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PARTNERSHIP FOR LAND USE SCIENCE (Forest-PLUS)

Optical Remote Sensing of Forest Carbon Training Report

January 2015
This publication was produced for review by the United States Agency for International Development and was prepared by Tetra Tech ARD.

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PARTNERSHIP FOR LAND USE SCIENCE (Forest-PLUS)

Optical Remote Sensing of Forest Carbon Training Report

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Table of Contents

BACKGROUND

FOREST-PLUS COMPONENT 1 TASK 1 ACTIVITY 1.2.1

This Forest-PLUS activity specifies:

> "Improve methodologies to estimate the carbon content of different forest types in India, particularly forest types found in Forest-PLUS' four landscapes, by developing forest carbon estimation models and protocols based on remote sensed data:
>
> a) Design or adapt software models that convert remote sensed data into carbon estimates.
>
> b) Integrate remote sensed data with ground-level inventory data, to improve the accuracy of carbon estimates."

MSU has a lead role implementing this activity and is supported by IORA. MSU has developed a series of software models in ERDAS Imagine Spatial Modeler Language (.gmd) to convert optical remote sensing satellite data to forest carbon maps at the landscape scale integrated with ground-level inventory data.

REMOTE SESNING SOFTWARE MODELS

The MSU team, in coordination with IORA, has completed the development of four software models. The models are written in ERDAS Imagine spatial modeler language. A suite of preliminary models pre-processes data to a fractional cover (fC) data product. The first preliminary model converts level 1G Landsat optical data from digital numbers to at-sensor top-of-atmosphere (ToA) reflectance values. This process normalizes data for improved inter-comparison and for large-area analyses that include more than one satellite scene. The ToA model can be modified for use with AWiFS and LISS-III data. The next model converts ToA data sets to a vegetation index using the [1]Modified Soil Area Vegetation 2 (MSAVI2) algorithm. A linear un-mixing model then converts the MSAVI2 data sets to vegetation continuous-fields (VCF) or fraction cover (fC) data set using two pure-pixel end-members of soil and closed canopy vegetation. End-members are user-defined through an area-of-interest (AOI) method using the MSAVI data sets. We have also developed an soil and forest end-member library for Landsat data for the four landscapes which can be used as inputs to the fC model.

Two primary models convert fC data to map carbon values at the pixel level. The first model up- and down-scales a Tier 2 mean value of carbon by the fC value within any particular forest strata. The second model uses plot level carbon and the location of plots to develop an equation based on the relationship between carbon estimates from plot data and the fC value at the same location. The two models map and compute landscape level forest carbon at the pixel-scale (Tier 2 and Tier 3). These two models provide relevant *emission factor data* as input to REDD+ projects.

[1] We are testing a number vegetation indices (NDVA, MSAVI2, EVI, Simple 4/3 band ratio) to determine the optimal VI data set that most accurately quantifies forest canopy and/or biomass/carbon for each of the four Forest-PLUS landscapes. The final set of models may therefore, be landscape specific as well. In other words we may deliver four distinct "pre-processing" models, one for each landscape type.

A third model processes multi-temporal fC (or carbon) data sets to compute deforestation and degradation (or carbon fluxes). The primary focus for this model is improved capability for assessing degradation using a finer classification for forest cover than currently used in India (4 classes of forest canopy cover: < 10 %, 10 < 40 %, 40 < 70 %, and >70 %) This model is a measure of activity data. This model provides relevant *activity data* as input to REDD+ projects.

A fourth model includes a series of computational tools to address common issues particular to use of optical remote sensing data. These include automated cloud-masking, gap-filling, and data mosaic models as well as correction processes for data with high topographic relief and hill-shade/shadow effects.

Table 1: MSU Deliverable 1.2.1 - Four Optical RS Software Models

Model	Name	REDD+ Input	Process
Pre-processing	Data normalization (ToA); Vegetation Index (MSAVI2); Fractional Cover (fC)	--	DN → ToA ToA → MASVI2 MSAVI2 → fC (linear unmixing; 2 end-members)
Model 1	Tier 2 Carbon Mapping	Emissions factor	Mean C = Mean fC per stratum; up- and down-scale carbon by fC deviation from the mean fC
Model 2	Tier 3 Carbon Mapping	Emissions factor	Plot C and fC relationship (OLS regression)
Model 3	Deforestation and *Degradation*	Activity data and Emission Baselines	Multi-temporal fC (or Carbon) analyses
Model 4	Tools for improved optical RS analyses	--	Cloud masking; gap-filling; mosaic processing, hill-shade/shadow correction

TRAINING DETAILS

VENUE AND AGENDA

A seven-day, comprehensive, hands-on, follow-up training to the two-day June 2014 workshop at FSI was given to remote sensing and GIS technicians from the state forestry departments of Karnataka, Madhya Pradesh and Himachal Pradesh. The technicians from Sikkim were unable to attend. The focus of the training was on running a suite of ERDAS models for optical remote sensing data (Landsat, AWiFS, and LISS-III) to map forest carbon at the pixel (or landscape) level. The training was held at Amity University in Noida, Uttar Pradesh from December 5 – 11, 2014, and incorporated two field days as well.

The training included participation from Dr. Sunil Chandra and Dr. Abhay Saxena from FSI as co-trainers along with Jay Samek (MSU) and Atri Shaw (IORA). Mr. Santanu Basu and Mr. Ankit Rawat from IORA also assisted.

Table 2: Seven day agenda

Day	Date	General Overview
1	5-Dec-2014	Introduction • Scientific and theoretical background • Data sets and data requirements • ERDAS Spatial Modeling Language (.gmd)
2	6-Dec-2014	Field Practicum • Land use and land cover field data collection
3	7-Dec-2014	Pre-processing models • DN → Radiance → Top of Atmosphere Reflectance (ToA) • Vegetation Indices (VI) • Fraction Cover (fC)
4	8-Dec-2014	Field Practicum • Plot inventory: biomass data collection
5	9-Dec-2014	Tier 2 Carbon Mapping • Calculating mean values • Stratification • Tier 2 Landscape level carbon map
6	10-Dec-2014	Tier 3 Carbon Mapping • Calculating plot level carbon • OLS regression of plot carbon and fC • Stratification • Tier 3 Landscape level carbon map
7	11-Dec-2014	Validation and calibration; Wrap-up • Calibrating fC • Validation – error analysis/confusion matrix (plots and hi-res data) • Forest-PLUS models 3 and 4 – deforestation/degradation & “data improvement” tools

PARTICIPANTS

A total of nine (9) participants were trained over the seven day period; three each from HPFD and KFD, two from MSPFD and one staff member from Amity University.

Table 3: Participants

No	Participant Name	Institution
1	Mr. Rajneesh Kumar	HP Forest Department
2	Mr. Prashant Gautam	HP Forest Department
3	Mr. Amit Rana	HP Forest Department
4	Ms. Aparna Dwivedi	MP Forest Department
5	Mrs. Veena Malviya	MP Forest Department
6	Mr. Mahadevaswamy. B.	Karnataka Forest Department
7	Mr. Palakshaiah. K.S.	Karnataka Forest Department
8	Mr. Boraiah K.T.	Karnataka Forest Department
9	Mr. Abhishek Banerjee	Amity University

OUTPUTS

PRE- AND POST-TRAINING SURVEYS

Short pre- and post-training surveys were administered on day 1 and day 7 respectively with the participants. The complete surveys are included in the appendix. Below are summary results from selected questions.

Pre-training survey (n=9):

Q1. Participant experience and knowledge (self assessment) of the following:

1	Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data				
	None	Some	Average	Above Ave	Expert
	0	0	3	4	2
2	Geographic Information Systems (GIS) Analyses				
	None	Some	Average	Above Ave	Expert
	0	1	2	4	2
3	Field Forestry – Plot Inventory Methods				
	None	Some	Average	Above Ave	Expert
	2	1	5	1	0
4	Methods for Measuring Forest Biomass and Carbon				
	None	Some	Average	Above Ave	Expert
	3	3	3	0	0

Q2. Level of experience using:

1 ERDAS Imagine

None	Some	Average	Extensive
0	0	5	4

2 ArcMAP

None	Some	Average	Extensive
0	1	2	6

Q3. Knowledge of the following terms:

1 REDD+

None	Somewhat	Know very well
1	6	2

2 MRV

None	Somewhat	Know very well	NA
5	2	1	1

3 REL

None	Somewhat	Know very well	NA
6	2	0	1

4 Five Carbon Pools

None	Somewhat	Know very well	NA
3	3	2	1

Post-training survey (n=8):

Q1. Level of knowledge and skill as a result of the training:

1	Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data		
	Stayed the same	Increased Somewhat	Increased Significantly
	0	4	4
2	Geographic Information Systems (GIS) Analyses		
	Stayed the same	Increased Somewhat	Increased Significantly
	0	5	3
3	Field Forestry – Plot Inventory Methods		
	Stayed the same	Increased Somewhat	Increased Significantly
	1	4	3
4	Methods for Measuring Forest Biomass and Carbon		
	Stayed the same	Increased Somewhat	Increased Significantly
	0	4	4

Q3. Expectations for Training

		Lower	**Met**	**Exceeded**
1	Overall knowledge sharing and transfer	0	6	2
2	Remote Sensing Tool	0	5	3
3	Methods for Mapping Forest Carbon	0	7	1
4	Carbon Accounting Principles and Methods	0	6	2
5	Training Format, Modality	0	6	2

Q5. Knowledge change as a result of training:

1	REDD+		
	Same	Increase Some	Increase a lot
	2	4	2
2	MRV		
	Same	Increase Some	Increase a lot
	5	2	1
3	REL		
	Same	Increase Some	Increase a lot
	6	2	0
4	Five Carbon Pools		
	Same	Increase Some	Increase a lot
	1	4	3

TRAINING HOURS

A total 360 person hours of training were completed with SFD staff under this training (see Table 4)

Table 4: Training hours total and by gender

Participants	Number	Lab Days	Field Days	Lab Hours	Field Hours	Total Hours
Male	6 (*1)	5 (2)	2	192	84	276
Female	2	5	2	60	24	84
TOTAL	***9***	***5***	***2***	***252***	***108***	***360***

* One participant from Himachal Pradesh became ill during the training and returned home after the 4th day.

TRAINING MANUAL AND DATA SETS

Participants were given a training manual as well as data sets from each of the four Forest-PLUS case study sites. A copy of the training manual is included with this document. The training manual includes a description of the sample data sets on the USB flash drives that each participant was given.

APPENDICES

1. Agenda
2. Sign in sheet
3. Pre-Training surveys
4. Post-Training surveys
5. Pictures
6. Forest Type Mapping (FSI) Presentation
7. Participant: June (FSI) & December (Amity U) Trainings

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Partnership for Land Use Science (Forest-PLUS) Program

Optical Remote Sensing Workshop / Training

Co-development of Remote Sensing Protocols for Forest Carbon Mapping

Date: December 5-11, 2014

Venue: Amity University, Noida, Uttar Pradesh

DRAFT AGENDA

Day	Date	General Overview
1	5-Dec-2014	Introduction • Scientific and theoretical background • Data sets and data requirements • ERDAS Spatial Modeling Language (.gmd)
2	6-Dec-2014	Field Practicum • Land use and land cover field data collection
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4	8-Dec-2014	Field Practicum • Plot inventory: biomass data collection
5	9-Dec-2014	Tier 2 Carbon Mapping • Calculating mean values • Stratification • Tier 2 Landscape level carbon map
6	10-Dec-2014	Tier 3 Carbon Mapping • Calculating plot level carbon • OLS regression of plot carbon and fC • Stratification • Tier 3 Landscape level carbon map
7	11-Dec-2014	Validation and calibration; Wrap-up • Calibrating fC • Validation – error analysis/confusion matrix (plots and hi-res data) • Forest-PLUS models 3 and 4 – deforestation/degradation & "data improvement" tools

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DAILY AGENDAS (pg.1)

Day 1: 5-Dec-2014

09:00 – 09:30	Sign in
09:30 – 10:00	Welcome and Introductions
10:00 – 10:15	Pre-Training Survey Questionnaire
10:15 – 10:30	Seven Day Training Overview – Jay Samek (MSU) and Swapan Mehra (IORA)
10:30 – 11:00	*coffee / tea break*
11:00 – 12:00	Basic training in using ERDAS Imagine – Jay Samek (MSU)
12:00 – 13:00	*Lunch*
13:00 – 14:30	Remote Sensing of Forest Carbon (Part 1) – Dr. Sunil Chandra (FSI), Jay Samek (MSU) and Atri Shaw (IORA) - Principles: Scientific and Theoretical background
14:30 – 15:30	Remote Sensing of Forest Carbon (Part 2) – Dr. Sunil Chandra (FSI), Jay Samek (MSU) and Atri Shaw (IORA) - Data set requirements
15:30 – 16:00	*coffee / tea break*
16:00 – 17:00	ERDAS Imagine Spatial Modeler Language – Jay Samek (MSU)

Day 2: 6-Dec-2014

09:00 – 09:30	Sign in
09:00 – 12:00	Field Practicum I: Land Use and Land Cover Data – (IORA/MSU)
12:00 – 13:00	*lunch in the field*
13:00 – 17:00	Field Practicum I continued …

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DAILY AGENDAS (pg.2)

Day 3: 7-Dec-2014

09:00 – 09:30	Sign in
09:30 – 10:00	Data Pre-Processing Models (Presentation) – Jay Samek (MSU)
10:00 – 10:45	Model 1 Practicum: DN → Radiance → TOA Reflectance
10:45 – 11:15	*coffee / tea break*
11:15 – 12:00	Vegetation Indices (Presentation) – TBD (IORA)
12:00 – 13:00	*Lunch*
13:00 – 14:00	Model 2 Practicum (VI's)
14:00 – 14:30	Fraction Cover (Vegetation Continuous Fields) – Jay Samek (MSU)
14:30 – 15:00	*coffee / tea break*
15:00 – 17:00	Model 3 Practicum (fC)

Day 4: 8-Dec-2014

09:00 – 09:30	Sign in
09:00 – 12:00	Field Practicum II: Plot Inventory Data
12:00 – 13:00	*lunch in the field*
13:00 – 17:00	Field Practicum II continued …

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DAILY AGENDAS (pg.3)

Day 5: 9-Dec-2014

09:00 – 09:30	Sign in
09:30 – 10:30	Stratification (Presentation) – TBD (FSI/IORA/MSU)
10:30 – 11:00	*coffee / tea break*
11:00 – 12:00	Practicum - Forest Carbon DMS | Plot Sample Design & Mean Carbon
12:00 – 13:00	*Lunch*
13:00 – 13:30	Mapping Tier 2 Carbon – Method 1 (Presentation) – Jay Samek (MSU)
13:30 – 14:30	Model 4 Practicum (Mapping Tier 2 Carbon)
14:30 – 15:00	*coffee / tea break*
15:00 – 17:00	Model 4 Practicum continued … (Mapping Tier 2 Carbon)

Day 6: 10-Dec-2014

09:00 – 09:30	Sign in
09:30 – 10:30	Tier 3 Carbon Mapping (Presentation) – Jay Samek (MSU)
10:30 – 11:00	*coffee / tea break*
11:00 – 12:00	Practicum: Plot Carbon to fC Value Relationships
12:00 – 13:00	*Lunch*
13:00 – 14:30	Model 5 Practicum (Mapping Tier 3 Carbon)
14:30 – 15:00	*coffee / tea break*
15:00 – 17:00	Model 5 Practicum continued … (Mapping Tier 3 Carbon)

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DAILY AGENDAS (pg.4)

Day 7: 11-Dec-2014

09:00 – 09:30	Sign in
09:30 – 10:30	Calibration and Validation – Dr. Sunil Chadra (FSI), Jay Samek (MSU)
10:30 – 11:00	*coffee / tea break*
11:00 – 12:00	Forest-PLUS RS Models No 3 and No 4 – Jay Samek (MSU), TBD (IORA)
12:00 – 13:00	*Lunch*
13:00 – 14:30	Special conditions: cloud, topography, deciduous forests
14:30 – 15:00	*coffee / tea break*
15:00 – 16:00	Discussion
16:00 – 16:30	Post-Training Survey Questionnaire
16:30 – 17:00	Presentation of Certificates

TRAINERS:

- Dr. Sunil Chandra (FSI)
- Mr. Swapan Mehra (Forest-PLUS IORA)
- Dr. David L. Skole (Forest-PLUS MSU)
- Mr. Jay Samek (Forest-PLUS MSU)
- Ms. Atri Shaw (Forest-PLUS IORA)
- Mr. Santanu Basu (Forest-PLUS IORA)
- Mr. Ashwin A. S. (Forest-PLUS IORA)

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Partnership for Land Use Science (Forest-PLUS) Program

Optical Remote Sensing Workshop / Training

Co-development of Remote Sensing Protocols for Forest Carbon Mapping

Date: December 5, 2014
Venue: Amity University, Noida

ATTENDANCE SHEET

Sl.No	Name	Designation, Organisation	Signature
1	Mr. Subhash Chandra		
2	Mr. Varghese Paul	USAID	
3	Dr. Christopher Kernan	Forest - PLUS	
4	Mr. Swapan Mehra	IORA Ecologics	
5	Dr. David Skole	Michigan State University	
6	Mr. Jay Samek	Michigan State Univ.	
7	Prof. B.K.P. Sinha	Adv SOA ASNRSD	
8	Mr. Popli	Consultant ASNRSD	
9	Mr. Santanu Basu	Sr. Manager	
10	Ms. Atri Shaw	Manager, RS & GIS IORA Ecological Solutions	

1

Sl.No	Name	Designation, Organisation	Signature
11	Mr. Ankit Rawat	Forestry & GIS Coordinator IORA Ecological solutions	Ankit
12	Mr. Mahadevswamy B	RANGE FOREST OFFICER ICT centre, KFD, Aranya Bhavan, Bengaluru.	B. Mahadevswamy
13	Mr. Palakshawarappa K S	GIS Scientist, ICT centre, KFD, Aranyabhavan, Malleshwaram, Bangalore, Karnataka	
14	Mr. Boraiya Boraiah K.T.	Range Forest officer, Agumbe Range, Megaravalli Shimoga Dist., Karnataka.	
15	Mr. Rajneesh Kumar	SENIOR GIS PROFESSIONAL H.P FOREST DEPTT SHIMLA -	
16	Mr. Amit Rana	~~HP~~ GIS Professional H. P FOREST Dept, Shimla	Amit Rana
17	Mr. Prashant Gautam	GIS PROFESSIONAL H.P. Forest Deptt. Shimla	
18	Ms. Aparna Dwivedi	MPFD IT RS Analyst	Aparna
19	Ms. Veena Malviya	MPFD - IT GIS Specialist	
20	Mr. SOUMITRI DAS	USAID Forestry specialist	S Das
21	Mr. C.P. GOYAL	Chief Conservator of Forests Project Cell, Lucknow cpgoyal@gmail.com	C.P. Goyal
22	Lt Col Sk Goel	DD, IRD RUBIF	
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Optical Remote Sensing Workshop / Training

Co-development of Remote Sensing Protocols for Forest Carbon Mapping

Date: December6, 2014
Venue: Amity University, Noida

ATTENDANCE SHEET

Sl.No	Name	Designation, Organisation	Signature
1	Mr. Mahadevswamy	KFD	
2	Mr. Palakshawarappa Palaksha K.S	KFD	
3	Mr. ~~Boraiya~~ Boraiah, K.T	KFD	
4	Mr. Rajneesh Kumar	HPFD	
5	Mr. Amit Rana	HPFD	Amit Rana
6	Mr. Prashant Gautam	HPFD	Prashant
7	Ms. AparnaDwivedi	MPFD	Aparna
8	Ms. VeenaMalviya	MPFD	
9	Mr. SantanuBasu	IORA Ecological Solutions	
10	Ms. Atri Shaw	IORA Ecological Solutions	Shaw
11	Mr. Ankit Rawat	IORA Ecological Solutions	Ankit
12	Mr. Jay Samek	MSU	Jay K Samek
13	Mr. Abhishek Banerjee	Research Scholar Amity University	
14			
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Optical Remote Sensing Workshop / Training

Co-development of Remote Sensing Protocols for Forest Carbon Mapping

Date: December 7, 2014

Venue: Amity University, Noida

ATTENDANCE SHEET

Sl.No	Name	Designation, Organisation	Signature
1	Mr. Mahadevswamy	KFD	
2	Mr. Palakshawarappa Palaksha K.S	KFD	
3	Mr. ~~Boraiya~~ Boraiah, K.T.	KFD	
4	Mr. Rajneesh Kumar	HPFD	
5	Mr. Amit Rana	HPFD	
6	Mr. Prashant Gautam	HPFD	
7	Ms. AparnaDwivedi	MPFD	
8	Ms. VeenaMalviya	MPFD	
9	Mr. SantanuBasu	IORA Ecological Solutions	
10	Ms. Atri Shaw	IORA Ecological Solutions	
11	Mr. Ankit Rawat	IORA Ecological Solutions	
12	Mr. Jay Samek	MSU	
13	Dr. Sunil Chandra	FSI	
14	Mr. AbhaySaxena	FSI	
15	Mr. Ankit Gupta	PG Student, Amity University	
16	Mr. Ankit Gachan	M. Tech Student & Amity University	
17	Mr. Abhishek Banerjee	Research Scholar Amity University	

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Co-development of Remote Sensing Protocols for Forest Carbon Mapping

Date: December 8, 2014
Venue: Amity University, Noida

ATTENDANCE SHEET

Sl.No	Name	Designation, Organisation	Signature
1	Mr. Mahadevswamy. B	KFD	
2	Mr. Palakshawarappa Palaksha K.S	KFD	
3	Mr. ~~Boraiya~~ Boraiah K.T.	KFD	
4	Mr. Rajneesh Kumar	HPFD	
5	Mr. Amit Rana	HPFD	Amit Rana
6	Mr. Prashant Gautam	HPFD	
7	Ms. AparnaDwivedi	MPFD	
8	Ms. VeenaMalviya	MPFD	
9	Mr. SantanuBasu	IORA Ecological Solutions	
10	Ms. Atri Shaw	IORA Ecological Solutions	
11	Mr. Ankit Rawat	IORA Ecological Solutions	
12	Mr. Jay Samek	MSU	
13	Dr. Abhay Saxena	FSI	
14	Mr. Abhishek Banerjee	ALGERS	
15	I. P. Popli	ASNRSA	
16			

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Optical Remote Sensing Workshop / Training

Co-development of Remote Sensing Protocols for Forest Carbon Mapping

Date: December 9, 2014
Venue: Amity University, Noida

ATTENDANCE SHEET

Sl.No	Name	Designation, Organisation	Signature
1	Mr. Mahadevswamy ·B	KFD	
2	Mr. Palakshawarappa Palaksha K.C	KFD	
3	Mr. Boraiya Boraiah K.T.	KFD	
4	Mr. Rajneesh Kumar	HPFD	
5	Mr. Amit Rana	HPFD	Amit Rana
6	Mr. Prashant Gautam	HPFD	
7	Ms. AparnaDwivedi	MPFD	
8	Ms. VeenaMalviya	MPFD	
9	Mr. SantanuBasu	IORA Ecological Solutions	
10	Ms. Atri Shaw	IORA Ecological Solutions	
11	Mr. Ankit Rawat	IORA Ecological Solutions	
12	Mr. Jay Samek	MSU	
13	Dr. Abhay Saxena	FSI	
14	Mr. Abhishek Banerjee	AIGLRS	
15	I.P. Pole	ASNRSC	
16			

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Optical Remote Sensing Workshop / Training

Co-development of Remote Sensing Protocols for Forest Carbon Mapping

Date: December 10, 2014
Venue: Amity University, Noida

ATTENDANCE SHEET

Sl.No	Name	Designation, Organisation	Signature
1	Mr. Mahadevswamy. B	KFD	
2	Mr. Palakshawarappa iah K S	KFD	
3	Mr. Boraiya iah. K S	KFD	
4	Mr. Rajneesh Kumar	HPFD	
5	Mr. Amit Rana	HPFD	Amit Rana
6	Mr. Prashant Gautam	HPFD	
7	Ms. AparnaDwivedi	MPFD	
8	Ms. VeenaMalviya	MPFD	
9	Mr. SantanuBasu	IORA Ecological Solutions	
10	Ms. Atri Shaw	IORA Ecological Solutions	
11	Mr. Ankit Rawat	IORA Ecological Solutions	
12	Mr. Jay Samek	MSU	
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Optical Remote Sensing Workshop / Training

Co-development of Remote Sensing Protocols for Forest Carbon Mapping

Date: December 11, 2014
Venue: Amity University, Noida

ATTENDANCE SHEET

Sl.No	Name	Designation, Organisation	Signature
1	Mr. Mahadevswamy .B	KFD	
2	Mr. Palakshawarappa	KFD	
3	Mr. Boraiya	KFD	
4	Mr. Rajneesh Kumar	HPFD	
5	Mr. Amit Rana	HPFD	
6	Mr. Prashant Gautam	HPFD	
7	Ms. AparnaDwivedi	MPFD	
8	Ms. VeenaMalviya	MPFD	
9	Mr. SantanuBasu	IORA Ecological Solutions	
10	Ms. Atri Shaw	IORA Ecological Solutions	
11	Mr. Ankit Rawat	IORA Ecological Solutions	
12	Mr. Jay Samek	MSU	
13	Mr Abhishek Banerjee	Amity University	
14	CPhyal	UPFD	
15			
16			

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
Bhopal Madhya Pradesh | 5 – 11 December 2014

PRE-TRAINING SURVEY

INSTRUCTIONS: PLEASE COMPLETE ALL QUESTIONS BELOW.

1. For each item below please indicate your level of experience and knowledge with a ✓ mark

Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data

_____ None _____ Some ___✓___ Average _____ Above Average _____ Expert

Geographic Information Systems (GIS) Analyses

_____ None _____ Some ___✓___ Average _____ Above Average _____ Expert

Field Forestry – Plot Inventory Methods

_____ None _____ Some ___✓___ Average _____ Above Average _____ Expert

Methods for Measuring Forest Biomass and Carbon

___✓___ None _____ Some _____ Average _____ Above Average _____ Expert

2. For each software item listed below please indicate your level of experience with a ✓ mark

ERDAS Imagine ____ None ____ Some ___✓___ Average ____ Extensive

ArcMAP ____ None ____ Some ___✓___ Average ____ Extensive

3. Using the space below please describe what your expectations are from the training.

I am looking forward to learning of carbon mapping techniques, Biomass estimation, etc...

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4. Please list 2 or 3 specific interests related to geospatial analyses and measuring/monitoring of forest carbon that you would like to see covered in this training.

a) _____

b) _____

c) _____

5. Please indicate your knowledge of the following terms with a ✓ mark

REDD+	___ None	✓ Somewhat	___ Know very well
MRV	✓ None	___ Somewhat	___ Know very well
REL	✓ None	___ Somewhat	___ Know very well
The five pools of carbon in forests	✓ None	___ Somewhat	___ Know very well

6. In your current position will you be supporting State-Level efforts to measure, monitor and report forest carbon (✓)?

___ No ✓ Yes

7. If you were at the initial introductory training at FSI, Dehra Dun, in June 2014, please comment on the utility of the first training and what you hope to learn as a continuation in this training.

_____

_____

_____

_____

NAME: PALAKSHAIAH K S

Thank you for taking time to attend this seven day training. We know you time is valuable and we will do everything possible to make this training useful to you professionally and personally.

Sincerely,

The Forest-PLUS Training Team

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
Bhopal Madhya Pradesh | 5 – 11 December 2014

PRE-TRAINING SURVEY

INSTRUCTIONS: PLEASE COMPLETE ALL QUESTIONS BELOW.

1. For each item below please indicate your level of experience and knowledge with a ✓ mark

Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data

____ None ____ Some ____ Average ✓ Above Average ____ Expert

Geographic Information Systems (GIS) Analyses

____ None ____ Some ____ Average ✓ Above Average ____ Expert

Field Forestry – Plot Inventory Methods

____ None ✓ Some ____ Average ____ Above Average ____ Expert

Methods for Measuring Forest Biomass and Carbon

____ None ____ Some ____ Average ____ Above Average ____ Expert

2. For each software item listed below please indicate your level of experience with a ✓ mark

ERDAS Imagine ____ None ____ Some ✓ Average ____ Extensive

ArcMAP ____ None ____ Some ____ Average ✓ Extensive

3. Using the space below please describe what your expectations are from the training.

Learn New Technological methods from High to medium Resolution Satellite Imageries. (multispectral & Hyperspectral data. Please Teach us about optical Remote Sensing Data. (Techniques & modules) in Erdas Imagine.

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4. Please list 2 or 3 specific interests related to geospatial analyses and measuring/monitoring of forest carbon that you would like to see covered in this training.

a) Optical Remote Sensing Techniques for Carbon Mapping
b) Hands on on Erdas Imagine
c) Give study materials for Practicing after Reading Back to STATE FOREST. (Provides us Literature)

5. Please indicate your knowledge of the following terms with a ✓ mark

REDD+	✓ None	Somewhat	Know very well
MRV	✓ None	Somewhat	Know very well
REL	✓ None	Somewhat	Know very well
The five pools of carbon in forests	None	✓ Somewhat	Know very well

6. In your current position will you be supporting State-Level efforts to measure, monitor and report forest carbon (✓)?

No ✓ Yes

7. If you were at the initial introductory training at FSI, Dehra Dun, in June 2014, please comment on the utility of the first training and what you hope to learn as a continuation in this training.

That training was on basics of Remote Sensing Techniques but this training hopefully the Advance Techniques we have to tought.

AMIT RANA

NAME: AMIT RANA

Thank you for taking time to attend this seven day training. We know you time is valuable and we will do everything possible to make this training useful to you professionally and personally.

Sincerely,

The Forest-PLUS Training Team

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
Bhopal Madhya Pradesh | 5 – 11 December 2014

PRE-TRAINING SURVEY

INSTRUCTIONS: PLEASE COMPLETE ALL QUESTIONS BELOW.

1. For each item below please indicate your level of experience and knowledge with a ✓ mark

Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data

____ None ____ Some ✓ Average ____ Above Average ____ Expert

Geographic Information Systems (GIS) Analyses

____ None ✓ Some ____ Average ____ Above Average ____ Expert

Field Forestry – Plot Inventory Methods

____ None ____ Some ✓ Average ____ Above Average ____ Expert

Methods for Measuring Forest Biomass and Carbon

____ None ____ Some ✓ Average ____ Above Average ____ Expert

2. For each software item listed below please indicate your level of experience with a ✓ mark

ERDAS Imagine ____ None ____ Some ✓ Average ____ Extensive

ArcMAP ____ None ✓ Some ____ Average ____ Extensive

3. Using the space below please describe what your expectations are from the training.

Learn theoretically and hands on training related to analysing satellite remote sensing data, collating with field level land use land cover and modelling. Be well versed with ERDAS Imagine and Arc Map.

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4. Please list 2 or 3 specific interests related to geospatial analyses and measuring/monitoring of forest carbon that you would like to see covered in this training.

a) Measuring carbon biomass in forest - plot inventory.

b) Knowing the different modellings to est monitor carbon at landscape level.

c) To expose myself to different gis analysis [different options]

5. Please indicate your knowledge of the following terms with a ✓ mark

REDD+	___ None	✓ Somewhat	___ Know very well
MRV	✓ None	___ Somewhat	___ Know very well
REL	✓ None	___ Somewhat	___ Know very well
The five pools of carbon in forests	___ None	✓ Somewhat	___ Know very well

6. In your current position will you be supporting State-Level efforts to measure, monitor and report forest carbon (✓)?

___ No ✓ Yes

7. If you were at the initial introductory training at FSI, Dehra Dun, in June 2014, please comment on the utility of the first training and what you hope to learn as a continuation in this training.

Not attended

NAME: BORAIAH, K.T

Thank you for taking time to attend this seven day training. We know you time is valuable and we will do everything possible to make this training useful to you professionally and personally.

Sincerely,

The Forest-PLUS Training Team

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4. Please list 2 or 3 specific interests related to geospatial analyses and measuring/monitoring of forest carbon that you would like to see covered in this training.

a) _____

b) _____

c) _____

5. Please indicate your knowledge of the following terms with a ✓ mark

REDD+	___ None	✓ Somewhat	___ Know very well
MRV	___ None	✓ Somewhat	___ Know very well
REL	✓ None	___ Somewhat	___ Know very well
The five pools of carbon in forests	___ None	✓ Somewhat	___ Know very well

6. In your current position will you be supporting State-Level efforts to measure, monitor and report forest carbon (✓)?

___ No ✓ Yes

7. If you were at the initial introductory training at FSI, Dehra Dun, in June 2014, please comment on the utility of the first training and what you hope to learn as a continuation in this training.

working algorithm/modules for extraction of information using GRASS

NAME: MAHADEVASWAMY. B

Thank you for taking time to attend this seven day training. We know you time is valuable and we will do everything possible to make this training useful to you professionally and personally.

Sincerely,

The Forest-PLUS Training Team

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
Bhopal Madhya Pradesh | 5 – 11 December 2014

PRE-TRAINING SURVEY

INSTRUCTIONS: PLEASE COMPLETE ALL QUESTIONS BELOW.

1. For each item below please indicate your level of experience and knowledge with a ✓ mark

Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data

_____ None _____ Some _____ Average _____ Above Average ✓ Expert

Geographic Information Systems (GIS) Analyses

_____ None _____ Some _____ Average _____ Above Average ✓ Expert

Field Forestry – Plot Inventory Methods

_____ None _____ Some ✓ Average _____ Above Average _____ Expert

Methods for Measuring Forest Biomass and Carbon

_____ None ✓ Some _____ Average _____ Above Average _____ Expert

2. For each software item listed below please indicate your level of experience with a ✓ mark

ERDAS Imagine ____ None ____ Some ✓ Average ____ Extensive

ArcMAP ____ None ____ Some ✓ Average ____ Extensive

3. Using the space below please describe what your expectations are from the training.

wish to learn methods of carbon estimation and working/ designing the modules for extraction of information from imagery

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
Bhopal Madhya Pradesh | 5 – 11 December 2014

PRE-TRAINING SURVEY

INSTRUCTIONS: PLEASE COMPLETE ALL QUESTIONS BELOW.

1. For each item below please indicate your level of experience and knowledge with a ✓ mark

Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data

____ None ____ Some ____ Average ✓ Above Average ____ Expert

Geographic Information Systems (GIS) Analyses

____ None ____ Some ____ Average ✓ Above Average ____ Expert

Field Forestry – Plot Inventory Methods

____ None ____ Some ✓ Average ____ Above Average ____ Expert

Methods for Measuring Forest Biomass and Carbon

____ None ____ Some ✓ Average ____ Above Average ____ Expert

2. For each software item listed below please indicate your level of experience with a ✓ mark

ERDAS Imagine ____ None ____ Some ____ Average ✓ Extensive

ArcMAP ____ None ____ Some ____ Average ✓ Extensive

3. Using the space below please describe what your expectations are from the training.

My expectation from this training is continued the MSAVI with LISS-3 and LISS-4 also and How we can use WV-2 Multispectral data for this analysis also.

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4. Please list 2 or 3 specific interests related to geospatial analyses and measuring/monitoring of forest carbon that you would like to see covered in this training.

a) Model Run with LISS-3 and LISS-4 data also.
b) Analysis of LU/LC also I want to part of this.
c) Some models for forest density also.

5. Please indicate your knowledge of the following terms with a ✓ mark

REDD+	___ None	___ Somewhat	✓ Know very well
MRV	___ None	___ Somewhat	✓ Know very well
REL	___ None	✓ Somewhat	___ Know very well
The five pools of carbon in forests	___ None	___ Somewhat	✓ Know very well

6. In your current position will you be supporting State-Level efforts to measure, monitor and report forest carbon (✓)?

___ No ✓ Yes

7. If you were at the initial introductory training at FSI, Dehra Dun, in June 2014, please comment on the utility of the first training and what you hope to learn as a continuation in this training.

Yes I was there in FSI Training. and the model which was discussed at that Time "MSAVI" was good but I want to continue with LISS-5 and LISS-4 also.

NAME: Aparnaa Dwivedi (MPFD)

Thank you for taking time to attend this seven day training. We know you time is valuable and we will do everything possible to make this training useful to you professionally and personally.

Sincerely,

The Forest-PLUS Training Team

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
Bhopal Madhya Pradesh | 5 – 11 December 2014

PRE-TRAINING SURVEY

INSTRUCTIONS: PLEASE COMPLETE ALL QUESTIONS BELOW.

1. For each item below please indicate your level of experience and knowledge with a ✓ mark

Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data

____ None ____ Some ✓ Average ____ Above Average ____ Expert

Geographic Information Systems (GIS) Analyses

____ None ____ Some ✓ Average ____ Above Average ____ Expert

Field Forestry – Plot Inventory Methods

____ None ____ Some ✓ Average ____ Above Average ____ Expert

Methods for Measuring Forest Biomass and Carbon

✓ None ____ Some ____ Average ____ Above Average ____ Expert

2. For each software item listed below please indicate your level of experience with a ✓ mark

ERDAS Imagine ____ None ____ Some ✓ Average ____ Extensive

ArcMAP ____ None ____ Some ____ Average ✓ Extensive

3. Using the space below please describe what your expectations are from the training.

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4. Please list 2 or 3 specific interests related to geospatial analyses and measuring/monitoring of forest carbon that you would like to see covered in this training.

a) _____

b) _____

c) _____

5. Please indicate your knowledge of the following terms with a ✓ mark

REDD+	✓ None	___ Somewhat	___ Know very well
MRV	✓ None	___ Somewhat	___ Know very well
REL	✓ None	___ Somewhat	___ Know very well
The five pools of carbon in forests	✓ None	___ Somewhat	___ Know very well

6. In your current position will you be supporting State-Level efforts to measure, monitor and report forest carbon (✓)?

___ No ✓ Yes

7. If you were at the initial introductory training at FSI, Dehra Dun, in June 2014, please comment on the utility of the first training and what you hope to learn as a continuation in this training.

No, it's my first training.

NAME: Mrs. Veena Malviya

Thank you for taking time to attend this seven day training. We know you time is valuable and we will do everything possible to make this training useful to you professionally and personally.

Sincerely,

The Forest-PLUS Training Team

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
Bhopal Madhya Pradesh | 5 – 11 December 2014

PRE-TRAINING SURVEY

INSTRUCTIONS: PLEASE COMPLETE ALL QUESTIONS BELOW.

1. For each item below please indicate your level of experience and knowledge with a ✓ mark

Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data

_____ None _____ Some _____ Average ✓ Above Average _____ Expert

Geographic Information Systems (GIS) Analyses

_____ None _____ Some _____ Average ✓ Above Average _____ Expert

Field Forestry – Plot Inventory Methods

_____ None _____ Some _____ Average ✓ Above Average _____ Expert

Methods for Measuring Forest Biomass and Carbon

_____ None _____ Some ✓ Average _____ Above Average _____ Expert

2. For each software item listed below please indicate your level of experience with a ✓ mark

ERDAS Imagine _____ None _____ Some _____ Average ✓ Extensive

ArcMAP _____ None _____ Some _____ Average ✓ Extensive

3. Using the space below please describe what your expectations are from the training.

To learn about advance modeling approach to track change in carbon content in forest strata.

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4. Please list 2 or 3 specific interests related to geospatial analyses and measuring/monitoring of forest carbon that you would like to see covered in this training.

a) Forest Density fraction with associated Carbon.
b) Field sampling intensity & methodology to capture Carbon change.

5. Please indicate your knowledge of the following terms with a ✓ mark

REDD+	___ None	___ Somewhat	✓ Know very well
MRV	___ None	✓ Somewhat	___ Know very well
REL	___ None	✓ Somewhat	___ Know very well
The five pools of carbon in forests	___ None	___ Somewhat	✓ Know very well

6. In your current position will you be supporting State-Level efforts to measure, monitor and report forest carbon (✓)?

___ No ✓ Yes

7. If you were at the initial introductory training at FSI, Dehra Dun, in June 2014, please comment on the utility of the first training and what you hope to learn as a continuation in this training.

NAME: Ankit Rawat.

Thank you for taking time to attend this seven day training. We know you time is valuable and we will do everything possible to make this training useful to you professionally and personally.

Sincerely,

The Forest-PLUS Training Team

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
Bhopal Madhya Pradesh | 5 – 11 December 2014

PRE-TRAINING SURVEY

INSTRUCTIONS: PLEASE COMPLETE ALL QUESTIONS BELOW.

1. For each item below please indicate your level of experience and knowledge with a ✓ mark

Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data

____ None ____ Some ____ Average ____ Above Average ✓ Expert

Geographic Information Systems (GIS) Analyses

____ None ____ Some ____ Average ____ Above Average ✓ Expert

Field Forestry – Plot Inventory Methods

✓ None ____ Some ____ Average ____ Above Average ____ Expert

Methods for Measuring Forest Biomass and Carbon

✓ None ____ Some ____ Average ____ Above Average ____ Expert

2. For each software item listed below please indicate your level of experience with a ✓ mark

ERDAS Imagine ____ None ____ Some ____ Average ✓ Extensive

ArcMAP ____ None ____ Some ____ Average ✓ Extensive

3. Using the space below please describe what your expectations are from the training.

I am looking forward to learn the technique for carbon mapping by using Remote Sensing data and modeling which you developed for calculating carbon from forest.

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4. Please list 2 or 3 specific interests related to geospatial analyses and measuring/monitoring of forest carbon that you would like to see covered in this training.

a) Fractional cover classification of data
b) Hand on experience of models to calculate the carbon from satellite data
c) _____

5. Please indicate your knowledge of the following terms with a ✓ mark

REDD+	___ None	✓ Somewhat	___ Know very well
MRV	✓ None	___ Somewhat	___ Know very well
REL	✓ None	___ Somewhat	___ Know very well
The five pools of carbon in forests	✓ None	___ Somewhat	___ Know very well

6. In your current position will you be supporting State-Level efforts to measure, monitor and report forest carbon (✓)?

✓ No ___ Yes

7. If you were at the initial introductory training at FSI, Dehra Dun, in June 2014, please comment on the utility of the first training and what you hope to learn as a continuation in this training.

Yes I was part of Dehra dun training and got good exposure on erdas Imagine to run the model and hopefully I will learn more in this training session

NAME: RAJNEESH KUMAR HP FOREST. SHIMLA

Thank you for taking time to attend this seven day training. We know you time is valuable and we will do everything possible to make this training useful to you professionally and personally.

Sincerely,

The Forest-PLUS Training Team

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
~~Bhopal Madhya Pradesh~~ | 5 – 11 December 2014
AMITY UNIVERSITY, NOIDA

PRE-TRAINING SURVEY

INSTRUCTIONS: PLEASE COMPLETE ALL QUESTIONS BELOW.

1. For each item below please indicate your level of experience and knowledge with a ✓ mark

Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data

____ None ____ Some ____ Average ✓ Above Average ____ Expert

Geographic Information Systems (GIS) Analyses

____ None ____ Some ____ Average ✓ Above Average ____ Expert

Field Forestry – Plot Inventory Methods

✓ None ____ Some ____ Average ____ Above Average ____ Expert

Methods for Measuring Forest Biomass and Carbon

____ None ✓ Some ____ Average ____ Above Average ____ Expert

2. For each software item listed below please indicate your level of experience with a ✓ mark

ERDAS Imagine ____ None ____ Some ✓ Average ____ Extensive

ArcMAP ____ None ____ Some ✓ Average ____ Extensive

3. Using the space below please describe what your expectations are from the training.

This is a good training to learn use of RS and GIS in Carbon mapping. We got to take after this training we learn how to use this technique to identify Carbon.

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4. Please list 2 or 3 specific interests related to geospatial analyses and measuring/monitoring of forest carbon that you would like to see covered in this training.

a) Practical session should include to calculate the Carbon on field.
b) The analysis (output) from RS & GIS in how much accurate in the field
c) What is way to calculate the carbon in field without the help of RS. These all should be include in the training.

5. Please indicate your knowledge of the following terms with a ✓ mark

REDD+	___ None	✓ Somewhat	___ Know very well
MRV	___ None	___ Somewhat	___ Know very well
REL	___ None	___ Somewhat	___ Know very well
The five pools of carbon in forests	___ None	___ Somewhat	___ Know very well

6. In your current position will you be supporting State-Level efforts to measure, monitor and report forest carbon (✓)?

✓ No ___ Yes

7. If you were at the initial introductory training at FSI, Dehra Dun, in June 2014, please comment on the utility of the first training and what you hope to learn as a continuation in this training.

On the previous training that was fantastic and we learnt lots of things regarding Carbon mapping. How to calculate the Carbon through RS. Now, I think this much is new things we will learn in 7 days time training. It is enough time to learn.

NAME: Prashant Gautam

Thank you for taking time to attend this seven day training. We know you time is valuable and we will do everything possible to make this training useful to you professionally and personally.

Sincerely,

The Forest-PLUS Training Team

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
Bhopal Madhya Pradesh | 5 – 11 December 2014

POST-TRAINING SURVEY

INSTRUCTIONS: PLEASE COMPLETE ALL QUESTIONS BELOW.

1. For each item below please ✓ one, "With this training my level of knowledge and skill with respect to ...

Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data

____ Stayed the same ____ Increased Somewhat ✓ Increased Significantly

Geographic Information Systems (GIS) Analyses

____ Stayed the same ✓ Increased Somewhat ____ Increased Significantly

Field Forestry – Plot Inventory Methods

____ Stayed the same ____ Increased Somewhat ✓ Increased Significantly

Methods for Measuring Forest Biomass and Carbon

____ Stayed the same ✓ Increased Somewhat ____ Increased Significantly

2. For each item below please ✓ one; Overall was the training provided useful to you ...

Professionally ____ Not at all ____ Somewhat ✓ Yes

Personally ____ Not at all ____ Somewhat ✓ Yes

3. For each item below please ✓ one; With respect to your expectations for the training ...

Overall knowledge sharing and transfer ____ Lower ✓ Met ____ Exceeded

Remote Sensing Tool ____ Lower ✓ Met ____ Exceeded

Methods for Mapping Forest Carbon ____ Lower ✓ Met ____ Exceeded

Carbon Accounting Principles and Methods ____ Lower ✓ Met ____ Exceeded

Training Format, Modality ____ Lower ✓ Met ____ Exceeded

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4. Please provide comments about ...

The strengths of the training: The way of teaching, lab and field visits organisation and pleasant accomodation, transportation.

Areas of improvement for the training: Proper site specific field visits, each one should have got the computer and the softwares to do practicum.

5. For each item below please ✓ one: Do you feel your knowledge of the following terms ...

a) REDD+ ___ Remained the Same ___ Increased Somewhat ✓ Increased Significantly

b) MRV ✓ Remained the Same ___ Increased Somewhat ___ Increased Significantly

(Not taught about these terminologies)

c) REL ✓ Remained the Same ___ Increased Somewhat ___ Increased Significantly

d) The five pools of carbon in forests ___ Remained the Same ✓ Increased Somewhat ___ Increased Significantly

6. Please provide any additional comments or suggestions for future training

More number of computers and softwares, two more days, requires good specific field visits, and also about food, & require ERDAS & ArcMap to practice.

7. Are you interested in additional advanced training from Forest-PLUS? ___ No ✓ Yes

If yes, in what specific areas? modeling on strata to estimate the pixel level carbon estimation, and also fine tuning and application of other models which are not taught due to time constraint.

NAME: BORAIAH, K.T.

Thank you again for participating in the Forest-PLUS training. We hope that it has been personally and professionally useful.

Sincerely,

The Forest-PLUS Training Team

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
Bhopal Madhya Pradesh | 5 – 11 December 2014

POST-TRAINING SURVEY

INSTRUCTIONS: PLEASE COMPLETE ALL QUESTIONS BELOW.

1. For each item below please ✓ one, "With this training my level of knowledge and skill with respect to ...

Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data

____ Stayed the same ✓ Increased Somewhat ____ Increased Significantly

Geographic Information Systems (GIS) Analyses

____ Stayed the same ✓ Increased Somewhat ____ Increased Significantly

Field Forestry – Plot Inventory Methods

____ Stayed the same ✓ Increased Somewhat ____ Increased Significantly

Methods for Measuring Forest Biomass and Carbon

____ Stayed the same ✓ Increased Somewhat ____ Increased Significantly

2. For each item below please ✓ one; Overall was the training provided useful to you ...

Professionally ____ Not at all ____ Somewhat ✓ Yes

Personally ____ Not at all ____ Somewhat ✓ Yes

3. For each item below please ✓ one; With respect to your expectations for the training ...

Overall knowledge sharing and transfer	____ Lower	✓ Met	____ Exceeded
Remote Sensing Tool	____ Lower	____ Met	✓ Exceeded
Methods for Mapping Forest Carbon	____ Lower	✓ Met	____ Exceeded
Carbon Accounting Principles and Methods	____ Lower	✓ Met	____ Exceeded
Training Format, Modality	____ Lower	____ Met	✓ Exceeded

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4. Please provide comments about ...

The strengths of the training: - As my first training on Forest-PLUS I need more field visit and field survey.

Areas of improvement for the training: _____

5. For each item below please ✓ one: Do you feel your knowledge of the following terms ...

a) REDD+ ✓ Remained the Same ____ Increased Somewhat ____ Increased Significantly

b) MRV ✓ Remained the Same ____ Increased Somewhat ____ Increased Significantly

c) REL ✓ Remained the Same ____ Increased Somewhat ____ Increased Significantly

d) The five pools of carbon in forests ____ Remained the Same ✓ Increased Somewhat ____ Increased Significantly

6. Please provide any additional comments or suggestions for future training

7. Are you interested in additional advanced training from Forest-PLUS? ____ No ✓ Yes

If yes, in what specific areas? _____

NAME: Veena Malviya

Thank you again for participating in the Forest-PLUS training. We hope that it has been personally and professionally useful.

Sincerely,

The Forest-PLUS Training Team

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
Bhopal Madhya Pradesh | 5 – 11 December 2014

POST-TRAINING SURVEY

INSTRUCTIONS: PLEASE COMPLETE ALL QUESTIONS BELOW.

1. For each item below please ✓ one, "With this training my level of knowledge and skill with respect to ...

Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data

____ Stayed the same ✓ Increased Somewhat ____ Increased Significantly

Geographic Information Systems (GIS) Analyses

____ Stayed the same ✓ Increased Somewhat ____ Increased Significantly

Field Forestry – Plot Inventory Methods

____ Stayed the same ____ Increased Somewhat ✓ Increased Significantly

Methods for Measuring Forest Biomass and Carbon

____ Stayed the same ____ Increased Somewhat ✓ Increased Significantly

2. For each item below please ✓ one; Overall was the training provided useful to you ...

Professionally ____ Not at all ____ Somewhat ✓ Yes

Personally ____ Not at all ____ Somewhat ✓ Yes

3. For each item below please ✓ one; With respect to your expectations for the training ...

Overall knowledge sharing and transfer ____ Lower ✓ Met ____ Exceeded

Remote Sensing Tool ____ Lower ✓ Met ____ Exceeded

Methods for Mapping Forest Carbon ____ Lower ✓ Met ____ Exceeded

Carbon Accounting Principles and Methods ____ Lower ✓ Met ____ Exceeded

Training Format, Modality ____ Lower ✓ Met ____ Exceeded

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4. Please provide comments about ...

The strengths of the training: The strengths of the training was models of Erdas Imagine which were discussed briefly and a good technical discussions on them.

Areas of improvement for the training: (1) Please increase some more techical things in terms of Erdas tools and in terms of programming of models also. (2) Please prepare these with HRST also.

5. For each item below please ✓ one; Do you feel your knowledge of the following terms ...

a) REDD+ ____ Remained the Same ✓ Increased Somewhat ____ Increased Significantly

b) MRV ✓ Remained the Same ____ Increased Somewhat ____ Increased Significantly

c) REL ✓ Remained the Same ____ Increased Somewhat ____ Increased Significantly

d) The five pools of carbon in forests: ____ Remained the Same ____ Increased Somewhat ✓ Increased Significantly

6. Please provide any additional comments or suggestions for future training

Please Try to provide the accomadation in training campus so that we can use the Hrs more and more.

7. Are you interested in additional advanced training from Forest-PLUS? ____ No ✓ Yes

If yes, in what specific areas? In Forest biomass Inventory plotting and field viewing with instrument and In Erdas Models.

NAME: Aparnaa Dwivedi

Thank you again for participating in the Forest-PLUS training. We hope that it has been personally and professionally useful.

Sincerely,

The Forest-PLUS Training Team

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
Bhopal Madhya Pradesh | 5 – 11 December 2014

POST-TRAINING SURVEY

INSTRUCTIONS: PLEASE COMPLETE ALL QUESTIONS BELOW.

1. For each item below please ✓ one, "With this training my level of knowledge and skill with respect to ...

Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data

___ Stayed the same ✓ Increased Somewhat ___ Increased Significantly

Geographic Information Systems (GIS) Analyses

___ Stayed the same ✓ Increased Somewhat ___ Increased Significantly

Field Forestry – Plot Inventory Methods

✓ Stayed the same ___ Increased Somewhat ___ Increased Significantly

Methods for Measuring Forest Biomass and Carbon

___ Stayed the same ✓ Increased Somewhat ___ Increased Significantly

2. For each item below please ✓ one; Overall was the training provided useful to you ...

Professionally ___ Not at all ___ Somewhat ✓ Yes

Personally ___ Not at all ___ Somewhat ✓ Yes

3. For each item below please ✓ one; With respect to your expectations for the training ...

Overall knowledge sharing and transfer	___ Lower	___ Met	✓ Exceeded
Remote Sensing Tool	___ Lower	___ Met	✓ Exceeded
Methods for Mapping Forest Carbon	___ Lower	___ Met	✓ Exceeded
Carbon Accounting Principles and Methods	___ Lower	___ Met	✓ Exceeded
Training Format, Modality	___ Lower	___ Met	✓ Exceeded

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4. Please provide comments about ...

The strengths of the training: Overall approach and technical skill has been build up with, this trying image processing model as well as field study

Areas of improvement for the training: For calculating the biomass and carbon we must use those satellite image where plot sampling are to be taken in field during the visit

5. For each item below please ✓ one; Do you feel your knowledge of the following terms ...

a) REDD+ ✓ Remained the Same ___ Increased Somewhat ___ Increased Significantly

b) MRV ✓ Remained the Same ___ Increased Somewhat ___ Increased Significantly

c) REL ✓ Remained the Same ___ Increased Somewhat ___ Increased Significantly

d) The five pools of carbon in forests ✓ Remained the Same ___ Increased Somewhat ___ Increased Significantly

6. Please provide any additional comments or suggestions for future training

My suggestion for future training would be hand on practis of plot sampling based on study area

7. Are you interested in additional advanced training from Forest-PLUS? ___ No ✓ Yes

If yes, in what specific areas? I would to learn modelling areana, specially how to develop model for getting good result

NAME: RANEESH kumar

Thank you again for participating in the Forest-PLUS training. We hope that it has been personally and professionally useful.

Sincerely,

The Forest-PLUS Training Team

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
Bhopal Madhya Pradesh | 5 – 11 December 2014

POST-TRAINING SURVEY

INSTRUCTIONS: PLEASE COMPLETE ALL QUESTIONS BELOW.

1. For each item below please ✓ one, "With this training my level of knowledge and skill with respect to ...

Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data

____ Stayed the same ____ Increased Somewhat ___✓___ Increased Significantly

Geographic Information Systems (GIS) Analyses

____ Stayed the same ____ Increased Somewhat ___✓___ Increased Significantly

Field Forestry – Plot Inventory Methods

____ Stayed the same ____ Increased Somewhat ___✓___ Increased Significantly

Methods for Measuring Forest Biomass and Carbon

____ Stayed the same ____ Increased Somewhat ___✓___ Increased Significantly

2. For each item below please ✓ one; Overall was the training provided useful to you ...

Professionally ____ Not at all ____ Somewhat ___✓___ Yes

Personally ____ Not at all ____ Somewhat ___✓___ Yes

3. For each item below please ✓ one; With respect to your expectations for the training ...

Overall knowledge sharing and transfer ____ Lower ___✓___ Met ____ Exceeded

Remote Sensing Tool ____ Lower ___✓___ Met ____ Exceeded

Methods for Mapping Forest Carbon ____ Lower ___✓___ Met ____ Exceeded

Carbon Accounting Principles and Methods ____ Lower ___✓___ Met ____ Exceeded

Training Format, Modality ____ Lower ___✓___ Met ____ Exceeded

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4. Please provide comments about ...

The strengths of the training: The focus on models & new methods rather than sticking to text. Special thanks to Dr. Jay & FORA for their effort. Nice interaction with officers of different states.

Areas of improvement for the training: Printed material, manuals for complete procedures, modeller syntax and how to write codes on the modeller (specially ERDAS).

5. For each item below please ✓ one; Do you feel your knowledge of the following terms ...

a) REDD+ ____ Remained the Same ✓ Increased Somewhat ____ Increased Significantly

b) MRV ✓ Remained the Same ____ Increased Somewhat ____ Increased Significantly

c) REL ✓ Remained the Same ____ Increased Somewhat ____ Increased Significantly

d) The five pools of carbon in forests ____ Remained the Same ✓ Increased Somewhat

____ Increased Significantly

6. Please provide any additional comments or suggestions for future training

The course stated above for improvement & may be extending the training duration & field trip work.

7. Are you interested in additional advanced training from Forest-PLUS? ____ No ✓ Yes

If yes, in what specific areas? Biomass, carbon estimation & biodiversity.

NAME: Mr. (Ir.) Abhishek Banerjee

Thank you again for participating in the Forest-PLUS training. We hope that it has been personally and professionally useful.

Sincerely,

The Forest-PLUS Training Team.

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
Bhopal Madhya Pradesh | 5 – 11 December 2014

POST-TRAINING SURVEY

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____ Stayed the same ____ Increased Somewhat ✓ Increased Significantly

Geographic Information Systems (GIS) Analyses

____ Stayed the same ____ Increased Somewhat ✓ Increased Significantly

Field Forestry – Plot Inventory Methods

____ Stayed the same ✓ Increased Somewhat ____ Increased Significantly

Methods for Measuring Forest Biomass and Carbon

____ Stayed the same ____ Increased Somewhat ✓ Increased Significantly

2. For each item below please ✓ one; Overall was the training provided useful to you ...

Professionally ✓ Not at all ____ Somewhat ____ Yes

Personally ✓ Not at all ____ Somewhat ____ Yes

3. For each item below please ✓ one; With respect to your expectations for the training ...

Overall knowledge sharing and transfer	____ Lower	____ Met	✓ Exceeded
Remote Sensing Tool	____ Lower	____ Met	✓ Exceeded
Methods for Mapping Forest Carbon	____ Lower	✓ Met	____ Exceeded
Carbon Accounting Principles and Methods	____ Lower	____ Met	✓ Exceeded
Training Format, Modality	____ Lower	✓ Met	____ Exceeded

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4. Please provide comments about ...

The strengths of the training: The Training was very productive in the Use of Remote sensing data. We have two field visits the practical Handson & material give to us will be Useful to Drive the knowledge about R.S.

Areas of improvement for the training: There should be Half Day for Handson & Practical & half day for field survey in a one day.

5. For each item below please ✓ one; Do you feel your knowledge of the following terms ...

a) REDD+ ___ Remained the Same ✓ Increased Somewhat ___ Increased Significantly

b) MRV ___ Remained the Same ✓ Increased Somewhat ___ Increased Significantly

c) REL ✓ Remained the Same ___ Increased Somewhat ___ Increased Significantly

d) The five pools of carbon in forests ___ Remained the Same ___ Increased Somewhat ✓ Increased Significantly

6. Please provide any additional comments or suggestions for future training

The training was very good, we are I want to be again & a Very advance training in the future

7. Are you interested in additional advanced training from Forest-PLUS? ___ No ✓ Yes

If yes, in what specific areas? I want to learn the optical RS Application for the LTM data also for a small area, may be it can be Training again.

NAME: AMIT RANA

Thank you again for participating in the Forest-PLUS training. We hope that it has been personally and professionally useful.

Sincerely, Amit Rana

The Forest-PLUS Training Team

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
Bhopal Madhya Pradesh | 5 – 11 December 2014

POST-TRAINING SURVEY

INSTRUCTIONS: PLEASE COMPLETE ALL QUESTIONS BELOW.

1. For each item below please ✓ one, "With this training my level of knowledge and skill with respect to ...

Satellite Remote Sensing Analysis using Medium-Resolution, Multi-Band Optical Data

____ Stayed the same ____ Increased Somewhat ✓ Increased Significantly

Geographic Information Systems (GIS) Analyses

____ Stayed the same ✓ Increased Somewhat ____ Increased Significantly

Field Forestry – Plot Inventory Methods

____ Stayed the same ✓ Increased Somewhat ____ Increased Significantly

Methods for Measuring Forest Biomass and Carbon

____ Stayed the same ____ Increased Somewhat ✓ Increased Significantly

2. For each item below please ✓ one; Overall was the training provided useful to you ...

Professionally ____ Not at all ____ Somewhat ✓ Yes

Personally ____ Not at all ____ Somewhat ✓ Yes

3. For each item below please ✓ one; With respect to your expectations for the training ...

Overall knowledge sharing and transfer	____ Lower	✓ Met	____ Exceeded
Remote Sensing Tool	____ Lower	✓ Met	____ Exceeded
Methods for Mapping Forest Carbon	____ Lower	✓ Met	____ Exceeded
Carbon Accounting Principles and Methods	____ Lower	✓ Met	____ Exceeded
Training Format, Modality	____ Lower	✓ Met	____ Exceeded

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4. Please provide comments about ...

The strengths of the training: The teaching method was excellent and Mr. Jay explained/answered for all our questions which inturn helped to understand more about Forest.

Areas of improvement for the training: More training in regional area would be better.

5. For each item below please ✓ one: Do you feel your knowledge of the following terms ...

a) REDD+ ____ Remained the Same ✓ Increased Somewhat ____ Increased Significantly

b) MRV ____ Remained the Same ____ Increased Somewhat ✓ Increased Significantly

c) REL ____ Remained the Same ✓ Increased Somewhat ____ Increased Significantly

d) The five pools of carbon in forests ____ Remained the Same ____ Increased Somewhat ✓ Increased Significantly

6. Please provide any additional comments or suggestions for future training

7. Are you interested in additional advanced training from Forest-PLUS? ____ No ✓ Yes

If yes, in what specific areas? In estimation of biomass and carbon using SAR data / SAR data analysis

NAME: MAHADEVASWAMY. B

Thank you again for participating in the Forest-PLUS training. We hope that it has been personally and professionally useful.

Sincerely,

The Forest-PLUS Training Team

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FOREST-PLUS TRAINING IN REMOTE SENSING OF FOREST CARBON
Bhopal Madhya Pradesh | 5 – 11 December 2014

POST-TRAINING SURVEY

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____ Stayed the same ✓ Increased Somewhat ____ Increased Significantly

Geographic Information Systems (GIS) Analyses

____ Stayed the same ____ Increased Somewhat ✓ Increased Significantly

Field Forestry – Plot Inventory Methods

____ Stayed the same ✓ Increased Somewhat ____ Increased Significantly

Methods for Measuring Forest Biomass and Carbon

____ Stayed the same ✓ Increased Somewhat ____ Increased Significantly

2. For each item below please ✓ one; Overall was the training provided useful to you ...

Professionally ____ Not at all ____ Somewhat ✓ Yes

Personally ____ Not at all ____ Somewhat ✓ Yes

3. For each item below please ✓ one; With respect to your expectations for the training ...

Overall knowledge sharing and transfer	____ Lower	✓ Met	____ Exceeded
Remote Sensing Tool	____ Lower	✓ Met	____ Exceeded
Methods for Mapping Forest Carbon	____ Lower	✓ Met	____ Exceeded
Carbon Accounting Principles and Methods	____ Lower	✓ Met	____ Exceeded
Training Format, Modality	____ Lower	✓ Met	____ Exceeded

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4. Please provide comments about ...

The strengths of the training: The way of teaching & field visit. The Remote Sensing Models, Organisation, pleasent accomodation & training

Areas of improvement for the training: Proper site choosen for field visit. Each should get the computer, softwares, & more time for practise/for practise.

5. For each item below please ✓ one; Do you feel your knowledge of the following terms ...

a) REDD+ ___ Remained the Same ___ Increased Somewhat ✓ Increased Significantly

b) MRV ___ Remained the Same ✓ Increased Somewhat ___ Increased Significantly

c) REL ___ Remained the Same ✓ Increased Somewhat ___ Increased Significantly

d) The five pools of carbon in forests ___ Remained the Same ✓ Increased Somewhat ___ Increased Significantly

6. Please provide any additional comments or suggestions for future training

More Computers, Softwares few more days, requires field visits, food

7. Are you interested in additional advanced training from Forest-PLUS? ___ No ✓ Yes

If yes, in what specific areas? Models on Strata for estimation of Carbon, Pixel level carbon estimation etc

NAME: PALANISHAMAAK.S

Thank you again for participating in the Forest-PLUS training. We hope that it has been personally and professionally useful.

Sincerely,

The Forest-PLUS Training Team

Opening Session - Day 1

Opening Session - Day 1

Lab Work and Field Sessions








Lab Work and Field Sessions








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Forest-PLUS Program

Forest Type

A unit of vegetation that possesses broad characteristics in physiognomy and structure sufficiently pronounced to permit its differentiation from other such units

Forest Type Classification by Champion & Seth (1968)

- Most widely used classification system for India's forests
- Forests are classified into 5 major groups (6 in revised classification) based on climatic factors
- Major groups divided into 16 type groups based on temperature and moisture contents
- Type groups have been classified into 221 forest types based on location specific climate factors

Forest Types of India*

MAJOR GROUPS	TYPE GROUPS
Moist Tropical Forests	Group 1 Tropical Wet Evergreen Forests Group 2 Tropical Semi-Evergreen Forests Group 3 Tropical Moist Deciduous Forests Group 4 Littoral And Swamp Forests
Dry Tropical Forests	Group 5 Tropical Dry Deciduous Forests Group 6 Tropical Thorn Forests Group 7 Tropical Dry Evergreen Forests Group 8 Southern Subtropical Broadleaved Hill Forests
Montane Temperate Forests	Group 9 Subtropical Pine Forests Group 10 Subtropical Dry Evergreen Forests Group 11 Montane Wet Temperate Forests
Montane Subtropical Forests	Group 12 Himalayan Moist Temperate Forests Group 13 Himalayan Dry Temperate Forests
Sub Alpine Forests	Group 14 Sub Alpine Forests
Alpine Scrub	Group 15 Moist Alpine Scrub Group 16 Dry Alpine Scrub

Sub-group- 22 Nos.

Types - 200 Nos.

*As per Champion and Seth classification(1968)

Factors Responsible for Forest Types

- Geographic Location
- Climate
  - Temperature
  - Rainfall
- Soil
- Altitude
- Topography
  - Slope
  - Aspect
- Socio-economic conditions

Forest Type Mapping of India's Forests

Objectives

- Preparation of district wise forest type maps of the entire country on 1:50,000 scale
- Preparation of a detailed report on forest type mapping of the country (using the classification by Champion and Seth)
- Publication of an atlas depicting the forest type maps for different regions, States & UTs of India

Expected Output

- A detailed report on forest type mapping
- Forest type maps of the entire country at 1:50,000 scale and larger
- Atlases of forest type for different regions, States & UTs of India

Time Frame

3 years from the date of sanction of proposal

(date of sanction – 16th December,2004)

District as unit of mapping

Chronology of the Project

- Meeting of the Task Team on 'Forest Type Mapping and Forest Density Classification under NNRMS Programme – **10th April,2003**
- 19th Meeting of the NNRMS Standing Committee of Bio-resources and Environment under the Chairmanship of the Secretary, MoEF, GOI – **31st December, 2003**
- Project Proposal submitted to the MoEF – **8th Jan, 2004**
- Expert Consultation on 'Forest Type Mapping of Indian Forests – **19th March, 2004**
- Project sanctioned – **16th Dec, 2004**
- 1st Meeting of Steering Committee – **20th May, 2005**
- 2nd Meeting of Steering Committee – **7th November, 2005**
- Mid –Term Review Workshop – **31st Jan, 2006**
- 3rd Meeting of Steering Committee – **11th September, 2006**
- **4th** Meeting of Steering Committee – **6th November, 2007**

1st Meeting of the Steering Committee

(20th May, 2005)

Recommendations

- The project to be completed within the prescribed time frame i.e. 31-03-07
- Reference map of all forested districts to be completed by October, 2005
- Entire ground truthing work should be completed by Aug, 2006
- Implementation schedule for all major activities should be finalized
- Additional requirement of Rs25 lakh for procurement of additional satellite data and 28 GPS sets by way of reappropriation within the sanctioned cost of the project as proposed by FSI to be considered by the MoEF for sanction. Re-phasing of the budget should be done by the FSI within total sanctioned outlay
- FSI should ensure quality of the work and for proposed sampling intensity of ground truthing should be appropriately worked out

2nd Steering committee Meeting

(7th Nov 2005)

Recommendations

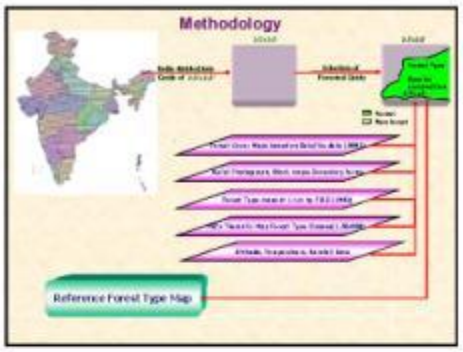
- Completion of project on time frame
- Reference Map of all forested districts to be completed by Oct 2005
- Ground truthing should be completed by Aug 2006
- Implementation schedule for all activities should be finalized
- Re phasing of the budget to be done
- A minimum of 80% accuracy is to be aimed for the final output
- Before the finalizing the maps, validation of the same by the SFOs to be ensured
- A Mid-term review workshop of the project should be organized preferably by the end of Jan /06
- To expedite ground truthing work a vehicle may be procured under the project

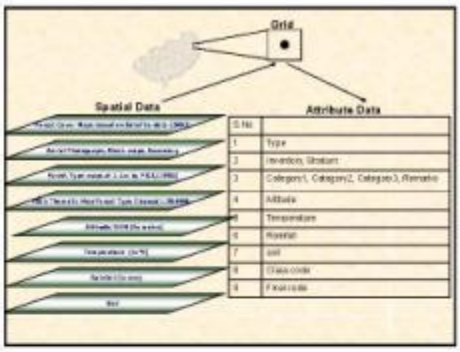
Recommendations of Review Workshop

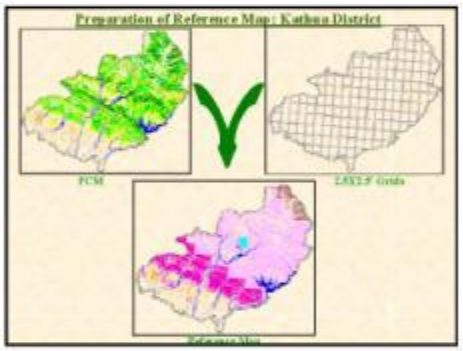
(31st Jan 2006)

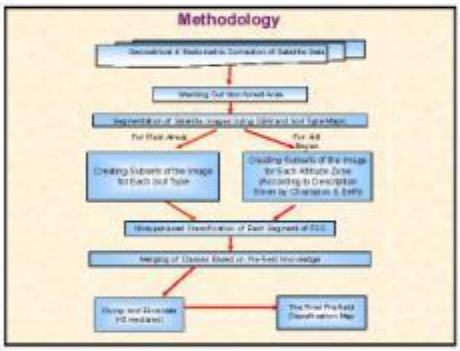
- There is an urgent need for preparation of a Working Manual describing objectives of the project, its utility, methodology in detail with examples of different areas needing slightly different approach, projection system to be used and database adopted.
- A sub-committee be constituted for preparation of the Working Manual.
- Man made plantations should not be assigned any forest type. They may be shown as plantations only.
- Output should be in vector form so as to make them useful for the users.
- Accuracy level should be provided in the final report.
- Project will require extension of time, as it may not be possible to complete the project within stipulated period of three years.
- A national level workshop to be organized towards the end of the project so that views of SFOs and others experts are taken before releasing the final output.

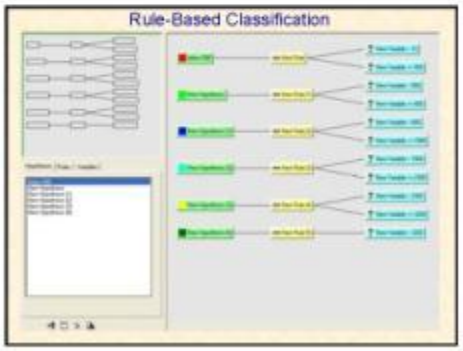
Approach

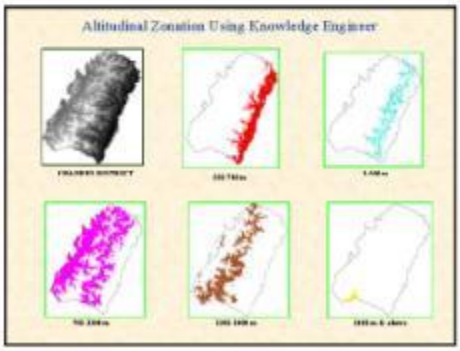

Methodology
Reference Forest Type Map

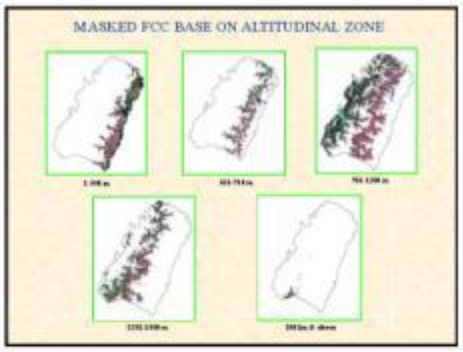

Grid
Spatial Data
Attribute Data
Sl No
1 Type
2 Inventory Stratum
3 Category1, Category2, Category3, Remarks
4 Altitude
5 Temperature
6 Rainfall
7 soil
8 Class code
9 Final code

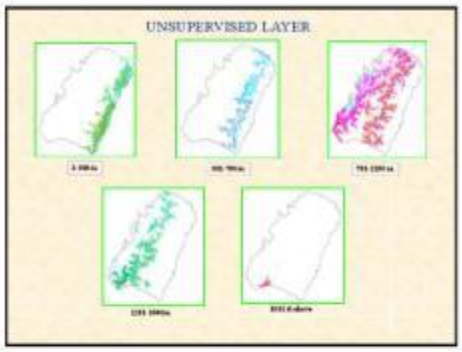

Preparation of Reference Map : Kathua District
FCM
2.5X2.5' Grids

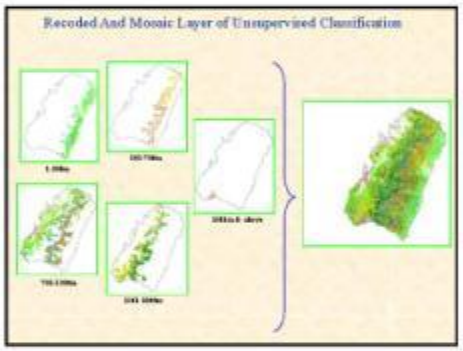

Methodology

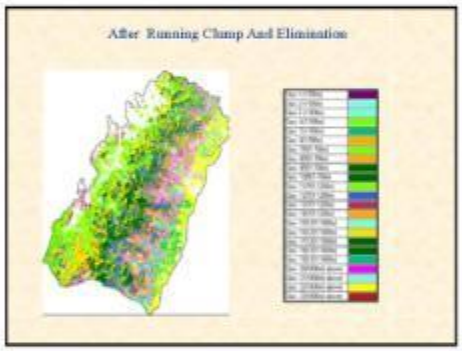

Rule-Based Classification

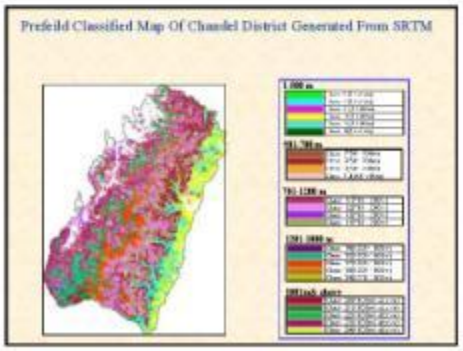

Altitudinal Zonation Using Knowledge Engineer

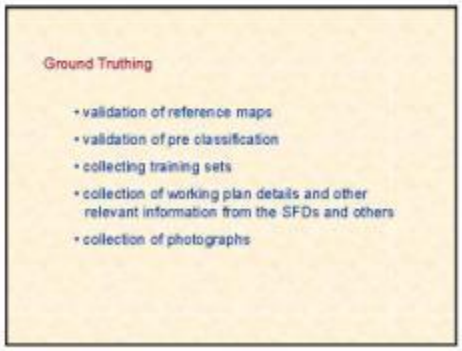

MASKED FCC BASE ON ALTITUDINAL ZONE

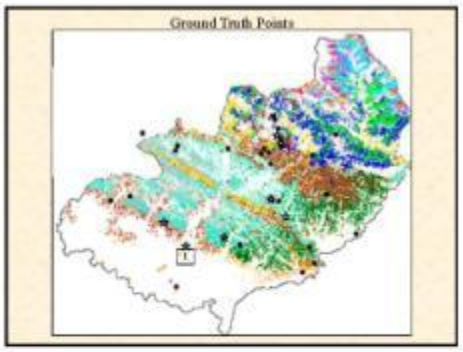

UNSUPERVISED LAYER


Recoded And Mosaic Layer of Unsupervised Classification

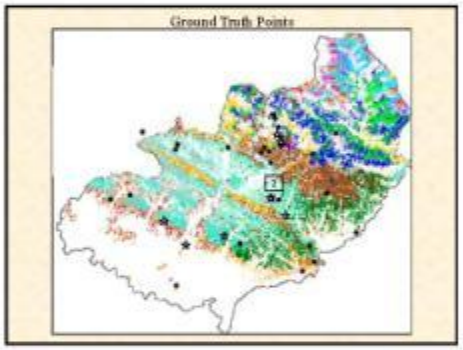

After Running Clump And Elimination


Prefeild Classified Map Of Chandel District Generated From SRTM


Ground Truthing
• validation of reference maps
• validation of pre classification
• collecting training sets
• collection of working plan details and other relevant information from the SFDs and others
• collection of photographs

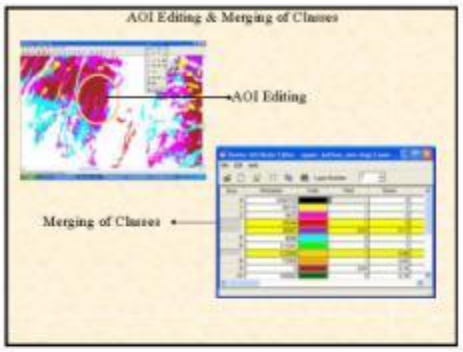

Ground Truth Points
1

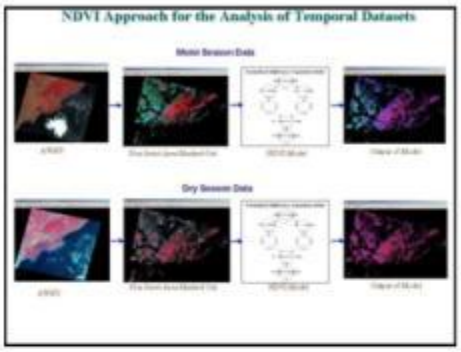

6B/152 Khair-Sissoo forest

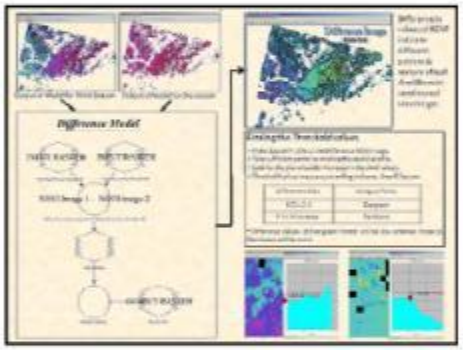

Ground Truth Points
3

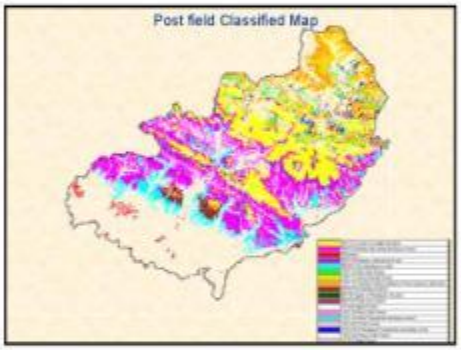

9C1/1a- Lower or Shivalik Chir pine


ATTRIBUTE TABLE

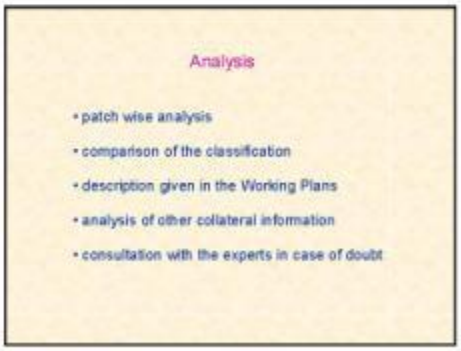

AOI Editing & Merging of Classes
AOI Editing
Merging of Classes


NDVI Approach for the Analysis of Temporal Datasets



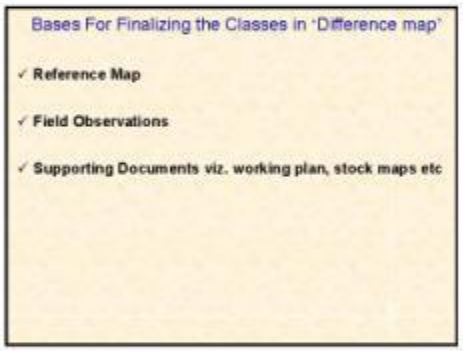

Post field Classified Map

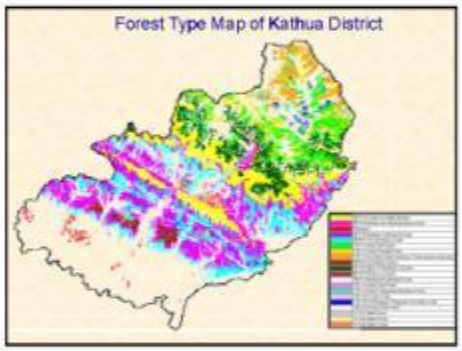

TEMPORAL DATA
PATCH WISE FOCUS
STATE MAP
POST CLASSIFIED MAP
ANALYSIS
WORKING PLAN
GROUND TRUTH
EXPERT CONSULTATION
REFERENCE MAP

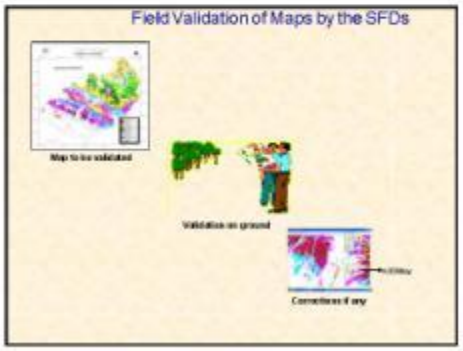

Analysis
• patch wise analysis
• comparison of the classification
• description given in the Working Plans
• analysis of other collateral information
• consultation with the experts in case of doubt

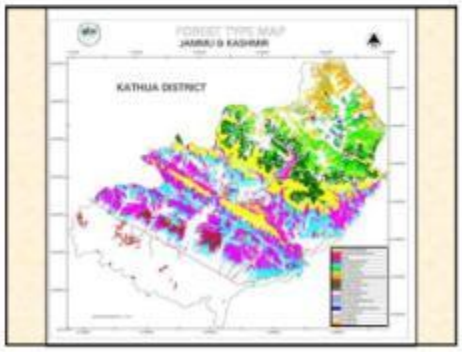

Criteria of Different Factors Described by C & S

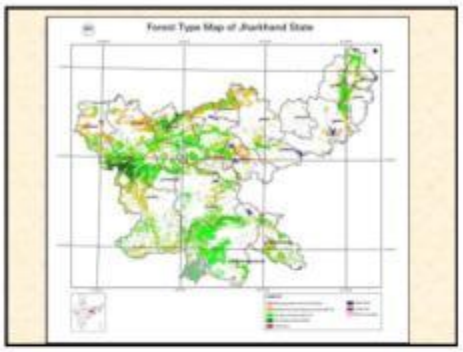

Bringing of all the Layers on same platform
✓ Same Projection
✓ Same Pixel Resolution (24m)
✓ Same Area
✓ Accurate Image to Image Rectification

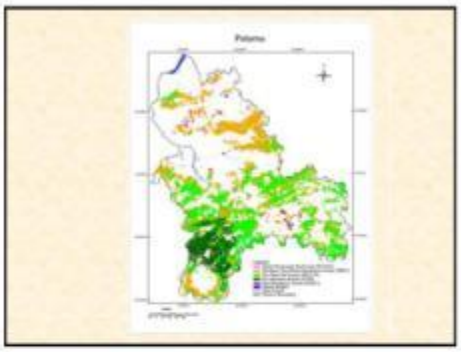

Bases For Finalizing the Classes in 'Difference map'
✓ Reference Map
✓ Field Observations
✓ Supporting Documents viz. working plan, stock maps etc

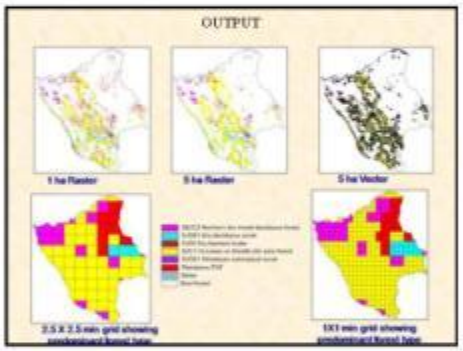

Forest Type Map of Kathua District


Field Validation of Maps by the SFDs


KATHUA DISTRICT


Forest Type Map of Jharkhand State




OUTPUT
1 ha Raster
5 ha Raster
5 ha Vector


Thanks

Names of the participants, who took part in the technical session on 5th – 11th December, 2014 and the Dehradun workshop (June 19-20, 2014)
Optical Remote Sensing Workshop / Training: *Co-development of Remote Sensing Protocols for Forest Carbon Mapping*

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