



# Proceedings of the national consultation on National Forest Inventory design



Bangladesh Forest Department 13 April 2016





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.

#### CONTACTS:

Md. Zaheer Iqbal	Matieu Henry
National Project Coordinator	Chief Technical Advisor
Bangladesh Forest Department	Food & Agriculture Organization of The United Nations
Email: <u>z.iqbal60@gmail.com</u>	Email: <u>matieu.henry@fao.org</u>

Suggested Citation: **Costello, L., Rahman, L. & Akhter, M.** 2016. Proceedings of the National Consultation on National Forest Inventory Design. 13 April 2016, Dhaka, Bangladesh. Bangladesh Forest Department, Food and Agriculture Organization of the United Nations.

#### **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 Bangladesh Forest Inventory (BFI) is a multifunctional instrument to provide information to guide social, economic and environmental forest-related policies and measures. The BFI aims at providing information on the state and trends of forest resources as well as the societal benefits they provide in terms of their goods and services. Various forest inventories have been implemented by the Bangladesh Forest Department (BFD) at regular intervals with support from different stakeholders, in particular the Food and Agriculture Organization of the United Nations (FAO). The last national level inventory was carried during 2005-2007 in which systematic sampling used whereby each sampling unit (tract) was 1 km X 1 km. A total of 297 tracts over the country. Four rectangular plots of 250m X 20m as well as three circular sub plots were taken from each plot.

An effective NFI design will consider the national context and the specificities that make its forests unique. To this end, the BFI team has considered the various forest types of Bangladesh and the close interaction that communities have with forests and trees outside forest within the design proposal. To ensure adequate review and critique of the design proposal a day long consultation workshop was arranged at BFD on 13 April, 2016. A total of 46 participants (Male-36, Female-10) attended. The main objectives of the workshop were to share the draft design to receive comments and suggestions from the participants. The involvement of the stakeholders in the NFI design is a paramount to ensure the sustainability of the NFI and reduce misunderstandings as much as possible.

The specific objectives of the consultation were to present two options for forest zoning and to share the NFI design options; discuss and receive comments for the finalization of the NFI design. Various important issues have been discussed such as proposing forest zones for stratification purpose to support inventory objectives, and the geographic location of the field inventory plots according to an hexagonal or lat/long square grid.

The group discussion centered around stratification options of either ecological zoning or legal boundaries based on BFD forest tenure. It was concluded that stratified, systematic sampling is preferred. The circular plot design presented was also considered efficient and favourable for the national context. The plot shape included 5 circular sub plots. Tree numbers, species, volume, biodiversity, forest ecosystems services and dependency of adjacent communities should be considered in the final NFI design.

# **Contents**

Executive Summary	3
1. Introduction	6
2. Objectives of the workshop	7
3. Methodology	7
4. Inauguration Session	7
5. Overview of the Presentations	9
5.1 Ecological Zoning for forest assessment by Mariam Akhter, FAO-BD	9
5.2 Proposed National Inventory Design by Laskar, Prof Al Amin and Olaf Kuegler	11
6. Group Discussions	13
6.1 Summary of Group Exercise	13
7. Conclusion:	16
APPENDIX 1: AGENDA OF THE WORKSHOP	17
APPENDIX 2: LIST OF THE PARTICIPANTS	18
Appendix 3: Evaluation	20

#### Acronyms

- AF Arannayk Foundation
- BBS Bangladesh Bureau of Statistics
- BFD Bangladesh Forest Department
- CHT Chittagong Hill Tracts
- CI Confidence Interval
- CREL Climate Resilient Ecosystems and Livelihoods
- CRPARP Climate Resilient Participatory Afforestation and Reforestation Project
- DFO Divisional Forest Officer
- FAO Food and Agriculture Organization of the United Nations
- IUCN International Union for Conservation of Nature
- NFA National Forest Assessment
- NFI National Forest Inventory
- PSP Permanent Sample Plot
- REDD+ Reducing emissions from deforestation and forest degradation and the role of conservation, Sustainable Management of forests and enhancement of forest carbon stocks in developing countries.
- RIMS Resources Information Management Systems
- TSP Temporary Sample Plot
- UNDP United Nations Development Programme
- USAID United States Agency for International Development
- USDA United State Department of Agriculture

#### **1. Introduction**

Forest inventory has been undertaken by the Bangladesh Forest Department (BFD) at regular time intervals with a view to assess and monitor national forest resources. The process provdes a multifunctional instruments to guide social, economic, environmental policies and measures like timber production, plant diversity, change forest cover, social forestry, value of livelihood, forest governance, REDD+ and different ecosystems services. Since 1950, several forest inventory projects have been carried out by the BFD but have mainly been focussed at sub-national scale in areas including Sundarbans, Chittagong Hill Tracts, Sylhet, or they have been carried out for research purposes including estimation of carbon in forest biomass and forest soil. The first national level inventory was done in 2005-2007 popularly known as NFA 2007 with assistant team of specialist from Bangladesh and FAO. A systematic sampling design was used with each sampling unit at 1 km X 1 km in 297 tracts across the country. Each tract comprises 4 rectangular plots with three circular sub plots in each. A decade after NFA 2007, a second national inventory is on track and an optimal design has been developed out of many sampling design options for forest inventories. The process is being implemented by the BFD with support from a number for organisations including the United States Agency for International Development (USAID), the Food and Agricultural Organisation of the United Nations (FAO), SilvaCarbon, the UN REDD Programme (UNDP, FAO, UNEP), the World Bank funded 'Climate Resilient Participatory Afforestation and Reforestation Project' (CRPARP), Climate Resilience Ecosyetem and Livelihoods (CREL) (USAID funded), national research institutions and affiliated government agencies.

With a view to disseminate the present NFI design a national consultation workshop was held at BFD's Korobi Conference Hall (ground floor), Banbhaban on 13 April 2016. Mr. Mr Ishtiaq Uddin Ahmed, Country Representative, IUCN present as a Chief Guest and Mr. Mohammed Shafiul Alam Chowdhury, Deputy Chief Conservator of Forests, Forest Management wing, BFD presided over the consultation workshop. Various methodological issues have been discussed regarding existing status of forest inventory in Bangladesh, Ecological Zoning for forest assessment and proposed NFI design at the consultation workshop. Mr Laskar M. Rahman from FAO moderated the workshop for successful execution. A total 46 participants (See APPENDIX 2: LIST OF THE PARTICIPANTS) attended at the workshop including Forest Department officials, FAO representatives, SilvaCarbon, USDA forest services, university professors and many others professionals.

## 2. Objectives of the workshop

The overall objectives of the workshop were to share the draft design that has been developed after several consultations with the BFD officials before the implementation of the national forest inventory. The specific objectives of the consultation was to

- Discuss and receive comments on the design;
- Finalize the design.

## 3. Methodology

The consultation workshop has been held into three sessions based on agenda of the workshop (APPENDIX 1: AGENDA OF THE WORKSHOP)

- 1. Opening/inauguration session
- 2. Presentation of the ecological zoning and
- 3. Proposed NFI design

Session 3 consisted of presentations of group exercise based on supplied questions.

A number of previous forest inventories have been carried out in Bangladesh. Data for the inventories has been harmonised and analysed to assist the NFI design process. A map of harmonised inventories in provided in Figure 1.



At the beginning, Laskar Rahman (FAO) welcomed to all the participants to attend the workshop and introduced Chief Guest, Special Guest and Chair of the programme as well as requested to provide the participants name and respective organization before going to formal discussion and presentation.

**Mr. Md. Mozaharul Islam,** Conservator of Forest and National Focal Point UN-REDD Forest Department addressed the welcome speech at the programme. He thanked all the participants for their attendance as well as gratitude to Chief Guest, Chair and Special Guest for their presence. He said the NFI is very important to track the forests resources and forest department is responsible for to provide information regarding forest update, forest services, design, methods, advantages and many others related to forests. The last forest inventory has been done by forest department in 2005-2007 with technical support from FAO. He wished the appropriate NFI design and methodology to consider the national context interests.

Following the discussion, **Mr. Zaheer Iqbal**, Deputy Conservator of Forests, RIMS Unit, FD presented "Existing status of the forest inventory in Bangladesh". He discussed previous survey and inventory done in Bangladesh particularly CHT in 1997, Sylhet in 2011, Sundarbans in 1963, 1983 and 1998. He mentioned that the methodologies of last national forest inventory done in 2007, latest Sundarban mangroves carbon and Sal forest inventory. In 2007, 150,000 trees were measured at the NFI.

**Mr. Shaheduzzaman**, Sr. Project Adviser cum National Team Leader, MOEF Project FAO thanked to all distinguished participants especially Chair, Chief Guest and Special Guest and expressed gratitude to the organizer. He shared different experiences regarding forest inventories that since 1950 FD has been conducting forest inventory in Bangladesh following different designs however there has been little consistency between them. He commented that the last NFI (2005-07) had flaws related to its capacity to provide comprehensive data on the range of forest types.

**Mr. Ishtiaq Uddin Ahmed**, Chief Guest of the workshop thanked the distinguish participants and expressed gratitude to organizer and Chief Guest. He discussed about importance of forest inventory in the country. Forest inventory is an integral part of forest department to monitor forest tree and forest resources. Forest inventory has been carried in different forest locations by different technical organizations for example forest inventory in Chittagong hill tracts in 1964 by Forestal/Canada and also in Sundarbans. To do inventory, design, sampling, stratification are important part for execution. Apart from these he discussed about design and layout of the forest inventory, its required time frame, skill person at FD, and permanent working member of FD to conduct after 10 years. He also emphasized the components of forest inventory; work plan, objectives of NFI end use, information collection, socio-economic, soil, processing of information.

Regarding design of the plot, he mentioned that both circular and rectangular plot are adequate. He suggested that there is little in the outcome however circular plots are easier to lay out measure while rectangular is very different and required high skills. Conducting of national forest assessment has many reasons; contributing to global forest assessment, informing national policy and others. He suggested the current NFI should learn from the lessons of previous experience.

The Chair of the consultation workshop **Mr. Mohammed Shafiul Alam Chowdhury,** Deputy Chief Conservator of Forest thanked to all participants especially Chief Guest and requested to senior forest officers to advise us for preparing the NFI. FD is mainly responsible for conducting NFI, this is a rolling programme and we need to understand composition and distribution of forest resources. The objective of the workshop is to finalize the NFI design. Finally he requested to all participants to provide good suggestion, good design and wished success of the consultation workshop.

#### **5. Overview of the Presentations**

#### 5.1 Ecological Zoning for forest assessment by Mariam Akhter, FAO-BD

Mariam Akhter discussed about ecological zoning for forest assessment. The main objective of the ecological zoning was to capture the variability of forests within the different eco-zones for forest management purposes.

Ecological zones may be appropriate to use as forest strata within the inventory design. Zoning or stratification is a process of creating sub-populations to assist survey design optimisation. The process involves dividing a population into non-overlapping subpopulations called strata that together comprise the entire population. An independent sample can then be drawn from each individual stratum (Czaplewski 2004). One important consideration for stratification is that the stratification area – or zone – should not change over time.

The eco-zones presented were developed based on several existing maps both global and national in context (agro ecological, physiographic and bio-ecological map). The information was analyzed to produce the eco-zones. The analyzed existing maps were land cover (NFA 2005), Precipitation (CRU), Temperature (CRU), Salinity (BARC), DEM (USGS), Soil (FAO) and Forest land (RIMS).

The eco-zone map was presented against another option for forest stratification based on legally defined administrative boundaries under the tenure of FD. The two options were presented:

**Option-1** is based on edaphic factors and climate (eco-zones). The map is clearly shown that Sundarban fall another zone, coastal, Hill and Sal fall another zone based on forest types in Bangladesh for the option 1.

**Option-2** is based on forest tenure and administrative boundaries, or FD managed areas.

The presentation compared the options based on areas and extent. It was shown that the ecozones equate to a larger area in total compared to the legal boundaries. The area of greatest discrepancy exist in the coastal zone. This is because the coastal eco-zone considered a homogeneous area based on soil type and salinity whereas the legal boundaries only consider the areas under mangrove plantation.



Figure 2: Eco-zone areas (green) compared to areas administered my FD (red).

#### Discussion

Discussion related to the merits of using the two options as strata for the design. It could be seen from the maps presented that the greatest discrepancy between the zones exists in the coastal areas.

For the Mangrove, Hill and Sal forest areas, the zonation is quite similar. The benefit of using the eco-zone for stratification mean that the area will not change over time, however the legal boundaries may. Some commented that the legal zones are better known to FD and may therefore be more suitable. The key question is what would make more sense in terms of deriving management outcomes which is embedded in determining the overall objectives of the NFI, and objectives for each forest type.

The participants also discussed about confusion matrix which presented the amount of actual forest that was likely to be present in the respective zones based on the two options. It was determined that further clarification is required to understand the matrix.

## 5.2 Proposed National Inventory Design by Laskar, Prof Al Amin and Olaf Kuegler

**Lasker M. Rahman** discussed about logistics of field operation related to how central and divisional forest offices will coordinate; how field inventory crew and QA/QC team will carry out their activities. Current proposals are for field crew teams to be made of 7 members. There will be 22 duty station and 109 divisional office.

Then **Prof Al Amin** presented proposed design of national forest inventory done by CRP-ARP. He discussed the methodology of the proposed forest inventory including design, procedure, sampling, and sample size.

**Olaf Kuegler** proposed 5 options for NFI design. The option 1: Stratified-systematic sampling on hexagonal grid, option 2: Systematic point and Carbon inventory plots, option 3: Systematic sampling grid lat 3' X long 2.5', option 4: Random sampling on systematic grid lat 3' X long 2.5' and option 5: Systematic sampling on grid Grid lat 3' X Long 2.5' with subsampling rule.

One limitation of the lat-long grid is the variation in area within the grids that occurs between the north and south of the country caused by the curvature of the earth. It has been calculated that grid area is up to 4.5% greater in the south of the country - towards the equator. The implication of this is that it creates bias in design as more plots will end up being allocated in the south of the country. Using the hexagonal grid system is one way to overcome this issue.



Figure 3: Systematic sampling Grid Lat 3'x Long 2.5'



Figure 4: Stratified - Systematic sampling on hexagonal grid

# <u>6. Group Discussions</u>

The participants were divided into four groups for exercising the group work. A questionnaire (consisting of 4 questions) was supplied to each to perform the group work. The group discussion was facilitated by Sasha Beth Gottlieb, Asia Pacific Programme Specialist, USDA Forest Service. The supplied questions were

- 1. Two options for forest zoning are proposed. Which are the advantages and disadvantages of the proposed forest zoning maps? What would be the recommended option?
- 2. Different sampling design options are proposed (Gird and Hexagonal). What are the advantages and disadvantages? What would you recommend?
- 3. Several forest inventories have been undertaken. How feasible is it to re-measure them?
- 4. Do you have any other recommendations/ comments on how to implement the National Forest Inventory (e.g. variables, plot shape, size, cost, etc.)

#### 6.1 Summary of Group Exercise

There was mixed views on the advantages and disadvantages related to questions 1 and 2.

For question 1, discussions revealed that participants could see value in ecological zoning however in some areas, such as in the coastal zone, there may be significant amount of non-forest included and therefore have implications for the stratum more broadly. Participants seemed less concerned about this than in the other forest zones.

For question 2, related to the sampling design, there was support for the 2.5 – 3 grid, due to its familiarity from the previous NFA and its alignment with the CRPARP proposal. There were advocates for the hexagonal grid too, though further clarification of its benefit would be required for broad endorsement.

For question 3, it was generally considered that to remeasure the NFA plots would be very difficult.

More detailed overview of discussion is provided below.

After completing the group works, each the group leader presented the findings which are below

Questions	Group 1	Group 2	Group 3	Group 4
1	<ul> <li>Advantage: None,</li> <li>Inconvenient: it arises complexity in NFI process, huge confusion and output is unexpected.</li> <li>Recommendation:         <ol> <li>First develop forest and non-forest strata</li> </ol> </li> </ul>	<ul> <li>Management vs Biophysical</li> <li>For the coastal areas, it is prefer to use management/legal zones</li> <li>because</li> <li>Biophysical zoning will include significant areas of habituated (non-forest) land</li> </ul>	<ul> <li>Option 2 is recommended</li> <li>With existing Forest Type boundaries</li> </ul>	Advantages Option 1: - Strong ecological basis (forest formation) - Larger area cover - Forest land dynamic could be addressed
	<ol> <li>Then stratify within forest types (HF, SF, MF, CA, SWF etc). Preferred every forest division should be included</li> <li>Tree outside forest</li> </ol>	<ul> <li>Legal/management zones are preferable to avoid legal problems.</li> </ul>		Option 2: - More precise representation of forests - Forest officials are more familiar <b>Inconveniences:</b> <b>Option 1:</b> -Requires more information and interpretation - Old data - Need more effort and time <b>Option 2:</b> Forest boundaries change due to socio-economic changes
2	<ul> <li>Stratified systematic sampling is recommended</li> <li>More sample plots from forest area and less sample plots from TOF/NFA</li> <li>Grid 3' X 2.5"</li> <li>Circular plot with 5 sub-plots</li> </ul>	<ul> <li>a) Sampling design options for coastal</li> <li>Systematic sampling is likely to be too intensive</li> <li>Option 2 is preferable: Hexagonal grid is beneficial as it allows for co-location of previous plots, particularly the NFA plots and understand the changes</li> <li>b) Sampling design options for Sundarbans</li> </ul>	Sampling Design: 1. Stratified Sampling, then stratified Systematic sampling, Grid type - with systematic interval (example : Sundarban Mangroves: 150 plots (2'X 4' interval) as 2009. In other Forest types(including TOF) ,	<ul> <li>For Sundarbans and coastal afforestation option 2 is recommended</li> </ul>

		<ul> <li>Systematic sampling is likely to be too intensive</li> <li>Option 2 is preferable: Hexagonal grid is beneficial as it allows for co-location of previous plots,</li> <li>For Sundarbans it should consider PSP and TSP of previous inventories.</li> </ul>	required sampling intensity should be identified	
3	Re-measure the NFD 2005 and SCI plots is recommended	Re measurement is 'very difficult'.	<ul> <li>Re-measurement of the previous NFA plot –Not feasible to re-measure the previous NFA plots in NFI</li> </ul>	<ul> <li>Feasibility of re-measuring: Less</li> </ul>
4	FAO prescribe 5 carbon pools should be measured	<ul> <li>Circular plots are preferred</li> <li>Systematic stratified is preferred</li> </ul>	<ul> <li>Recommendations :</li> <li>1. Plot shape – Circular</li> <li>2. Subplot distance – 50 m (centre to centre)</li> <li>3. Size : optimization exercise is needed</li> <li>4. QA QC team – Team already formed by Forest Department should be involved. University people may be incorporated.</li> <li>5. Crew team member: Forestry Graduates and Forestry Diploma holders will be the member of the crew team.</li> </ul>	<ul> <li>Biomass, Volume, No. of tree, Biodiversity, forest eco- system services and dependency of adjacent communities</li> <li>Circular sample plots are recommended</li> <li>Proposed plot size is ok</li> </ul>

## 7. Conclusion:

The presentation and discussion will assist the BFI team to finalise a design that is in line with the national context. The next steps in the process will be to present a unified design based on comments and options that provide the best outcome for forest assessment and monitoring for Bangladesh. The design will be presented to FD official for their final comment and endorsement in May.

## 8. Next Steps:

- 1. Finalize Ecozone vs Legal boundaries, especially in coastal areas where polygons are most fragmented
  - Define precision requirement for coastal forest strata.
- 2. Hexagons vs. Lat-Long grid. If the Lat-Long grid is used the bias created by areas variability of the grid will need to be addressed. For this the following options may be explored:
  - Stratify by latitude bands, however this reduces the ability to stratify by other factors.
  - Estimators that have weights reflecting the changing probabilities of selection
  - Unequal probability estimators
  - Subsample from the grid to give equal weights across latitudes.
  - o Ignore the problem and assume that the country is the same from north to south (maintain bias).
- 3. Re-run FRIED to check that the plot design is optimal, else propose a new one
- 4. Recompute sample sizes
- 5. Determine plot locations.

Date	Торіс	Speaker/facilitator	
Morning	Session 1: Opening session		
9.00-9.30	Registration	<b>Ms Shuhala Ahsan</b> , FAOBD	
9.30-9.35		Mr. Md. Mozaharul Islam	
	Malcomo Addross	Conservator of Forests and National	
	Welcome Address	Focal Point UN-REDD, Forest	
		Department	
9.35-9.45	Existing status of forest inventory in	Mr. Zaheer Iqbal, Deputy Conservator	
	Bangladesh	of Forests, RIMS-FD	
9.45-9.55		Md. Shaheduzzaman	
	Special guest	Sr. Project Adviser cum National Team	
		Leader MOEF Project, FAO	
9.55-	Chief Guest	Mr Ishtiaq Uddin Ahmad	
10.05		Country Representative, IUCN	
10.05-		Mohammed Shafiul Alam Chowdhury	
10.15	Address by the chair	DCCF, Forest Management Wing, Forest	
		Department	
10.15-	Tea Break		
10.30			
	Session 2: Presentation of the ecological zoning		
10:30AM	Ecological zoning for forest assessment	Mariam Akhter, PhD, FAO-BD	
	Session 3: Proposed NFI design		
	Proposed National Forest Inventory Design	Olaf Kuegler	
		Mathematical Statistician	
		Forest Service Pacific Northwest	
		Research Station, Portland, USA and	
		Zaheer Iqbal, DCF, RIMS	
11.00AM	Group Discussion	Sasha Beth Gottlieb	
		Asia Pacific Programme Specialist	
		USADA forest servie International	
		Programs and Md. Mozaharul Islam,	
1.00016		NPC, CF	
1.30PM	Closing & Lunch		

# **APPENDIX 1: AGENDA OF THE WORKSHOP**

## **APPENDIX 2: LIST OF THE PARTICIPANTS**

SI			Designation and	Mobile	
No.	Name of the participants	Gender	organization	number	E-mail address
1.	Mr. Md. Shaheduzzaman	Male	FAO		md.shaheduzzaman@fao.org
			Country		
2.	Mr. Ishtiag Uddin Ahmad	Male	Representative IUCN		iuahmad55@gmail.com
3.	Mr. Md. Farugue Hossain	Male	DCCF, FD	01731-928106	farugue hossain@yahoo.com
4.	Mr. Md. Mahmudur Rahman	Male	CRPARP	01913510107	misgis.crparp@gmail.com
	Mr. Ruhul Mohainmen				
5.	Chowdhury	Male	Manager, M&E, CREL	01726892305	ruhulforester@yahoo.com
6.	Prof. Dr. Md. Al-Amin	Male	IFESCU	01819820184	prof.alamin@yahoo.com
			Professor, Khulna		
7.	Prof. Dr. Golam Rakkibu	Male	University	01730062903	golamrakkibu@yahoo.co.uk
8.	Mr. Abdul Mannan	Male	AF	01735684848	amannan77@gmail.com
	Mr. Mohammed Shafiul				
9.	Alam Chowdhury	Male	DCCC	01819323000	msalamchow@gmail.com
10.	Mr. Md. Akbar Hossain	Male	DCCF, FD		
	Mr. Md. Zaid Hussain				
11.	Bhuiyan	Male	DCCF edtw	01712074350	dccf-edtw@bforest.gov.bd
			Director, Wildlife		
12.	Dr. Sunil Kumar Kundu	Male	centre	01711801049	sunilkundu98@gmail.com
13.	Mr. Md. Mozaharul Islam	Male	CF, BFD	01713002891	Maxhar.raj@gmail.com
14.	Mr. Uttam Kumar Saha	Male	PD, CRPARP	01715549120	pdcrparpfd@gmail.com
15.	MS. Fatima Tuz Zohora	Female	DCF, FD	01712655290	Fatima26bd@yahoo.com
16.	Mr. Md. Zaheer Iqbal	Male	DCF, FD	01711443750	dcf.rims@gmail.com
17.	Ms. Umme Habiba	Female	DCF, FD	01712583892	habiba_fo@yahoo.com
18.	Mr.Md. Rakibul Hasan Mukul	Male	ACCF, BFD	01711438032	
19.	Mr. Md. Aminul Islam	Male	Sociologist	01712859311	aminul.sociologist@yahoo.com
20.	Mr. Abani Bhushan Thakur	Male	CF, FD	01761494639	thakurabani@yahoo.com
21.	Mr. Md. Baktiar Nur Siddiqui	Male	DFO, FD	01711819670	baktiar1971@gmail.com
22.	Ms. Raihana Siddiqui	Male	CF, FD	01731828106	raihana003@yahoo.com
	Mr. Hossain Mohammad				
23.	Nishad	Male	DFO, SFD, Dhaka	01715005677	hmnishad@gmail.com
			DFO, Management		
24.	Mr. Nirmal Kumar Paul	Male	plan division, Khulna	01761494707	paulnirmalbgd@hotmail.com
25.	Mohammed Aminul Islam	Male	SCCF (G) FD,	01712503494	Animul.bfd@gmailcom
26.	Mr. Imran Ahmed	Male	DFO, Rajshahi	01711445247	imranforest@gmail.com
27	Mr. Quazi Md. Nurul Karim			04744205002	
27.		Male	ACF, Legal unit, FD	01/11395992	<u>quazi.karim@gmail</u> .com
28.	A.K.M Shasuddin	Male		01715298675	
29.	Ariful Hoque	Male		01/12115625	arifulnoquebelai@gmail.com
30.	Dr. Md. Talabur Ranman	Male	PSO, SKDI	01552306698	mtranman63@gmail.com
31.	Liam Costello	Male	FAU	01711074452	
32.	All	IVIAIE	FRU Country Coundinator	01/119/4153	
22	Duliahana Cultana	Famala	Country Coordinator,	01725442670	wulasha na Qailua sa nha na hal ang
33.	Rukshaha Sultana	Female	Slivacarbon, BD	01/35442679	ruksnana@silvacarbon-bd.org
24	Borsia Nargis	Fomala	Frogram Officer,	01725442700	norsia@silvasarhan.hd.ara
54. 2⊑	reisia indigis	Female		01711170607	persia@silvaCarbon-bd.org
55.		remale	GIZ liason sunnort	01/111/009/	
36	Mahmud Hasan Tohir	Male		01818174030	Manmud hasan@giz de
27	Sultana Pazia	Female	Manager CPDAD c4	01706250421	
57.	Juitalla Nazia	remaie	wanager, CRPAR-54	01/30230421	

38.	Sasha Gottlieb	Female	USFS		
39.	Ehse De Rel	Female	USFS		
40.	Olaf Kuegler	Male	USFS		
41.	Gael Sola	Male	FAO		
42.	Nikhil Chakma	Male	FAO		
43.	Rashed Jalal	Male	FAO		
44.	Tasnuva Shabnam Udita	Female	FAO, Intern	01677539047	Tasnuva.shabnam@gmailcom
45.	Sharmin Shabnam	Female	FAO		
			PSO, Bangladesh		
46.	Dr. Sarder Nasir Uddin,	Male	National Herbarium	01914007503	nsarder@yahoo.com

# Appendix 3: Evaluation

I would describe my self as?	
A professor/academic	22%
A student	0%
Forest Department staff	56%
Government staff (outside Forest Department)	0%
NGO staff	22%
Private consultant	0%
Other	0%
My professional background relates most closely to:	
Forester	67%
GIS/RS	11%
Statistics	0%
Social survey/assessment	22%
Economics	0%
Natural Resource Management	22%
Ecology	0%
other	0%
My years of relevant experience is:	
1-2 years	0%
3-5 years	0%
5-7 years	0%
8-10 years	22%
More than 10 years	78%
The workshop was relevant to my daily work	
Strongly agree	44%
Agree	56%
Neutral	0%
Disagree	0%
Strongly disagree	0%
I had enough relevant experience to make a valuable contribution to the	event
Strongly agree	22%
Agree	78%
Neutral	0%
Disagree	0%
Strongly disagree	0%
The outcomes of the event were well defined	
Strongly agree	44%

Agree	56%
Neutral	0%
Disagree	0%
Strongly disagree	0%
The event was well organised	
Strongly agree	22%
Agree	78%
Neutral	0%
Disagree	0%
Strongly disagree	0%
The resource person/facilitator(s) presented information in a way that i c	ould understand and was
easy to follow	
Strongly agree	22%
Agree	78%
Neutral	0%
Disagree	0%
Strongly disagree	0%
I feel like the event was a good use of my time	
Strongly agree	22%
Agree	78%
Neutral	0%
Disagree	0%
Strongly disagree	0%
I was pleased with the venue/meeting room/snacks etc	
Strongly agree	44%
Agree	56%
Neutral	0%
Disagree	0%
Strongly disagree	0%

Q11\_Are there other people/agencies/organisations that you think should have been included in the event?

A statistician like Mr.Bikash Chandra Saha, SRO; may include

Prof. Dr. Khondaker Md. Shariful Huda

Geography and Environment Dept.

Jahangir nagar University

Participant from Shahjalal University of Science and Technology.

Department of Land Records and Survey

Local Administration from Pilot sites

Local Government representatives from pilot sites

DFO of all working plan divisions of Forest Department would be included.

This is a professional and technical event, important observations needed whether many of the experts of this area was present or not.

Q12\_What do you think should be the next steps in the process?

to finalize with long discussion

After having sample survey by both CEGIS and DatEx, the results may be shared with the participants to finalize the method having maximum accuracy.

Fix the sample plot design and see how it fits for our purpose.

Make a provision to include representatives from Department of Land Records and Survey, Local Administration from Pilot sites, and Local Government representatives from pilot sites;

Need to have some budget for their functional engagement

According to the opinion of the majority after consultation

the NFI draft design should be shared and later on it should be finalised accordingly.

Selecting the perfect design with its cost effectiveness and practical implementation ability will be the next important step with the concurrence of the attendees of the workshop.

13\_Any other comments?

It was a very effective workshop.

If possible, data of all Permanent Sample Plots (120 plots@0.2 ha) in the Sundarbans should be collected.

This is a relatively difficult job, however very much needed.