,[24] "at the turn of the 20th century, Kenya had a forest cover of well over 10%. Today, this has been reduced to a meager 1.7% due to deforestation, commercial agriculture, charcoal burning, forest cultivation and replacement of indigenous forest with exotic plantations."

According to the FAO[25] Kenya has lost over 12,000 ha of forest per year between 1990 to 2005, falling from 3,708,000 hectares to 3,522,000 hectares. Primary forest loss during that period averaged 2,400 hectares/yr dropping from 742,000 hectares to 704,000 hectares. It was estimated that 26.6 million m^3 (over bark) of wood products was removed in 2005, which was equal to 9.5% of the country's growing stock. Of this, 24,256,000 m^3 (over bark) was removed or fuel wood.

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[22] AR-AMS0001, Section II.5.

[23] Abwoli Banana, Paul Ongugo, Joseph Bahati, Esther Mwangi and Krister Andersson, "Resource, Recourse And Decisions: Incentive Structures In Forest Decentralization and Governance In East Africa. Accessed November 5, 2009 at http://pdf.usaid.gov/pdf_docs/PDACO151.pdf

[24] UNDP, "Community Action for Mt. Kenya Forest, the Environment and Sustainable Livelihoods," a UNDP GEF/SGP grant report. Accessed 22 September 2010 at http://www.ke.undp.org/GEF-SGP/Compact_Summary_Green_Belt_Movement.pdf.

[25] Global Forest Resources Assessment, 2005 (FAO). Accessed 22 September 2010 at http://www.fao.org/forestry/fra/fra2005/en/

On top of this, the population of Kenya is growing at 2.6%.[26] Since the same population will continue to rely on local wood supplies, there will be added pressure on the existing biomass in and outside the project areas.

The specific project areas are part of this environment. They are lands owned and used by the rural residents and are subject to constant pressure to provide fuel wood, food and livelihood for these subsistence-level farmers.

2.5 Additionality

Additionality of the proposed project activity is proven using the "Assessment of Additionality" contained in Appendix B of AR-AMS0001, which demonstrates that the project activity would not have occurred in the absence of the proposed project activity.

From the Project Participant's perspective, TIST has numerous investment barriers. TIST does not create or sell any products other than GhG credits associated with carbon sequestration. The trees and their products are owned by the Small Groups. Any revenue generated by the tree products belongs to the Small Groups. The TIST GhG "business" has been funded by Clean Air Action Corporation (CAAC), as an investor based solely on future GhG revenues. There is no business or business case without carbon revenues. There is no payback or ROI without carbon revenues. But for the expectation of a carbon market and the expectation of the sale of GhG credits from the project activity, CAAC would not have invested in TIST. Without carbon revenues, TIST is not viable or sustainable.

From the Small Groups or member's perspectives, there are barriers that have prevented reforestation of these lands:

Investment barrier. Tree plantations require investment to obtain seedlings and, in the case of TIST farmers, to take land out of current revenue production activities such as cropland for long-term gain. Investment requires access to credit. However, due to their low income, the farmers participating in TIST have little opportunity for investment loans or capital. Banks tend to be reluctant to lend to those living at the subsistence level because they have few assets for collateral and little disposable income available for debt service. According to The International Fund for Agricultural Development (IFAD), "more than one billion people – 90 per cent of the world's self-employed poor – lack access to basic financial services, depriving them of the means to improve their incomes, secure their existence, and cope with emergencies."[27]

At a more local level, a Kenya Participatory Management Study[28] revealed:

[26] Accessed 22 September 2010 at https://www.cia.gov/library/publications/the-world-factbook/fields/2002.html.
[27] Accessed 22 September 2010 at http://www.ifad.org/media/press/2004/38.htm.
[28] John Thinguri Mukui, "Poverty Analysis in Kenya: Ten Years On," Study conducted for the Central Bureau of Statistics (CBS), Society for International Development (SID), and Swedish International Development Agency (SIDA) February 4, 2005, p.10. Accessed 22 September 2010 at http://www.worldbank.org/afr/padi/Poverty%20Analysis%20in%20Kenya%20by%20John%20Mukui.pdf.

"access to credit and extension services is limited. The majorities are excluded from the formal financial sector due to lack of collateral and bankable proposals, and thus mainly rely on merry-go-rounds…Those who can afford seek such services from private extension providers, who in turn charge them exorbitantly. The study reinforces the findings of the first PPA conducted in 1994 that showed that only 3.7% of the responding households had access to the formal credit market."

TIST members are the people described above. They are subsistence farmers with little access the credit required for a plantation. Table 2.5.A is based on community data developed by the Kenya Ministry of Agriculture in Miriga Meru East and West Divisions using Participatory Analysis of Poverty and Livelihood Dynamic (PAPOLD).

Table 2.5.A Annual Income Brackets

Income Level (Ksh)		Income Level US$		Pct of Groups
Min	Max	Min	Max	
0	12,000	$0	$160	5%
12,000	60,000	$160	$800	40%
60,000	180,000	$800	$2,400	25%
180,000	300,000	$2,400	$4,000	15%
300,000	420,000	$4,000	$5,600	10%
420,000	above	$5,600	above	5%

While the trees can have a long-term financial benefit without the carbon component, day-to-day household expenses prevent these farmers from spending their minuscule income on reforestation projects. For example, seedlings cost Ksh 5 to Ksh 30 per seedling. A farmer wishing to plant 500 trees would need Ksh 2,500 to Ksh 15,000 of upfront capital to finance a tree plantation. This is a significant portion of their annual income and, in the case of subsistence farmers, would take that land out of farming for 8 to 30 years (depending on the type of trees).

The following table provides a cost example of the initial costs to the farmers to start a plantation. Without TIST, the farmer must buy the seedlings and incur labor costs. Without TIST, an investment is required, but there is no credit available to fund it. TIST overcomes the investment barrier two ways. First, it provides training that reduces the capital required to develop a tree plantation. The training teaches TIST members how to obtain seeds and build nurseries at zero cost, thereby, reducing the need for credit. Second, under the terms of the Project Participant's contracts with the TIST Small Groups, the farmers receive an annual advance on their potential carbon revenues which eliminates the need for credit.[29] These payments are paid at least annually based on the number of live trees counted each year. The payments are $0.02 per tree per year and are initially of greater value than the value of the carbon. Ultimately, the Small Groups will receive 70% of the net carbon revenues.

[29] "The International Small Group and Tree Planting Program Carbon Credit Sale Agreement" among Small Groups and CAAC provides the payment terms. Examples of the Agreement were provided to the DOE during validation.

Table 2.5.B Start-up Cost Comparison: 1 ha Plantation[30]		
	Without TIST	**With TIST**
Live Trees	500	500
Income	$ -	$ 10
Cost of a 500 Tree Plantation		
Seedlings	$ 141	$ -
Labor	$ 38	$ -
Total Yearly Cost	$ 178	$ -
Income/(Loss)	$ (178)	$ 10

Barriers due to social conditions, lack of organization. Planting large plantations requires more than a single individual. The local communities lack the organizational structure to put together a volunteer effort to plant trees. This statement is supported by the fact that Kenya has had Forestry Policies since 1957 but is still seeing annual losses in forest cover (see Section 2.4). TIST and the Small Group approach provide the organizational structure necessary to overcome this barrier. TIST provides the training and the member's Small Group provides the necessary manpower and support.

Laws and regulations requiring tree planting. The trees are planted on private lands and there are no laws or regulations that require the TIST farmers to plant them. Article 69 of the new Kenya Constitution (2010) states that the States shall: "work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya." However, no laws or regulations have been promulgated that place any burden for this goal on individuals or private land holders.

Common Practice. There are cases in the area where farmers have planted fast rotation trees without the carbon incentive. These farmers have no incentive to maintain the trees; indeed, their incentive is to harvest them as soon as possible to get the revenue. In contrast, TIST is using the annual tree payment to encourage and promote long-term, managed tree stands. The TIST GhG Agreement requires the members to "plant a minimum of 1,000 trees and raise them to maturity", "replant trees that die, for any reason, each year for the next 20 years;" and to "not cut down trees, except when implementing best practices for agroforestry developed by TIST." This is only possible because of the potential carbon revenues.

Conclusion. The extension activities implemented by TIST that allow the project participants to overcome these barriers, and the incentive payments TIST provides that support their decision to participate, are entirely dependent on the carbon market. These kinds of activities are not possible without external financing of some kind. TIST's operational budget for the project is funded through an investment from CAAC, which is contingent on returns of future GhG revenues. Without carbon revenues, on which its funding solely depends, the TIST project is neither viable nor sustainable.

[30] See Appendix 03, "Plantation Costs" worksheet for assumptions and references.

3.0 Monitoring

3.1 Title and reference of the VCS methodology

The monitoring methodology applied to the proposed VCS project activity is CDM AR-AMS0001 Version 05: *Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on grasslands or croplands*. See Section 2.2 for the explanation for why AR-AMS0001 was chosen.

3.2 Monitoring approach

The Small Groups manage themselves based on a covenant among the members of each Small Group. They manage and oversee their own trees. They contract with Clean Air Action Corporation (CAAC) to sell their carbon, receive payments, and receive training. The GhG component of TIST is managed by CAAC, who developed the database, web site and procedures for monitoring the GhG. CAAC is responsible for this PDD and for selling any GhG credits that become available.

Purpose of monitoring. The purpose of monitoring is to gather information on planting and growth of the trees planted for this VCS project, so that an estimation of carbon sequestered can be made.

Overview. The operational processes for monitoring the actual GhG removal by the sinks are for quantifiers to visit each grove once per year, and at minimum, once every five years, to count trees and collect circumference, GPS, and other data. Quantifiers transmit the monitoring data via the Internet to the TIST website, where it is managed by CAAC. CAAC oversees the data and conducts QA/QC reviews. Feedback is provided to TIST's quantifiers and office staff. CAAC is responsible for tabulating carbon stocks.

The TIST Data System stores all of the current and archived data. CAAC managers use customized reports to analyze the data and look for trends, missing data or obvious errors. TIST managers visit selected project areas and observe quantifications and audits.

Types of data and information to be reported. The basis of the monitoring is to count each individual tree by age/species strata, to take representative circumference measurement (cm), use allometric equations to estimate biomass (kg or tonnes) and use conversation factors to calculate carbon stocks (tonnes, CO_2e) at each verification event. Ex post leakage requires monitoring of cropland, domesticated grazing animals and domesticated roaming animals displaced by the project activity.

Origin of the data. The data will come from direct field observations in the form of a trained Quantifiers physically counting the trees, identifying strata and measuring the circumference. Allometric equations will come from literature research. Leakage monitoring will come from surveys of the TIST members in charge of an individual project area.

Monitoring approach. TIST quantifiers will regularly visit each project area, count each tree at that location by strata, take circumference readings by strata and enter them into a hand held computer database. They will upload the data via the internet to the TIST database server. Allometric equations will be used to convert the circumference to biomass. The allometric equations will be from literature. Where local equations are available, they will be used. Otherwise, defaults will be used. The strata will be based on three main species and a fourth "other" category. The allometric equations will be applied to each tree and the sum of the biomass will be converted to CO_2e using the appropriate factors.

Monitoring periods. TIST has ongoing monitoring. Typically, pairs of quantifiers will visit TIST project areas as much as one time per year. During a verification event, the most current data for a project area will be used. Increases or decreases in tree counts will be reflected in subsequent quantification visits.

Monitoring roles and responsibilities. The Small Groups manage themselves based on a covenant among the members of each Small Group. They manage and oversee their own trees. They contract with Clean Air Action Corporation (CAAC) to sell their carbon, receive payments, and receive training. The GhG component of TIST is managed by CAAC, who developed the database, web site, and procedures for monitoring the GhG. CAAC is responsible for this PD and for selling any GhG that becomes available.

The operational processes for monitoring the actual GhG removal by the sinks are for quantifiers to visit each grove once per year and, at minimum, once every five years to count trees and collect circumference, GPS, and other data. Quantifiers transmit the monitoring data via the Internet to the TIST website where it is managed by CAAC. CAAC oversees the data and conducts QA/QC reviews. Feedback is provided to the TIST's quantifiers and office staff. CAAC is responsible for tabulating carbon stocks.

The TIST Data System stores all of the current and archived data. CAAC managers use customized reports to analyze the data and look for trends, missing data or obvious errors. TIST managers visit selected project areas and observe quantifications and audits.

Managing data quality. TIST will use the following QA/QC procedures:

- **Quantifier Training:** Quantifiers receive explicit training in regard to TIST's Standard Operating Procedures, so that quantifications are performed in a standard and regular fashion. The quantifier field manual/handbook is available online at www.tist.org under "Documents to Download" and is updated to reflect changes in internal procedures. Quantifiers meet monthly to discuss questions or problems that they may have and receive training and software updates when necessary. Quantifiers are not dedicated to a grove for the life of that grove and may be rotated to other groves.
- **Staff Audits:** TIST staff members are trained to quantify groves and have handheld devices that are programmed to conduct audits. A requirement of their job is to periodically audit quantifiers, including an independent sampling of tree counts and circumference measurement.

- **Multiple Quantifications:** TIST's internal goal is to quantify each project area once per year. Inaccurate data and errors are self-correcting with the subsequent visits. If trees have died or have been removed, a new count will reflect the current population. The growth of the trees, as indicated by increased DBH, is monitored with these subsequent visits. If a species is mislabeled, it will arise as a conflict when different quantifiers attempt to perform tree counts for that grove that do not match the previous one. Comparisons are made over time to determine whether a particular quantification or tree count appears unrealistic.
- **Multiple Tracks:** In order to ensure that the location and perimeter of each discrete project area is accurate, each GPS track of the parcel is measured at least twice or until two tracks that reliably define the project area are obtained. Quantifiers will be required to re-trace the tract with each quantification to verify that they are at the correct project area and that they are counting the correct trees.
- **Data Quality:** TIST quantifiers count every tree in each discrete project area. Counting each tree is 100% sampling and provides greater than 1% precision at the 95% confidence level. Up to 20 circumference readings for each strata in a project area will be taken and archived to develop a localized database of growth data by strata. This data will provide the circumference data for each stratum. This sampling will exceed the 10% precision at the 95% confidence level required by the methodology.
- **TIST Data System:** The data system is an integral part of TIST's quality assurance and quality control plan. The handheld devices are programmed in a manner that requires the data to be collected in a step-by-step manner, increasing the likelihood that all the data will be collected. Data field characteristics are defined to force the use of numbers, text or special formats. Drop down menus are used to restrict answers to certain subsets (e.g. a TIST Small Group name comes from a drop down menu). Some data fields are restricted to a range of data (e.g. negative numbers are not allowed). The data is uploaded within a few days to the main database, providing timely reporting and secure storage of the data.
- **Desk Audit:** TIST has developed analytical tools for reviewing data as it comes in from the field to look at track data, tree counts, and completeness of data.
- **Transparency:** By providing the quantification data online and available to anyone with an internet connection, TIST is open to audit by anyone at any time. By providing the location, boundaries, tree count by species and circumference, any interested party can field check TIST data. This transparency and the actual visits that have already taken place provide a further motive to make sure the field data is correct.
- **Data Storage:** The data will be stored in an electronic format on the TIST server. Currently, the server hardware is operated by a third party company that specializes in web and data hosting. They are in Dallas, Texas, USA. However, CAAC could, in the future, change hosts or choose to host the server at its offices.

3.3 Data and parameters monitored

Table 3.3 Data to be Monitored							
Data/ Para-meter	**Data unit**	**Descrip-tion**	**Source of data**	**Value of Data**[31]	**Measur-ment Methods**[32]	**QA/QC**	**Comment**
Location	Latitude and longitude	Single point location of the area where project activity has been implemen-ted	GPS	See "Grove Summary" worksheet for each result.	Go to each project area, take a single location point per area with GPS/PDA, up-load to server.	SOP, audit and multiple visits	The location of each project area is obtained with a GPS.
Project area	ha	Size of the areas where the project activity has been implemen-ted.	GPS	See "Grove Summary" worksheet for each result.	Go to each project area, take a track of the perimeter with the GPS/PDA, up load to server. Software computes area inside track	SOP, audit and multiple visits	The area of each project area is obtained with a GPS by walking and mapping the boundary of the project area.
DBH	cm	Diameter of tree at breast height (1.30 m)	Measur-ing tape	Multiple values specific to strata taken from selected project areas	Ongoing measurement taken by quantifiers as they visit project areas	SOP, audit and multiple visits, multiple locations	TIST measures DBH of up to 20 representative trees of each age/species stratum in different project area.
No of trees	trees	Number of trees in a project area by strata	Physical count	See "Grove Summary" worksheet for current results. This number will change over time for each project area based on replanting and mortality	Physical count by Quantifiers with each visit	SOP, audit and multiple visits	
Ownership	name	Ownership of land of project area	Project registra-tion data	See "Grove Summary" worksheet for each result.	Ask members about changes in ownership. Record on PDA	SOP, audit and multiple visits	List of owners of each PA, their contract status and the status of their carbon rights will be reviewed with each

[31] TBD means to be determined during quantification
[32] PDA means personal digital assistant, the hand held computer and custom software used by TIST.

Table 3.3 Data to be Monitored							
Data/ Para-meter	**Data unit**	**Descrip-tion**	**Source of data**	**Value of Data**[31]	**Measur-ment Methods**[32]	**QA/QC**	**Comment**
							monitoring event to confirm ownership.
Total CO2	Mg	Total CO2	Project activity	Changes over time based on tree count, strata and growth	Calculated using allometric equations and conversion factors	See above for tree count and circumference. Calculation subject to verification.	Based on data collected from all plots and carbon pools
Area displaced	ha	Area under cropland within the project boundary displaced due to the project activity	Survey	See "Grove Summary" worksheet for each result.	The TIST members in charge of a project area are asked if they have had to displace cropland	Use of survey, and SOP.	Monitoring only in first crediting period
Grazing animals displaced	Head of cattle	Number of domesticate d grazing animals within the project boundary displaced due to the project activity	Survey	See "Grove Summary" worksheet for each result.	The TIST members in charge of a project area are asked if they have had to displace grazing animals	Use of survey, and SOP.	Monitoring only in first crediting period
Roaming animals displaced	Head of cattle	Time-average number of grazing domesticate d roaming animals per hectare within the project boundary displaced due to the project activity	Survey	See "Grove Summary" worksheet for each result.	The TIST members in charge of a project area are asked if they have had to displace roaming animals	Use of survey, and SOP.	Monitoring only in first crediting period

3.4 Description of the monitoring plan

Background. Each project area is owned and managed by a different group of people that TIST calls a Small Group. The areas are discrete parcels of land spread out over many districts and villages. The Small Groups select the species of trees, the number of trees to plant and the planting schedule. They also maintain the trees. While TIST works with the groups to develop best practices that can be shared and adopted by everyone in the organization, the fact remains that each project area is different. The difference is such that the monitoring system required is different than typical forest monitoring protocols.

TIST has met the challenge of obtaining accurate information from a multitude of small discrete project areas in remote areas where roads are poor and infrastructure is minimal, by combining high-tech equipment and low-tech transportation within its administrative structure. The TIST Data System is an integrated monitoring and evaluation system currently deployed in Kenya and three other countries. On the front end is a handheld computer-based platform supported by GPS technology that is utilized by field personnel (quantifiers, auditors, trainers and host country staff) to collect most project information. This includes data relating to registration, accounting, tree planting, baseline data, conservation farming, stoves, GPS plots, and photographs. The data is transferred to TIST's main database server via the internet and a synchronization process where it is incorporated with historical project data. The server provides information about each tree grove on a publicly available website, www.tist.org. In addition, the other data is available to TIST staff through a password-protected portal.

The handheld computers have been programmed with a series of custom databases that can temporarily store GPS data, photographs, and project data. The interface is designed to be a simple to use, checklist format, that ensures collection of all of the necessary data. It is simple enough for those unskilled in computers and high-tech equipment to be able to operate after a short period of training. The interface can also be programmed for data collection not specific to the project. The handhelds are "off the shelf," keeping their costs relatively low.

The synchronization process takes place using a computer internet connection. While office computers are used where available, field personnel commonly use cyber cafes, reducing travel time and improving data flow. Where available, cell phones using GPRS technology are now allowing synchronization from remote tree groves and project areas, providing near real-time data.

The TIST Data Server consists of a public side, accessible by anyone over the internet and a private side only accessible through a password-protected portal. On the public side, a dynamic database is used to constantly update the displayed data. Changes can be seen daily as new synchronizations come in. By mapping the project data with photos and GPS data, the results of each Small Group can be seen on a single page. The GPS data has been programmed with Google Maps to locate project activities anywhere in the world on satellite imagery.

On the private side, confidential accounting data, archive data and data not currently displayed is available. This is the source data for the custom reports and tables necessary for project managers.

The TIST database is off-site and has an off-site backup. The information collected and used for this monitoring program will be archived for at least two years following the last crediting period.

Method for Calculating Carbon Stocks.

A. Ex-post estimation of the baseline net greenhouse gas removals by sinks

No monitoring of the baseline is required. As demonstrated in Section 4.2, the change in baseline carbons stocks is below the threshold that would require monitoring. Because only the trees planted as part of the project are counted in the estimation of project removals, the baseline carbon stocks are fixed at zero.

B. Ex-post estimation of the actual net greenhouse gas removals by sinks

Step 1: Because of the difference in species and age of the trees and location, ownership and management of the project areas, each project area shall be monitored. They are documented in "Grove Summary" and "Strata" worksheets. The boundary of the project area has been obtained with a GPS (Appendix 02) and the area calculated (see "Grove Summary" worksheet).

Step 2: The strata for the ex-post estimation of the actual net greenhouse gas removals will be by species and year similar to the ex ante estimate as described in Table 4.3.A. Where a tree species exceeds 5% of the total tree inventory, it will be assigned its own species/age strata. The DBH of up to 20 trees per stratum per project area will be measured. Height will not be used in the allometric equations.

Step 3: Following are examples of allometric equations that may be used. The list will be updated as new or more appropriate ones become available.

Y = 0.887 + [(10486 x (DBH)2.84) / ((DBH2.84) + 376907)] for temperate/tropical pines[33]
$Y = (0.2035 \times DBH^{2.3196}) \times 1.2$ for default for non eucalyptus[34]
Log Y = -2.43 + 2.58 Log C for eucalyptus.[35]

Where:
Y= aboveground dry matter, kg (tree)-1
DBH = diameter at breast height, cm
C = Circumference at breast height, cm
ln = natural logarithm

[33] International Panel on Climate Change, "Good Practice Guidance for Land Use, Land-Use Change and Forestry", Annex 4A.2, Table 4.A.1, 2003. ("GPG-LULUCF")
[34] Tim Pearson, Sandra Brown and David Shoch, in "Assessment of Methods and Background for Carbon Sequestration in the TIST Project in Tanzania," Report to Clean Air Action Corporation, (December 2004)..
[35] DH Ashton, "The Development of Even-aged Stands in Eucalyptus regnans F. Muell. in Central Victoria," Australian Journal of Botany, 24 (1976): 397-414, cited by Tim Pearson, Sandra Brown and David Shoch, in "Assessment of Methods and Background for Carbon Sequestration in the TIST Project in Tanzania," Report to Clean Air Action Corporation, (December 2004).

exp = e raised to the power of
1.2 = Expansion factor to go from bole biomass to tree biomass

Step 4: Each DBH value for each tree measured will be applied to the appropriate allometric equation to determine the average biomass per tree in the stratum.

Step 5: The average biomass per tree will be multiplied times the number of trees of the stratum to yield the above ground biomass of the stratum.

Step 6: The above ground biomass of each stratum shall be multiplied by 0.5 to convert biomass to carbon.

Step 7: The t C/ha of the above ground biomass of each stratum will be calculated as follows:

$$\text{t C/ha} = \frac{\text{Carbon in a specific stratum x Area of PA}}{\text{Total Carbon in PA}}$$

Where:
PA = Project Area
Total Carbon = Sum of carbon in each stratum in PA

Step 8: The above ground biomass of each stratum shall be multiplied by the appropriate root to shoot ratio to determine the below ground biomass. Where national values are not available, the default value will be 0.27 for tropical/subtropical dry forest.[36]

Step 9: The t C/ha of the below ground biomass of each stratum will be calculated as follows:

$$\text{t C/ha} = \frac{\text{Carbon in a specific stratum x Area of project area}}{\text{Sum of carbon in each stratum in project area}}$$

Step 10: The area of each project area determined in Step 1 and the results of Step 7 and Step 9 shall be applied to the general equation required by the methodology.

$$P(t) = \sum_{i-I}^{I} (PA(t)\, i + PB(t)\, i) * Ai*(44/12)$$

Where:
$P_{(t)}$ = carbon stocks within the project boundary at time *t* achieved by the project activity (t C)
$PA_{(t)}I$ = carbon stocks in above-ground biomass at time *t* of stratum *i* achieved by the project activity during the monitoring interval (t C/ha) from Step 7.
PB(t)I = carbon stocks in below-ground biomass at time *t* of stratum *i* achieved by the project activity during the monitoring interval (t C/ha) from Step 7.
Ai = project activity area of stratum *i* (ha) from Step 1.

[36] GPG-LULUCF, Table 3.A.1.8

I = stratum i (I = total number of strata)

C. Ex post estimation of leakage

In accordance with the methodology, ex ante leakage is assumed to be zero. For ex post leakage, the methodology requires the monitoring of cropland, domesticated grazing animals and domesticated roaming animals displaced by the project activity during the first crediting period. If the indicators are less than 10%, leakage is set to zero.[37] The CDM Executive Board also provided additional guidance regarding grazing which, among other things, established a 50 hectare threshold on the monitoring of grazing.[38] It stated:

> The approach in this document can be used to determine whether the increase in emissions of greenhouse gases due to displacement of pre-project grazing activities attributable to the A/R CDM project activity is insignificant and may be accounted as zero.

The required monitoring was conducted through the use of a survey of the TIST members during baseline monitoring, the results of which are presented in the "Grove Summary" worksheet. The pertinent column titles are:

- Cultivated: A "Y" in this column indicates this was cropland and subject to the leakage monitoring.
- Activity Displaced: The farmers were asked if any activity was displaced which includes farming and grazing. A "Y" indicates they responded an activity was displaced.
- Grazing: Farmers were also asked specifically if grazing was displaced.

The procedures used to collect this data are part of the overall TIST program. Quantifiers go to the Small Groups and interview them about the specific circumstances regarding each individual project area. They also look around and collect the required information. The Quantifiers have been trained that this is critical information and that it must be accurate and is subject to audit both internally and during validation and verifications. In addition, as evidenced by the GhG contracts (see Section 8.0), the Small Groups are bound by the TIST values of accuracy and honesty.

An analysis for the croplands displaced was conducted in the "Misc Calc" worksheet. Using the DSUM spreadsheet function, the "Grove Summary" worksheet was queried to find the sum of the project areas that was both cultivated, and is therefore cropland, and where displacement was indicated. The results are that there were 0.0 hectares of cropland displaced.

An analysis of grazing displacement was conducted. First, this is not an area where domesticated roaming animals are present, so any incidental roaming animals are included in the domesticated grazing animals category. Using the DSUM spreadsheet function, the "Grove

[37] AR-AMS0001, Section VI, 48.

[38] UNFCCC, "Guidelines On Conditions Under Which Increase In GhG Emissions Related To Displacement Of Pre-Project Grazing Activities In A/R CDM Project Activity Is Insignificant," CDM Executive Board Report 51, Annex 13, December 2009.

Summary" worksheet was queried to find the sum of the project areas by grazing intensity category (i.e. "never", "rarely," "sometimes" and "often"). The total area of the "often" category was 7.5 hectares.

The monitoring results indicate cropland and grazing leakage is below the thresholds that require further monitoring and that the ex post leakage can be set at zero.

Beneficial "leakage" from project activities: The program is designed to allow sustainable harvest within the project boundary by the members, which will reduce the need for fuel wood from external sources. The trees are owned by the Small Groups members and as the trees die, either naturally or through thinning, they can be used as fuel wood by the members.[39] This is in addition to the biomass maintained for the calculation of actual net GhG removals by sinks (since ex post carbon calculations are based on current tree counts, any trees lost to harvest, etc., are automatically excluded from the calculation). The project activity will have a beneficial effect on area deforestation; instead of causing it, it will ameliorate it.

D. Data to be monitored.

The data to be monitored for monitoring actual net GhG removals by sinks are the number of trees in each project area and representative circumference. Because of the potential difference among project areas, the tree count of each project area is monitored. TIST has a staff of trained Quantifiers that visit each and every project area periodically. When quantifying a project area, they:

- Identify or confirm identification of the project area by its unique name combination of Small Group name and grove name (grove is the vernacular used by the project for a project area).
- Determine the latitude and longitude of the approximate center point of the project area with a GPS. It is automatically logged into the hand-held computer database for temporary storage.
- Map the boundaries of the project area by walking the perimeter using a GPS. The data is stored in the hand-held computer database for temporary storage.
- Count each tree in the project area by age and species strata. This data is entered by the operator directly into the handheld computer database for temporary storage.
- Measure the circumference of up to 20 trees in the age and species strata of a project area. Data will not be collected at all locations. It is entered by the operator into the handheld computer database for temporary storage. The data is uploaded to the TIST database where it is compiled for later use in calculating biomass and carbon stocks.

The data on the handheld computer database is uploaded to the TIST server through the internet for additional processing and permanent storage.

The confidence and precision levels will be assessed in future monitoring.

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[39] Thinning will be used to give surviving trees more opportunity to grow. While thinning will result in a dip in the carbon stocks below that present prior to thinning, the carbon stocks of the project area will not go below baseline levels. In addition, because of the different species, different growth rates and different planting schedules it is expected that the carbon stocks of the entire project will always be increasing.

4.0 GHG Emission Reductions (ex ante)

4.1 Explanation of methodological choice

The monitoring methodology applied to the proposed VCS project activity is CDM AR-AMS0001 Version 05: *Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on grasslands or croplands*. See Section 2.2 for the explanation for why AR-AMS0001 was chosen.

4.2 Quantifying baseline GHG removals

The methodology allows the change in baseline carbon stocks to be deemed zero in the absence of the project activity. Therefore this section will 1) calculate the baseline carbon stocks and 2) demonstrate that the project meets the requirements that allows the change to be considered zero.

Equations to calculate estimated baseline carbon stocks. The methodology is applied in the context of the project activity using the following formula:

$$B_{(t)} = \sum_{i=1}^{I} (B_{A(t)i} + B_{A(t)i}) * A_I \qquad \textbf{Eq. 4.2.a}$$

Where:

$B_{(t)}$ = carbon stocks in the living biomass within the project boundary at time *t* in the absence of the project activity (t C)

$B_{A(t)\,i}$ = carbon stocks in above-ground biomass at time *t* of stratum *i* in the absence of the project activity (t C/ha)

$B_{B(t)\,i}$ = carbon stocks in below-ground biomass at time *t* of stratum *i* in the absence of the project activity (t C/ha)

A_i = project area of stratum *i* (ha)

i = stratum *i* (*I* = total number of strata)

The above-ground biomass $(B_{A(t)})$ is calculated per stratum *i* as follows:

$$B_{A(t)} = M_{(t)} * 0.5 \qquad \textbf{Eq. 4.2.b}$$

Where:

$B_{A(t)}$ = carbon stocks in above-ground biomass at time *t* in the absence of the project activity (t C/ha)

$M_{(t)}$ = above-ground biomass at time *t* that would have occurred in the absence of the project activity (t d.m./ha)

0.5 = carbon fraction of dry matter (t C/t d.m.)

The below-ground biomass $(B_{B(t)})$ is calculated per stratum *i* as follows:

$$B_{B(t)} = 0.5 * (M_{grass} * R_{grass} + M_{woody\ (t=0)} * R_{woody}) \qquad \textbf{Eq. 4.2.c}$$

Where:

$B_{B(t)}$ = carbon stocks in below-ground biomass at time t that would have occurred in the absence of the project activity (t C/ha)

M_{grass} = above-ground biomass in grass on grassland at time t that would have occurred in the absence of the project activity (t d.m./ha)

$M_{woody\ (t=0)}$ = above-ground biomass of woody perennials at $t=0$ that would have occurred in the absence of the project activity (t d.m./ha)

R_{woody} = root to shoot ratio of woody perennials (t d.m./t d.m.)

R_{grass} = root to shoot ratio for grassland (t d.m./t d.m.)

The baseline net GhG removals by sinks is calculated using:

$$\Delta C_{BSL,t} = (B_{(t)} - B_{(t-1)})*(44/12) \qquad \textbf{Eq. 4.2.d}$$

Where:

$\Delta C_{BSL,t}$ = baseline net GHG removals by sinks (t CO2-e)

$B_{(t)}$ = carbon stocks in the living biomass pools within the project boundary at time t in the absence of the project activity (t C)

As allowed by the methodology, the change in carbon stocks that would be expected in the absence of the project activity is zero, meaning $B_{(t)}$ and $B_{(t-1)}$ are equal. Therefore:

$$\Delta C_{BSL,t} = (B_{(t)} - B_{(t-1)})*(44/12)$$

$$\Delta C_{BSL,t} = (0)*(44/12)$$
$$\Delta C_{BSL,t} = 0$$

Baseline Strata. Table 4.2.A shows the strata selected for the baseline calculations. It includes the hectares and percent of area of each strata and the appropriate factors needed to determine whether the changes in baseline carbon stocks is expected to exceed 10% or not.

Table 4.2.A Baseline Strata

			AG and BG Biomass t CO2e/ha[40]		
Baseline Strata	**Hectare**	**Area**	**Non-woody**	**Trees**	**Total**
Cropland, annual crops	107.4	27.0%	18.3	13.2	31.6
Grassland as grassland	290.7	73.0%	16.0	13.2	29.2
Total	398.1	100.0%			

Assumptions:

- Hectares of cropland are based on field estimates made for each individual project area as listed in "Grove Summary" worksheet. Where active farming was identified (a “Y” in the

[40] AG = Above Ground, BG = Below Ground

"cultivated" column), the area for that project area was multiplied by the "% Barren" plus annual crop columns. The remainder of the project areas were determined to be grassland.

- Annual cropland non woody stocks = 5 t C/ha above and below ground = 18.3 t CO2e/ha.[41]
- Tropical dry grassland non woody stocks = 8.7 t d.m./ha above and below ground = 16.0 t CO2e/ha.[42]
- Woody biomass stocks represented by trees at a density of 16.6 stems per ha (6,605 trees over 398.1 ha). The numbers of baseline trees was determined by a physical count of each tree. [43]
- Average dbh of pre-existing trees = 27.4 cm from inventory of pre-existing trees.[44]
- Aboveground tree biomass calculated applying equation from for dry forest, where Kg dry mass = exp(-1.996+2.32*ln(dbh cm)).[45]
- Root:shoot ratio of 0.48.[46]
- Carbon fraction of dry biomass = 0.5

Change in Carbon Stocks without the Project Activity. The methodology requires documentation to justify that in the absence of the project activity whether the change in carbon stocks in the living biomass of woody perennials and the below ground biomass of grasslands are expected to:

- increase by less than 10% of the ex ante actual GhG removals by sinks (case 6.(a)),
- decrease (case 6.(b)), or
- increase by more than 10% of the ex ante actual GhG removals by sinks (case 6.(c)).

As croplands and grassland under active human intervention, the carbon stock in the living biomass pool of woody perennials and below ground biomass of grassland is not expected to exceed 10% of the ex ante actual net GhG removals by sinks (case 6.(a)) and would quite possibly decrease in the absence of the project activity (case 6.(b)). In either case, the methodology allows the change in baseline carbon stocks to be deemed zero in the absence of the project activity.

To determine if the change in baseline carbon stocks could exceed 10% of the net GhG removals from the project activity, Table 4.2.B was prepared. As shown, the combined area of cropland or the area of grassland, with generous assumptions concerning growth in the woody biomass carbon stocks, is not expected to exceed 10% of the ex ante actual net GhG removals.

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[41] International Panel on Climate Change, "2006 Guidelines for National Greenhouse Gas Inventories, Volume 4, Agriculture and other Land Use," Chapter 5, "Cropland", Section 5.3.1.2, Table 5.9, 2006. ("IPCC 2006 AOLU")
[42] IPCC 2006 AOLU, Chapter 6, "Grassland", Section 6.3.1.2, Table 6.4, 2006.
[43] Appendix 04, "Baseline Strata" worksheet.
[44] Ibid.
[45] Brown, S. 1997. "Estimating biomass and biomass change of tropical forests: a primer." FAO Forestry Paper 134, Rome, Italy. Section 3, "Methods for Estimating Biomass Density from Existing Data." Citing Brown et al. (1989). Accessed 22 September 2010 at http://www.fao.org/docrep/W4095E/W4095E00.htm. Also See of AR-AMS0001, Appendix C
[46] GPG-LULUCF, Annex 3A.1 Biomass Default Tables for Section 3.2 Forest Land, Table 3A.1.8, Woodland/savannah

Table 4.2.B Change in Baseline Carbon Stocks						
Year	Woody Biomass Stocks (AG and BG) t CO2e/ha (1)[47]		Woody Biomass Stocks (AG and BG) t CO2e (2)		Cumulative Baseline Removals t CO2e	% of Net GHG Removals from Project Activity (3)
	cropland	grassland	cropland	grassland		
2004	13.2	13.2	1,423.2	3,850.8		
2005	13.8	13.8	1,484.2	4,015.9	226.1	0.1%
2006	14.4	14.4	1,546.6	4,184.9	457.5	0.1%
2007	15.0	15.0	1,610.6	4,357.9	694.4	0.2%
2008	15.6	15.6	1,676.0	4,534.9	936.8	0.2%
2009	16.2	16.2	1,742.9	4,715.9	1,184.7	0.3%
2010	16.9	16.9	1,811.2	4,900.9	1,438.1	0.4%
2011	17.5	17.5	1,881.1	5,090.0	1,697.1	0.4%
2012	18.2	18.2	1,952.5	5,283.2	1,961.7	0.5%
2013	18.9	18.9	2,025.4	5,480.5	2,231.9	0.5%
2014	19.5	19.5	2,099.9	5,681.9	2,507.8	0.6%
2015	20.3	20.3	2,175.8	5,887.5	2,789.3	0.7%
2016	21.0	21.0	2,253.4	6,097.2	3,076.6	0.8%
2017	21.7	21.7	2,332.4	6,311.1	3,369.5	0.8%
2018	22.5	22.5	2,413.0	6,529.2	3,668.3	0.9%
2019	23.2	23.2	2,495.2	6,751.6	3,972.8	1.0%
2020	24.0	24.0	2,578.9	6,978.2	4,283.1	1.0%
2021	24.8	24.8	2,664.3	7,209.1	4,599.3	1.1%
2022	25.6	25.6	2,751.2	7,444.2	4,921.4	1.2%
2023	26.4	26.4	2,839.7	7,683.7	5,249.3	1.3%
2024	27.3	27.3	2,929.8	7,927.4	5,583.2	1.4%
2025	28.1	28.1	3,021.5	8,175.5	5,923.0	1.4%
2026	29.0	29.0	3,114.8	8,428.0	6,268.8	1.5%
2027	29.9	29.9	3,209.7	8,684.9	6,620.6	1.6%
2028	30.8	30.8	3,306.2	8,946.1	6,978.4	1.7%
2029	31.7	31.7	3,404.4	9,211.8	7,342.2	1.8%
2030	32.6	32.6	3,504.2	9,481.9	7,712.1	1.9%
2031	33.6	33.6	3,605.7	9,756.4	8,088.1	2.0%
2032	34.5	34.5	3,708.8	10,035.4	8,470.3	2.1%
2033	35.5	35.5	3,813.6	10,318.9	8,858.5	2.2%
Notes:						
(1) AG = Above ground, BG = Below Ground						
(2) Biomass for all project areas						
(3) Project ex ante tonnes =			**409,891**			

[47] Appendix 03, "Baseline Trees" worksheet.

Assumptions:

- Carbon stocks in non-woody vegetation are constant.
- Woody biomass stocks are based on the number of baseline trees as determined by a physical count of each tree. See "Baseline Strata" worksheet.
- Average dbh of pre-existing trees was determined during the baseline evaluation. See "Baseline Strata" worksheet.
- The biomass of the baseline trees were grown at a diameter increment of 0.5 cm. See "Baseline Trees" worksheet.
- Aboveground tree biomass calculated applying equation for dry forest in India, where Kg dry mass = exp(-1.996+2.32*ln(dbh cm))[48]
- Root:shoot ratio of 0.48.[49]
- Carbon fraction of dry biomass = 0.5
- Project ex ante tonnes are from Table 4.3.C.

Application of methodology to support Cases 6.(a) and 6.(b). While there may be ample evidence to support a case of decreasing baseline carbon stocks absent the project activity (see Section 2.4), a conservative case was demonstrated above. As shown in Table 4.2.B, if the baseline carbon stocks are assumed to increase absent the project activity, the increase is less than 10% of the ex ante project tons and meets the conditions of Case 6.(a). As such, the change in baseline carbon stocks shall be assumed to be zero.

4.3 Quantifying GHG removals by the project

Ex ante project removals.

Equations for ex ante project removals. The ex ante net greenhouse gas removals by sinks is calculated using the following equation:

$$N_{(t)} = \sum_{i=1}^{I} (N_{A(t)i} + N_{B(t)i}) * A_i \qquad \textbf{Eq. 4.3.a}$$

Where:

$N_{(t)}$ = total carbon stocks in biomass at time t under the project scenario (t C)
$N_{A(t)\,i}$ = carbon stocks in above-ground biomass at time t of stratum i under the project scenario (t C/ha)
$N_{B(t)\,i}$ = carbon stocks in below-ground biomass at time t of stratum i under the project scenario (t C/ha)
A_i = project activity area of stratum i (ha)
i = stratum i (I = total number of strata)

For above-ground carbon stocks, $N_{A(t)\,i}$ is calculated per stratum i as follows:

[48] Brown, S. 1997.
[49] GPG-LULUCF, Annex 3A.1 Biomass Default Tables for Section 3.2 Forest Land, Table 3A.1.8, Woodland/savannah.

$N_{A(t)\,i} = T_{(t)i} * 0.5$ **Eq. 4.3.b**

Where:

$N_{A(t)\,i}$ = carbon stocks in above-ground biomass at time t under the project scenario (t C/ha)

$T_{(t)i}$ = above-ground biomass at time t under the project scenario (t d.m./ha)

0.5 = carbon fraction of dry matter (t C/t d.m.)

Where volume tables are used to calculate the aboveground biomass, the following equation is used:

$T_{(t)i} = SV_{(t)i} * BEF * WD$ **Eq. 4.3.c**

Where:

$T_{(t)i}$ = above-ground biomass at time *t* under the project scenario (t d.m./ha)

$SV_{(t)i}$ = stem volume at time *t* for the project scenario (m3 /ha)

BEF = biomass expansion factor (over bark) from stem to total above-ground biomass (dimensionless)

WD = basic wood density (t d.m./m3)

For below-ground biomass, $N_{B(t)}$ is calculated per stratum *i* as follows:

$N_{B(t)\,i} = T_{(t)} * R * 0.5$ **Eq. 4.3.d**

Where:

$N_{B(t)\,i}$ = carbon stocks in below-ground biomass at time *t* under the project scenario (t C/ha)

$T_{(t)}$ = above-ground biomass at time *t* under the project scenario (t d.m./ha)

R = root to shoot ratio (t d.m./t d.m.)

0.5 = carbon fraction of dry matter (t C/t d.m.)

Strata for ex ante project removals. For the purpose of calculating ex ante actual net GhG removals, the area of project activity has been stratified by major species and age class.[50] The primary species are stratified separately and the minor species are aggregated into one species class.

Table 4.3.A Ex Ante Strata

Scientific Name	Age Class	Hectare	Area %
Eucalyptus grandis	2004	5.4	1.3%
Eucalyptus grandis	2005	18.8	4.7%
Eucalyptus grandis	2006	24.0	6.0%
Eucalyptus grandis	2007	12.8	3.2%
Eucalyptus grandis	2008	3.6	0.9%

[50] Appendix 03, "Strata" worksheet and "Misc Calc" worksheet.

Table 4.3.A Ex Ante Strata			
Scientific Name	**Age Class**	**Hectare**	**Area %**
Eucalyptus grandis	2009	0.1	0.0%
Eucalyptus grandis	2010	0.0	0.0%
Grevillea robusta	2004	10.1	2.5%
Grevillea robusta	2005	32.6	8.2%
Grevillea robusta	2006	56.4	14.2%
Grevillea robusta	2007	61.2	15.4%
Grevillea robusta	2008	37.4	9.4%
Grevillea robusta	2009	9.4	2.4%
Grevillea robusta	2010	0.0	0.0%
Cypress spp.	2004	0.1	0.0%
Cypress spp.	2005	1.0	0.3%
Cypress spp.	2006	1.8	0.5%
Cypress spp.	2007	3.2	0.8%
Cypress spp.	2008	1.7	0.4%
Cypress spp.	2009	0.6	0.1%
Cypress spp.	2010	0.0	0.0%
Other Africa, Dry Tropical	2004	9.5	2.4%
Other Africa, Dry Tropical	2005	14.2	3.6%
Other Africa, Dry Tropical	2006	31.9	8.0%
Other Africa, Dry Tropical	2007	37.2	9.3%
Other Africa, Dry Tropical	2008	21.3	5.3%
Other Africa, Dry Tropical	2009	3.9	1.0%
Other Africa, Dry Tropical	2010	0.0	0.0%
Total ha		**398.1**	**100.0%**

Factors for ex ante project removals. The factors used for estimating the actual net GhG removals for the four tree classes are shown below.

Eucalyptus spp.
I_v = 32.5 m^3/ha/yr.[51]
Where: I_v = annual increment in volume based on over the bark log volumes.
BEF = 1.5.[52]
WD = 0.51 t.d.m/m^3.[53]

[51] GPG-LULUCF, Table 3A.1.7. Average Annual Above Ground Net Increment in Volume in Plantations By Species, referencing L Ugalde & O Pérez, "Mean annual volume increment of selected industrial forest plantation species," Forest Plantation Thematic Papers, Working Paper 1. Forest Resources Development Service, Forest Resources Division. FAO, Rome (unpublished), Accessed 22 September 2010 at http://www.fao.org/DOCREP/004/AC121E/ac121e03.htm.
[52] GPG-LULUCF, Table 3A.1.10, Default Values Of Biomass Expansion Factors (BEF), Tropical, broadleaf.
[53] GPG-LULUCF, Table 3A.1.9-2, Basic Wood Densities (D) of Stemwood (Tonnes Dry Matter/M^3 Fresh Volume) for Tropical Tree Species, Tropical America, Eucalyptus robusta.

R = 0.45 when AGB <50 t/ha, 0.35 when AGB range is 50 to 150 t/ha, 0.20 when AGB >150 t/ha.[54]

Grevillea robusta

I_v = 12 m^3/ha/yr.[55]

Where: I_v = annual increment in volume based on over the bark log volumes.

BEF = 1.5.[56]

WD = 0.60 t.d.m/m^3.[57]

R = 0.27.[58]

Cupressus spp.

I_v = 24 m^3/ha/yr.[59]

Where: I_v = annual increment in volume based on over the bark log volumes.

BEF = 1.2.[60]

WD = 0.43 t.d.m/m^3.[61]

R = 0.46 when AGB <50 t/ha, 0.32 when AGB range is 50 to 150 t/ha, 0.23 when AGB >150 t/ha.[62]

Other Africa, Dry Tropical

N_A = 15 t.d.m/ha/yr.[63]

Where: N_A = annual increment of above ground biomass, t.d.m/ha/yr

BEF = 1.5.[64]

WD = 0.60 t.d.m/m^3.[65]

R = 0.27.[66]

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[54] GPG-LULUCF, Table 3A.1.8, Temperate broadleaf forest/plantation, Eucalyptus Plantation. AGB means aboveground biomass.

[55] Winrock International, "Fact Sheet, A quick guide to multipurpose trees from around the world," Fact 98-05, September 1998. ("Winrock Fact Sheet 98-05"). Accessed 22 September 2010 at http://www.winrock.org/fnrm/factnet/factpub/FACTSH/grevillea.htm.

[56] GPG-LULUCF, Table 3A.1.10, Default Values Of Biomass Expansion Factors (BEF), Tropical, broadleaf.

[57] Winrock Fact Sheet 98-05.

[58] GPG-LULUCF, Table 3A.1.8, Tropical/Sub-tropical dry forest.

[59] GPG-LULUCF, Table 3A.1.7, Average Annual Above Ground Net Increment in Volume in Plantations By Species.

[60] GPG-LULUCF, Table 3A.1.10, Default Values Of Biomass Expansion Factors (BEF), Tropical, Pines.

[61] GPG-LULUCF, Table 3A.1.9-2, Basic Wood Densities (D) of Stemwood (Tonnes Dry Matter/M^3 Fresh Volume) for Tropical Tree Species, Tropical America, Cupressus lusitanica.

[62] GPG-LULUCF, Table 3A.1.8, Conifer forest/plantation. AGB means aboveground biomass.

[63] GPG-LULUCF, Table 3A.1.6, Annual Average Above Ground Biomass Increment in Plantations By Broad Category, Africa, Other Species, Dry.

[64] GPG-LULUCF, Table 3A.1.10, Default Values Of Biomass Expansion Factors (BEF), Tropical, Pine.

[65] A sample set of tree counts by species planted by TIST farmers around Mt Kenya was obtained from the TIST database. The wood densities where tree counts of a species exceeded 500 trees were obtained and a weighted average was calculated. See Table 4.3.B.

[66] GPG-LULUCF, Table 3A.1.8, Tropical/Sub-tropical dry forest.

Table 4.3.B Other Tree Density Estimate				
Species	**Count**	**Density (D)**	**Count*D**	**Reference Code**[67]
Acacia spp.	6,563	0.64	4,200	1
Bridelia taitensis	7,353	0.64	4,706	1
Callistemon spp.	9,236	0.64	5,911	1
Casuarina equisetifolia	7,256	0.81	5,877	2
Citrus sinensis	6,486	0.74	4,800	1
Cordia Africana	7,421	0.48	3,562	1
Croton megalocarpus	6,262	0.57	3,569	2
Macadamia spp.	8,625	0.80	6,900	4
Mangifera indica	8,961	0.55	4,929	2
Markhamia lutea	7,065	0.43	3,041	3
Persea americana	9,494	0.47	4,462	2
Prunus africana	5,190	0.72	3,737	1
Vitex keniensis	7,556	0.40	3,022	2
Grand Total	**97,468**	**0.60**	**58,717**	

Ex ante project removals. Table 4.3.C provides the cumulative and annual ex ante actual net GhG removals by sink as carbon and as CO_2 equivalent. The table is based on the calculations shown in "Ex Ante Carbon Est" worksheet and "Ex Ante Strata Est" worksheet derived using the equations, strata and factors, above.

Table 4.3.C Ex Ante Project Removals			
Year	**Ex Ante Carbon**	**Ex Ante CO_2**	**Ex Ante CO_2**
Planted	**t (cum)**	**t (cum)**	**Yearly t**
2004	248	909	909
2005	1,239	4,542	3,633
2006	3,412	12,509	7,967
2007	6,746	24,734	12,225
2008	10,757	39,441	14,707

[67] Table 4.3.B References:

1. Ministry of Water, Lands and Environment, Forest Department, National Biomass Study, 2002, Local data for wood density, Reference No. 16a. http://cdm.unfccc.int/UserManagement/FileStorage/B7Y5L3VPMSJN0ODWU2HARC41Z9XG8I
2. IPCC-GPG, 2003. Table 3A.1.9-2**,** Basic Wood Densities (D) of Stemwood (Tonnes Dry Matter/M^3 Fresh Volume) for Tropical Tree Species.
3. Zanne, A.E., Lopez-Gonzalez, G.*, Coomes, D.A., Ilic, J., Jansen, S., Lewis, S.L., Miller, R.B., Swenson, N.G., Wiemann, M.C., and Chave, J. 2009. Global wood density database. Dryad. http://datadryad.org/bitstream/handle/10255/dryad.235/GlobalWoodDensityDatabase.xls
4. Ilic J., Boland D., McDonald M., Downes G. and Blakemore P. (2000) Wood Density Phase 1. National Carbon Accounting System, Technical Report No. 18. Australian Greenhouse Office, Canberra. http://www.rrrc.org.au/publications/downloads/Monitoring-toolkit-wood-density.xls

Table 4.3.C Ex Ante Project Removals			
Year	Ex Ante Carbon	Ex Ante CO_2	Ex Ante CO_2
Planted	t (cum)	t (cum)	Yearly t
2009	14,893	54,607	15,166
2010	18,994	69,644	15,037
2011	23,135	84,827	15,183
2012	27,316	100,157	15,331
2013	31,507	115,524	15,367
2014	35,691	130,868	15,344
2015	39,863	146,165	15,298
2016	43,915	161,021	14,855
2017	47,637	174,668	13,647
2018	51,202	187,742	13,074
2019	54,995	201,650	13,907
2020	58,986	216,281	14,631
2021	63,054	231,200	14,919
2022	67,126	246,129	14,930
2023	71,198	261,059	14,930
2024	75,270	275,988	14,930
2025	79,341	290,918	14,930
2026	83,413	305,847	14,930
2027	87,485	320,777	14,930
2028	91,555	335,703	14,926
2029	95,613	350,579	14,877
2030	99,658	365,414	14,835
2031	103,684	380,174	14,760
2032	107,729	395,007	14,833
2033	111,788	409,891	14,884

Project emissions.

As noted in Section 2.3, the methodology considers the project emissions insignificant and they are therefore neglected. Section 2.3 also provides an overview of potential project emissions that supports this treatment.

Leakage.

Methodology defines leakage. The methodology provides that if project participants demonstrate that the project does not result in displacement of activities or people or does not trigger activities outside the project boundary that would increase GhG emissions, a leakage estimate is not required.[68] It also states that if evidence can be provided that if displacement of pre-project activities does not cause deforestation, leakage can be considered zero.[69]

[68] AR-AMS0001, Section IV. Leakage (ex ante)
[69] Ibid.

Furthermore, the CDM Executive Board has determined that if moving to ones own existing farm plot “does not trigger activities outside the project boundary that would be attributed to the small-scale afforestation or reforestation project activity under the CDM, such that the increase in greenhouse gas emissions by a source occurs, a leakage estimation is not required."[70]

Fossil fuel emission: TIST owns no fossil fuel vehicles or equipment. Quantifiers and staff use public transport, walking and bicycles to go to various project areas. Use of palm computers and the Internet allows quantifiers to upload their data at local Internet cafés, or by using mobile phone technology, reducing travel and use of public transportation back to TIST offices. None of these trigger an ex ante leakage calculation.

Displacement of people: TIST members plant trees on their own lands. The Greenhouse Gas Agreement among the Small Group members and the Project Participant does not give the Project Participant any right to the Small Group's land or require that they leave. TIST does not displace any people.

Displacement of farming activities: Given their reliance on the remainder of their land for subsistence agriculture, TIST small hold farmers only plant trees to the extent that they can afford to. The value of their crops far exceeds the GhG revenues that are available. In addition, where Small Groups have adopted conservation farming, the applicable crops have yielded over twice that of traditional farming. As part of the data collection for the baseline activity, Small Groups are asked, "Will any activities be displaced?" This question is asked in the context of the CDM Executive Board's interpretation that if moving to ones own existing farm plots “does not trigger activities outside the project boundary that would be attributed to the small-scale afforestation or reforestation project activity under the CDM, such that the increase in greenhouse gas emissions by a source occurs, a leakage estimation is not required."[71] A survey of TIST members controlling the project areas indicated that activities were displaced on 0.0 hectares. See Section 3.4.

Based on the above, an ex ante leakage calculation is not necessary.

4.4 Quantifying GHG removal for the project

The required formula is $ER_{AR\ CDM,\ t} = \Delta C_{PROJ,t} - \Delta C_{BSL,t} - GHG_{proj,t} - L_t$

Where:

$ER_{AR\ CDM,\ t}$ = net anthropogenic GHG removals by sinks (t CO_2e/year)
$\Delta C_{PROJ,t}$ = project GhG removals by sinks at time t (t CO_2e/year)
$\Delta C_{BSL,t}$ = baseline net GhG removals by sinks (t CO_2e/year)
$GHG_{proj,t}$ = project emissions (t CO_2e/year)
L_t = leakage from project (t CO_2e/year)

[70] UNFCCC, "Simplified Baseline And Monitoring Methodologies For Selected A/R Small-Scale CDM Project Activity Categories," CDM AR Working Group Meeting 5, Page 5. Accessed 22 September 2010 at http://cdm.unfccc.int/Panels/ar/ARWG05_repan1_simplified%20AR_SSC_meths.pdf.
[71] Ibid.

The results are shown in Table 4.4.

Table 4.4 Net Project GhG Removals					
Years	**Ex ante Project removals (t CO2e)**	**Baseline GHG removals (t CO2e)**	**Project Emissions (t CO2e)**	**Leakage (t CO2e)**	**Net Project GHG Removals (t CO2e)**
Year 2004	909	0	0	0	909
Year 2005	3,633	0	0	0	3,633
Year 2006	7,967	0	0	0	7,967
Year 2007	12,225	0	0	0	12,225
Year 2008	14,707	0	0	0	14,707
Year 2009	15,166	0	0	0	15,166
Year 2010	15,037	0	0	0	15,037
Year 2011	15,183	0	0	0	15,183
Year 2012	15,331	0	0	0	15,331
Year 2013	15,367	0	0	0	15,367
Year 2014	15,344	0	0	0	15,344
Year 2015	15,298	0	0	0	15,298
Year 2016	14,855	0	0	0	14,855
Year 2017	13,647	0	0	0	13,647
Year 2018	13,074	0	0	0	13,074
Year 2019	13,907	0	0	0	13,907
Year 2020	14,631	0	0	0	14,631
Year 2021	14,919	0	0	0	14,919
Year 2022	14,930	0	0	0	14,930
Year 2023	14,930	0	0	0	14,930
Year 2024	14,930	0	0	0	14,930
Year 2025	14,930	0	0	0	14,930
Year 2026	14,930	0	0	0	14,930
Year 2027	14,930	0	0	0	14,930
Year 2028	14,926	0	0	0	14,926
Year 2029	14,877	0	0	0	14,877
Year 2030	14,835	0	0	0	14,835
Year 2031	14,760	0	0	0	14,760
Year 2032	14,833	0	0	0	14,833
Year 2033	14,884	0	0	0	14,884
Total (t CO2e)	409,891	0	0	0	409,891

5.0 Environmental Impact

5.1 Environmental assessment

The environmental assessment of the project activity was made by NAREDA Consultants of Nanyuki, Kenya.[72] The follow summarizes their conclusions.

Table 5.1.A Existing Positive Impacts	
Project Component	**Existing Positive Impacts**
-Promotion of tree planting through carbon credit programs and conservation farming -Promotion of compost manure	Increased tree cover
	Improved incomes at the household level, through cash remuneration, to groups and individual households, based on the number of trees in farms
	Reduction of global warming through increased sink for Green House Gases (GHG), hence a mitigation against sudden climate change
	High potential for the program activities to attract further/future carbon credit markets, hence income generation
	Improved farming methods that prevent carbon dioxide (CO_2) from escaping into the atmosphere, while trees act as carbon sinks
	Increased tree variety, hence wood based products
	Enhanced biodiversity, hence increased ecosystem services such as pollination for food
	Improved opportunity to get rid of unsuitable trees for Agroforestry such as Eucalyptus spp through appropriate awareness creation activities
	Contribution to the improvement of the catchment area of the larger Mt. Kenya and Aberdare ecosystems, which are two of the five main water towers of this country
	Increased availability and access to tree products such as firewood and timber products
	Improved soil fertility, hence improved crop production through planting of nitrogen fixing shrubs and trees
	-Improved food security and nutritional status through increased crop production and growth of fruit trees, as well as adoption of improved conservation farming (some farmers reported an increase of production from two to three bags to eight, from a quarter of farm after adopting conservation farming -Diversification of livelihood sources, i.e. training in beekeeping
	Possible replication of the project activities in other areas, following successful implementation
	Management of water catchment areas through promotion of tree

[72] NAREDA

Table 5.1.A Existing Positive Impacts	
Project Component	**Existing Positive Impacts**
	planting
	Increase in groundwater recharge, as a result of increase in vegetation cover that minimizes surface runoff and improves infiltration.
	Increased tree-based environmental services such as moderation of local climate, reduced soil erosion and aesthetic values associated with trees

Table 5.1.B Potential Positive Impacts	
Project Component	**Potential Positive Impacts.**
Promotion of tree planting through carbon credit programs	High potential of program activities to attract carbon markets
	Improved farming methods prevent carbon dioxide (CO_2) from escaping into the atmosphere, while trees act as carbon sinks
	Possible replication of the project activities in other areas
	Increase in groundwater recharge, as a result of increase in vegetation, that minimizes surface runoff and improves nutrition
	Possible introduction of other nature based activities, like bee keeping due to increased foliage material, thus contributing to maintenance and enhancement of the biodiversity through pollination by bees
	Increased population of native species through TIST's PES program
Conservation farming	Possible increased incomes as a result of improved farm productivity
	Possible improved food security
	Possible replication and adoption of conservation farming both within the project area (those farmers that are not group members) and outside the project area
	Improved farm productivity and environmental improvement through appropriate farming practices
	Possible reduced soil erosion as farmers increasingly adopt organic farming

The tables below present the existing and potential negative impacts of program activities

Table 5.1.C Existing Negative Impacts and their Mitigation Measures		
Project Component	**Existing Negative Impacts.**	**Proposed Mitigation Measures**
Promotion of tree planting through the	-High expectations from farmers which TIST may not be able to meet or are outside its scope of coverage	-TIST to continue and improve awareness creation on TIST policies of support to specific activities through increasing seminars/ training aimed at

Table 5.1.C Existing Negative Impacts and their Mitigation Measures		
Project Component	**Existing Negative Impacts.**	**Proposed Mitigation Measures**
carbon credit program		developing best practices with and empowerment of TIST farmers -Conduct participatory techniques to identify farmers concerns and use these forums for feedback
	- Farmers' dissatisfaction due to delayed payment	-Promptly implement the proposed M-PESA mode of payment already agreed upon with mobile phone services provider, Safaricom -Improve awareness creation of TIST policies such as the 500 trees rules among group members and the fact that payment is made based on available man hours -Improve awareness on TIST's policy/value of "low budget big results" -Educate farmers that payments will increase once the GHG credit is initialized when farmers will receive 70% of the income after in country costs
	Inadequate information dissemination of information between TIST staff and group members	-Streamline the information dissemination mechanisms between TIST staff at the project area level and those at the grassroots -Ensure regular trainings of TIST grassroots staff to update them on the latest TIST policies -Ensure regular and consistent meetings at the groups level -Ensure adequate awareness creation among TIST grassroots staff and group members on TIST's institutional structure
	Poor awareness among farmers on how to join TIST activities leads them to believe that they have been excluded from TIST activities	-Improve awareness creation on TIST policies in the registration of members -Conduct participatory techniques to identify farmers concerns and use these forums as feedback forums

Table 5.1.D Potential Negative Impacts and their Mitigation Measures		
Project Component	**Potential Negative Impacts.**	**Proposed Mitigation Measures.**
Promotion of tree planting	Possible negative changes in soil properties as litter becomes dominated by one or a few tree species and decomposition dynamics are altered.[73]	-Encourage crop rotations that incorporate use of indigenous tree species -Interplant exotic with native tree species -Continue with the TIST campaign of encouraging the planting of more indigenous tree species
Promotion of conservation farming	Farmers resistant to retain chemical fertilizers and pesticides utilization for perceived high yields	-TIST promotes awareness on usefulness and benefits derived from organic fertilizers and pesticides

The report concludes "drawing from the positive and negative impacts as highlighted above, the former outweighs the latter by far, an observation clearly pinpointed by community, especially during the focused group discussions."

TIST has reviewed the mitigation measures and finds that they are part of the existing program. Most refer to constant outreach to the member to increase awareness. TIST provides regular training in the above mentioned activities through seminars, cluster meetings, Small Group meetings and the newsletter. In addition, TIST quantifiers are trained in most aspects of the program and they try to visit each Small Group once a year. While their primary purpose is quantification, they can also provide answers to some questions while on site.

5.2 Socio-economic impacts

An analysis of the socio-economic impacts is provided:

Administration. TIST requires a Host Country staff to operate. There are currently six staff employees and over 50 contract Quantifiers. TIST personnel travel by public transportation and buy food and supplies from local merchants, bolstering the local economy. TIST uses Host Country professionals such as accountants and lawyers. TIST staff is trained to use the handheld computers and GPS and how to collect data. They synchronize their devices in cyber cafés, requiring the use of personal computers.

Direct Effects to Small Groups. TIST benefits thousands of Small Group members by providing a new source of income. Small Group members are paid for each tree they plant and maintain. When the project becomes self-funding from the sale of carbon credits, they will receive 70% of the net carbon revenues.

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[73] An issue not raised by the EIA is the fact that TIST members plant an abundance of non-native trees. This is because they are common and familiar to the members. The planting of non-native species is widespread outside the TIST program. TIST did not introduce them to the member or the region. As noted in this document, TIST farmers own the land on which the trees are planted and select the species they feel best meet their needs.

Small Group Structure. Empowerment of Small Groups and creation of "best practices" improves farm production, health, and farmer life. Small Groups use "rotating leadership" which supports gender equality and develops the capacities of each member. The visible success of the TIST groups and the availability of wood, shade, lumber, fruit, and improved crop yields provides the entire community with positive examples.

Additional benefits for Small Group members and their families:

- Fruits and nuts from tree plantings
- Wood products and limited timber from trees
- Natural medicines and insecticides from trees
- Capacity building on agricultural improvements, business skills, nursery development, and reforestation
- Animal fodder
- Small Groups organize to deal with other social and economic problems such as famine, AIDS, inadequate water supply
- Improved beauty of the landscape
- Surpass "sustainability" in that people meet their needs today in ways that improve the next generation's ability to meet its needs in the future

The project will create a positive socio-economic impact.

6.0 Stakeholders comments

6.1 Description of how comments are obtained

Membership in TIST is completely voluntarily. The actions that members take are on their own land. They maintain ownership of the land, the trees planted for sequestration and all the products that the trees yield. TIST exists for the local farmers and only grows if the local farmers support it. The rapid growth of TIST is a reflection of the positive reaction that the farmers and other stakeholders have had about TIST.

When TIST begins in an area, they contact community leaders, village heads/village leaders, local NGOs and local government officials to determine if there is an interest in the program. If there is an interest, TIST holds a public seminar to present the program, answer questions, address concerns and receive comments. This is followed by regular and on-going meetings the public is invited to attend. TIST representatives have met with numerous State, District and Village officials seeking comment and showing them the project. Since TIST is organic in its growth, this process continues as it expands to new villages. In addition to the meetings, information about TIST is disseminated by word of mouth; using the "Mazingira Bora," a multi-lingual newsletter published by TIST Kenya; and direct contact with community leaders and government officials.

The original TIST program was started in Tanzania in late 1999 to meet local needs in a sustainable way, while at the same time addressing climate change. In February 2004, TIST was invited to begin the project in Kenya. At that time, a trip was made around Mt Kenya where community leaders in Meru and Nyeri were briefed on TIST to gauge the level interest that local farmers might have. They were asked to spread the word about the program and if there was grassroots interest, prospective members were invited to begin planting trees. Between February 2004 and February 2005, additional meetings were held with community leaders and government offices such as the Forest Department.

The first TIST seminar of TIST Kenya was held in Nanyuki from February 21, 2005 to February 26, 2005. The seminar began with the process of customizing TIST to the desires and needs of farmers in the Meru and Nanyuki areas. Seventy-three people attended, 40 men and 33 women. A second training seminar was held April 11, 2005 to April 14, 2005 at the Gitoro Conference Centre in Meru. Seventy-five people attended, 39 men and 36 women.

In February 2005, the first "Mazingira Bora" was published and circulated within the communities to TIST members and those interested in the program. Since that time, TIST has published regular newsletters that document an ongoing dialogue and support with members of the community, both inside and outside the program. These documents are available to the public in a transparent form on the internet at tist.org.[74] TIST also has a collection of written stakeholder comments (see Section 6.2).

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[74] http://www.tist.org/moreinfo.php

At the Small Group level, member farmers meet with TIST representatives regularly, where they have an opportunity to ask more questions and make more comments. Since one of TIST's main focuses is adopting best practices, these are forums to review what is working about the program and how it can be improved. Changes to the program are announced in the newsletter.

The result of this stakeholder process has led to numerous invitations for TIST to come to new villages and numerous positive comments about TIST. The following section will summarize written comments. TIST has not received any negative comments.

6.2 Summary of the comments received

D.K. Mbugua, Chief Conservator of the Forest, in a letter to the Director General of the National Environment Management Authority on 08 January, 2007. "The Forestry Department has looked at the proposal [the TIST PIN for Kenya] and is of the view that the proposal can easily be implemented and the carbon resources can be secured over the proposed time frame. The purpose of this letter is to request your office allow the group [to] develop the project further while preparing a PDD for transmission to the UNFCCC Executive Board."

Dr. A. Muusya Mwinzi, Director General, National Environment Management Authority in a letter dated 19 March 2007. "We wish to refer to the Forest Department on behalf of Clean Air Action Corporation that the above mentioned programme [TIST] be allowed to proceed… As the authorized representative of Kenya, I hereby confirm that we have no objection to the further development of the TIST project.

N.M. Ndwiga, for the District Forest Officer, Meru North District, in a letter to the Administrator, TIST Kenya, dated September 13, 2007. "This office highly appreciates what your organization is doing and its ready to liaise with your office to enable them achieve their goals which are of enormous importance to this district and the nation at large."

Shieni K. Kioyiet, NEMA, Bomet District, Chemaner Area – invites TIST to come to this area to plant trees for long-term conservation and climate advantages.

Waweru Kimani, District Commissioner, Bomet District – invites TIST to Bomet District to advise farmers on reforestation, carbon trading and suitable agriculture.

Friar Patrick Nkaai, Parish Priest of Ngong, Mulot Catholic Mission – we are in support of TIST to help community in training of sustainable farming.

S.M. Gighohi, District Officer, Mulot Division – fully invites TIST to share efforts in this region and guarantees full cooperation and support.

Edward Wawire, District Environmental Officer, Narok South District – very willing to support TIST program in this area and believes it will help restore Mara Basin.

Edward Aubey, Office of the President, Meru North District – agrees for TIST team to enter Meru North and train their people in planting trees to clean the air.

Joseph K. Thirtu, Office of the President, Meru North District – gives permission of Jeremiah Murangiri [a TIST leader] to participate as TSE to facilitate environmental conservation.

Chief, Meru District – John Kinyua is introduced and approved to train and work as TSE in Kiorimba location to plant trees and conserve soil.

F.D. M.Mugwimi, District Forest Officer, Kirinyaga – his office gives support to Benard Githui [a TIST leader] in working with Community Groups in his District.

Rev. John Mararo Gachoki, Admin. Secretary, Diocese of Kirinyaga – extend invitation to TIST to promote tree planting in this area and work with to improve farming methods.

C.M. Wamola, District Forest Officer, Isiolo District – has no objection to the program, and is ready to assist in TIST activities pertaining to forestry.

Samuel K. Mukundi, District Forest Officer, Laikipia West District – willing to cooperate/add support and believes TIST will add value to their area like it has in Laikipia East District.

John Maine, African Inland Church, Nyahururu – very interested in TIST and wants a seminar with the community.

Pastor L.M. Miltiru, Truevine Apolistic Ministry, Nyahururu – requests a date for a seminar to inform them about the program.

NJuli K. Jeremiah, Kenya Assembly of God, Nyahururu – invite TIST to come to the Salama area and present a seminar and teach them more.

Rev. J. Mimitha, Jesus Victory Ministry, Mara Meru – invite TIST to come their deforested area and help them improve thru tree planting.

Fr. John Mbanbum, St. John the Baptist Church, Meru-Kenya – he invites Fabiano Kobia, TSE [a TIST leader], to train farmers in this parish in areas of Thanantu, Macegene, Rurii, Kagwuru and Kiguru.

L.R. Njagi, District Officer, Tigania West – introduces Jennifer Kithure [a TIST leader] and supports her as the appointed person to work with TIST in their area.

H. Kayes, District Officer, Buuri Division-Meru – supports Jennifer Kithure [a TIST leader] to work in their division with local farmers in planting trees.

J.M. Kamau, District Environmental Officer, Igembe/Tigania District – supports Mary Wanyoike, TSE [a TIST leader], to support environmental activities in this district.

District Officer, Igembe/Nekunudeth Districts – support Mary Wanyoike, TSE [a TIST leader], in assisting the community in growing trees and cleaning the environment.

B.M. Muriuki, District Officer, Meru North – supports Mary Wanyoike [a TIST leader] to educate and sensitize people to the need of planting trees in Nguyaya location.

Jacob J. Mugambi, Assistant Chief of A/NJoune sub-location - agrees to the TIST tree program in his jurisdiction.

Adam Kubai M'umbeal, Chief, Kiengu location – invites and will assist TIST's noble activities in his area.

K.M. Ndwiga, District Forest Officer, Meru North District – His office appreciates Mary Wanyoike [a TIST leader] and the TIST organization and is ready to liaison with us.

B.K. Nanyo, Forest Extension Officer, Igembe South/West Division – is allowing Augenio Akwalu as TSE [a TIST leader] to work in their division.

C.W. Mwangi, District Environment Officer, Kirinyaga – Bernard Githui [a TIST leader] has their support to improve environment and livelihood thru tree planting.

C. Wafula, District Officer, Muthambi Division – accords their assistance in supporting a successful program and highly appreciates TIST.

Brother Timothy Mathenge, Presbyterian Church of E. Africa, Gituamba Parish – interested in the good works of TIST and ready to work and obtain more information.

Rev. Sammy Kithinil Majuri, Presbyterian Church of E. Africa, Chogorja South – supports a church elder, who is retired teacher, to work with TIST to improve environmental innovation of this area.

B.M. Birichi, District Environment Officer, Tharaka District – supports Susan Muita, TSE [a TIST leader], and shall collaborate and assist her as necessary.

J.M. Kamau, District Environment Officer, Igembe/Tigania Districts – welcomes Susan Muita, TSE [a TIST leader], to support environmental activities in this district.

K.M. Ndwiga, District Forest Officer, Meru North District – his office highly appreciates TIST organization and is ready to work with us to reach enormously important goals.

Rev. Michael Simba, Methodist Church in Kenya, Marimanti, Tharaka, Kenya – church highly recommends and supports Susan Muita [a TIST leader] in the task of tree planting.

Dominic Kirimi, Assistant Chief, Kuja sub-location - accepts Susan Muita [a TIST leader] in this location to plant trees and supports community to do same.

Chief Phillip Koboi, Ntunene Location – TIST is a viable endeavor and gives permission to Susan Muita [a TIST leader] to begin work with group in this location.

Rev. Justus Mwenda, Superintendent Minister, Laare Circuit – Susan Muita [a TIST leader] presented program to church and find the mission worthy for their district. They will assist her as necessary.

Chief D. Mutino, Nguyuyu Location – acknowledges and welcomes Susan Nuita as TSE [a TIST leader] in their location.

Julius Kiruneya, Chairman, St. Julius Catholic Church, Khurene –they are very thankful and request program members come teach their church more about TIST/CAAC.

B.M. Kinyili, for District Forest Officer, Nyeri – request TIST collaborate, supervise, follow-up and assist in all activities to reforest their area.

The Chiefs Office, Kabuthee Location – Welcomes TIST program and reports residents are very happy to have in their area.

Group letter from Foresters, Chiefs, Reverend and Pastor Geruasio Kobia Mutia – They are thankful for the TIST – TSE program in all 13 areas of Kenya, and vouch for Paulina Nyoroka [a TIST leader].

Rev. Solomon Mukindia and Meru North Tree Farmers, Mbaranga/Karama location – acknowledge the good work TIST is undertaking and request extension to the areas of Mbaranga, Uuru, and Antuaduran.

Pastor Muangi Charles, Full Gospel Church of Kenya – He is sure the program will improve the farmers land, supports TIST and John Kingua [a TIST leader].

Written comments are maintained by TIST and are available for review.

There have been no negative comments received.

6.3 How due account was taken of comments received

TIST has not received any negative comments to take into account.

When Small Groups report success, TIST's partners work together to communicate that success and the basis of that success to the other Small Groups. TIST is built upon sharing best practices. When Small Groups find a benefit of planting trees, we communicate this learning to the other program participants through the TIST newsletter, through monthly node meetings, and we discuss it at annual seminars.

When digging holes provided a tangible way of boosting crop and tree survival rates, we communicated this to all groups – that digging holes not only starves the weeds at the surface for water, but also collects what little there is for the tree seedlings or the crops to enable them to survive when traditional tree plantings may not.

When groups needed more room to plant trees than where they already owned, TIST participants found that they needed to communicate their intentions and work with local government officials. This was helpful in two ways – it procured more land to plant trees, and it strengthened the understanding that officials had of the TIST program and its benefits.

When we hear the encouragement of the program from participants and local officials, it spurs us to work even harder to try to complete the documentation (e.g. methodological applications) necessary to secure a long-term GhG income stream for these Small Group members.

6.4 Ongoing communication with stakeholders

TIST will maintain communications with stakeholders several ways.

- As a community-based project, the 50,000 members represent a cross section of the population. These are stakeholders both because they are members and because they represent the community.
- TIST's aforementioned communication structure (seminars, cluster meeting, Small Group meetings, regular visits by quantifiers, trainers and newsletter) will provide avenues for ongoing dialogue.
- TIST has a full time staff of Kenyans that are part of the community. They liaise with the community, government officials and other NGOs.
- TIST membership includes government officials, church leaders and members of other NGOs.
- The TIST website allows direct communication with the US office. The US office answers questions, addresses concerns and can direct the Kenya staff to issues that have been raised.

7.0 Schedule

The starting date of the proposed small-scale A/R CDM activity and the crediting period begins 1 January, 2004. The project is scheduled to last 30 years but may be extended if the carbon market is vibrant enough to support it.

Justification: TIST maintains a database record of each project area showing when it was first quantified by a TIST staff member and how old the trees were. These records appear at www.tist.org under "Project Areas" and under each region, group center, and Small Group where audits have taken place. The data collected by TIST indicates that the first trees planted by Small Groups in project areas subject to this PD were planted in 2004. See "Grove Summary" and "Strata" worksheets for age of trees. See Section 6.1 for more details regarding the beginning of the TIST program.

Gantt Charts: The following Gantt charts show the timing of annual events for the project. The numbers along the top of each chart are years. Where "project" is indicated in the title it is for the 30-year project life. Where "project area" is indicated, it is for events that might take place within a project area and the year one may be an event rather than the beginning project date. With all the different project areas, species, farmers and planting schedules, these charts are very general and subject to change.

Main planting schedule (project). Main planting has taken place but additional planting may take place in individual project areas over the next few years, where the original planting density is low.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

Replacement planting schedule (project). As trees die, farmers are to replant for 20 years. Replanting can start as soon as the second year. Replanting is shown for 25 years because of the staggered start of individual project areas.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

Monitoring (project). Monitoring is ongoing. The internal goal is to quantify each grove annually. Whether that is achieved or not, the quantifiers are out in the field all the time visiting the multitude of project areas.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

Validation and verification (project). Validation takes place around year six, when project areas have been established and trees are already in the ground and growing. It is expected that the initial verification will take place at the same time. While it is a cost trade off, because the monitoring is ongoing, it is possible that verification could take place as much as annually.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

Thinning (project area). Thinning is allowed because it improves tree growth. Because of the different species and their different growth rates, the different planting schedules, the different original spacing and different farmers, thinning can begin in as early as four years, where an early harvest for poles or firewood is made.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

Fruit and nut harvest (project area). Most of the trees won't bear any fruits, nuts or other products for five or six years. After that, harvest will be annual.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

Deadwood harvest (project areas). Farmers may harvest deadwood any time it exists. For those that lose trees in the first year, it will come in year one. However, it is expected that most deadwood harvest will take place in later years as larger tree are lost or branches die.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

8.0 Ownership

8.1 Proof of title

Each project area is a tree grove planted by a Small Group. It is named using a unique combination of the TIST number for that Small Group and the grove name.

- The landowner is a small hold farmer who is one of the TIST Small Group members. Kenya is going through a transition from customary tenure to land registry. While most of the ownership is still through customary tenure, some of the projects areas are part of lands recorded in the land registry.
- The Project Participants do not own any of the land. TIST is a project name, not a legal entity, and does not own, control or have any rights to any of the land.
- The landowner covenants together with other farmers to form a Small Group. The Small Groups own the trees that they plant and determine how tree products and carbon revenues are divided among themselves.
- Host Country land law is silent as to the ownership of carbon and carbon pools. However, the Small Groups own the trees that they plant together and grant the rights to all carbon associated with TIST to Clean Air Action Corporation (CAAC) under a "Carbon Credit Sale Agreement."
- Under Paragraph 4 of the "Carbon Credit Sale Agreement," the members affirm their ownership or rights to the land designated as project areas.
- CAAC is registered as a branch in Kenya under the Companies Act and is a legal entity in Kenya.
- Under this PD, VERs shall be issued to CAAC.
- The current land use is agricultural.

The status of the contractual relationship between the land owner and TIST will be monitored. This will include changes in ownership of the land and changes in Small Group membership.

8.2 Reduce GHG emissions from activities in a trading program

Not Applicable. The GhG reductions associated with this PD are not a result of participation in a trading program or due to a national cap.
