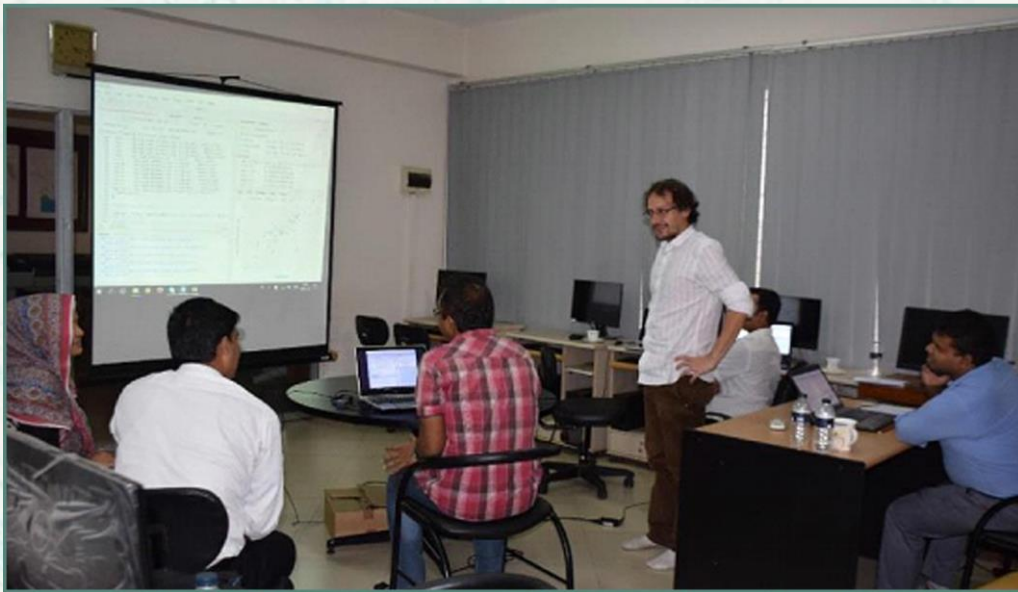




# Proceedings of R training for the Bangladesh Forest Inventory



**Bangladesh Forest Department**  
**01 – 30 August 2017**

**UN-REDD**  
PROGRAMME



The UN-REDD Programme, implemented by FAO, UNDP and UNEP, has two components: (i) assisting in developing countries to prepare and implement national REDD strategies and mechanisms; (ii) supporting the development of normative solutions and standardized approaches based on sound science for a REDD instrument linked with the UNFCCC. The programme helps empower countries to manage their REDD processes and will facilitate access to financial and technical assistance tailored to the specific needs of the countries.

The application of UNDP, UNEP and FAO rights-based and participatory approaches will also help ensure the rights of indigenous and forest-dwelling people are protected and the active involvement of local communities and relevant stakeholders and institutions in the design and implementation of REDD plans.

The programme is implemented through the UN Joint Programmes modalities, enabling rapid initiation of programme implementation and channelling of funds for REDD efforts, building on the in-country presence of UN agencies as a crucial support structure for countries. The UN-REDD Programme encourage coordinated and collaborative UN support to countries, thus maximizing efficiencies and effectiveness of the organizations' collective input, consistent with the "One UN" approach advocated by UN members.

The UN-REDD Bangladesh National Program is implemented by the Bangladesh Forest Department under the leadership of Ministry of Environment and Forests. United Nations Development Program (UNDP) and Food and Agriculture Organization (FAO) are the two implementing partners.

### **Contacts**

#### **Rakibul Hassan Mukul**

Project Director

UN-REDD Bangladesh National Programme

Bangladesh Forest Department

Email: [pd-unredd@bforest.gov.bd](mailto:pd-unredd@bforest.gov.bd)

#### **Matieu Henry**

Chief Technical Advisor

Food & Agriculture Organization of the United Nations

Email: [matieu.henry@fao.org](mailto:matieu.henry@fao.org)

Suggested Citation: **Kumar, M. F. & Mahamud, R.** 2017. Proceedings of R training for the Bangladesh Forest Inventory. 01-30 August 2017, Dhaka, Bangladesh Forest Department, Food and Agriculture Organization of the United Nations.

### **Disclaimer**

This report is designed to reflect the activities and progress related to UNJP/BGD/057/UNJ UN-REDD Bangladesh National Programme. It does not reflect the official position of the supporting international agencies including FAO and UNDP and should not be used for official purposes. Should readers find any errors in the document or would like to provide comments for improving the quality they are encouraged to contact one of above contacts.

## **Executive summery**

The Forest Department in association with FAO organized a 14 days training program for forest department officials on using “R” software for the data analysis of Bangladesh Forest Inventory (BFI). The training was held on different date throughout the total August, 2017 at the Ban Bhaban, Dhaka. The training included introductory session, BFI data quality checking session, allometric equation development session, BFI data analysis script development session and Closing session.

Twelve participants attended the training among them 9 were male and 3 were female. The participants were from the Forest Department, BFRI, Khulna University and FAO.

The objective of the training was to ensure the data quality of BFI and prepare a script for the BFI data analysis. Another main objective is also to develop the capacity of forest department in data analysis using “R” statistical package. Besides, Allometric equation is also needed to be developed by using same application.

At the end of the training the participants showed high level of satisfaction and became confident of using this software. The use of practical data was particularly appreciated as well as the content of the course. The errors with data were identified, Allometric equation was developed and also data analysis script for BFI was initiated from the training successfully.

## TABLE OF CONTENTS

<b>Executive summary</b> .....	<b>3</b>
<b>1 INTRODUCTION</b> .....	<b>5</b>
<b>2 OBJECTIVES</b> .....	<b>5</b>
<b>3 ACTIVITIES</b> .....	<b>5</b>
3.1 1 <sup>st</sup> Session: Introductory Session .....	6
3.2 2 <sup>nd</sup> Session: BFI Data Quality Checking session .....	7
3.3 3 <sup>rd</sup> Session: Allometric Equation Development Session.....	8
3.4 4 <sup>th</sup> Session: BFI Data Analysis Script Development Session .....	8
3.5 5 <sup>th</sup> Session: Closing session .....	8
<b>4 RECOMMENDATION FOR NEXT STEPS</b> .....	<b>9</b>
<b>5 CONCLUSION</b> .....	<b>9</b>
<b>APPENDIX 1. AGENDA</b> .....	<b>10</b>
<b>APPENDIX 2. LIST OF PARTICIPANTS</b> .....	<b>12</b>

# 1 INTRODUCTION

Field work of Bangladesh forest inventory started in November 2016 to collect data regarding forest resources, biomass measurement and the volume of wood available in the country. BFI is using latest technological advances in field of forest inventory. The entire country is divided into 5 different zones and 1858 plots have been selected by using pre-stratified systematic sampling.

12 Field teams were employed to collect field data. After collecting field data field teams send the data to the BFI central unit and all the data are managed and stored there. To manage the data several steps are followed to ensure the data quality. Data are checked in both ways automatically and manually. This checks ensure the data quality and find out the inconsistency of the data for correction and re-measurements in severe cases.

Checking thousand plots with millions data perfectly in a completely manual way is a nearly impossible task to be done and it is hugely time consuming also. That's the reason a latest and highly appreciated software named "R" statistical packages are used in BFI data checking. For this software a QA/QC data checking script is developed with several attributes check. By running this script BFI team finds out the inconsistency of data for further decision.

Besides the data quality check "R" will be used for final data analysis of BFI. A data analysis script is initiated and under development. Under BFI allometric equation of several species are also being developed. This equations are crucial for the volume and biomass calculation of the species. "R" software is also using in developing the allometric equation under this program.

The training was attended by 6 forest department officials, 1 BFRI official, 1 academician from Khulna University and 4 FAO officials. This training was inaugurated and facilitated by Luca Birigazzi, International Consultant of FAO. He explained the process how "R" can be incorporated successfully with inventory work and defines the way of using this package with its benefits. It is expected that the participants from the training will develop expertise in "R" for further statistical activities.

## 2 OBJECTIVES

1. Update the QA/QC data quality checking script
2. Find out the plot numbers having severe inconsistency for re-measurement
3. Initiate and develop BFI data analysis script
4. Develop allometric equation for Sal (*Shorea robusta*)
5. Improve the capacity of Forest department officials for using "R" software

## 3 ACTIVITIES

The duration of the training was 14 days and it was not continuous. The training started at 1<sup>st</sup> August, 2017 and ended at 30<sup>th</sup> August, 2017. Total training was designed in such a way that it can be helpful for the trainees. Actually it was a gradual process started from the introduction of "R" and ended at the data analysis of BFI. There are several sessions of the training-

### 3.1 1<sup>st</sup> Session: Introductory Session

Duration: 1<sup>st</sup> August to 3<sup>rd</sup> August, 2017

The introductory session started on the 1<sup>st</sup> August, 2017 which was the starting day of the training. Mr. Rajib Mahmud, National Consultant of BFI presented the progress and findings of Bangladesh Forest inventory 1<sup>st</sup> season. After presentation an open discussion took place between the participants and FAO officials to clarify the confusions and problems identified in the BFI field data set. It was a clear message to all participants that to analyze the data first understand the data. After field data inconsistency discussion soil issues were discussed. It is very frequent that soil information of BFI data don't match with soil sample information received by Khulna University. Khulna University is responsible for soil analysis. Some cases inconsistencies are also found in soil data scoresheet provided by them also. It is discussed that how "R" can be used to identify and solve this inconsistencies related with soil.

In the second half of the day Mr. Luca Birigazzi took over the facilitation and started the journey to "R". First he started with the introduction of the software. This introductory session continued to the 3<sup>rd</sup> August, 2017. Some easy calculations and general practices were performed by the trainees to make their basics clear about the statistical software. No BFI data and its related things were used during this "R" introduction session. Any confusions, queries and questions of the participants were solved by the resource person Mr. Luca. Major things of this session-

- ✓ Presentation on the progress and findings of BFI 1<sup>st</sup> session
- ✓ Discussion over data inconsistency of BFI
- ✓ Understand BFI data by the trainees
- ✓ Discussion over soil issues of BFI
- ✓ Introduction to "R"



Figure 1: Participants are learning the use of "R"

## 3.2 2<sup>nd</sup> Session: BFI Data Quality Checking session

Duration: 6<sup>th</sup> August to 10<sup>th</sup> August, 2017

After basic or introductory session the participants were ready to play with the BFI data set. This session's duration was 5 days which started on the 6<sup>th</sup> August, 2017 and ended on the 10<sup>th</sup> August, 2017. Previous QA/Qc script was updated in this session, Mr. Akter Hossain and Mr. Luca Bririgazzi mainly worked for this script upgradation. Some new checks were developed and incorporated with the previous script-

- Height-diameter inconsistency check for trees
- Plot level tree biomass outlier check
- Sub-plot level biomass outlier check in relation with tree presence
- Biomass outlier check for land features
- Seedling and sapling distribution check

In total 12 QA/QC checks were established finally for the updated data quality checking script. All participants also practiced the same checks development procedure with the resource persons. The updated QA/QC script was shared by Mr. Luca with all participants and BFI team. According to the script result inconsistencies were identified and 85 plots were proposed for re-measurement. So, the major activities of this session were-

- ✓ Practice "R" with BFI data
- ✓ Update QA/QC data quality checking script
- ✓ Identification of re measured plot numbers

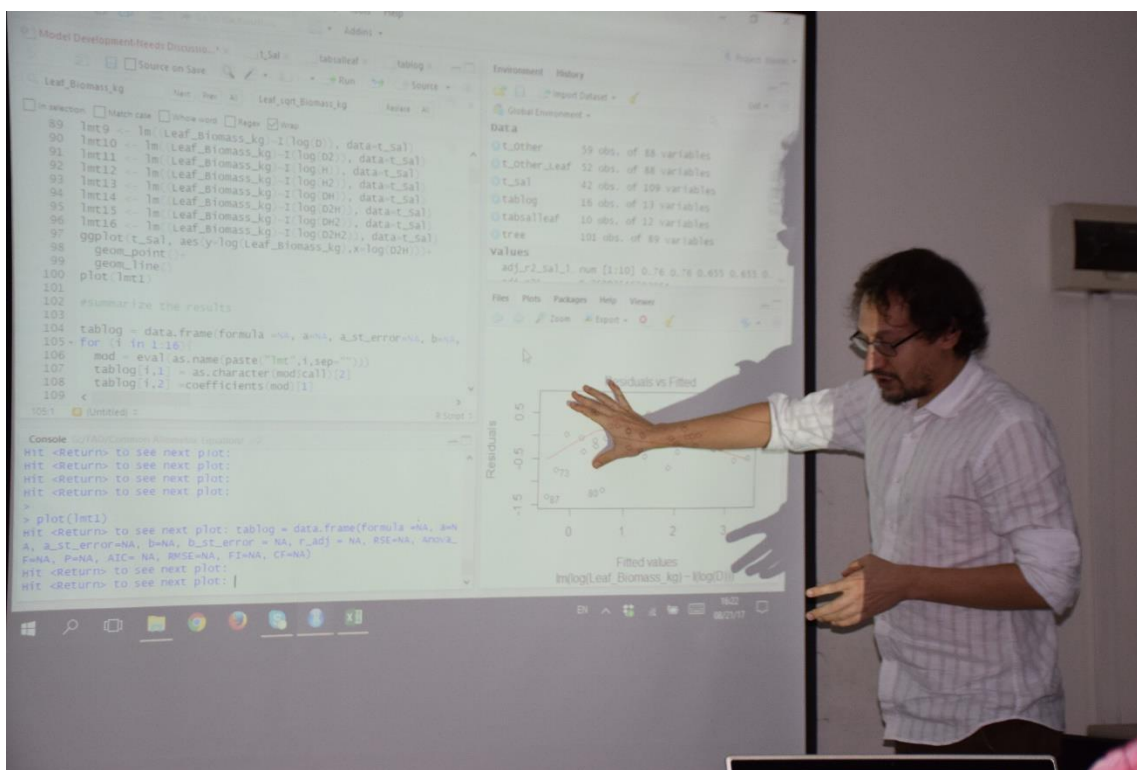


Figure 2: BFI data quality assessment through "R"

### **3.3 3<sup>rd</sup> Session: Allometric Equation Development Session**

Duration: 20<sup>th</sup> August to 24<sup>th</sup> August, 2017

Both allometric equation development session and data analysis script development session were derived in a parallel process. Mr. Raquibul Hasan Siddiqui with support from Mr. Luca Birigazzi was the main responsible person for preparing the allometric equation development session. The species for allometric equation development was Sal. It is a deciduous tree and its scientific name is *Shorea robusta*. Data for this allometric equation development was collected from Tangail district. Mr. Siddiqui and Luca finalized equation and showed the process to develop the equation with “R” to all participants. So, they were being introduced with allometric equation development with “R”. Later Mr. Siddiqui shared the allometric equation, data and necessary calculation and used “R” script with the participants and BFI team as well. The highlighted activities of this session were-

- ✓ Allometric equation development for *Shorea robusta*
- ✓ Introduction of allometric equation development with “R” to the participants
- ✓ Share the Allometric equation

### **3.4 4<sup>th</sup> Session: BFI Data Analysis Script Development Session**

Duration: 20<sup>th</sup> August to 24<sup>th</sup> August, 2017

As mentioned before that allometric equation development session and data analysis script development session were derived together. Mr. Akter Hossain and Mr. Luca Birigazzi were the main responsible person for preparing the data analysis script development session. Other participants also worked with them shared their views and comments regarding the data analysis script development process. For data analysis script (DAAN) major developments were-

- Wood density filling at tree level according to the species
- Estimates tree above ground biomass from Chave’s equation 2015
- Model tree biomass with tree leaf coverage

This session ended in the 24<sup>th</sup> August, 2017 as well as Allometric equation development session. The data analysis script was shared with the participants and BFI team. From this session the FD officials and other participants came to know that how the data will be analysed using “R” and all of them became a part of the data analysis script. Important points of this session were-

- ✓ Development of the Data analysis (DAAN) script
- ✓ Share the script with the stakeholders

### **3.5 5<sup>th</sup> Session: Closing session**

Duration: 30<sup>th</sup> August, 2017

Mr. Zaheer Iqbal (National Project Coordinator, FD), Mr. Matieu Henry (Chief Technical Advisor, FAO) and Ms. Mariam Akter (Senior Forestry Officer, FAO) were present there to conclude the training program. Mr. Luca Birigazzi presented how QA/QC script identifies the inconsistencies of plot data. Besides he described how re-measured plots were identified and which attributes and issues were considered to finalize the re-measurement list. Later the participants expressed what they learned from the training and how that



will help to perform their tasks. Lastly an evaluation survey was done to know the status and perception of the participants regarding the training.

#### **4 RECOMMENDATION FOR NEXT STEPS**

From the experience of R training some recommendations are appeared, as follows-

- Involvement of FD people with data management should be increased
- Data analysis script should finalized as soon as possible
- An Open Foris training should be organized
- Database management training should be facilitated
- Playing with BFI data in “R” should be continued

#### **5 CONCLUSION**

Forest inventory is a continuous process and it should be done after certain interval to keep track of resources. It will help in taking data management related issues. This training program was helpful to develop a pool of expertise in the forest department, who will lead the present inventory as well as contribute in future. The participants expressed a lot of interest in learning as well as the experts also tried their best in teaching. Without any doubt, this people will do their job with highest accuracy and help in successful implementation for the BFI.

## Appendix 1. Agenda

Work plan (Luca Birigazzi, FAOHQ)		
date	Activities	Participants
Tuesday, August 01, 2017	BFI team meeting	BFI Team
	presentation of BFI data collection process, analysis status and discussion	Rajib, Falgoonee, Tarik, Tauhid
Wednesday, August 02, 2017	review and check the BFI data quality and scripts	Rajib, Falgoonee, Tarik, Tauhid
Thursday, August 03, 2017	Check data cleansing, provide recommendation and support the script development for QAQC (Check point 4.12)	Akhter, Rajib and Falgoone and RIMS (3)
Sunday, August 06, 2017	Support the R-script development for QAQC for soil and litter data	Akhter, Rajib and Falgoone and RIMS (3)
	Review the R-script developed for QAQC of BFI data	
Monday, August 07, 2017	Support the R script development for correction procedures for check points 3.7 to 3.11	Akhter, Rajib and Falgoone and RIMS (3)
Tuesday, August 08, 2017	Support the R script development for correction procedures from check points 4.3 to 4.5	Akhter, Rajib and Falgoone and RIMS (3)
Wednesday, August 09, 2017	Support the R-script development for correction procedures from check points 4.6 to 4.13	Akhter, Rajib and Falgoone and RIMS (3)
Thursday, August 10, 2017	Support the R-script development for correction procedures from check points 5 to 11	Akhter, Rajib and Falgoone and RIMS (3)
	Review the R-script developed for correction procedures	
Sunday, August 20, 2017	Check the scripts and data of AE developed for Sal zone, support for graphical exploration of data	Raquibul Hassan Siddiqui, Rajib, Tarik
	Review the data analysis scripts and select allometric equation and identify the necessary conversion factors (branch to biomass, root to biomass, etc. if necessary) for biomass calculation.	Akhter, Rajib and Falgoone and RIMS(3)
	support the development of scripts for the calculation of biomass for forest types, for zones and develop models	
	support for selecting the most appropriate tree biomass equations and for the estimation of national tree biomass stock based on the BFI data	
Monday, August 21, 2017	Check the scripts and data of AE developed for Sundarban, support for graphical exploration of data	Raquibul Hassan Siddiqui, Rajib, Tarik

	support the script development for carbon stock calculation, carbon stock for land use classes, develop model for the zones and forest types, develop model to assess the carbon stock change, create model for height diameter relationship	Akhter, Rajib and Falgoone and RIMS (3)
Tuesday, August 22, 2017	support for the development of scripts for fitting a linear model and fitting a non-linear model	Raquibul Hassan Siddiqui, Rajib, Tarik
	support for the development of scripts for stratification and aggregation factors	
	Support the script development for analysis (check results for species, saplings, seedlings, no. of stem per hectares etc. check results for trees )	Akhter, Rajib and Falgoone and RIMS (3)
	review, guide and support the data analysis for BFI , check data for the quantification of species and ecological diversity in the country based on the BFI data	
Wednesday, August 23, 2017	Support the development of scripts for model validation, volume and biomass prediction for sal and sundarban	Raquibul Hassan Siddiqui, Rajib, Tarik
	Check the scripts developed for BFI data analysis	Akhter, Rajib and Falgoone and RIMS (3)
Thursday, August 24, 2017	Support the script development for model selection for AE's and finalize for sal and sundarban	Raquibul Hassan Siddiqui, Rajib, Tarik
	Support NFI result reporting and production of statistical summary for the country, by region and ecological zones	Akhter, Rajib and Falgoone and RIMS (3)
Wednesday, August 30, 2017	Review the scripts and support the BFI team for finalization of report for season 1	Akhter, Rajib and Falgoone and RIMS (3)

## Appendix 2. List of Participants

<b>Name</b>	<b>Gender</b>	<b>Organization</b>	<b>Designation</b>
<b>Mr. Tarek Aziz</b>	M	Forest Department	Research Officer
<b>Mr. Babluzzaman</b>	M	Forest Department	Forester
<b>Ms. Asma Islam</b>	F	Forest Department	Draftsman
<b>Ms. Shamima begum Shewli</b>	F	Forest Department	Senior Research officer
<b>Mr. Touhidor rahman</b>	M	Forest Department	Forester
<b>Ms. Afroza Begum</b>	F	Forest Department	Research Officer
<b>Mr. Abul kalam Azad</b>	M	BFRI	Research Assistant
<b>Mr. Akter Hossain</b>	M	FAO	Consultant
<b>Mr. Raquibul Hassan Siddiqui</b>	M	Khulna University	Associate Professor
<b>Mr. Luca Biribazzi</b>	M	FAO	Consultant
<b>Mr. Rajib Mahamud</b>	M	FAO	Consultant
<b>Mr. Mondal Falgoonee Kumar</b>	M	FAO	Consultant