Proceedings of the training programme on basic statistics

Bangladesh Forest Department

15 - 16 May 2016

USAID FROM THE AMERICAN PEOPLE

Food and Agriculture Organization of the United Nations

SilvaCarbon

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 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 process also supports climate change mitigation and implementation of REDD+.

The Bangladesh Forest inventory, led by the Forest Department, is a constant and comprehensive process that assesses, evaluates, interprets and reports on the status of trees and forest resources nationally. The activities implemented under the Bangladesh Forest Inventory process are implemented in 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), the Food and Agriculture Organization of the United Nations (FAO) and SilvaCarbon are supporting the development of technical and financial resources that will assist in institutionalizing the process.

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

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Suggested Citation: **Hossain, M. & Birigazzi, L.** 2016. Proceedings of the training on basic statistics. 15-16 May 2016, Dhaka, Bangladesh Forest Department, Food and Agriculture Organization of the United Nations.

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Disclaimer

This report is designed to reflect the activities and progress related to the project GCP/BGD/058/USAID "Strengthening National Forest Inventory and Satellite Land 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, FAO or SilvaCarbon and should not be used for official purposes. Should readers find any errors or inconsistency in the document or would like to provide comments for improving quality they are encouraged to contact one of above contacts.

Executive Summary

Collection of information on trees, shrubs, and other components of forest are important to estimate the existing forest resources. Some basic statistics are essential to synthesize the information on forest composition and different dimension of tree, shrub and other components (wildlife and recreational resources). Therefore, some basic statistical knowledge is prerequisite to understand the complexity of forest ecosystem, spatial and vertical distribution of population, stratification and sampling of the targeted population, correlation among variables, and test statistics. Total Participants attended the training is 13 (Male-8 and Female-5).

FAO is currently assisting Bangladesh Forest Department (BFD) to establish a national forest monitoring system under a project "Strengthening National Forest Inventory and Satellite Land Information System in support of REDD+ in Bangladesh". One of the objectives of the project activity is to strengthen national capacities in data analysis to ensure the capacity in forest monitoring system.

Contents

1. Introduction

National Forest Inventory (NFI) is going to implementing in Bangladesh to assess the existing tree and forest resources and also aim to enhance the capacity of related people for the implementation of NFI and for future monitoring of forest resources. This assessment of resources will direct the management initiative in a sustainable way. Therefore, it requires accurate measurement of tree and shrub dimensions, land uses, biomass and volume stock assessment.

A series of capacity-building exercises have been organized to enhance national capacity among national institutions on various elements of national forest monitoring including on development of data management system, data management and analysis for the NFI inventory data, assessment of GHG, R software for allometric model selection, management and analysis of forest data, quality assurance and control of the data.

Khulna University with the support of Forest Department and FAO has organized a training programme from 15 to 16th May on basic statistics with emphasizing stratification and sampling of population, measurement of central tendency, correlation and 't' test, experimental design. The outputs of this training will particularly contribute to support the initial effort to National Forest Inventory in Bangladesh and implementation of the national forest monitoring system.

2. Objectives

The general objective of this training was to strengthen the national capacities in basic statistics for the implementation NFI and future monitoring of forest resources.

The specific objectives were as follow:

- To enhance the knowledge on complexity of forestry ecosystems
- To up-to-date the knowledge on basic statistic with required exercise.
- To present the application of different sampling methods and scheme in forest inventory.
- To present the applicability of correlation, test statistics and experimental design in forestry data analysis
- To enhance the capacity in field data analysis using common tools (MS Excel).

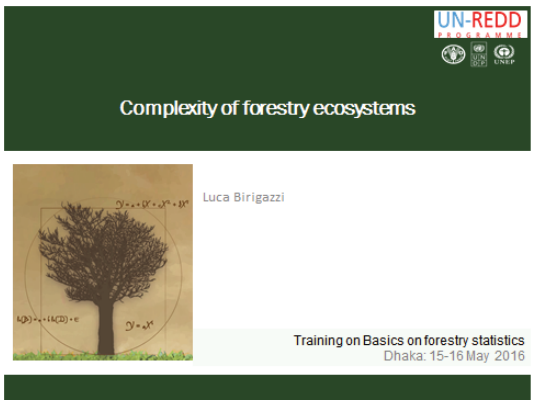
3. Summary of the training programme

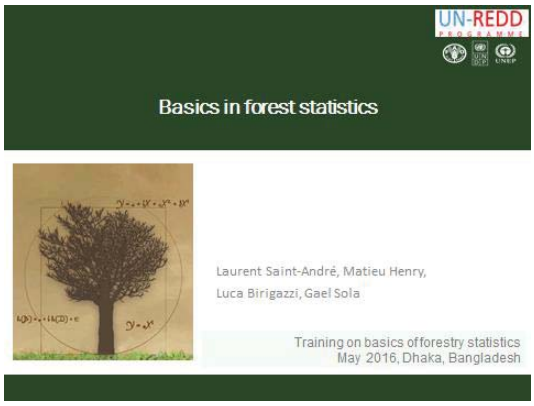
3.1 Inauguration session

Dr. Mariam Akhter, Assistant Conservator of Forests and Forestry Officer of FAO Bangladesh delivered her welcome speech. Mr. Zaheer Iqbal, DCF, FD-RIMS presented the objectives of this national consultation. Dr. Matieu Henry, Chief Technical Advisor discussed the technical assistance provided by the FAO for this training programme. Mr. Mozaharul Islam, Conservator of Forests and National Project Coordinator was present as the Chief Guest of the inaugural session. He highlighted important of basic statistics in different activities of forest inventory and coming NFI activities.

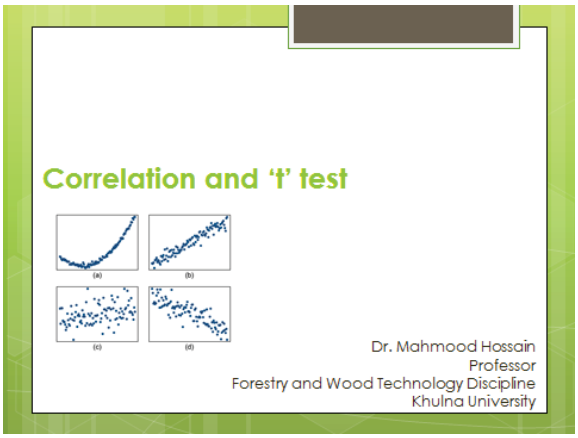
3.2 Overview of the presentation

The technical session 1 was started with a lecture on Complexity of forest ecosystems. In this session, Mr. Luca Birigazzi, FAO highlighted the horizontal variability in measurement of tree dimensions, sample plot size and uncertainty in plot size. He also discussed the representativeness of the sample plots for ant forest inventory. Second technical session was on basics on forest statistics. In this session Mr. Luca Birigazzi discussed the theory and calculation of frequency distribution, arithmetic mean, median, mode, normal distribution of data. He also discussed the importance of accuracy, precision and bias in measurement. These basic statistics are very much related to the NFI data analysis. Some exercise on basic descriptive statistics on sample plots, plot of histograms and frequency distribution of data were conducted using MS Excel.





At the 3rd technical session on 15th May afternoon, Dr. Mahmood Hossain, Khulna University discussed the concept and use of correlation in forestry data analysis. In his presentation he also pointed out the direction and strength of the relationship and necessity of significant test for 'r'. During this session, the concept of 't'-test and its application in forest data analysis were discussed. Finally, correlation and 't'-test were exercised both in manual calculation and using MS-Excel.



Exercise on Correlation

	DBH (cm) X	Oven-dried biomass (kg) Y	X^2	Y^2	X*Y
Data	2.00	3.00	4	9	6
	4.00	4.00	16	16	16
	5.00	5.00	25	25	25
	6.00	6.00	36	36	36
	7.00	7.00	49	49	49
	8.00	7.00	64	49	56
	9.00	10.00	81	100	90
	10.00	10.00	100	100	100
	11.00	11.00	121	121	121
	12.00	11.00	144	121	132
n	10	10			
Sum	74.00	74.00	640.00	626.00	631.00
$(Sum)^2$	5476.00	5476.00			

SP_{yx} $SP_{yx} = \sum xy - \frac{\sum x \times \sum y}{n}$

SS_x $SS_x = \sum x^2 - \frac{(\sum x)^2}{n}$

SSy $SS_y = \sum y^2 - \frac{(\sum y)^2}{n}$

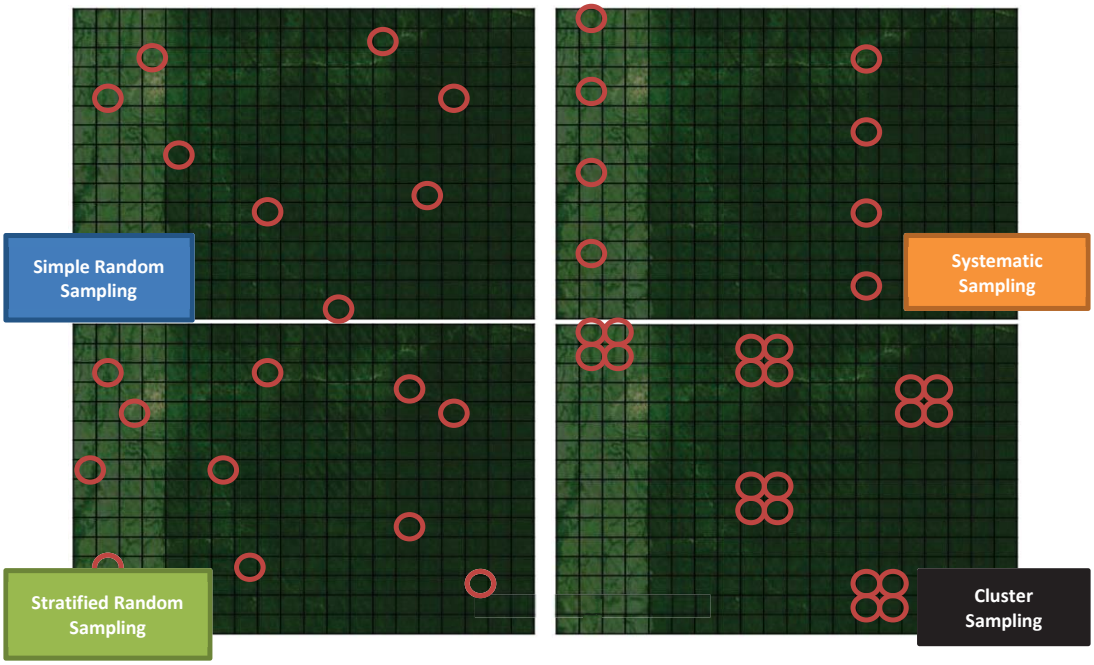
r $r = \frac{SP_{yx}}{\sqrt{SS_x \times SS_y}}$

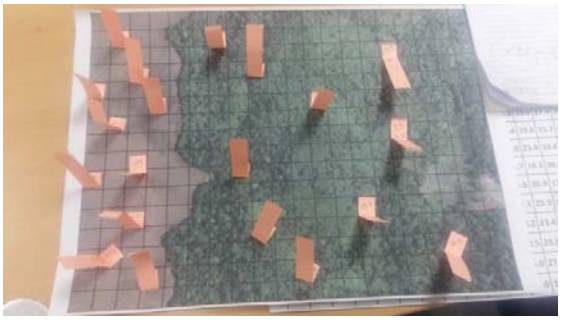
Test of significant

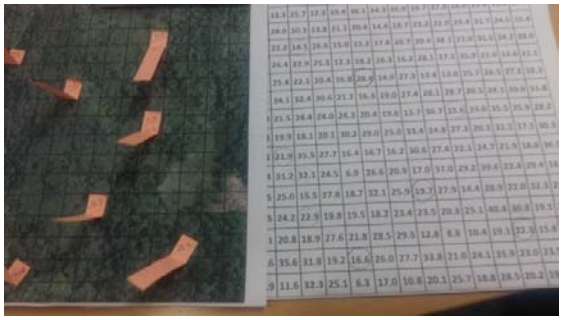
S_r
t
df (n-2)

$t = \frac{r}{s_r}$ *where* $s_r = \sqrt{\frac{1-(r)^2}{n-2}}$

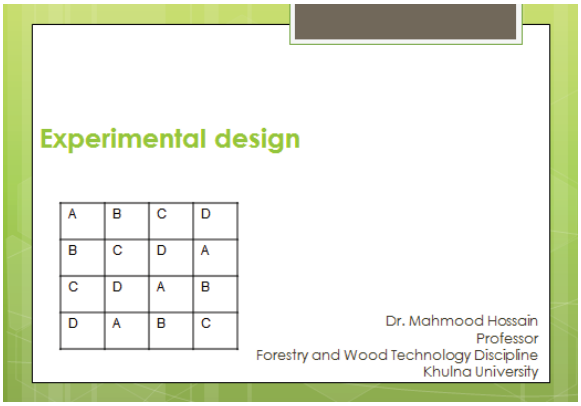
On the second day 1st session, Mr. Luca Birigazzi, FAO discussed on the common sampling techniques with species focused on present NFI sampling scheme. He also discussed the applicability and layout of stratified and multistage sampling in forest inventory. A practical exercise was carried out to let the participants apply the sampling techniques discussed during the presentation. Participants had to estimate the total volume of an imaginary country using 4 different sampling methods, namely: simple random sampling, systematic sampling, stratified random sampling and cluster sampling. The results of each method were then compared and discussed. Examples of the group works are illustrated below.







At the 2nd session, Dr. Mahmood Hossain, Khulna University described the applicability of experimental design in forest statistics. Description of different terms related to experimental design like treatment, block, experimental unite, confounded relationship, extraneous variable have been well discussed. He also showed the randomization procedure under each category of experimental design. Exercise on completely randomized design, randomized block design and Latin square design layout and problems were solved both using manual and MS-Excel. The detailed agenta and related materials are given in the appendix 1 to 3.



Exercise on Randomized Block Design

Number of treatments, K =
Number of block, n = 4,
Total number of observation, N = K x n =

Varieties (Treatments	Locations				Treatments	
	B1	B2	B3	B4	Total T	Means
E1	10.2	9.9	10.3	8.6	39	9.75
E2	10.1	10.2	10.1	9.9	40.3	10.075
E3	10	10.2	11.1	9.9	41.2	10.3
E4	13.2	14.4	13.6	13.2	54.4	13.6
E5	12.3	12.8	13.1	12.3	50.5	12.625
Block Total, B	55.8	57.5	58.2	53.9	$\sum y$	225.4
Block means	11.16	11.5	11.64	10.78	$(\sum y)^2$	50805.16

$\sum y^2$ 2592.26

$\sum (T^2/n)$ 2588.035

$\sum (B^2/K)$ 2542.468

Correction factor = $(\sum y)^2 / N$
Treatment SS= $\sum (T^2/n) - CF$
Total SS = $\sum y^2 - CF$
Block SS = $\sum (B^2)/K - CF$
Residual (error) SS = Total SS – Treatment SS – Block SS

Total d.f = N – 1 =
Treatment d.f. = K -1 =
Block d.f.= n-1=
Residual d.f. = Total d.f.-Treatment d.f.-Block d.f.=

ANOVA	SS	df	MS	V ratio	Tabulated F
Block					3.49
Treatment					3.26
Residual					
Total					

4. Recommendation and next steps

This training was quite helpful for the Forest Department people. But, the training time two days was not enough for this type of training.

Recommendation 1: This type of basic statistical training should be arranged with more time with theory and exercise.

Recommendation 2: The exercise should be done in both manual and software

Next step:

This type of training should be given in border scale to other FD people and students of Forestry.

Appendix 1. Agenda

Training on Basic Statistics
15th to 16th May 2016
BBS Conference Room, 2nd floor, Agargaon, Dhaka

Date	Session	Resource person
15th May		
Morning	Opening session	Md Mozarul Islam, NPC CF, Forest Department
	Objectives of the training	Zaheer Iqbal, DCF, FD-RIMS, Forest Department
	Complexity of forestry ecosystems, spatial and vertical variability, population, sub-population and stratification	Luca Birigazzi, FAO
	Basic statistics	Luca Birigazzi, FAO
	Exercise on basic statistics	Luca Birigazzi, FAO
Afternoon	Correlation and 't' test	Dr. Mahmood Hossain, Khulna University
	Exercise 2	Dr. Mahmood Hossain, Khulna University
16th May		
Morning	Forest sampling + Sampling techniques for NFI: stratified and multistage sampling	Luca Birigazzi, FAO
	Exercise on sampling techniques	Luca Birigazzi, FAO
Afternoon	Experimental design and analysis	Dr. Mahmood Hossain, Khulna University
	Exercise 4	Dr. Mahmood Hossain, Khulna University

Appendix 2. Participant List

ID	Name	Gender	Organization	Designation	Phone no	E-mail
1	Ms Afroza Begum	F	FD	Research Officer, RIMS Unit	01711283846	b.afroza@yahoo.com
2	Ms. Asma Begum	F	FD	Drafts Man, RIMS Unit	01552444690	asmafd1967@gmail.com
3	Mr. Babluzzaman	M	FD	Forester, RIMS Unit	01718003727	zzaman1978@gmai.com
4	Mr. Md. Shahin Kabir	M	FD	ACF, Chittagong North Forest Division	01741520030	sheikhshah00@gmail.com
5	Mr. Abdullah Al Mamun	M	FD	ACF, Sylhet Forest Division	01776834219	almamun.0022@gmail.com
6	Mr. Anisur Rahman	M	FD	ACF, Coxs Bazar north Forest Division	01745315749	anisur.boi@gmail.com
7	Mr. Hossain Mohammad Nishad	M	FD	DFO, Dhaka Social Forest Division	01715005677	hmnishad@gmail.com
8	Mr. Sohail Rana	M	FD	ACF, Coxs Bazar South Forest Division	01843712087	mdrumel7777@gmail.com
9	Mr.Md.Zaheer Iqbal	M	FD	DCF, RIMS Unit	01611443750	z.iqbal60@gmail.com
10	Ms. Sharmeen Akter	F	FD	ACF, Dhaka Forest Division	01916522803	sharmin_titly@yahoo.com
11	Ms. Umme Habiba	F	FD	DCF, Monitoring Unit	01612583892	habiba_fo@yahoo.com
12	Ms. Rokeya Begum	F	FD	ACF, Legal Unit	01715865276	rupa_zaman@yahoo.com
13	Mahmood Hossain	M	KU	Professor	01711959380	mahmoodhossain@hotmail.com

Appendix 3. Evaluation of the training

In total 12 (7-Male, 5- Female) participants attended the training and among the 5 took part in the evaluation process		
Male	4	80%
Female	1	20%
1. How often do you participate in training related to forest monitoring?		
First time	3	60%
1-3 every year	1	20%
More than 3 per year	0	0%
Regularly (approximately one per month)	1	20%
2. I would describe my self as?		
A professor/academic	0	0%
A student	0	0%
Forest Department staff	5	100%
Government staff (outside Forest Department)	0	0%
NGO staff	0	0%
Private consultant	0	0%
Other	0	0%
3. My professional background relates most closely to:		
Forester	5	100%
GIS/RS	1	20%
Statistics	0	0%
Social survey/assessment	0	0%
Economics	0	0%
Natural Resource Management	0	0%
Ecology	0	0%
other	0	0%
4. My years of relevant experience is		
1-2 years	1	20%
3-5 years	1	20%
5-7 years	0	0%
8-10 years	0	0%
More than 10 years	2	40%
5. The training was relevant to my daily work		
Strongly agree	4	80%
Agree	1	20%
Neutral	0	0%
Disagree	0	0%
Strongly disagree	0	0%
6. I had enough previous knowledge to understand the content of the event		
Strongly agree	2	40%
Agree	2	40%

Neutral	1	20%
Disagree	0	0%
Strongly disagree	0	0%
7. The training met my expectations in terms of the content and learning outcomes		
Strongly agree	1	20%
Agree	4	80%
Neutral	0	0%
Disagree	0	0%
Strongly disagree	0	0%
8. The learning resources provided were adequate and useful		
Strongly agree	2	40%
Agree	3	60%
Neutral	0	0%
Disagree	0	0%
Strongly disagree	0	0%
9. The resource person presented information in a way that i could understand and was easy to follow		
Strongly agree	3	60%
Agree	2	40%
Neutral	0	0%
Disagree	0	0%
Strongly disagree	0	0%
10. I feel confident to be able to carry out the tasks described in the training without supervision.		
Strongly agree	0	0%
Agree	4	80%
Neutral	1	20%
Disagree	0	0%
Strongly disagree	0	0%
11. I was pleased with the venue/meeting room/snacks etc		
Strongly agree	3	60%
Agree	2	40%
Neutral	0	0%
Disagree	0	0%
Strongly disagree	0	0%
12. Are there other people/agencies/organisations that you think should have been included in the training?		
students of forestry and environmental science should be include in this type of training		
students of forestry discipline should have been included I think		
13. Any other comments?		
training materials and content was so good but duration of training was too short to learning about basic statistic		