NFI Data Analysis Workshop Report

Venue: Skylodge Hotel, Nadi, Fiji

Date: 17 -19 June 2015

By Senilolia Tuiwawa and Loraini Baleilomaloma

Background:

The Food and Agriculture Organisation-led (FAO) UN-REDD Programme project on "Strengthening Regional Support to National Forest Monitoring Systems for REDD+ in the Pacific" began in May 2014. The project aimed to strengthen the technical support in the Pacific region for small island developing states on forest monitoring and forest inventory. The capacity building activities are being delivered through the Secretariat of the Pacific Community (SPC) with technical and financial support from FAO through the UN-REDD Programme. This support includes a range of National Forest Inventory workshops and Remote Sensing/Forest Monitoring workshops, the development of a regional forest monitoring web portal and a range of backstopping activities.

Through the request of the Fiji Island Forestry division to the Pacific Islands National Forest Facility, the backstopping workshop, aimed at building capacity on NFI data analysis was held in Nadi, Fiji from the 17-19 of June and hosted 15 participants from Papua New Guinea, Solomon Islands, Vanuatu, Tonga and Fiji. The targeted audience were technical officers with a general forestry background and experience with statistical analysis and have an in-depth knowledge of their countries forest stratification and National Forest Inventory approaches.

The training provided guidance and knowledge on the following components of data analysis: statistical measures; plot analysis (specifically in the plot area calculation and scaling factor); Carbon stocks (specifically in live trees including calculations for cluster plots and standing dead wood, lying dead wood, litter and herbaceous vegetation, saplings and soil); wood products; calculation of total carbon stocks and total uncertainty; destructive sampling; change in tree carbon stocks over time and an overview of estimating emission factors.

Objectives:

The key objectives of the workshop were to:

- introduce participants to all the calculations necessary to convert field measurements into mean carbon stock estimates for various pools and for estimating net change in carbon stocks;
- identify gaps in skills and the main needs of each country, exploring opportunities for regional support and training where common needs are identified, and specific support for particular issues in specific countries.

Day 1

The meeting progressed as outlined in the workshop agenda (Annexe 1). A total of 12 participants (5 Pacific Island Countries) and four observers (1 Fiji Forestry Department, 1 SPC and 2 FAO/SPC) attended the workshop (Annexe 2).

Dr. Haywood then introduced and highlighted the objectives of the workshop (Annex 4). Participants were then provided the opportunity to self-introduce themselves as well as indicate the roles they held in their respective countries. They were then asked to list their expectations of the workshop.

The first technical session then commenced, comprising several presentations, covering a range of related topics. The main objective was to get all the participants to have a common understanding of the statistical measures associated with estimating carbon stocks from forest inventory. The presentation covered the following topics: Statistical Measures which essentially covered the basic statistics used in a forest assessment. Specifically, these looked at the importance and relevance of statistics, critical statistical definitions together with respective equations and formulas for calculation purposes, some of the common sampling objectives, sampling design criteria, the different sampling methods and adopted assumptions (simple random, stratified, cluster and systematic sampling etc.). The presentation was then followed by a class exercise where the participants were tasked to carry out simple calculations of the forest parameters. Following the exercise, Dr Haywood presented on plot analysis using specific methods. These were using different plot shapes, the plot adjustments to consider before and when in the field and when carrying out the analysis. The participants were then tasked to carry out an exercise on plot analysis. The third presentation looked at plot analysis and calculating scaling factors follwed by an exercise relating to the presentation. The fourth presentation covered means of calculating live tree carbon stocks. It specifically detailed the information needed and the calculation methods required for the respective carbon pools. An exercise entailing the calculations in all the pools was then tasked to the participants.

Day 2

The second technical session focussed in calculating carbon stocks in each carbon pools. The objective of the session was that all participants have a common understanding of how to calculate the carbon stocks in each pool. This session commenced with a presentation looking at the calculation of cluster plots. It covered the simplified clustered analysis method and comprehensive cluster analysis method. The participants were then tasked to carry out an exercise relating to the topic.

The session then continued, comprising several other presentations, covering a range of related topics. Key topics covered and presented on during this session were calculating density from wood samples and calculation of carbon stocks from standing dead wood. Participants were then tasked to carry out an exercise. The next presentation covered in detail the information required and the calculation steps involved in the respective carbon pools: Calculation of lying dead wood carbon stocks, Calculation of litter carbon stocks and

the calculation of carbon stocks from sapling. After each presentation, the participants were carried out exercises to gain better understanding of analysing carbon stock at respective carbon pools.

Day 3

Technical session two was drawn to a conclusion the following day with a presentation on how to calculate the soil carbon stocks/wood products.

Technical session three then commenced, focussing on total biomass carbon stocks and propagation uncertainty. The objective of the session was to get the participants to have common understanding on calculating carbon stocks and associated uncertainty. The presentations commenced with analysing total carbon stocks, error propagation, destructive sampling and changes in tree carbon over time. After each presentation, the participants were tasked respective exercise to gauge better understanding in calculating carbon stocks.

Technical session four then commenced, focussing on the calculation of emission factors for deforestation. The objective of the session was to have the participants have a common understanding of what is necessary to create emission factors for deforestation using existing carbon stock data. An overview of emission factor estimation was presented followed by a class exercise.

Feedback Evaluation:

Given the outcomes to the training, the workshop feedbacks were very favourable (Annexe 4). More than 50% of the participants strongly agreed on the following points: that the workshop content was as described in publicity materials; that the workshop was applicable to their line of work and would recommend this workshop to other foresters; that the program was well placed and within the allotted time; that the facilitator was a good communicator and knowledgeable on the topic; that the material presented was done so in an organized manner and that they would want to follow up on the workshop but perhaps on a more advanced level. Similarly, majority of the participants indicated the length and the level of training to be fairly sufficient and was not too advanced for learning and that the facilitation of the workshop (i.e. the visuals, acoustics, meeting place, handouts and the overall program) was outvoted to have outstandingly been implemented.

On the same note, whilst there were inconsistencies in the participant ratings between the extreme scores of agreement and disagreement, the ratings against each question was consistently lower than 50%, sometimes even zero percent. Similarly, very few participants rated the extreme scores of disagreement. The ratings were significantly lower than 50% against all the questions asked. It was assumed that these variations were because the participant did not have the formal background training to fully grasp the concepts within the three day workshop; that they perhaps did not understand the question asked or were simply undecided with the rating scores provided.

Overall, the participants were very positive about the training workshop. The topics presented and discussed in particular, were new to some of the participants but very applicable to the remaining majority in terms of their line of work. The focus of discussions were on the carbon calculations and statistical tools to which the facilitator was applauded for being very well prepared and knowledgeable about the subject presented and more so, providing the participants the opportunity to network. More importantly, the participants were able to highlight areas that they thought needed capacity building in their own respective countries and prospects of similar training within the region (Annex 4).

Summary and Conclusion:

Data analysis is an intricate component of NFI that needs proper planning, the right skill sets and knowledge to generate valuable and effective outputs. Some NFI in the Pacific region only reach the data collection (field work) phase, where raw data from the field are not analysed and reported on due to the lack of capacity within the sector tasked with carrying a country's forest inventory. To do so, international experts are hired which often is a luxury for developing pacific islands countries. These frequently results to field datasets often not being analysed and reported. This ongoing issue led to a request by the Fiji Forestry division to the Secretariat of the Pacific Community for a regional training on NFI data analysis. Made possible by the team under the SPC National Forest Inventory Facility housed under the Land Resource Division, the first 'Data Analysis training on NFI' was carried out in June, 2015 in Fiji. The training and exercises followed a step by step approach on data analysis from calculating biomass and carbon stock to the final step of analysing uncertainties.

The training on 'Data analysis in National Forest Inventory' ended with a high note with participants now having the needed knowledge to internally analyse their country's NFI data. Proposals were also put forward by the participants for more data analysis and reporting training to further build on their capacity.

Annexes

Annex 1: Workshop Agenda

**Forest Inventory Backstopping
Data Analysis (Emission Factors)**
17-19 June 2015, Nadi, Fiji

Draft AGENDA

DAY 1: Wednesday 17 June 2015
Registration and coffee/tea from 8:30 am

Day 1	Topic and Activity	Speaker
09:00-10:00	**Welcome & Introduction** *Session Objective: All participants are welcomed and have a common understanding of the agenda and workshop objectives.*	
09:00-09:15	Welcome and opening remarks from host country representative	**Representative from Fiji Forestry**, TBA
09:15-09:25	Introduction to the workshop	**Sairusi Bulai,** Acting Deputy Director, LRD, SPC
09:25-09:35	Objectives the workshop	**Andrew Haywood,** FAO UN-REDD
09:35-09:45	Self-Introduction of the participants	All
09:45-10:00	*Participants discuss expectations in pairs and write up cards*	All
10:00-10:30	**Coffee/Tea**	
10:30-15:00	**Technical Session 1: Statistical Measures** Facilitator: Andrew Haywood *Session Objective: All participants have a common understanding of the statistical measures associated with estimating carbon stocks from forest inventory*	
10:30-11:00	Statistical Measures	**Andrew Haywood,** FAO UN-REDD
11:00-11:30	*Exercise 1*	**Andrew Haywood,** FAO UN-REDD
11:30-12:00	Plot Analysis -Calculation of Sampled Plot Area	**Andrew Haywood,** FAO UN-REDD
12:00-12:30	*Exercise 2*	**All**
12:30-13:30	**Lunch**	
13:30-14:00	Plot Analysis Calculation of Scaling Factors	**Andrew Haywood,** FAO UN-REDD
14:00-14:30	*Exercise 3*	**All**
14:30-15:00	Calculation of Live Tree Carbon Stocks	**Andrew Haywood,** FAO UN-REDD
15:00-15:30	**Coffee/Tea**	
	Technical Session 2: Calculating Carbon Stocks in each carbon pool Facilitator: Andrew Haywood *Session Objective: All participants have a common understanding of how to calculate the carbon stocks in each pool*	
15:30-16:00	*Exercise 4*	**All**
16:00-16:30	Calculation of Cluster Plots	**Andrew Haywood,** FAO UN-REDD
16:30-17:00	*Exercise 5*	**ALL**

DAY 2: Thursday 18 June 2015

DAY 2:	Topic and Activity	Speaker
	Technical Session 2: Calculating Carbon Stocks in each carbon pool (Continued) Facilitator: Andrew Haywood *Session Objective: All participants have a common understanding of how to calculate the carbon stocks in each pool*	
09:00-09:30	Calculation of Density from Wood Samples	**Andrew Haywood,** FAO UN-REDD
09:30-10:00	Calculation of Standing Dead Wood Carbon Stocks	**Andrew Haywood,** FAO UN-REDD
10:00-10:30	**Coffee/Tea**	
10:30-11:00	*Exercise 6*	**All**
11:00-11:30	Calculation of Lying Dead Wood Carbon Stocks	**Andrew Haywood,** FAO UN-REDD
12:00-12:30	*Exercise 7*	**All**
12:30-13:30	**Lunch**	
13:30-14:30	Calculation of Litter Carbon Stocks	**Andrew Haywood,** FAO UN-REDD
14:30-14:00	*Exercise 8*	**All**
15:00-15:30	**Coffee/Tea**	
15:30-16:00	Calculation of Carbon Stocks from Saplings	**Andrew Haywood,** FAO UN-REDD
16:00-16:30	*Exercise 9*	**ALL**

DAY 3: Friday 19 June 2015

DAY 3:	Topic and Activity	Speaker
	Technical Session 2: Calculating Carbon Stocks in each carbon pool (Continued) Facilitator: Andrew Haywood *Session Objective: All participants have a common understanding of how to calculate the carbon stocks in each pool*	
09:00-09:30	Calculation of Soil Carbon Stocks/Wood Products	**Andrew Haywood,** FAO UN-REDD
	Technical Session 3: Total Biomass Carbon Stocks and Propagation Uncertainty Facilitator: Andrew Haywood *Session Objective: All participants have a common understanding of how to calculate carbon stocks and associated uncertainty*	
09:30-10:00	Calculating Total Carbon Stocks	**Andrew Haywood,** FAO UN-REDD
10:00-10:30	**Coffee/Tea**	
10:30-11:00	Exercise 10	**All**
11:00-11:30	Error Propagation	**Andrew Haywood,** FAO UN-REDD
11:30-12:00	Exercise 11	**All**
12:00-12:30	Destructive Sampling	**Andrew Haywood,** FAO UN-REDD
12:30-13:30	**Lunch**	
13:30-14:00	Exercise 12	**All**
14:00-14:30	Changes in tree carbon over time	**Andrew Haywood,** FAO UN-REDD
14:30-15:00	Exercise 13	**All**
15:00-15:30	**Coffee/Tea**	
	Technical Session 4: Emission Factors for Deforestation Facilitator: Andrew Haywood *Session Objective: All participants have a common understanding of what is necessary to create emission factors (EF) for deforestation using existing carbon stock data.*	
15:30-16:00	Overview of Emission Factor Estimation	**Andrew Haywood,** FAO UN-REDD
16:00-16:30	Exercise 14	**All**
16:30-17:00	**Workshop Close-out** *Session Objective: All participants review workshop and provide feedback*	

Forest Inventory Data Analysis Training

17-19 June, Skylodge Hotel, Nadi, Fiji

PARTICIPANTS LIST

	NAME	DESIGNATION	CONTACT DETAILS
Fiji			
1.	Mr Noa Vakacegu	Manager Planning Unit	Level 3, Takayawa Building, Toorak Tel: (679) 3301611; Fax: (679) 3310679 Email: vakacegunoa@yahoo.com
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Solomon Islands			
7.	Mr Terence Titiulu	Deputy Commissioner of Forests	P O Box G24, HONIARA, Solomon Islands P:677—7650473 F:677-23029 Email: ttiurukale@gmail.com / ttitiulu@mofr.gov.sb
8.	Mr Chris Giro Wagatora	REDD Plus Officer	P.O Box G24 HONIARA, Solomon Islands P:677-7754613 F:677-24660 E: krys@gmail.com / chriziegi@gmail.com
9.	Mr. John Johnson Palmer	Forest Officer	PO Box G24, HONIARA, Solomon Islands T: 677-24215 F: 677- 24660 E-mail: ttitiulurukale@gmail.com

	Tonga			
10.	Mr. Tevita Fakaosi	Deputy Director - MAFFF, Forestry Division, Tokomololo,	P:29-500 / 7751490 E: forestry@kalianet.to	
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	Vanuatu			
12.	Mr Isaiah Sero	Forest Officer	Private Mail Bag 9064 PORT VILA, Vanuatu Email: isaiahsero163@gmail.com T: 678-7733656	
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14.	Titus Ray Kerry	Forest Officer	T: (678) 5403599 F: (678) 23856 E-mail: raykerry8@gmail.com	
	SPC			
15.	Mr Sairusi Bulai	Deputy Director – Land Resources Division (SPC)	Secretariat of the Pacific Community, Luke Street, Nabua, Private Mail Bag, SUVA, Fiji T: 679-3370 733	
16.	Mr Jalesi Mateboto	Specialist Community Forester	T: 679-3370 733 F:679-3370021	
17.	Mrs Bale Wilikibau	Programme Assistant	T: 679-3370 733 F:679-3370021	
	UN-FAO			
18.	Dr Andrew Haywood	FAO International Consultant	C/- Secretariat of the Pacific Community, Luke Street, Nabua, Private Mail Bag, SUVA, Fiji T: 679-3370 733 F:679-3370021	
19.	Ms Loraini Baleilomaloma	Technical Assistant	albaleilomaloma@gmail.com T: 679-3370 733 F:679-3370021	
20.	Ms Senilolia Tuiwawa	Technical Assistant	Senilolia.Tuiwawa@fao.org T: 679-3370 733 F:679-3370021	

Workshop Evaluation Form

Your feedback is critical for SPC to ensure we are meeting your targeted support needs. We would appreciate if you could take a few minutes to share your opinions with us so we can serve you better.

Please email this form to the instructor or organizer at the end of the workshop. Thank you.

Workshop title: Data Analysis Emissions Factors
Date:_17-19 June 2015 _____   Instructor: Andrew Haywood_____

	Strongly agree				Strongly disagree
1. The content was as described in publicity materials	1	2	3	4	5
2. The workshop was applicable to my job	1	2	3	4	5
3. I will recommend this workshop to other foresters	1	2	3	4	5
4. The program was well paced within the allotted time	1	2	3	4	5
5. The instructor was a good communicator	1	2	3	4	5
6. The material was presented in an organized manner	1	2	3	4	5
7. The instructor was knowledgeable on the topic	1	2	3	4	5
8. I would be interested in attending a follow-up, more advanced workshop on this same subject	1	2	3	4	5

9. Given the topic, was this workshop: ❑ a. Too short   ❑ b. Right length   ❑ c. Too long

10. In your opinion, was this workshop: ❑ a. Introductory ❑ b. Intermediate   ❑ c. Advanced

11. Please rate the following:

	Excellent	Very Good	Good	Fair	Poor
a. Visuals	❑	❑	❑	❑	❑
b. Acoustics	❑	❑	❑	❑	❑
c. Meeting space	❑	❑	❑	❑	❑
d. Handouts	❑	❑	❑	❑	❑
e. The program overall	❑	❑	❑	❑	❑

12. What did you most appreciate/enjoy/think was best about the course? Any suggestions for improvement?

_____

OVER, Please ➔➔➔

Your Background

_____

Future Needs

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13. I would be able to do my work better if I knew _____

14. Please describe the top two topics you would like to learn more about in the next 12 months:

Topic
1:_____

       Preferred level: ❑ a. Introductory ❑ b. Intermediate ❑ c. Advanced

       Preferred format: ❑ a. Seminar/workshop (how many days?__1 week_____)
                                   ❑ b. Self-study materials
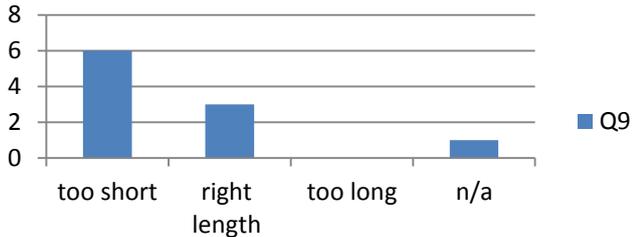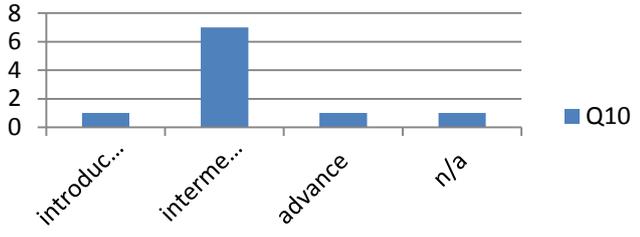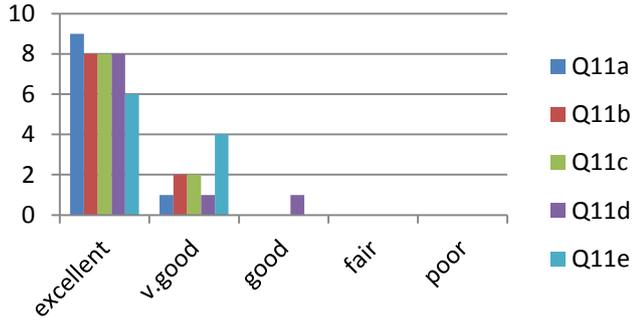   ❑ c. Interactive distance learning (i.e., Web-based)
                                   ❑ d.

Other:_____

Topic
2:_____

       Preferred level: ❑ a. Introductory ❑ b. Intermediate ❑ c. Advanced

       Preferred format   ❑ a. Seminar/workshop (how many days?_____)
                                   ❑ b. Self-study materials
                                   ❑ c. Interactive distance learning (i.e., Web-based)
                                   ❑ d.

Other:_____

Thank you!
Please return this form to the instructor or coordinator at the end of the workshop.

Annex 4: Evaluation Analysis of Workshop Feedback

<table>
<tr>
<td colspan="2" align="center">Workshop Feedback</td>
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<tr>
<td align="center">Questionnaire</td>
<td align="center">Results</td>
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<tr>
<td>
Q1. The content was as described in publicity materials
Q2. The workshop was applicable to my job
Q3. I will recommend this workshop to other foresters
Q4. The program was well paced within the allotted time
Q5. The instructor was a good communicator
Q6.The material was presented in an organized manner
Q7. The instructor was knowledgeable on the topic
Q8. I would be interested in attending a follow-up, more advanced workshop on this same subject
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For question one, there were six participants that strongly agreed that content was as described in publicity materials, none of the participants agreed, one neither agreed nor disagreed, none of the participants disagreed and three participants strongly disagreed.

For question two, there were seven participants that strongly agreed the workshop was applicable to their work, none of them agreed it was relevant to their work, none of them neither agreed or disagreed, one participant disagreed it was applicable to their work and two participants strongly disagreed.

For question three, there were five participants that strongly agreed they would recommend this workshop to other foresters, one participant agreed, one participant neither agreed nor disagreed and two participants strongly disagreed.

For question four, there were six participants that strongly agreed the program was well paced within the allotted time, one participant agreed, none of the participant neither agreed nor disagreed, one participant disagreed and two participants strongly disagreed.

For question five, there were seven participants that strongly agreed the instructor was a good communicator, none of the participants agreed, agreed nor disagreed, disagreed and three participants strongly disagreed.

For question six, there were six participants that strongly agreed the material was presented in an organised manner, one participant agreed, none neither agreed nor disagreed, none disagreed and three participants strongly disagreed.

For question seven, there were six participants that strongly agreed the instructor was knowledgeable on the topic, one agreed, none neither agreed nor disagreed, none disagreed and three participants strongly disagreed.

For question eight, there were five participants that strongly agreed they would be interested in attending a follow-up, more advanced workshop on the same subject, two participants agreed, none agreed or disagreed, none disagreed and three participants strongly disagreed.

Q9. Given the topic, was this workshop	**Q9** [bar chart: too short ≈ 6, right length ≈ 3, too long ≈ 0, n/a ≈ 1]

Six participants rated the workshop was too short, three indicated it was the right length, none rated the workshop as being too long and one did not provide a rating

Q10. In your opinion, was this workshop	**Q10** [bar chart: introduc... ≈ 1, interme... ≈ 7, advance ≈ 1, n/a ≈ 1]

One participant rated the workshop as introductory, seven as intermediate, one as advanced and one participant did not provide a rating

Q11. Please rate the following: a. Visuals b. Acoustics c. Meeting space d. Handouts e. The program overall	[bar chart with categories excellent, v.good, good, fair, poor for Q11a, Q11b, Q11c, Q11d, Q11e]

For visuals, there were nine participants that rated visuals as excellent, one as very good, none rated it as good, fair nor poor; for the acoustics, there were eight participants that rate it as excellent, two as very good, none rated it as good, fair nor poor; for the meeting space, there were eight participants that rated it as excellent, none rated it as good, fair nor poor; for the handouts, there were eight participants that rated it as excellent, one rated it as good, one rated it as fair and none rated it as poor; for the overall programme, six rated it as excellent, four as very good, none of the participants rated it as fair or poor.

Q12. What did you most appreciate/enjoy/think was best about the coarse? Any suggestions for improvement?	• Very well structured, presented and relevant exercises that follow logical processes involved (2). • the calculating is a revision but it is new when carbon calculation comes in. It was quite difficult when learning some of the new secrets. When learning about new things it entirely depends on how the knowledge or concept is relayed to individual participants in the room. Understanding between the presenter and the participants is very important for the message to and more importantly to me relay effectively to everyone in the room • the training has enabled me: 1. to better understand statistics (data analysis) and especially the calculation of confidence interval and uncertainty apart from calculating carbon in the different pools 2. promote networking in the region (with people

	working on similar tasks) 3. I would suggest future training on a program (database, if any) for data analysis, to properly manage/store data analysis and dissemination of information reports to stakeholders • I appreciate the explanation and reasoning behind the use of ever statistical equation. I love the presentation materials-well documented for future reference. I like the views of cloud hosting for 24/7 availability and backup services • Overall, I really appreciate and enjoy this coarse and the most enjoyable part was building the right or correct excel formula or functions to come up with the correct answers etc. I recommend that normal data analysis formulas with their corresponding excel formulas should be printed out in handouts and issued to us so it is easy to do the calculations and understand the calculations. • the best part of the exercise that we did. This enabled me to have a more hands on approach and understanding to the different theories taught. • the facilitator was well prepared and very knowledgeable about the subject matter and thus answering out questions very well. • Enjoy every presentation and the way the exercise was laid out. Really gives a clear picture on steps to do the calculation • the workshop training was an excellent module and the presentation was very relevant and most appropriate. I very much look forward to attend a similar NFI data analysis soon as a follow up and upgrade to the next level. Otherwise, it will be great to have such training at the country level so that specific country wide participations can take part as this is a very important training • the workshop training was an excellent module and the presentation was very relevant and most appropriate. I very much look forward to attend a similar NFI data analysis soon as a follow up and upgrade to the next level. Otherwise, it will be great to have such training at the country level so that specific country wide participations can take part as this is a very important training • the workshop training was an excellent module and the presentation was very relevant and most appropriate. I very much look forward to attend a similar NFI data analysis soon as a follow up and upgrade to the next level. Otherwise, it will be great to have such training at the country level so that specific country wide participations can take part as this is a very important training
Q13. I would be able to do my work better if I knew more about	Data analysis cause we have so many forest inventory field work but lack of understanding the end output; sampling statistics; governing guidelines on creating a National Forest Inventory System for a country; How can our results from data analysis be used to gain access to International Fundings; How to report on our results from data analysis, making sure that it would meet International requirements, linking our results to international guidelines; data analysis calculations and calculations of emission factors; system and process

	management; the REDD+ process and requirements; experimental design and analysis (using specific analysis software programs), access software or a database where i can apply actual large field data to use in the data analysis training; practical part of plot designs, not sophisticated example but at least an exceptional one; practical plot designs not a sophisticated example but at least an exceptional one
Q14. Please describe the two topics you would like to learn more about in the next 12 months	Topic 1: Forest Inventory; Statistical measures ; Reporting on our data analysis results; Data analysis calculations; Refresher course using local inventory system, data, analysis, reporting requirement; programming and reporting for REDD+ ; experimental design and analysis; application of the carbon formula calculations using large data from country. Topic 2: GIS; Changes in tree carbon overtime; Pilot Inventory Planning (Field Work); Data analysis calculations; GIS Training (Arc GIS); sampling and inventory with modern tools; GIS; use actual raw data from field, application of residuals, entering of data to start of with