Proceedings of workshop on the development of the Bangladesh Forest Inventory final report

Bangladesh Forest Department
9-10 January 2019

USAID
FROM THE AMERICAN PEOPLE

Food and Agriculture Organization of the United Nations

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DISCLAIMER

This publication reflects the contributions from the project of "Strengthening National Forest Inventory and Satellite Land Monitoring System in Support to REDD+ in Bangladesh" with technical support from the Food and Agriculture Organization of the United Nations (FAO) and financial support from United States Agency for International Development (USAID). This information herein does not reflect the official position of the supporting international agencies including USAID, FAO and national entities such as Forest Department. Should readers find any errors in the document or would like to provide comments for improving quality they are encouraged to contact Bangladesh Forest Department.

Abbreviation and Acronyms

ACF	Assistant Conservator of Forests
BFD	Bangladesh Forest Department
BFI	Bangladesh Forest Inventory
CCF	Chief Conservator of Forests
CHT	Chittagong Hill Tracts
DCCF	Deputy Chief Conservator of Forests
DCF	Deputy Conservator of Forests
ECA	Ecologically Critical Area
FAO	Food and Agriculture Organization of the United Nations
FRA	Global Forest Resources Assessment
FREL	Forest Reference Emission Level
IFESCU	Institute of Forestry and Environmental Sciences, Chittagong University
KU	Khulna University
LCC	Land Classification System
NFI	National Forest Inventory
NLRS	National Land Reference System
RIMS	Resources Information Management System
SE	Socioeconomic
SLMS	Satellite Land Monitoring System
SRF	Sundarban Reserved Forests
SUST	Shahjalal University of Science and Technology, Sylhet
UMD	University of Maryland
USAID	United States Agency for International Development
USFS	United States Forest Service

Executive Summary

Following the decision of the Forest Department after the presentation of the BFI report a three days' workshop was designed for bringing BFD officials and the experts together for working on development of zero draft of the BFI report. Biophysical and socio-economic data were collected under the BFI project. A group of experts from Forest Department, Khulna University and FAO were involved at looking at the BFI results and drafting the inventory report. The event was an important step towards finalizing the report. The draft was shared to the participants beforehand so they could be ready to discuss and participate. Comments from the experts were recorded and will be well reflected in the next draft, provided that they are justified.

After the workshop, the comments were combined and addressed one by one. The new version (first draft) was then shared again with the BFD in February 2019. The full list of comments and responses is included in Annexure 3.

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1. Introduction

In Bangladesh, the state and trends of the forestry resources are not fully known. The existing information is not dated. It is mainly constrained by the lack of institutional capacity and financial inadequacy in carrying out the National Forest Inventory (NFI) and Satellite Land Monitoring System (SLMS). The Forest Department (FD) has identified a national forestry inventory and satellite forest monitoring system as the priority activities for the Forest Department under the Ministry of Environment and Forests.

With the technical support of FAO and financial support of USAID Bangladesh Forest Department has initiated first cycle of national forest inventory in 2015 under the project titled "Strengthening National Forest Inventory and Satellite Land Monitoring System in support of REDD+ in Bangladesh GCP/BGD/058/USA".

2. The working groups

The FD assigned several participants from each of the zones in Bangladesh to make comments based on their expert knowledge of the area. Below is the final list of assignments by zone.

Hill Zone:
Dr. Md. Zaglul Hossain, Conservator of Forests, Chittagong Circle, Chittagong
Mr. Md. Sanaullah Patwary, Conservator of Forests, Rangamati Circle, Rangamati
Mr. Md. Towfiqul Islam, Divisional Forest Officer, CHT South Division
Mr. Md. Baktiar Nur Siddiqui, Divisional Forest Officer, Chittagong North Forest Division
Mr. Abu Naser Md. Yasin Newaz, Divisional Forest Officer, Wildlife Management & Nature Conservation Division, Chittagong
Mr. Md. Zaheer Iqbal, Deputy Conservator of Forests, RIMS Unit, Dhaka
Sal & Village Zone:
Mr. Md. Rakibul Hasan Mukul, Conservator of Forests, Central Circle, Ban Bhaban, Mohakhali, Dhaka
Mr. Mohammad Abdul Awal Sarker, Conservator of Forests, Social Forest Circle, Bogra
Mr. Hossain Mohammad Nishad, Assistant Chief Conservator of Forests, Establishment Unit, Ban Bhaban, Agargaon, Dhaka
Mr. A.S.M. Jahir Uddin Akon, Divisional Forest Officer, Wildlife Management & Nature Conservation Division, Dhaka
Mr. Md. Motlubur Rahman, Director, Botanical Garden and Eco park, Chottogram
Dr. Mariam Akter, Assistant Conservator of Forests, RIMS Unit, Dhaka
Sundarban & Coastal Zone:
Mr. Md. Amir Hosain Chowdhury, Conservator of Forests, Khulna Circle, Khulna
Mr. Gobinda Roy, Conservator of Forests, Coastal Circle, Barisal
Dr. Mohammad Zahirul Haque, Assistant Chief Conservator of Forests, Social Forestry & Extension, Ban Bhaban, Agargaon, Dhaka
Mr. Md. Bashirul-Al-Mamun, Divisional Forest Officer, Sundarbans West Forest Division
Dr. Golam Rakkibu, Professor, Khulna University, Khulna

3. Inaugural Session:

Mr Md. Zaheer Iqbal, National Project Coordinator, NFI project, BFD welcomed all the participants attending the workshop and explained the objective of the workshop. Kristofer Johnson, FAO briefed the method and data arrangement of the report. Mr. Md. Akhter Hossain explained the known issues of report preparation. Ms Mariam Akter, ACF, RIMS reviewing the objectives provided brief comments on the drarft BFI report. Ms Mariam Akter mentioned that input from both national and international expert is required to make it a complete report for Bangladesh Forest Department. She mentioned that through the workshop section-wise comments will be provided to update the report.

4. Discussion

Below is a summary of the points raised by the experts to consider in the report. FAO will take the comments and respond to each of them.

4.1 General Recommendations

1. The section 'new era' is not clear. It is to be explained in which respect BFI is new. In the first para of the section there should reasoning for naming new era. The report format is as usual so why should call it a new era of inventory.
2. There was no division wise information in the report. FAO technical expert explained that there are no boundaries available for summarizing totals by FD divisions. However, mean estimates at the division level growing stock are possible and one example is included in the report. Further questions come from BFD if division level growing stock is there why not other parameters as well.
3. BFD pointed out nowadays growing stock from social forestry programme is very crucial. Whether we can get growing stock volume under social forestry programmes. FAO said growing stock volume of social forestry programmes were not considered in the inventory.
4. History of forest assessment should be annexed.
5. The phrases "unemployment and extensive rural poverty" as causes of degradation in Bangladesh should be rephrased. Cyclones, flooding, erratic rainfall may cause deforestation or damage of forest plantations as justified by BFD.
6. There should be limitation section in the report.
7. In the case of CHT "political unrest' should not be used rather land use conflict / and land dispute may be mentioned.
8. Contribution from different institutions should be in acknowledgement or appendix, but not in the main report.
9. Definition/interpretation section should move to Appendix.
10. 'Forest definition' by FAO/USFS should not be used, but the definition agreed for Bangladesh as used in FREL report should be followed.
11. There should be brief definitions of 'density', 'biomasses, 'growing stock', 'basal area' etc. Where they forest appear and also in the Glossary sector.
12. The report should follow the same style and may be finalized by a panel of editors.

4.2 Specific recommendations:

1. The report should be restructured.
2. Tabular data should be checked, specifically the SE data should be checked very seriously. Data presented are ridiculous.
3. The next revised version may be named as Draft v1.
4. The Chapter should be named in a similar style.
5. Presentation should be checked by expert.
6. A table should present two classes of data or two-way Table.
7. To explain/define term at first appearance, should be in box/coloured or highlighted for general readers.
8. A similar workshop should be arranged again to work on Draft version v1 report.

5. Technical Session

Groups of two or three were organized to review specific sections in detail. Comments were provided in soft copy of the draft report. Following the small group work, three larger groups were organized for reviewing each other's comments and making final recommendations. The recommendations were then presented to the whole group. The final comments include the minutes of the meeting which are included in Section 3 of these proceedings and also several soft copy draft reports.

Large Group	Small Group	**Names**	**Sections for reading and comment**
1	1	Dr. Golam Rakkbu, Mariam Akhter	Section 1 – 2.1 (22 pages)
1	2	Md. Amir Hosain Chowdhury, Hossain Mohammad Nishad,	Section 2.2 – 2.4 (23 pages)
1	3	Md. Rakibul Hasan Mukul and Dr. Mohammad Zahirul Haque	Section 8 (15 pages)
2	4	Md. Baktiar Nur Siddiqui, Md. Zaheer Iqbal, Tarik Aziz	Section 3 - 4.2 (21 pages)
2	5	Gobinda Roy, A.S.M. Jahir Uddin Akon	Section 4.3 – 4.7 (16 pages)
2	6	Md. Sanaullah Patwary, Md. Zaglul Hossain, Abu Naser Md. Yasin Newaz	Section 5 – 5.2 (25 pages)
3	7	Mohammad Abdul Awal Sarker, Md. Bashirul-Al-Mamun,	Section 5.3 – 5.4.3 (25 pages)
3	8	Md. Towfiqul Islam, Matlubur Rahman	Section 5.4.4 – 7.5 (19 pages)

6. Concluding Remarks and Next Steps

In conclusion Mr. Md. Zaheer Iqbal mentioned that out of remaining 320 plots in the CHT up to 50 more plots may be worked.

- Conservator of Forests, Rangamati and concerned DFOs are requested to provide cooperation for the remaining biophysical data collection.

- To finalize the text of the report (v0 to v1) Kris or other professional editor may be hired. Each of the comments from this meeting should be addressed.
- The v1 Report should be presented to CCF/DCCF and they will decide what to do next, if needed they may suggest another workshop with the same participants.

Annexure-1 Time Schedule

Tuesday, 8 January	
TRAVEL	
Timeline	Program
Afternoon and evening	Travel to BCDM Rajendrapur, Gazipur
Wednesday, 9 January	
WORK SESSIONS	
Timeline	Program
08.00 am - 09.00 am	Breakfast
09.00 am - 09.10 am	Welcome: **Zaheer Iqbal** (FD)
09.10 am - 9.40 am	Overview of BFI report (10 min): **Kristofer Johnson** (FAO) Structure of BFI report (10 minutes) **Md. Akhter Hossain** (FAO) Overview of workshop agenda (10 min) **Mariam Akhter (**FD)
09.40 am - 10:40 am	Comments from assigned sections
10.40 am - 11.00 am	Refreshment Break
11.00 am - 1:00 pm	8 Small Working Group Sessions (comments in hard copy)
01.00 pm - 02.00 pm	Lunch
02.00pm - 4:00 pm	3 Large Working Group Sessions (combined comments in soft copy)
04.00 pm – 4.10 pm	Overview of next day

Thursday, 10 January	
PRESENTATIONS AND NEXT STEPS	
Timeline	Program
08.00 am - 09.00 am	Breakfast
09.00 am – 11.00 am	3 Group Presentations about recommendations
11.00 am – 11.30 am	Refreshment Break
11.30 am – 12.00 pm	Presentation – Mexico's experience with accuracy assessment (30 min) **Oswaldo Carrillo** (FAO)
12.00 pm – 01.00 pm	Open Discussion
01.00 pm – 02.00 pm	Lunch
02.00 pm - 03.00 pm	Next steps and plan for presenting to CCF **Md. Zaheer Iqbal**

Annexure-2 Participants Details of the Workshop

SL	Name	Gender	Designation	E-mail	Phone
1.	Mr. Md. Motlubur Rahman	M	Director, Botanical Garden and Eco Park, Sitakunda, Chittagong	Mrahman10169@gmail.com	01712627900
2.	Mr. Md. Zaheer Iqbal	M	DCF, RIMS	z.iqbal60@gmail.com	01711443750
3.	Mr. Md. Rakibul Hasan Mukul	M	CF, BFD	lalpiprey@gmail.com	01711438032
4.	Mr. Md. Tariq Aziz	M	Research Officer, BFD	tqriqaziz9718@gmail.com	01790284328
5.	Mr. Md. Basirul-Al-Mamun	MM	DFO, BFD	mamun98sust@yahoo.com	01999005891
6.	Mr. Dr. Md. Golam Rakkibu	M	Professor, Khulna University	golamrakkibu@yahoo.co.uk	01711260342
7.	Dr. Mohammad Zahirul Haque	M	ACCF (CF&E), BFD	zahirfd@yahoo.co.uk	01747767651
8.	Mr. Md. Baktiar Nur Siddiqui	M	DFO, BFD	baktiar1971@gmial.com	01711819670
9.	Mr. ANM Yasin Newaz	M	DFO. BFD	newaz.yasin@gmail.com	01711447161
10.	Mr. Gobinda Roy	M	CF. BFD	gobinda_dcf@yahoo.com	01718688937
11.	Mr. ASM Jahir Uddin Akon	M	DFO, BFD	jahirakon1970@gmail.com	01999000095
12.	Mr. Md. Amir Hossain Chowdhury	M	CF Khulna BFD	amirhdfo@yahoo.com	01999005829
13.	Mr. Hossain Mohammad Nishad	M	ACCF, BFD	hmnishad@gmail.com	01715005677
14.	Mr. Md. Sanaullah Patwary	M	CF, BFD	dcfsanaullah@gmail.com	01816301439
15.	Dr. Md. Zaglul Hossain	M	CF, BFD	cfctgbfd@gmail.com	01711279529

SL	Name	Gender	Designation	E-mail	Phone
16.	Mr. Md. Towfiqul Islam	M	DFO. BFD	islambfd@yahoo.com	01761494702
17.	Mr. Mohammad Abdul Awal Sarker	M	CF, BFD	awal.bfd@gamil.com	01712638606
18.	DR. Mariam Akter	F	ACF, BFD	mariamakter2002@gmail.com	01711170697
19.	Dr. Kristofer Johnson	M	FAO		
20.	Dr. Laskar Muqsudur Rahman	M	FAO	laskar.rahman@fao.org	01732998449
21.	Md. Akhter Hossain	M	FAO	akhter.hossain@cu.ac.bd	01827501435
22.	Mr. Oswaldo Ismael Carrillo Negrete	M	FAO	oswaldoisma@gmail.com	+521 5533104856
23.	Mr. Rashed Jalal	M	FAO	rashed.jalal@fao.org	01723383854

Major changes to this version

- Addressed all comments provided by BFD
- Addressed all comments from Dr. Mahmood Hossain
- Sections 1.1 and 1.2 were re-written per BFD comments
- New criteria 8 was added
- Maps were added in several sections
- New tables and figures added in several sections
- Results updated to include many (not all) CHT plots
- Results updated to include new land cover classes
- More emphasis on Trees Outside Forest

General Comments

1. General comment on section 1: Limitations of the process should be mentioned in relevant place (zoning, wildlife etc.). It should be revised thoroughly as per the comments to make it more reader friendly. It can be reviewed by some nationally recognized forestry experts.

Thanks for the comment. The report has been significantly revised per the comments of the FD reviewers. The text is now more concise and hopefully easier to read. In addition, the report was extensively reviewed by Dr Mahmood Hossain who made valuable suggestions. Please inform in the case that some things are still left out of the report or were not adequately addressed.

2. Validate the estimations from R code with an independent check

Confirmed. An independent check of all estimations is being performed by an international forest inventory expert.

3. Consider renaming zones, especially Sundarbans of the socio-economic survey

It is not recommended to rename the zones as they were determined in consultation with stakeholders and used in multiple documents. However, in the case of the Sundarbans zone of the socio-economic survey the zone was modified, so it would be appropriate to use a different name. The proposed name is "Sundarbans Periphery" which makes the reader understand that it is different than the Sundarbans of the biophysical inventory.

4. Remove per ha estimations from tables from the socio-economic results

This was done.

5. Delete all of section 4.6 Abundance of animals

The section was not deleted. Please provide clarification about why it should be removed.

6. Change the name of Section 8 from "Tree and forest services and livelihoods" to "The socio-economic survey data of the Bangladesh Forest Inventory"

We do not recommend changing the title here since this would introduce inconsistencies with the naming of the other criteria. Remember that each section presents the results of 7 criteria. Instead, we have aimed to make the purpose of Section 9 clearer. A table with a description of each criteria was added in Section 2. In addition, it is now mentioned in Section 9 description that these results are exclusively from the socio-economic survey.

7. Elaborate the section introductions to give more clear idea about the contents

Confirmed. All section introductions now highlight sub-section highlights, and provide context about what the criteria is. In addition, a table was added to Section 2 which describes the criteria to add more clarity.

8. Other results should also be given by forest divisions

More information is needed about which results. Waiting for Forest Department to determine which things to include

9. (1.1) Define and justify the title of "A new era.." in the text. It can be said in one paragraph in the beginning. A new paragraph, defining and justifying "new era" with criteria and indicators. Highlight the attribute of present BFI compare to previous inventory that characterizes the present as a new era

Confirmed. The whole section 1 was revised and reduced. It now relates clearly to the title of the section about "a new era". For example:

The BFI participates in a new era of forest assessment and monitoring because it: 1) is designed to be fully institutionalized, 2) uses multiple sources of information and the latest forest mensuration technologies, and 3) meets the data needs of multiple sectors.

10. (1.2) Can be placed in appendix referring the section.

The four page table was reduced to a 1 page table of selected inventories. The full table was moved to the appendix.

11. (1.4) FD is thinking for revising some targets based on the recent inventory and information. Delete the detail and specific targets. Better to refer the documents.

This whole section was revised. Some of the targets were given less emphasis and the document is referred to instead per the comment. However, in the case of some key targets such as forest coverage, it seems necessary to include them because the BFI is designed exactly for the purpose of monitoring progress towards these goals.

Specific Comments

Section 1

12. (1.2) Can be placed in appendix referring the section.

Agreed. The table of the full history was moved to the Appendix. It was replaced by a shorter 1 page table that highlights some key inventories.

13. (1.1) This sentence should be rewritten in light with the D&D study, e.g. lack of good governance. Unemployment and poverty can be kept but delete the word "extensive". Include other reasons too and mention sequentially putting the main reasons first. Also highlight the zone wise reasons.

Confirmed. This entire section was re-written. The D&D study is now explicitly referred to. For example:

A recent based on expert opinions and a robust literature review concluded that most of the forest loss was attributed to overpopulation, poverty and unemployment, and ineffective governance (UN-REDD Bangladesh, 2017).

14. (1.1) Are these the reason for deforestation and degradation! Anthropogenic resons should be mentioned

We revised this to give an understanding that while human impacts are the driver for deforestation / degradation, the effects are worse when combined with natural disturbances, e.g.:

The impacts of deforestation and forest degradation are significant and often involved the interactive effects of both human and natural disturbances.

15. (1.1) Natural events can not be treated as threat to forest ecosystems particularly for Sundarbans

See response to #16

16. (1.1) Clarify this word - replace

This was removed. See response to #16

17. (1.1) Is this a consecuence of deforestation ! Better delete this words.

This was deleted.

18. (1.2) Check ref.

Ok, this was changed to: *Sources: FAO (2005); Costello et al. (2017)*

19. (1.4) Please check

Ok, it was corrected.

20. (1.5) This figure seems to be unrealist though a reference is here. What is the definition here! Is it in line with other document! E.g. FREL. Consider rewording.

Confirmed. All of section 1.5 was revised and paragraphs were moved to 1.4 and 2.1

21. (1.5) Check and update this sentence during finalization of this section.

Confirmed. All of section 1.5 was revised and paragraphs were moved to 1.4 and 2.1

22. (1.5) Better delete this word. Highlight what other can adopt from us i.e. NLRS.

Confirmed. All of section 1.5 was revised and paragraphs were moved to 1.4 and 2.1

Section 2

23. (2.1) Better shift it to appendix

Please provide some reasons why this should go in the appendix. It seems important for FD to present collaborations with other institutions. Recognition of their contributions will strengthen their engagement.

24. (2.1.2) Rewrite the sentence. Anchoring in PMU not necessary.

Ok, this sentence re-written as:

The BFI was implemented by the BFD under the Ministry of Environment, Forest and Climate Change (MoEFCC).

25. (2.1.2) Delete this sentence

Ok, it was deleted.

26. (2.1.2) Detailed break ups can be revised as appropriate e.g. daily labour should be removed. Can we propose such structure here? If need to be proposed than shift it to appendix, just mention in one or two sentence here.

MATIEU

27. (2.1.2) In this figure it is not clear that who being in the centre (BFD) completely executed the BFI. It need to be ensured that all contributions were mentioned nobody is left i.e. In the socio-economic survey CU's involvement.

Ok, the figure was revised to show the BFD at the center. The contribution of CU to SE survey is also indicated.

Sections 3

28. (3.1) List of the 33 Land cover classes drived from spot image.

The list is provided in the table of the same section. A reference to the table was added.

29. (3.1) Need to check the area of swamp plantation.

Checked. It is entered correctly

30. (3.1) Need to mention full of NLRS if it is not mention in earlier.

The full name is given in both Section 2 and 3 and the list of Acronyms.

31. (3.2) Change table title to: Annual changes in 23 land cover classes

Ok. Changed to "Changes in land cover in 23 classes from 2000 to 2015"

32. (3.2) Verify the land cover class with FRA 2020 class

Checked. It is entered correctly

33. (3.2) Need to be checked whether it is 15 or 16 years. By Rashed Jalal.

The annual land cover change is based on 15 years considering land cover areas at four times (slope).

34. (3.3) Add (ref. UMD 2000-14)

Reference added.

35. (3.3) (need to checked)

Comment is not clear

36. (3.3) (Percentage is confusing. need to check)

Data and methodology section, and the figure are revised to clarify.

37. (4.1) Please check it. Elaborate the Paragraph and compare with other sections of this report.

This result was removed. It is found in the appendix but not elaborated in this section. Section 4.1.2 provides similar results.

38. (4.1) *insert new table mentioning specific example of trees against each family.

This was done for this section and also the appropriate appendices

39. (4.1.2) (please check the plot data)

Ok, some species such as Gmelina arborea, were not highlighted. This was revised to read:

Although uncommon, some species had trees greater than 40 m in height, such as Albizia richardiana, Eucalyptus alba, Chukrasia tabularis, Swintonia floribunda, Dipterocarpus costatus

40. (4.1.2) Please split the table

This was done.

41. (4.1.2) Insert 1 column local name/English name

This was done for this section and also the appropriate appendices

42. (4.1.2) Basal area is not necessary. Delete.

Ok, this column was deleted.

43. (4.1.2) Sundri in Hill forest!!

Ok, this error was found in the database and corrected.

44. (4.1.2) Please verify the 383 species with 5.1.2

Ok, this was revised in 5.1.2 to clarify the difference:

Among the 383 species inventoried, there were 361 with DBH >= 10 cm for volume estimations.

45. (4.1.3) Insert : Distribution map of highest ,tallest trees and max DBH

Two maps were added showing the mean DBH and mean height by zone and land cover.

46. (4.1.4) Explanation need regarding the different values of the major LCC of respective zones (i.e. mangrove forest Vs Sundarbans zone)

Ok, the table is modified to show stem density by land cover and zone. The number of species per land cover remains the same.

47. (4.2.1) Saplings included or not? Need to be cleared.

The methodology explains that both tree and saplings are included.

48. (4.2.2) Include a column in the table with local names (and provide a box with the local names of the 10 spcies)

Ok this was added, also family and common names were added in Appendix

49. (4.2.3) Rearrange the table/split the table into two (by LCC and zones)

To be consistent with previous tables, this table was left the same. It explains the distribution of basal area by zones

50. (4.3.1) Add another table for restulst by LCC

This information is already in the graph. A new table was added in the appendix for the same information.

51. (4.3.2) Mention number of unknown species in the footnote

The findings revealed that there were at least 259 species of seedlings belonging to 61 families (NN% of the seedlings could not be identified)

52. (4.3.2) Check the number – 94

Checked. In Coastal zone a total of 92 seedlings of *Ceriops decandra* were recorded. That's why the density is 94)

53. (4.3.3) Mentioned the data by LCC in table (may in the appendix)

A new table was added in the appendix for the same information.

54. (4.3.3) Check the information the sentence)

Ok, this sentence was deleted

55. (4.3.3) It's better to omit

Same as above

56. (4.3.3) Check the figure – 56

The figure was checked and found OK)

57. (4.3.3) Check the figure – 19

The figure was checked with data and found OK)

58. (4.3.4) Rewirte the sentence more positively.

The paragraph re-written as:

> *As there is only one inventory cycle, recruitment status was not calculated based on observed change in seedlings or saplings between two time periods, rather, the proportions of seedlings or saplings is reported. For example, the seedling to sapling recruitment is the percent of seedling density of total seedling and sapling density by zone. In addition, the seedling and sapling densities for the 10 most dominant tree species is reported by tree DBH class.*

59. (4.3.4) Put the values in a separate table (may be in the appendix)

Ok, this is now percent by Zone only and the table used for the graph 4.7

60. (4.3.4) Provide recruitment percentage by zone and land cover classes

Ok, this was done.

61. (4.3.4) Delete the table. Replace it with graphs by DBH class Vs stem density for top 10 speices

The new table includes seedling to tree percent recruitment by species and zone. Seedling to sapling recruitment was removed. The 2 to 10 cm DBH class is included in section 4.1.3, so it was not added again here.

62. (4.3.4) Put a footnote with explanation - Ceriops decandra

Revised to:

The low number is due to the nature of this species which is shrubby and does not grow to the height and DBH of other forest tree species.

63. (4.4) Provide biodiversity index by LCC in graph and table

A map was created showing the spatial distribution of the SDI. A separate table was added in the appendix to show the results by zone.

64. (4.5) Check - Brickfield (Br)

Checked. It is now 96% in the updated database.

65. (4.5) No exotic? Check - Shrub Dominated Area (S)

Remember that no shrubs were inventoried. The number only reflects native trees. The number was checked and in the latest database native tree species is 83%.

66. (4.5) Naturalized? Same to borassus flabellifer, Cocos nucifera

The table heading was added to make it clear – "Complete list of introduced tree species densities by zone". If the species was naturalized, it was indicated.

67. (4.5) Check and compare with the coastal zone

Checked; the number seems OK. This species is mostly reported from coastal areas of Barisal, Bhola and Noakhali. It is recorded from more than 12 plots of coastal zone.

68. (4.7) Mention some information on the occurrence in LCC

Ok, a new table was added to the appendix.

69. (4.7) Justify and explain – 76

This number is correct. The species is very high in the Sundarbans zone.

70. (4.7) Check the occurrence and number – 0.03

Checked with the latest data and found correct.

Section 5

71. (5) Check all highlighted yellow values in all sub-sections

Checked with the updated data.

72. (5.1.1) Add a little introductory description under this heading.

Per a previous suggestion, we are expanding the description of each section (e.g. 5). This will include more detail about the estimations provided in the following sub-sections all in the same place. We think this will be easier to read instead of the descriptions being scattered among the sub-sections.

73. (5.1.1) Sal and Sundarbon zone check the family

These were checked and found ok.

74. (5.1.1) Need to change the family.

Ok, this was corrected.

75. (5.1.1) Need to be check the species number.

See comment above (#46)

76. (5.1.2) Only this specices or check the other mahagoni species.

The other mahagoni is also recorded by the field teams, but this is highest.

77. (5.1.3) Change the description according to the table

This was changed in the new tables.

78. (5.1.3) ci(+/-%)

Ok, this was changed.

79. (5.1.3) Change the description according to the table

Ok, this was changed.

80. (5.1.4) Check the estimation and comparison

This was checked and found ok.

81. (5.1.4) Check Mud Flats or Intertidal Area (MF)

This one was changed when the new LCC were updated. New tables were prepared.

82. (5.1.4) Other results should also be given by forest divisions

Need more information. Which results? We are waiting for FD to determine which results they want by forest division and then we will prepare the tables.

83. (5.1.4) Delete the column

This information is important to understand the sample number for each division and therefore indicates the reliability of the result, so it was kept.

84. (5.2.2) Add All LCC

The LCC were added and updated in a new table

85. (5.3.1.1) Incorporate more description on method of estimation

Methods of estimations is densely documented in the statistical procedures document. We have provided in the report the equations for only aboveground and belowground biomass in section 2. If we include all the equations (dead wood, dwd, volume, carbon, litter, etc) then this report becomes perhaps too detailed.

If the current summary of the methods is not clear enough, please suggest the information that appears to be missing.

86. (5.4.4.2) Value should be mentioned here; Same as before

For consistency, we do not provide the values in the highlights here. We have adopted the method of presenting the values in the tables and only summarizing trends or important differences in the description and highlights. We think it will make the document easier to read.

Section 6

87. (6.1) Check the word natural and related 40%

This sections was completely re-written. Please see the revised section

88. (6.1) Should be clarified or delete

Deleted

89. (6.1) Why we should mention it!

Deleted

90. (6.1) Explain clearly (the explanation indicates last inventyory does not inclue the strip and forest plantation),

The results for plantations were removed. There are two ways to report the total area of plantations – with field data and from the Land Cover Map 2015. To be consistent with results in Section 3, and for comparability with previous NFA estimates, we removed the results from the field and only report the results from the map.

91. (6.1) Roadside plantation and strip plantation should be merged together

See previous comment. Roadside and strip plantations are not specified in the Land Cover Map.

Section 7

92. (7.2) Check the table and text

The table and text are correct, however we agree it could be made clearer. We have removed this from the highlights and instead added the below to the description:

Several forest land covers had no disturbance reported - Bamboo Forest, Swamp Forest, and Shrub Dominated Forest Area – and so were not included in the table.

93. (7.3) Should be filled up for all otherwise the row should be removed

Filling the cells with 0's or no data have different meanings. Currently the cells are left blank. When the final dataset is collected then we may definitively put 0 if desired.

94. (7.3) Check

The results are correct, and the highlight was re-worded:

The highest occurrences of natural disturbances were landsliding and erosion in the Hill zone, and cyclone and tidal surges in the Coastal zone.

95. (7.3) Fill up for all zones

Filling the cells with 0's or no data have different meanings. Currently the cells are left blank. When the final dataset is collected then we may definitively put 0 if desired.

96. (7.4) Results is not practical as human interfearence is more then the natural disturbance in Hills

AKTHER

97. (7.4) Fill up the columns for all zones

Filling the cells with 0's or no data have different meanings. Currently the cells are left blank. When the final dataset is collected then we may definitively put 0 if desired.

98. (7.5) Check the graph!

Thanks for the comment. This section was removed because the same information is included in another section. We also checked the information as suggested.

Section 8

99. (8.2.1.1) Table should be revised

Done. The Table 8.1.2 with per ha estimates is removed.

100. (8.2.1.1) Why the timber collection is more here compare to village. From the timber is coming from! Why fruit is here?

The Table 8.1.1 show average household level collection, i.e. how much a household annually collects. It does not necessarily mean that, total collection in the location is less. We have estimated total collection for each location. Please see the new estimates below. It shows, compared to the Sundarbans periphery, collection quantity is high in the village zone. The new results will be available in Chapter 8 Table 8.1.2

Table 8.1.1: Total quantity of the five most common primary tree and forest products collected (Quantity/HH/year)

Zones	Timber (m3/year)	Bamboo (no/ year)	Fuel wood (t/year)	Leaves (t/year)	Fruits (t/ year)
Sundarbans periphery	270410	1001536	176836	317170	66387
Coastal	546782	2862231	1092556	739337	152771
Hill	387694	23582926	1051976	159429	159244
Sal	370747	17757559	201067	1388598	535605
Villages	6185092	261953123	12327647	22263131	5353377
Total	7760725	307157373	14850082	24867666	6267384

101. (8.2.1.1) data from the periphery of Sundarban (ECA) i.e. part of village Due to moratorium in Sundarban, no timber extraction from SRF// also illegal extraction is very minimum

Please refer to classification of zone used in the socio-economic survey, which is developed through several rounds of consultation with the expert group, BFD and other stakeholders. The zones are endorsed by BFD and mentioned in several other documents.

The survey was conducted in the Sundarbans periphery, not inside Sundarbans. Hence the figures indicate collection from Sundarbans periphery, not extraction from the forest Sundarbans.

102. (8.2.1.1) Why the value is less here then the ECA area, the fruits collection in ECA areas should be less then sal

We have estimated total collection from each zone and it shows collection is high in Sal zone than the Sundarbans periphery. Probably the confusion arose as we estimated per household level collection whereas our general perception says fruits are more available in the Sal zone.

103. (8.2.1.1) Total representation of HH in the zones can provide better picture

We agree with this and will do for each indicator. Please refer to response to Comment no 101 for a sample.

104. (8.2.1.1) We have to consider that no timber extraction is taking place from forests. Timber extraction is taking place from the villages of zones. Table is not properly reflecting the reality…

The survey design and questionnaire were not planned in a way that it can distinguish collection from inside forest and locality. As samples are not taken from inside forest, there should not be any scope of confusion that figures for Sal zone means collection from the Sal forest. Rather the figures mean collection from areas where human habitat are there in the Sal zone.

105. (8.2.1.2) Needs validation, seems not realistic.

Following the Comment no 100, all the per ha estimates will be removed.

106. (8.2.1.2) Justify, seems very less. Let the SE expert groups check first the values/justify the reliability.

The document is shared with SE expert groups and we are waiting for their comments. Meanwhile, we would humbly request your for supporting literature based on which we can accept or reject the estimated value.

107. (8.2.1.2) Not realistic

Following the Comment no 100, all the per ha estimates will be removed.

108. (8.2.1.3) Why heating?

Some households, particularly in rural areas use fuelwood and leaves for heating purposes. During the survey, we asked the households for quantity of fuelwood and leaves that they collect for cooking and heating purposes.

109. (8.2.1.3)????? what is the reason? It is not realistic! Check and explain.

Probably, the household level estimate has again created confusion here. We will replace it by total collection from the zone to remove the confusion.

Comments from Dr. Mahmood Hossain

110. (2.3.3) Very brif description of sampling desihn need to mension here with minimum and maximum aerial distance among the plots of each zone. It may help reders to get an idea on sampling intensity

Good suggestion. We have added this sentence to the brief description of the sampling design:

The design of the BFI is a pre-stratified systematic sample with different intensities for each zone or stratum (BFD, 2016). Hence, the sample intensity within each zone differs and was determined by a target precision requirement of 5% confidence interval for tree resource estimates. The plots are located randomly within a hexagonal grid, where the average distance between plots was between 5900 and 10400 meters. The final result was the selection of 2245 plot locations, of which 1858 fell on land and required sampling field visits (Figure).

111. (2.3.3) Is this information is required here?

This sentence moved to next paragraph.

112. (2.3.5) It is important to present the below-ground models in a table

Ok, the following table was added for below ground biomass in the Appendix tables:

SN	*Zone or species*	*Allometric equation*	*Reference*
1	*Hill, Sal and Village zones*	$Y_{bgb} = exp[-1.0587 + 0.8836\ ln(Y_{agb})]$	*Pearson et al. (2007)*
2	*Sundarbans zone*	$Y_{bgb} = 0.199 \times \rho^{0.899} \times (D)^{2.22}$	*Komiyama et al. (2008)*
3	*all bamboos (except Bambusa vulgaris)*	$Y_{bgb} = Y_{agb} \times 0.05$	*Stokes et al. (2007); Bijaya (2008)*
4	*live stumps*	$Y_{bgb} = \frac{0.00001 \times D^{2.529}}{1000}$	*Hjelm (2015)*

113. (2.3.6) This content should be under quality control not under data analysis and estimation

Agreed. Too much emphasis was on QAQC, however instead of removing it, we moved QAQC discussion to a later paragraph to de-emphasize.

114. (4.1.1) What about L plot with 19 m radius?

Yes, you could say that the trees were also measured within the L plot. However, as the plot dimensions are less important, they were removed here and elsewhere.

115. (4.1.3) What about large plot?

See previous.

116. (4.1.4) This land class includes the Sundarbans and what? Sundarbans has 29 species with 7272 stem/ha density

The Mangrove Forest occurs in both the Coastal and Sundarbans, so that is why the numbers are different. This was revised to make it clear by stating in the text:

Note that Mangrove Forest occurs in both Coastal and Sundarbans zones, so this estimate will be different that the Sundarbans zone estimate (see table 4.3).

117. (4.2.1) What about large plot?

See previous response.

118. (4.2.3) The basal area value according to Land cove class should be similar to the Table 4.4: Species, tree density and basal area by land cover classes. The table 4.4 contains 25 land cover class but this table contains 26 classes.

The basal area values in both tables are consistent, however it was decided to remove basal area from 4.4 and other tables in that section so as to not duplicate information.

119. (4.2.3) Check the basal area for the Sundarbans with Table 4.3: Tree species composition, stem density and basal area per zones. So it is important to check the results for other zones and lans classes.

See previous response.

120. (4.6.1) Can we separate the birds to another table?

We understand the preference. For not we have included all the birds with the other animals in one table.

121. (4.6.1) Parrot has been entried two times

This was fixed, it is only there once now.

122. (4.6.1) What about tiger, leopard and bear

Yes, they were reported, but not common. The following was added to clarify:

Some respondents also reported the decline or disappearance of large mammals such as bear and "big cats" but the results are not shown because it was not common.

123. (5.1.3) check title

This was a mistake, it is now corrected.

124. (5.1.4) this figure is not same as mention in table 5.4.

Thanks for noticing this, we have discovered a small data inconsistency with land feature proportioning. The problem is corrected.

125. (5.1.4) This type of Table may raise confusion with zone wise and LLC wise values like Sundarban Zone

Yes, others have also commented on this point. The confusing arises because of the names of the zones, e.g. Sal zone can have other forest types besides Sal. However, the names cannot be changed now as multiple stakeholders have already agreed on them. The best thing to do is explain the issue in the Descriptions and let the reader understand the differences.

126. (5.1.8) Figure 5.1 and Table 5.9 are redundant- same comment for similar presentation of data.

Yes, agreed. We have removed the zone-wise results from the table and added the CI's instead. They will be moved to the appendix.

127. (5.3.1) Is this database for Bangladesh or global? Need to mension

Added:

*The wood density at species level was collected from **local** sources found in Bangladesh's online wood density database (BFD, 2016) and other global sources.*

128. (5.3.1) Table 2.2 presented the measuring unite not the Allometric equation

Ok, this was corrected.

129. (5.3.1) Is it average or what?

Yes, it is the statistical weighted average for all zones. See the estimations procedures document for details.

130. (5.3.2.1) check value - 66.46

Ok, it was checked and updated and found ok

131. (5.3.2.2) check value - 74.81

Ok, it was checked and updated and found ok

132. (5.4.4.1) check value - 0.17

Ok, it was checked and updated and found ok