

**Measurement of Forest Carbon Stocks**  
**Training Programme for the Staff of Madhya  
Pradesh Forest Department**

under

**Ecosystem Services Improvement Program**

17-18 June 2019

**Venue: Itarsi, Madhya Pradesh**



**Organized by:**

**Indian Council of Forestry Research and Education, Dehradun**

**Measurement of Forest Carbon Stocks**  
**Training Programme for the Staff of Madhya Pradesh Forest**  
**Department under Ecosystem Services Improvement Project**  
**Training Report**

1. Title of the training programme: “Measurement of Forest Carbon Stocks”
2. Duration and period of the training programme: 17-18 June 2019, Two Day
3. Number of Participants: 49 (46 Male and 03 Female)
4. General observations:

*i. Course Objectives:* To building the capacity of Madhya Pradesh Forest Department on Measurement of Forest Carbon Stocks.

*ii. Training Kits:* Training materials were provided in the form of printed Resource Manual.

*iii. Resource Persons:* The training programme was organized at Itarsi. Dr. Sanjay Singh, Scientist ‘D’, Biodiversity and Climate Change, ICFRE and Dr. Mohommad Shahid, Carbon Sequestration Consultant, ESIP imparted the training. Schedule of the training is annexed as Annexure I.

*iv. Training Methodology:* Training methodology includes class room lectures followed by hands-on in the field to lay the sample plots, data collection and collection of soil, litter and plant samples.

*v. Hands-on in the Field :* Trainees were taken to Banapura Forest Range for in-field demonstration including laying of the plot, marking plot boundary, four corners and the center trees, shrubs and herbs inventory as well as collection of plant material (of shrubs, herbs & litter) for dry biomass determination and soil samples for bulk density and soil organic carbon determination.

5. The participants have shown keen interest on all the lectures and hands-on training programme as this training programme was new and informative for most of the participants. List of the participants is enclosed as Annexure II.
6. Interactive session was arranged with participants to solve their queries and to get feedback. Summary of the feedback is enclosed as an Annexure IV.

**Way Forward:** This training programme has built the capacity of 49 Officers of MP Forest Department. Participants include Divisional Forest Officer, Sub Divisional Officer, Range Officer, Deputy Ranger and Consultants. Trained officer will act as master trainer of the forest department in providing training to the staff in their respective Forest Divisions. Minutes of session of training are enclosed as Annexure III.

**Schedule of the Training**

**Training Programme on Forest Carbon Stocks Measurement for the Staff of  
Madhya Pradesh Forest Department under Ecosystem Services Improvement  
Project**

17 to 18 June 2019

**Venue: The Park Hotel, Itarsi (Hoshangabad), M.P.**

<b>17 June 2019</b>		
<b>TIME</b>	<b>TOPIC</b>	<b>MODERATOR</b>
8:30-9:00 AM	Participants Registration	
9:00-9:30 AM	Opening Session <ul style="list-style-type: none"> <li>• Overview of ESIP and introduction to training programme by Dr. Sanjay Singh, Scientist 'D', ICFRE, Dehradun</li> <li>• Introduction by Participants</li> <li>• Introductory remarks by Representative of MP Forest Department</li> <li>• Vote of Thanks by Dr. Mohommad Shahid, Carbon Sequestration Consultant, ESIP, ICFRE, Dehradun</li> </ul>	
9:30-10:00 AM	Hi Tea break and Group Photo	
10.00-11.00 noon	Role of forest and soil in climate change mitigation	Dr. Sanjay Singh, Scientist 'D', ICFRE
11.00 AM -12:00 PM	Forest carbon pools and carbon accounting  Questions & Answers	Dr. Md. Shahid, Carbon Sequestration Consultant, ESIP, ICFRE
12.00-1.00 PM	Methodological aspects of forest carbon stocks measurement: Stratification, variability estimation, selection of appropriate number of sample plots and distribution of sample plots  Questions & Answers	Dr. Md. Shahid, Carbon Sequestration Consultant, ICFRE
1:00-2.00 PM	Lunch	
2.00-3.30 PM	Methodological aspects of forest carbon stocks measurement: Laying out of sample plots in forest, estimation of above ground biomass, litter, below ground biomass and soil organic carbon including field equipment handling and analysis of litter, vegetation and soil analysis	Dr. Sanjay Singh, Scientist 'D', ICFRE

	Questions & Answers	
3.30 - 3.45 PM	Tea Break	
3.45.- 5:30 PM	Filling of the data in the field forms Procedure for data entry and analysis	Dr. Md. Shahid, Carbon Sequestration Consultant ICFRE
<b>18 June 2019</b>		
8.00 AM to 12.00 PM	Key steps in 'On-site forest carbon stock assessment': Hands on in laying out of sample plots, measurement of trees, shrubs and herbaceous plants, collection of litter, ground vegetation and soil samples etc, including handling of equipment (Group field exercise) <b>Venue for On-site forest carbon stocks assessment: Banapura Forest Range, Hoshangabad Forest Division</b>	Dr. Sanjay Singh, Scientist 'D', ICFRE Dr. Md. Shahid, Carbon Sequestration Consultant ICFRE
1:00 – 2 :00 PM	<b>Lunch</b>	
2:00 – 5:00 PM	Class room exercise on biomass carbon estimation for sample plot data: Application of relevant allometric equations Data Entry and analysis  Questions & Answers	Dr. Sanjay Singh and Dr. Md. Shahid ICFRE, Dehradun
5.00-5.30 PM	Wrap up and vote of thanks	Dr. Md. Shahid, Carbon Sequestration Consultant ICFRE

**ANNEXURE II****List of Participants  
Training on Measurement of Forest Carbon Stocks (17-18 June 2019)**

<b>S. No.</b>	<b>Name</b>	<b>Address</b>	<b>Designation</b>	<b>Phone No</b>
1	Bhajan Lal Pal	Seoni	Range Officer	9424794123
2	Himanshu Rai	Karangi, South Balaghat	Range Officer	9424790206
3	K.S. Dhakar	Sheopur	Range Officer	9893769450
4	Nand Kishore Parihar	Dhanora	Range Officer	8319843894
5	Rishabh Bisaria	Shivpuri	Range Officer (Trainee)	9990925229
6	Ashish Samadhiya	Shivpuri	Range Officer	8223841777
7	V.K. Gupta	Sudhawa	Sub Divisional Officer	9424566316
8	H.S. Thakur	Pati Barwani	Sub Divisional Officer	9424793028
9	Seema Dwivedi	South Sagar	Sub Divisional Officer	9424799811
10	Ajay Daheriya		Forester	9424795927
11	S.K. Som	Chicholi, West Betul	Range Officer	9424790503
12	Sanjay Singh Rajput	Tilwari Raisen	Range Officer	9826830858
13	Pappu Singh	Nowrosh Umaria	Range Officer	9424794514
14	Bhakt Raj Panwar	Borata	Range Officer	9424793030
15	Jibotosh Pandit	Bhopal	GIS Expert	9174869557
16	T.S. Suliya	South Seoni	DFO	9424794107
17	Narendra Pandwa	South Seoni	IFS	9013942074
18	Amit Patodi	South Balaghat	ACF	9424790240
19	Rakesh Kodge	South Seoni	ACF	9424394110
20	Kshitij Kumar	Sagar	DFO	9424793806
21	N.K. Sharma	Shahpur	SDO	9424790303
22	G.D. Warwade	Raisen	SDO	9424780659
23	M.K.S. Bhadoria	Budhni	SDO	9424790908
24	Suresh Bagel		Range Officer	8085952781
25	Rahul Mishra	Pati	SDO	9424794544
26	Asha Roseline Kujur	Bhopal	Consultant	7949140695
27	S.N. Shrivastava	Chiklod	Range Officer	9755292095

28	Akhilesh Agrawal	Badi	SDO	9424790213
29	Shiv Awasthi	Obedullaganj	SDO	9424792028
30	Khushal Singh Baghel	Bhaura	Range Officer	9424790308
31	Santosh Kumar Ranshore	Jhabua	SDO	9424792428
32	N. S. Chauhan	Itarsi	Range Officer	8120207805
33	H.S. Mishra	Banapura	Range Officer	9424792079
34	Mrs. Anshu Soni	Sukhtawa	Range Officer	9425304097
35	AK Joshi	Shahdaol	CCF	9424794449
36	K.K. Bhardwaj	Hoshangabad	CCF	9424792025
37	Ajay Pandey	Hoshangabad	DFO	9424792027
38	Kesari Pal	Banapura	Forest Guard	
39	S. Rai	Itarsi	Forester	9424792038
40	Raj Kumar Gour	Itarsi	Forest Guard	
41	N. S. Chauhan		Deputy Ranger	
42	Hemant Yadav	South Panna	SDO	
43	Raj Kumar Maluiya			9827554112
44	Aaftab Khan		Range Officer	9424732278
45	Dharmendra Singh Rathore	Dhamnood	Range Officer	9424792235
46	Dhivendra Pratap Singh	Satna	SDO	9424793426
47	K. Raman	Bhopal	APCCF, Project Director	9407586818
48	Ram Kumar	Seoni Malwa	Range Officer	9424792070
49	M.D. Manikpuri	Kalda	Range Officer	7974571398

**Minutes of Training Program**

**Day 1 (17/06/2019)**

**Inaugural Session**

Two-day training programme for the staff of Madhya Pradesh Forest Department on Measurement of Forest Carbon Stocks under Ecosystem Services Improvement Project (ESIP) was organized at the Itarsi, Hoshangabad (MP) for the capacity building of staff of the Forest Department. A total of 49 participants including DFO, SDO, Ranger from various Forest Divisions of Madhya Pradesh Forest Department participated the training programme.

The training programme was started with the warm welcome address and introductory remark of Dr. Sanjay Singh, Scientist 'D', Biodiversity and Climate Change Division, (BCC) ICFRE. Dr. Singh briefed about the various components of Ecosystem Services Improvement Project (ESIP) implemented by Indian Council of Forestry Research and Education, Dehradun. He briefed about the significance of assessment of forest carbon stocks and importance of the capacity building of State Forest Department on measurement and monitoring of forest carbon stocks.

Sh. K.K. Bharadwaj, CCF, Hoshangabad explained about the activities carried by Forest Department, under ESIP in the inaugural session of the training. He further briefed about the importance of training on forest carbon stocks for State Forest Department. He stressed the need to understand forest carbon stocks and after the completion of training, the participants will work as Master Trainer in their respective Divisions for providing the training to other staff of the Department.

Sh. Ashok Kumar Joshi, CCF, explained about the historical development of forest department and the role played by forest official in protecting and conserving the forest. He explained that with the onset of climate change, the importance of forest has increased in terms of carbon sequestration and the role played by forest in climate change mitigation.

## **Technical Session**

Technical Session started with the presentation of Dr. Sanjay Singh on “Role of forest and soil in Climate Change’. Dr. Singh explained the phenomenon of climate change, and explained the causes, and impacts of climate change on the biological diversity. He elaborated on the impacts of climate like rise in sea level, melting of glaciers, species diversity, change in the movement of species, early flowering in various species. He further explained that the forest through the carbon sequestration can mitigate climate change. Training on assessment of forest carbon stock may build the cadre to estimate the carbon stock in forest of Madhya Pradesh.

Dr. Mohommad Shahid, Carbon Sequestration Consultant, ESIP, ICFRE focused on the various carbon pools required for the assessment of forest carbon stocks. He further briefed that forest are both source and sink of carbon dioxide. Deforestation results in immediate release of the carbon originally stored in the trees as CO<sub>2</sub> emissions. Forest degradation also contribute in the release of carbon emission from the forest. He highlighted the methodological aspects of forest carbon stock assessment. Dr. Shahid elaborated on the role of Geographical Information System in assessment of carbon stock. He explained about the stratification of forest type and forest density layer using GIS. The significance of GIS in spatial planning was also explained. In his presentation, Dr. Shahid spoke the variability assessment, calculation of sample plots and allocation of samples plots in the stratified layers using GIS.

Dr. Sanjay Singh elaborated on the design of the sample plot followed for the estimation of carbon stock. He briefed about the standard protocols to be followed for the collection of data like tree CBH, herb, shrub, litter and soil samples etc. He stressed to properly follow the procedure so that the samples are collected in an efficient manner and results are satisfactory. Dr. Singh also highlighted the coding of the samples and proper codes should be well written on the samples so that samples may be tested appropriately. He further explained about the field equipments, and their handling in the forest.



## **Day 2 (18/06/2019)**

In first half, trainees were taken to Pipalgota, Banapura Forest Range for in-field demonstration including laying of the plot, marking plot boundary, data collection on trees, shrubs, herbs litter and soil for carbon stock assessment. Participants were divided into three groups (Team A, B and C). 03 Sample plots were laid in the field and data regarding tree CBH, litter name of the species, height etc. were collected in data collection form. After returning from the field, data entry and analysis was conducted at the training venue (Itarsi). Live example was demonstrated to the participants. Participants were told to enter the data in excel file and the entered data was further analyzed using the equations and procedure mentioned in the manual.

Brain Storming Session was also conducted to clarify the doubts generated during the training programme. Dr. Sanjay Singh and Dr. Mohommad Shahid explained about the various questions raised by the participants.

Sh. K.K. Bharadwaj, CCF, Hoshangabad concluded that efforts of ICFRE team in conducting training on forest carbon stocks and appreciated the IFRE efforts in successful organization of the training. He believed the trained official will act as master trainer of the MP Forest Department in providing training to the staff in their respective divisions.

Vote of thanks was presented by Dr. Mohommad Shahid, Carbon Sequestration Consultant, ESIP, ICFRE.

**Feedback**

**Findings of Feedback form:** The participants has requested to provide the Training Manual in bilingual (Hindi and English). Forest Range level training should be organized for ground level staff. More time shall be given to analysis and calculation session.

## Feedback

#	Name	General Training Facility	Training Material	Will this training help in Future	Discussion during Training	Resource Manual & Class notes match	Overall Analysis	Accommodation and Food Facility	What new you get in training	Did you get methodology	Suggestion
		1	2	3	4	5	6	7	8	9	10
1	Dhirendra Pratap Singh	5	5	5	5	5	5	5	Carbon Measurement method	Yes	
2	Kshitij Kumar	5	5	5	5	4	5	4			
3	Rahul Mishra	5	5	5	5	5	5	5	Carbon Stock Mapping in Forest for record maintain	Yes	
4	Suresh Baroti	5	5	5	5	5	5	5	Very useful, Importance of GIM with carbon estimation	Yes, but master Trainer has less patience	Class room training is ok, need more time for field work
5	Aashish Smadhiya	5	4	4	5	5	5	5	Carbon stock measurement is new subject, good info about survey plot and analysis	Y	Also incorporate new technique
6	Santosh Kumar Ranshoray	5	5	5	5	5	5	5	Tree carbon stock, biomass, sample plot layout & practical approach	Y	Field exercise time should be increase
7	Anshu Soni	4	4	5	5	5	5	4	By training we came to know how to calculate the biomass and volume of various species	Y	More field training sessions
8	Nartendra Pandwa	4	4	5	3	4	4	5	Standardize carbon stock measurement	Y	Introduction should be less and more

											focus on analysis
9	Jibotosh Pandit	5	5	5	5	4	4	5	Plot layout exercise, theory/ concepts behind the carbon estimate, calculation for carbon analysis	Y	The training was very successful. One extra day would be better
10	Rishabh Bisauria	4	4	4	3	3	4	5	Carbon measurement	Y	
11	Nand Kishore Parihar	4	4	5	5	4	4	4	Carbon Measurement method	Y	Facility of computer operator
12	Dharmendra Singh Rathore	5	5	5	5	5	5	5	more Practical exercise with classroom, Sample plot measurement & calculation	Y	Circle level training should be organized
13	Aftab	4	5	4	3	4	5	4	measurement of carbon	Y	Circle level training should be organized
14	M. K.Sharma	4	4	4	5	4	4	5	carbon stock estimation	N	training should be 3 day
15	Bhajanlal Pal	4	4	5	5	5	5	5	carbon stock sample plot. New process and calculation	Y	calculation session should be increased
16	Pappu Singh Vaskal	5	5	5	5	5	5	5	Carbon stock measurement in forest	Y	
17	Sanjay Singh Rajput	5	5	5	5	5	5	5	New information method of carbon sequestration, biomass calculation, soil sample collection method	Y	Need training on Forest Management practices of volume calculation

18	M.D.Adhikari	5	4	5	2	5	4	5		Y	Training session should be more
19	Naval Singh Chauhan	5	5	4	5	4	5	5	Practical session should be on respective field	Y	Training program should be in Hindi
20	Hargovind Mishra	5	5	5	5	5	5	5	Practical knowledge of carbon measurement	Y	Training manual should be in Hindi
21	Ramkumar	5	5	5	5	5	5	5	Carbon Measurement method	Y	how to make projects for GIM
22	Rakesh Kohapay	5	5	5	4	5	5	5	Carbon Measurement method	Y	Regional level training should organize for ground level staff
23	T.S. Suliya	5	5	5	4	4	4	5	First time learn carbon estimation	Y	Field level staff should be trained
24	Kalyan Singh Dhakad	5	4	5	4	5	4	5	Carbon measurement is new topic , training is really helpful in current scenario	Y	Beat guard level training should be organized
25	Seema Diwedi	5	4	5	5	5	4	5	Laying out of Plot and field data collection, Carbon stock estimation method, Allocation of sample plot in each stratum	Y	Allocation of sample plot in each stratum should be explained in sectors app at practical basis
26	Hemant Yadav	5	5	5	5	5	5	5	Carbon Stock measurement	Y	
27	Himanshu Rai	4	4	4	4	5	4	5	Global warming, Carbon credit,	Y	

									measurement of carbon		
28	Suresh Kumar	5	5	5	5	4	4	3		Y	Accommodation should be nearby place of training
29	Bhatraj Panwar	5	4	5	4	4	5	5	Knowledge of carbon sequestration, theory & practical	Y	how to make projects for GIM
30	M.K.S.Bhaduria	5	5	5	5	5	5	5	Measurement of forest carbon stocks, sample plot & fieldwork	Y	Field practical should be more
31	Vijay Gupta	4	4	4	4	5	4	4	Carbon estimation method	Y	Field exercise time should be increase
32	S.N.Srivastava	5	5	5	4	5	5	5	Carbon estimation method	Y	Manual should be in Hindi
33	Akhilesh Agarwal	5	5	5	5	5	5	5	Carbon estimation field exercise and its calculation is a new topic for us	Y	It was excellent
34	G.D.Varbade	5	4	4	4	5	4	5	detail information on Carbon storage measurement	Y	Trainers language should be simple
35	H.S.Thakar	5	3	4	3	4	3	4	Carbon estimation	Y	
36	Amit Patodi	5	5	4	5	5	5	5	Field Survey practices and carbon estimation	Y	More Focus or Field visit and field practices

Scale of Ranking: 1 - Poor, 2 - Satisfactory, 3 - Good, 4 - Very Good, 5 - Excellent

**Consolidated Abstract and Summary of the Individual Feedback**

S.No.	General Training Facility	Training Material	Will this training help in Future	Discussion during Training	Resource Manual & Class notes match	Overall Analysis	Accommodation and Food Facility
	1	2	3	4	5	6	7
1	5	5	5	5	5	5	5
2	5	5	5	5	4	5	4
3	5	5	5	5	5	5	5
4	5	5	5	5	5	5	5
5	5	4	4	5	5	5	5
6	5	5	5	5	5	5	5
7	4	4	5	5	5	5	4
8	4	4	5	3	4	4	5
9	5	5	5	5	4	4	5
10	4	4	4	3	3	4	5
11	4	4	5	5	4	4	4
12	5	5	5	5	5	5	5
13	4	5	4	3	4	5	4
14	4	4	4	5	4	4	5
15	4	4	5	5	5	5	5
16	5	5	5	5	5	5	5
17	5	5	5	5	5	5	5
18	5	4	5	2	5	4	5
19	5	5	4	5	4	5	5
20	5	5	5	5	5	5	5
21	5	5	5	5	5	5	5
22	5	5	5	4	5	5	5
23	5	5	5	4	4	4	5

24	5	4	5	4	5	4	5
25	5	4	5	5	5	4	5
26	5	5	5	5	5	5	5
27	4	4	4	4	5	4	5
28	5	5	5	5	4	4	3
29	5	4	5	4	4	5	5
30	5	5	5	5	5	5	5
31	4	4	4	4	5	4	4
32	5	5	5	4	5	5	5
33	5	5	5	5	5	5	5
34	5	4	4	4	5	4	5
35	5	3	4	3	4	3	4
36	5	5	4	5	5	5	5
Sum	171	164	170	161	167	165	172
Average	4.75	4.56	4.72	4.47	4.64	4.58	4.78



**Overall average rating of the training programme: 4.64/5.0**

General Training Facility	4.75
Training Material	4.56
Will this training help in Future	4.72
Discussion during Training	4.47
Resource Manual & Class notes match	4.64
Overall Analysis	4.58
Accommodation and Food Facility	4.78
Average	4.64

Scale of Ranking: 1 - Poor, 2 - Satisfactory, 3 - Good, 4 - Very Good, 5 - Excellent

