CCBA Monitoring Plan
for
TIST Program in Kenya
CCB-001

for verification under

The Climate, Community and Biodiversity Standard

Second Edition

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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/or CDM 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.

General

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 TIST projects around the globe. 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 project information. This includes data relating to registration, accounting, training, 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. It is also the source of much of the date used in the CCB monitoring reports.

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 of the carbon credits associated with this CCB project.

Climate Impacts Monitoring

TIST was designed as a climate change project and has been operational since 2004. It is made up of thousands of individual discrete project areas spread over thousands of square kilometers, over many districts and near many villages. Each project area is owned and managed by a different group of people, which TIST calls Small Groups. The Small Groups select the species of trees, the number of trees to plant and the planting schedule. They also own and maintain the trees and the tree products. 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.

The data to be monitored, for monitoring actual net GhG removals by sinks, are the number of trees in each project area and representative circumferences. 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. This data is entered by the operator into the handheld computer database for temporary storage.

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

Monitoring selected carbon pools. The selected carbon pools are above ground and below ground biomass. The following monitoring plan is being used and will continue to be used.

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. The initial project area data was collected by TIST Quantifiers prior to CCB validation and was included in the CCB PD. The initial data that will be included in the monitoring reports are at a minimum:

- Project Area ID. This is as used in the VCS project document. It is a unique combination of the TIST Number and Grove Name.
- Group Center. This defines an administrative area internal to TIST.

- Group Number. Combined with the Group Center, it provides one of the unique Small Group identifiers used by TIST. This is a different number than the TIST Number.
- Grove Name. This identifies a project area within the Small Group. There are duplicate Grove Names, so it is necessary to combine them with a TIST Number to know to whom they belong.
- TIST Number. This is a unique Small Group identifier that, combined with a Grove Name, makes up the Project Area ID.
- District. This is an official Kenya District.
- Project Area. This is a higher level administrative unit internal to TIST and is best used when navigating the TIST website.
- Group Name. This is the name given to the Small Group by its members. It is not used in either the VCS or CCB project documents as an identifier.
- Latitude and Longitude. This is a single point geographic reference for the project area.
- Outline of the Project Areas. Whereas the above will be provided in a tabular form, the project areas are in a standalone GIS file. To improve worldwide transparency, the current file format is designed for use with Google Earth. TIST proponents reserve the right to change this format as necessary.

Step 2: Quantifiers will visit each project area regularly, with a goal of once per year, but at minimum, at five-year intervals. In the monitoring report, the following data for each visit will be collected:

- Monitoring Date. This is the date of the most recent visit to the project area.
- Tree Count. This is the number of trees planted in each grove. They will be stratified by species and age.
- DBH. Diameter at breast height defines the size of a tree for use in allometric equations. Quantifiers will measure up to 20 trees per stratum, per project area. Height will not be used in the allometric equations.

Step 3: Allometric equations will be used to convert the DBH of a tree to dry biomass (kilograms or tonnes). Following are some of the allometric equations that may be used. The list will be updated as new or more appropriate ones become available.

$Y = 0.887 + [(10486 \times (DBH)2.84) / ((DBH2.84) + 376907)]$ for temperate/tropical pines[1]
$Y = (0.2035 \times DBH^{2.3196}) \times 1.2$ for default for non eucalyptus[2]
$\text{Log } Y = -2.43 + 2.58 \text{ Log } C$ for eucalyptus[3]

Where:

[1] GPG-LULUCF, Table 4.A.1
[2] 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).
[3] 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).

Y= aboveground dry matter, kg (tree)-1
DBH = diameter at breast height, cm
C = Circumference at breast height, cm
ln = natural logarithm
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.[4]

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)

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

$PA_{(t)}I$ = 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

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

The following table summarizes the monitoring plan.

Data/ Parameter	Data unit	Description	Source of data	Value of Data[5]	Measurment Methods[6]	QA/QC	Comment
Location	Latitude and longitude	Single point location of the area where project activity has been implemented	GPS	See "Grove Summary" worksheet for each result.	Go to each project area, take a single location point per area with GPS/PDA, upload 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 implemented.	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)	Measuring 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	Physical count by Quantifiers with each visit	SOP, audit and multiple visits	

[5] TBD means to be determined during quantification

[6] PDA means personal digital assistant, the hand held computer and custom software used by TIST.

Data/ Para-meter	Data unit	Descrip-tion	Source of data	Value of Data[5]	Measur-ment Methods[6]	QA/QC	Comment
				time for each project area based on replanting and mortality			
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 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 circumferen ce. Calculation subject to verification.	Based on data collected from all plots and carbon pools

TIST will use the following QA/QC procedures:

- **Quantifier Training:** Quantifiers receive explicit training in regards 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. The confidence and precision levels will be assessed in future monitoring.
- **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 several days to the main database, providing timely reporting and secure storage of the data. Data will be maintained for at least two years following the end of the last crediting period.
- **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.

Monitoring change in baseline carbon. The selected CDM/VCS methodology does not require monitoring of the baseline. As determined with the ex-ante calculations required by the methodology, the change in baseline carbons stocks is fixed at 39,643 tonnes (see PD section G2.3).

Monitoring Leakage. Leakage was monitored within five years of the start of the project by surveying the members responsible for a discrete project area whether participation in the program caused leakage in the form of displaced activity. The answers were universally no. Because no leakage has been identified, no further leakage monitoring is necessary.

Community Impact Monitoring

Monitoring will be done annually as part of the overall monitoring of TIST. Data will be collected by TIST quantifiers as they visit each Small Group to count trees by species, count and measure Conservation Farming plots and count fuel-efficient stoves. Trainers will collect training information at cluster meeting, seminars and training meetings, which will include the subjects covered and the numbers and gender of people attending. The metric for training will be person-sessions, meaning the numbers reported are expected to exceed the number of members. Contracts will be collected and recorded by the administrative staff. The number of people employed or under contract with TIST and the amount of GhG payments to Small Groups will be obtained from administrative records.

Data collection is ongoing and will be reported every five years in accordance with the CCBA standard. Field data will be recorded on custom programmed hand-held computers and uploaded to the TIST database. Data will be kept at least three years from the end of the reporting period.

The following are the components of the Community Impact Monitoring plan.

1. **Number of Small Group members in PD (male and female).** Number of active members associated with the Small Groups that are listed in the CCB PD.
2. **Number of Small Groups in PD.** The Small Groups that are listed in the CCB PD.
3. **Number of community members in TIST Kenya (male and female).** This is for all of TIST Kenya and extends beyond the Small Groups listed in the CCB PD.
4. **Number of Small Groups in TIST Kenya.** This is for all of TIST Kenya and extends beyond the Small Groups listed in the CCB PD.
5. **Number of community members active in TIST Kenya.** Active member means they participate in any of the following TIST programs: tree planting, nurseries, conservation farming, stoves, riparian buffer, erosion control, etc. This is for all of TIST Kenya and extends beyond the Small Groups listed in the CCB PD.
6. **Number of members adopting natural resource management (NRM) practices.** This is expected to be the same as the number of community members active in TIST Kenya. However, if TIST adds new programs that are not NRM related, they will differ. This is for all of TIST Kenya and extends beyond the Small Groups listed in the CCB PD.
7. **Number of community members with greenhouse gas agreements with TIST.** Cumulative number of TIST members who have GhG contracts. This is for all of TIST Kenya and extends beyond the Small Groups listed in the CCB PD.
8. **Total payments to community.** Accumulated cash payments including carbon stipend, carbon revenue share and any other payment for environmental service paid to the Small Groups that are in TIST Kenya. This extends beyond the Small Groups listed in the CCB PD.
9. **Number of community members adopting Conservation Farming.** Cumulative number of members in TIST Kenya who have used Conservation Farming. This extends beyond the Small Groups listed in the CCB PD.
10. **Number of person-training session in climate change (male and female).** Cumulative number of attendees to a TIST Kenya training session. Invitees extend beyond Small Group members associated with the CCB PD. Person-training session metric.

11. **Number of person-training session in HIV/AIDS (male and female).** Cumulative number of attendees to a TIST Kenya training session. Invitees extend beyond Small Group members associated with the CCB PD. Person-training session metric.
12. **Number of person-training session in biodiversity (male and female).** Cumulative number of attendees to a TIST Kenya training session. Invitees extend beyond Small Group members associated with the CCB PD. Includes indigenous trees, erosion and riparian buffers. Person-training session metric.
13. **Number of live trees planted by TIST Small Groups.** This is the total trees alive at the last quantification visit by a TIST quantifier. It goes beyond the Small Groups in the CCB PD and includes all of TIST in Kenya.
14. **Number of fruit or nut trees.** Total number of fruit and nut trees planted by TIST Kenya and alive at the last quantification visit at each project area. It extends beyond the Small Groups in the CCB PD.
15. **Number of eucalyptus trees.** Total number of eucalyptus trees planted by TIST Kenya and alive at the last quantification visit at each project area. It extends beyond the Small Groups in the CCB PD.
16. **Number of fuel efficient stoves used in TIST Kenya.** Cumulative number of fuel-efficient stoves used by a TIST Kenya member or group. It extends beyond the Small Groups in the CCB PD and includes all of TIST in Kenya.
17. **Number of people employed by TIST or under contract to deliver services.** Number utilized at the time of the monitoring report preparation. It extends beyond the Small Groups in the CCB PD and includes all of TIST in Kenya.

In addition, many more program components such as GPS tracts of all the project areas are being obtained in the climate change monitoring plan.

Monitoring will be done annually as part of the overall monitoring of TIST. Data will be collected by TIST quantifiers as they visit each Small Group to count trees by species, count and measure Conservation Farming plots and count fuel efficient stoves. Trainers will collect training information at cluster meetings, seminars and training meetings, which will include the subjects covered, gender and numbers of people attending. The metric for training will be person-sessions, meaning the numbers reported are expected to exceed the number of members. Contracts will be collected and recorded by the administrative staff. The number of people employed or under contract with TIST and the amount of GhG payments to Small Groups will be obtained from administrative records.

Data collection is ongoing and will be reported every five years in accordance with the CCBA standard. Field data will be recorded on custom programmed hand held computers and uploaded to the TIST database. Data will be kept at least three years from the end of the reporting period.

Monitoring of HCV impacts. Because the project takes place on private lands that have been under human habitation and agriculture for generations, there will be no direct monitoring of the Mt Kenya HCV.

Biodiversity Impact Monitoring

The plan uses TIST's strength in gathering, verifying, and analyzing field data to measure critical biodiversity metrics in the farms and groves where TIST farmers work and live. Trees will be the main focus of biodiversity impact monitoring since they provide important habitat diversity and structural features for biodiversity. Tree biodiversity is expected to increase as a result of awareness raising, training and incentives.

TIST Quantification is a constant process. Trained Quantifiers will visit each discrete project area as part of their normal duties and collect the data required by this monitoring plan. Using the TIST Data System, key observations and measurements will be recorded in a digital format on hand held computers and sent to the TIST database. As new data comes in, it will populate the TIST.org website. Annual monitoring of each site is expected and a minimum of every five years will be achieved to conform with CCBA monitoring reports. Reports for CCBA will be at minimum every five years.

The biodiversity monitoring will be:

1) **Total hectares of the project.** This was presented in the project description and is based on the sum of each individual project area. While this is expected to remain constant over the life of the project, any changes will be reflected in the monitoring report.
2) **The area and location of each project area.** The original area and location of each project area was determined as part of the project description and presented in the PD and will be updated with each monitoring report.
    a) A Landsat image of central Kenya showing the location of the individual project areas as dot. This provides an overview of the project areas. This will be updated for each monitoring report.
    b) A KML file that displays the name, location and boundary of each project area on Google Earth. This will be updated for each monitoring report.
3) **Number of tree by species.** This is a list of trees by species with a count for all the CCBA project areas. Data is collected from each project area using a physical count of the trees by species.
4) **Number of indigenous trees by species.** This is a subset of the number of trees by species listing only the indigenous trees.
5) **Hectares of indigenous trees.** This is based on the proportion of indigenous trees to all trees in a project area times total hectares of the project area.
6) **The tree inventory of each project area.** This is a list of each stratum (species and age) for each project area.
7) **Hectares of improved riparian areas.** These are project areas that meet the following criteria:
    a) Land within 100 meters of a selected (selection expected to change over time) water course, or land where runoff flows directly into those rivers
    b) No eucalyptus planted within 100 meters of the waterway, and no more then 5% of the trees in the grove can be eucalyptus
    c) Over 30% of the grove must be planted with indigenous trees