Proceedings of the equipment training for the implementation of BFI

Bangladesh Forest Department

05 September 2016

USAID FROM THE AMERICAN PEOPLE

Food and Agriculture Organization of the United Nations

The Forest Department of Bangladesh leads actions to improve forest management and conservation, adopting forward thinking, innovative approaches in its management of approximately 1.55 million hectares of land across the country.

In 2015, the Forest Department began a process to establish a National Forest Inventory and Satellite Land Monitoring System for improved forest and natural resource management. The process supports national objectives related to climate change mitigation and provides information in support of the UN-REDD programme aimed at Reducing Emissions from Deforestation and Forest Degradation (REDD+). The process also addresses domestic information needs and supports national policy processes related to forests and the multitude of interconnected human and environmental systems that forests support.

The activities implemented under the Bangladesh Forest Inventory process are collaboration between several national and international institutions and stakeholders. National partners from multiple government departments and agencies assist in providing a nationally coordinated approach to land management. International partners, including the United Stated Agency for International Development (USAID) and the Food and Agriculture Organization of the United Nations (FAO) are supporting the development of technical and financial resources that will assist in institutionalizing the process.

The results will allow the Forest Department to provide regular, updated information about the status of trees and forests for a multitude of purposes including for assessment of role of trees for firewood, medicines, timber, and climate change mitigation.

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Disclaimer

This report is designed to reflect the activities and progress related to the project GCP/GD/058/USAID "Strengthening National Forest Inventory and Satellite Forest Monitoring System in support of REDD+ in Bangladesh". This report is not authoritative information sources – it does not reflect the official position of the supporting international agencies including USAID or FAO and should not be used for official purposes. Should readers find any errors in the document or would like to provide comments for improving its quality they are encouraged to contact one of above contacts.

Executive Summary

The 2nd national forest inventory is planned under a project titled “Strengthening National Forest Inventory (NFI) and Satellite Land Monitoring System (SLMS) in support of REDD+ in Bangladesh” under Forest Department with the financial assistance from USAID and technical assistance from FAO and SilvaCarbon. Variables to be considered for the NFI are identified and design has been prepared after doing several National consultations and meetings with the key stake holders. Manual is under revision for finalization.

One day training on the equipment’s is held at Botanical garden engaging the Field Team Leaders and Deputy Team leaders of field crew to show and teach the specific use of Range finder, GPS, Compass, densitometer and clinometer. This training will support to implement the NFI training in November 2016. Total 32 participants (29 male and 3 female) attended in the training.






Table of Content

1. Introduction

The training has been designed for implementation on 5th September 2016 involving the BFI Team on the field equipment for the proper implementation of the BFI. The training will ensure the staffs involved in the implementation of the Bangladesh Forest Inventory have the necessary skills to collect the information from the field plots.

Around 30 participants joined in the training. They are the QA/QC Team Leaders, field crew team leaders and deputy team leaders. The equipment's such as: Range Finder, GPS, Compass, Densitometer and Suunto Clinometer were used to teach the use of the instruments to be used during BFI for data collection.

The specific objectives of the trainings is to

- Describe and show the field equipment's to be used during inventory
- Provide hands on training on the equipment's.

At the beginning, instructions for the field measurements using the equipment were described by the QA/QC team leaders as describes below sections.

2. Use of Equipment for field measurements

2.1 Recording GEOGRAPHIC COORDINATES with GPS

2.1.1 Basic operations

The GPS unit is used to navigate to plot lactation and also to record information about reference positions used to monument the permanent plot locations. The main operations to achieve this involve navigating to a waypoint (GPS position) and recording a waypoint. The main operating buttons is described in Figure 1.

FIND	Select to open the search menu.
MARK	Select to save your current location as a waypoint.
QUIT	Select to cancel or return to the previous menu or page.
ENTER	Select to select options and acknowledge messages.
MENU	Select to open the options menu for the page that is currently open. Select twice to open the main menu (from any page).
PAGE	Select to scroll through the main pages.
▲▼◄►	Select ▲, ▼, ◄, or ► to select menu options and move the map cursor.
IN	Select to zoom in on the map.
OUT	Select to zoom out on the map.

FIGURE 1: KEYS ON THE GARMIN GPSMAP 64S (TAKEN FROM GARMIN QUICK START MANUAL).

2.1.2 Aquiring Sattelites

The device must be communicating with at least four (4) satellites in order to record a position with suitable accuracy. The number of satellites can be checked via the satellites page which is access by scrolling through the main pages (use the ***Page*** button to scroll through the main functions).

FIGURE 2: PRESSING THE *PAGE* FUNCTION BRINGS UP THE MAIN FUNCTIONS OF THE DEVICE.

2.1.3 Create a waypoint

Waypoints are created to record Reference Object (REFER) or Witness Objects that help in establishing a permanent plot location. To create a waypoint:

- Select ***Mark***
- The attributes can be edited using the arrow keys and pressing ***Enter*** on the appropriate field. *The coordinates are recorded on decimal degrees.*

2.1.4 Finding a waypoint

Finding a waypoint is the process of navigating to a plot coordinate. To find a waypoint, Go to the Waypoint Manager by scrolling through the ***Pages.*** Or select ***Find > Waypoint***

- Select ***Waypoint*** and scroll to find the specific waypoint
- Select ***Go***

2.1.5 Finding a coordinate

If the waypoints are not preloaded on to the device, a location can be found by navigating to a coordinate. To navigate to a coordinate:

- Select ***Find***
- Scroll to ***Coordinates***
- Enter the coordinate using the arrow keys and then select ***Done.***

A comprehensive instruction manual by Hossain, Costello et al. (2015) is available in Bangla via the BFI Unit.

2.2 MEASURING DISTANCES with the TruePulse Laser RangeFinder

The TruePulse 200 Laser Range Finder is used for measuring distance and height. It can also measure slope, horizontal distance and vertical distance. To operate the device, look through the view finder and press the 'fire/on'button 

on the top. The digital display shows an acronym for the function which can be changed by navigating the up and down arrows on the side of the device.

2.2.1 Changing units

It is critical to ensure all measurements are being collected in metres. The device allows you to choose between YARDS, METERS, and FEET for distance measurements. To change the units selection:

1. Press ▼ for 4 seconds to access the System Setup Mode. "UnitS" will appear in the Main Display.
2. Press FIRE to select the "UnitS" option.
3. Press ▲ or ▼ to display the previous or next distance unit option.
4. Press FIRE to select the displayed distance unit and return to the operational Mode.

Each time the device is powered ON, it will return to the same unit setting that was last used.

2.2.2 The basic steps for taking any distance measurement:

1. Look through the eyepiece and use the crosshair to aim to the target.
2. **Press-and-hold** FIRE. The LASER status indicator is displayed while the laser is active. The laser will remain active for a maximum of 10 seconds while acquiring data about the target. If the target is not acquired in the 10 second period, release FIRE and repeat this step.
3. Once the measurement is displayed, release FIRE. The measurement will flash one time indicating the measurement was downloaded. Then the measurement will be displayed steady until you press any button or the unit powers OFF.

The device has a range of measurement functions as outlined in Table 1.

TABLE 1: THE VARIOUS MEASUREMENT FUNCTIONS CAN BE CHANGES BY SCROLLING WITH THE ▲ OR ▼ ARROWS.

Code	Function	Description	
SD	Slope Distance	Straight line distance between the TruPulse and the target.	
VD	Vertical Distance	The distance between the target and the perpendicular to the path of the horizontal distance.	
HD	Horizontal Distance	The level distance between the TruPulse and the plane of the target.	
INC	Inclination	The angle of inclination between the TruPulse at level and the target.	
HT	Height	Three-step height routine. The final calculation represents the vertical distance between the points on the target represented by ANG1 and ANG2.	

2.2.3 Measuring Height

Height Measurements involve a three step process. This includes one horizontal distance (HD) and two angle (INC) measurement aimed – one to the top of the tree and one to the bottom. At each step prompts are provided through the eye piece. The device uses these results to calculate the height of the target.

It is important to stand at a suitable distance from the tree so the aim can be made to the top of the tree (step 3) and not the outer branches.

Figure shows the three shots required for the height routine.

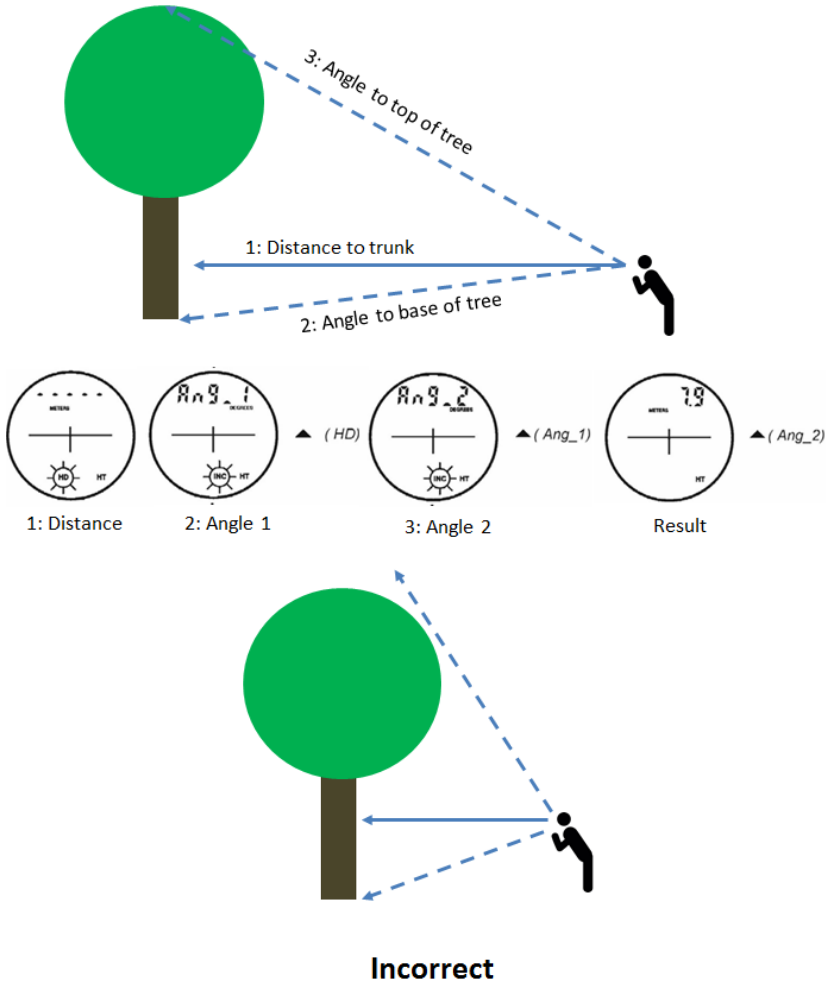


FIGURE 3: CORRECT METHOD (LEFT) OF HEIGHT MEASUREMENT. THE ICONS SHOW THE TREE STEP PROMPTS AS VIEWED THROUGH THE EYE PIECE. INCORRECT METHOD (RIGHT) OCCURS IF THE PERSON IS STANDING TOO CLOSE TO THE TREE.

2.3 MEASURING SLOPE AND BEARING

All distances are expressed as horizontal distances. *Horizontal* distance differs from *slope* distance. Horizontal distance is the measurement between two points at a constant angle. Slope distance considers angle and will therefore be longer. When the terrain is flat, distances can be measured directly. But on sloping terrain the horizontal distances differ from direct distances (See Figure 4). A corrected distance is taken from a slope correction table (Annex 2) and these distances are applied at all slopes above or equal to 5 percentage.

2.3.1 Measuring height with the Suunto

The Sunnto is acts as both a compass and clinometer. The compass us used by looking through the device while it is flat. Slope distance is measured by looking through the device upright. You will know if you are holding the device correctly if the numbers appear the right way up.

- Measure the distance from the tree (d)
- Measure the angle of the tree (a)
- Height = a x d
- Add your height to eye level to get the total tree height.

TABLE 2: SUUNTO COMPASS AND CLINOMETER

2.3.2 Recording Slope

Measure slope angle across the subplot to the nearest 1 percent using the Suunto. Looking through the view finder, the numbers on the left hand side are the degrees. The numbers of the right hand side are **percent**. REMEMBER: the units are recorded in **PERCENT.**

SUBPLOT SLOPE is determined by sighting the clinometer along a line parallel to the slope of each subplot. This angle is measured along the shortest pathway down slope before the drainage direction changes. To measure SUBPLOT SLOPE, Observer 1 should stand at the uphill edge of the subplot and sight Observer 2, who stands at the downhill edge of the subplot. Sight Observer 2 at the same height as the eye-level of Observer 1. Read the slope directly from the percent scale of the clinometer:

- If slope changes gradually across the subplot, record an average slope.
- If slope changes across the subplot but the slope is predominantly of one direction, record the predominant slope percentage rather than the average.

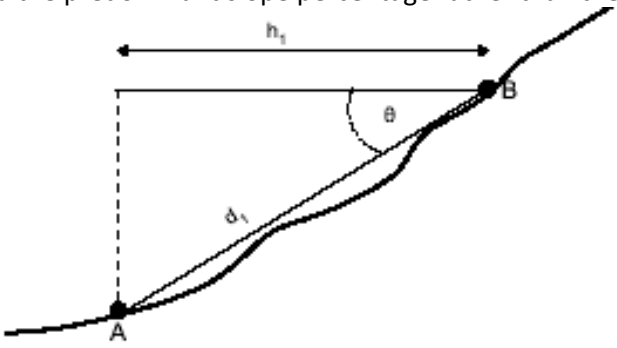


FIGURE 4. DISTANCES ON SLOPE. H1 DISPLAYS HORIZONTAL DISTANCE. D1 DISPLAYS SLOPE DISTANCE.

Note: The distance between two points, measured along slope (d_1) is always longer than an equivalent horizontal distance (h_1). On slope terrain, the horizontal distance must be multiplied by a factor that corresponds to the inclination, in order to obtain a corrected distance.

Slope is measured using the TruePulse, clinometer or Suunto hypsometer. The unit in this inventory is percentage. Where distances are measured using a measuring tape on sloping ground, slope distance will need to be corrected back to horizontal using the following equation:

$$Horizontal\ distance = Slope\ distance \times Cos(\sigma)$$

Where σ = slope angle in degrees.

The equation can be written in the following form when slope angle is in percentages:

$$Horizontal\ distance = Slope\ distance \times Cos(Atan(\alpha/100))$$

Where α = slope angle in percentages (%).

The slope correction table for distances is presented in Appendix NNN.

Note: The points recorded by the GPS will reflect horizontal distance. No corrections for distances on slope are required.

2.3.3 SUBPLOT SLOPE DIRECTION

SUBPLOT SLOPE DIRECTION is measured with a hand compass along the same direction used to determine slope.

- If aspect changes gradually across the subplot, record an average aspect.
- If aspect changes across the subplot but the aspect is predominately of one direction, record the predominate direction rather than the average.

2.4 Measuring Leaf Cover with a Densiometer

To record LEAF COVER, look through densitometer and step out the transects from the subplot centre and record a value every 1m. At each 1m interval, record a '1' for canopy covered area and '0' for the sky (see **Error! Reference source not found.**). The 8m transects are the same used to later measure the wood debris, see section **Error! Reference source not found.**.

Leaf cover: 1 (YES) Leaf cover: 2 (NO)

2.5 Recording Bearing with a Compass

To find a bearing with a compass, line up the red north arrows by twisting the circular bevel. The degrees are listed around the outer circle of the compass. A bearing is recorded by following the line of the bearing. The direction north is at 360 or 0.

FIGURE 5: THE BEARING MEASUREMENTS ARE NUMBERED AROUND THE OUTSIDE OF THE INSTRUMENT.

3. Exercises

Five groups were formed to conduct the exercises using the equipment. The following exercises were designed for the groups.

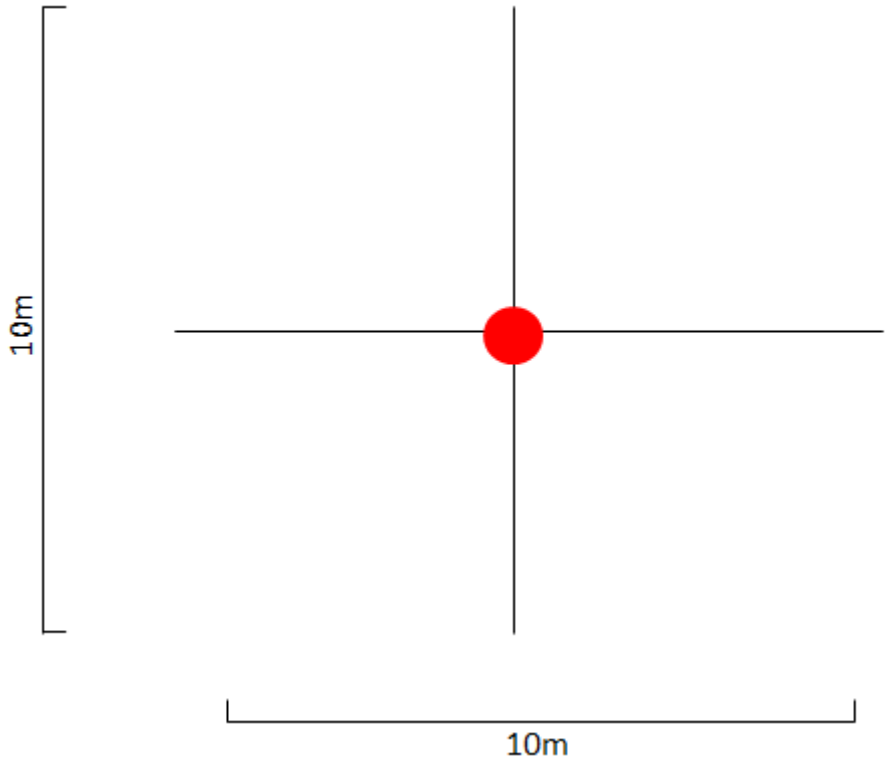
3.1 Densiometer Exercise

Navigate to the Location. Record the leaf cover along two 10m transect in cardinal directions with the plot coordinate located at the midpoint.

What is the leaf cover?

Compare your answers with your colleagues and discuss reasons for the variability. Is it within an acceptable threshold!

The tolerance for the BFI if =/- 5%



3.2 Suunto Exercise

Measure the slope in degrees at each location

3.3 Laser (TruePulse) Exercise

Record the height of a tree at distances of 10, 15 and 20m. What is the variation? Which do you think is most accurate?

What do you think is the optimum distance to record the height of the tree?

Now use the Suunto to measure height at the optimum distance

The answer is the distance should be somewhat proportional to the height of the tree

Tree 1: Height using Laser			
Distance	Angle 1	Angle 2	Height
10			
15			
20			
Height using Suunto			
		a*d=h+eye level	

3.4 GPS Exercise

Location 1

- Use the Page Button and access the Satellites page. Note how many satellites are displayed. How many satellites are required to record a position?
- Use the Page button to find the Waypoint Manager. Scroll through the Waypoints until you find the plot Loc 1. Navigate to the position.
- What is the accuracy reading on the GPS?
- Use the Find Coordinates Function and navigate to the coordinates:

  x: 90.350419
  y: 23.823153
- What is the distance and bearing to Loc 1
- Walk 28m at 60 degrees from Loc 1. What are the coordinates?
- Walk approximately 30-40m in a random direction from Loc point. Create a Waypoint and note the coordinates. Take the distance and bearing from Loc point. Ask one of your colleagues to navigate to the coordinate and then provide the distance and bearing to the location. Where they within the tolerance threshold? (The tolerance for the BFI is 5% for distance and 4 degrees).

4. Conclusion

It was a basic training on the uses of the equipment for data collection. The idea was for conducting the training to support the later trainings to be organised for the implementation of BFI in November 01-06, 2016.

Appendix 1. Agenda

Equipment training for the implementation of BFI

05 September 2016

Dhaka

5th September 2016	Items	Facilitator
9.00AM	Registration	
9.30AM	Introduction of the participants, training objectives	Mariam Akhter and Laskar Maqsudur Rahman
10.00AM	Brief on the instruments, discussion on the exercises and group formation	Mariam Akhter. Zaheer Iqbal, Imran Ahmed
10.30	Use of the instruments and conduct the exercises by groups	Mariam Akhter
1.00PM	Lunch Break	
1.45PM	Continue the exercises	Mariam Akhter
4.00PM	Open Discussion	Mariam Akhter
5.00PM	Closing	

Appendix 2. Participant List

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Appendix 3. Evaluation of the training