TRAINING REPORT

APN Project CBA2020-10SY-Samek

Ecosystem services measurement and monitoring tools supporting KPH and community forest management in Aceh, Indonesia

Phase 1 and Phase 2 Training
February 2021

ASIA-PACIFIC NETWORK FOR
GLOBAL CHANGE RESEARCH

Ecosystem services measurement and monitoring tools supporting KPH and community forest management in Aceh, Indonesia

Training Report

Phase 1 and Phase 2 Trainings

Authors

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Overview of the Project

Devolution of forest management in Indonesia through policy has meant the proliferation of Forest Management Units (KPH, Kesatuan Pengelolaan Hutan) for watershed scale sustainable forest management as well as forest areas under community management through the MOEF Social Forestry program. KPH protection (KPHL) and production (KPHP) units require 10 year, long-term and 1-year, short-term management plans. The "utilization of environmental services" for both KPHL and KPHP units (Government Regulation No. 6/2007) identify specifically biodiversity protection and carbon sequestration and/or storage. The MOEF Directorate General of Social Forestry regulations specify guidelines for preparing village forest management plans (No. P.16/PSKL/SET/PSL.0/12/2016). Activities specified include utilization of NTFPs such as medicinal plants and utilization of environmental services through ecotourism activities and carbon storage and sequestration. Challenges exist for both KPH staff and community members in accurately collecting and reporting information specific to forest carbon, biodiversity, and the various forest provisioning and cultural ecosystem services. This project focuses on training KPH staff and social forestry community members in Aceh province to use Excel-based ecosystem services tools for measuring and reporting forest carbon, tree biodiversity, and forest integrity and health. These tools will support the inclusion of ecosystem services in KPH long-term and Social Forestry village management plans.

Three Ecosystem Services Tools

Forest Carbon Tool

The forest carbon tool consists of several tabs and include tabs with user guidance, example data, a user-defined tree species inventory list of local and scientific names, plot data tabs and a synthesis reporting tab. Tree DBH measurement data from nested fixed-area plots are input to the tool which are used to compute plot-level biomass carbon using allometric equations specific to the forest type and region. The tool was first developed under the USAID LESTARI project (2015 – 2020) by Michigan State University for use with Central Kalimantan forest ecosystems. Prior to this training we modified the tool for application with forest ecosystems in Aceh province. Tree height data are computed from three measurements recorded in the field: distance of the observer from the tree, height of the observer's eyes from the ground, and the protractor angle from the clinometer tool as the observer identifies the top of the tree. These data are used to compute the biomass volume of trees in the plot. The number of trees recorded are used to compute the stem density of the plot. The tool then computes the average tons of Carbon per hectare for all plots where data are collected. The tool also reports error and confidence accuracies based on the variation of Carbon in the plots.

Tree Biodiversity Tool

The tree biodiversity tool has a similar set of tabs as the forest carbon tool. Plot inventory data are recorded for the number of each tree species greater than 5 cm DBH present in the largest of the nested fixed-area plots. Biodiversity indices are then computed that include species richness, Shannon index of species diversity, Simpson index of diversity, evenness and abundance. The same plot area used for the carbon tool data collection is also used for the biodiversity tool.

Forest Integrity Assessment Plus Tool

The forest health and integrity tool is a modified and adapted version of The Forest Integrity Assessment (FIA) tool which is a check-list and scoring tool used for assessing and monitoring biodiversity conditions in forests and forest remnants. The tool was developed by the High Conservation Value Resource Network (HCVRN). The encoded FIA data sheets in Excel include automatic computations and reporting. This tool is an essential compliment to the tree biodiversity tool, which tends toward a more scientific assessment. The forest health and integrity tool includes four sections for data observations: (1) forest structure and composition, (2) impacts and threats to the forest, (3) the forests focal habitats, and (4) the forests focal species. We also include data collection tabs in the tool to document the forest resources used by local communities and households that are provisioning or cultural services.

Modification to Original Project Activity Timeline

Due to the COVID-19 pandemic our original training plans and schedule had to be modified. Travel restrictions and changes to research protocols from Michigan State University impacted our research project. Approval from MSU was required to conduct the training in Indonesia which delayed our initial first two training phases of the three-phase training project plan. The November 2020 Phase 1 and January 2021 Phase 2 trainings were combined to be completed over two 6-day sessions with each session including no more than 20 – 25 participants and training staff. The lower participant numbers helped us conduct the trainings with COVID-19 mitigation practices in place (wearing masks and social distancing). We took advantage of Zoom to allow Jay Samek to participate as a co-trainer remotely from the United Sates with a 12-hour time difference.

Phase 1 Training

The phase 1 component of the training:

- introduced participants to the fundamental concepts of ecosystems and ecosystem services,
- reviewed the Greenhouse Effect, GHG emissions and the Carbon Cycle,
- explained the five pools of forest carbon,
- discussed the allometric equations used in the Forest Carbon Tool,
- described DBH measurements on various tree morphology types,
- demonstrated the use of a simple clinometer for measuring the height of trees,
- explained the nested fixed-area plot design for measuring Forest Carbon and the use of the large plot to record tree species for the Tree Biodiversity Tool and to make observations for input to the FIA Plus Tool
- previewed, described, and demonstrated the Excel-based Forest Carbon, Tree Biodiversity and FIA Plus Tools

As part of the Phase 1 component of the training participants:

- discussed and shared their knowledge regarding the forest resource and forest condition for the forest area they are associated with,
- were given hands-on practice time inputting data to the three Excel-based Tools to familiarize themselves with the different Tools' functionalities.

Phase 2 Training

The Phase 2 component of the training was a field-based practicum where participants practiced demarking a fixed-area nested plot and collected plot level data for use in the three tools. Data collected included: tree DBH (1.3 m above the ground) measurements, measurements to compute tree height (distance from tree, angle of clinometer, height above ground to observer's eye level), tree species counts, seedling counts in 2x2m plots, and FIA checklist observations.

In the first session the participants conducted two days of field training. The first day in a secondary tropical forest ~15 kilometers east of the city of Meulobah in Ujong Tanoh Darat. The second day was in a 5-ha secondary tropical city forest of Lueng Baro, Suka Makmue Nagan Raya Regency located ~44 kilometers east of Meulobah. In the second session the participants also conducted two days of field training. The first day in a mangrove forest ~15 kilometers northeast of Langsa city. The second day was in 2.38-ha secondary tropical city forest located in the northeast section of Langsa city.

Following the two field training practicum days, the participants met for a final day of training. The final day of training we reviewed the results of the data collection efforts from the two field days, discussed specific questions they had about the tools and data collection (e.g. species identification, palms versus trees) reviewed the tool outputs from the data collection in terms of management plans, discussed plot allocation strategies and designs, and planed for data collection between March and July in each of the KPH, community and National Park forest areas prior to the final Phase 3 training scheduled for July/August.

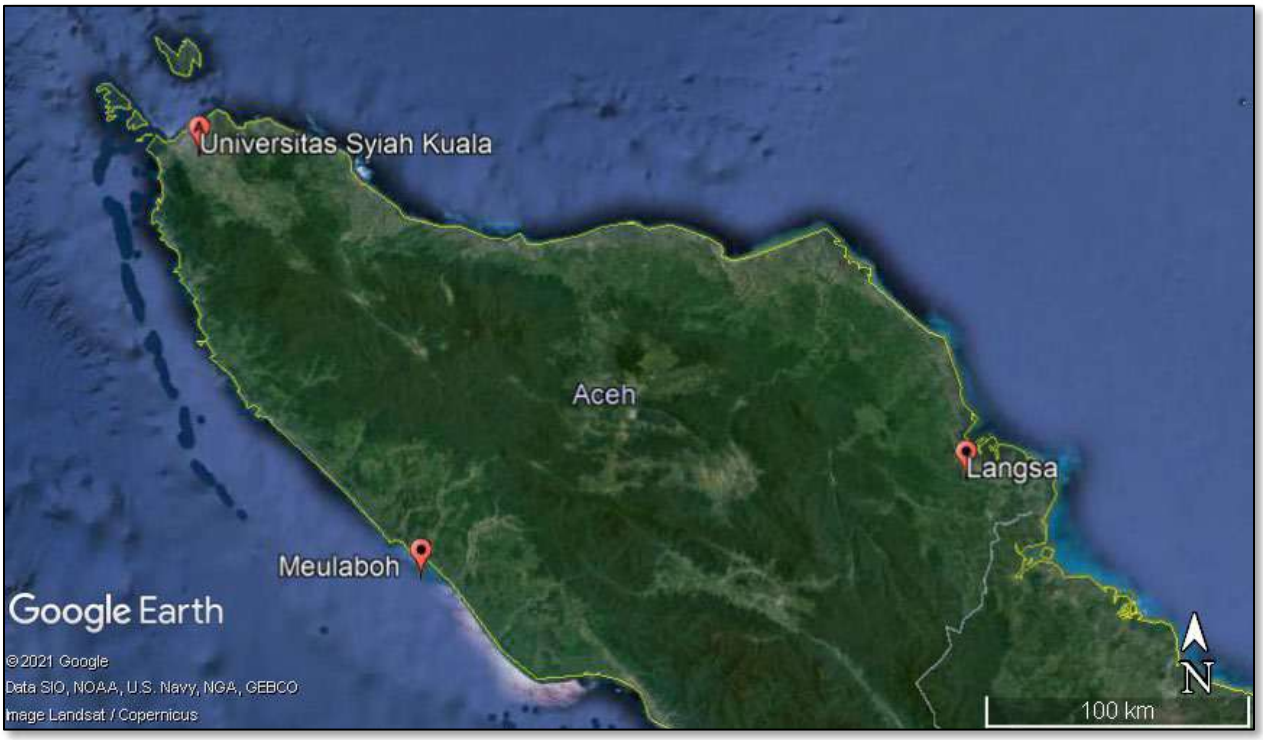

FIGURE 1: LOCATIONS OF THE TWO TRAINING SESSIONS (SESSION 1: MEULOBAH; SESSION 2: LANGSA)

Training Agenda and Session Locations

Each training session was conducted over a total 6 days. The first session was conducted 7 – 12 Feb 2021 in Kota Meulaboh, West Aceh Regency, Aceh. The second session was conducted 14 – 19 Feb 2021 in Kota Langsa, Aceh. See figure 1.

The Session schedule is shown below.

DAY 1	
14.00-18.00	Registration, Sign in, Hotel Check in
18.00-19.00	Dinner
19.00-19.30	Welcome and Introduction
19.30-20.00	Introduction to Ecosystem Services
DAY 2	
08.00-08.30	Registration, Sign in
08.30-10.30	Mapping ecosystem services-small group break out with report back (Coffee Break)
10.30-12.30	Introduction to three Ecosystem Services Tools
12.30-13.30	Lunch
13.30-14.30	Introduction to three Ecosystem Services Tools
14.30-15.00	Coffee Break
15.00-16.30	Data entry practice for Forest Carbon Tool
16.30-17.00	Wrap up, Questions
DAY 3	
08.00-08.30	Registration, Sign in
08.30-09.00	Review Forest Carbon Tool
09.00-10.30	Data entry practice for Biodiversity Tool
10.30-11.00	Coffee Break
11.00-12.30	Data entry practice for FIA Plus Tool
12.30-13.30	Lunch
13.30-14.30	Data collection: Plot Design and tools
14.30-15.00	Coffee Break
15.00-16.30	Data collection: measurements and recording
16.30-17.00	Wrap up, Questions
DAY 4	
08.00-17.00	• All day field practicum • Demonstrate marking out nested plot for forest carbon and biodiversity sections • Small teams practice marking out plots-each team of 5 people establish one or two plots • Plots should be minimum 50 m apart • If there is time remaining-demonstrate data collection for one of the tolls
DAY 5	
08.00-14.30	• All day field practicum • Demonstrate data measurement and recording for forest carbon tool • Demonstrate data collection and recording for biodiversity tool • Demonstrate data collection and recording for FIA Plus tool

	• Small teams collect and record data in the plots established on Day 3
DAY 6	
08.00-08.30	Registration, Sign in
08.30-09.00	Review and Discuss the results of the data collection and tool reporting
09.00-10.00	Plot allocation strategy and data collection plan for next five months
10.00-10.30	Coffee Break
10.30-11.00	Questions, comment, next steps and wrap up
11.00-11.30	Presentation of training certificates
11.30-12.30	End of training, lunch

Participants

Training participants included staff from several KPH (Forest Management) units throughout Aceh, members of forest communities, local government agencies (BKSDA Aceh, BPDASHL KA, TNGL) and University staff and students. There was a total of 42 participants in the two sessions (22 in Session 1 and 21 in Session 2 – with one individual participating in both sessions). Ten of 42 participants were female (24%) the remaining male (76%). Tables 1 and 2 list the participants, their gender, their agency, KPH, Community or University and their location. A list of participants including their contact information is provided in the report appendix section.

Session1 Training: 7 – 12 Feb 2021 Kota Melaboh, West Aceh Regency, Aceh

TABLE 1: SESSION 1 PARTICIPANTS LIST

No	Name	M/F	Agency, KPH or Community	Location
1	Satirin	M	BKSDA Aceh	Banda Aceh
2	Robi Gunawan	M	KPH IV Aceh	Meulaboh, Aceh Barat
3	Wahyu Juanda	M	KPH IV Aceh	Meulaboh, Aceh Barat
4	Sirky Ahkiyat	M	Community of KPH IV Aceh	Meulaboh, Aceh Barat
5	Rizki Akhbar	M	Community of KPH IV Aceh	Meulaboh, Aceh Barat
6	Sigit Suparmanto	M	BPDASHL KA	Banda Aceh
7	Syahrul	M	KPH VI Aceh	Subulussalam
8	Aria Mesa	M	KPH VI Aceh	Subulussalam
9	Adam Malik	M	KPH V Aceh	Gayo Lues
10	Sulaiman	M	KPH V Aceh	Gayo Lues
11	Fael Septianda	M	Community of KPH V Aceh	Gayo Lues
12	Hermansyah	M	Community of KPH V Aceh	Gayo Lues
13	Bagio, S.P., M.Si	M	Lecturer of Agriculture Department, Teuku Umar University	Meulaboh, Aceh Barat
14	Ulfa Hansri Ar Rasyid, S.Pd., M.Si	F	Lecturer of Forestry Department, USK	Banda Aceh

15	Anna Farida, S.T., M.Si	F	Lecturer of Forestry Department, USK	Banda Aceh
16	Ripa Nirpya	F	Student Forestry Department, USK	Banda Aceh
17	Sri Ningrum	F	Student Forestry Department, USK	Banda Aceh
18	Jannatun Amin	M	Community of KPH VI	Subulussalam
19	Musdar Ilyas	M	Community of KPH VI	Subulussalam
20	Fajar Nofriadinal	M	Community of KPH VI	Subulussalam
21	Puji Asi Asih, S.P	F	Instiper Yogyakarta	Jogjakarta

Session 2 Training: 14 – 19 Feb 2021 Kota Langsa, Aceh

TABLE 2: SESSION2 PARTICIPANTS LIST

No	Name	M/F	Agency, KPH or Community	Location
1	Mainsir, S.Hut	M	KPH I	Calang, Aceh Jaya
2	Rakhmad Rinaldi Wahfar	M	KPH I	Sigli, Pidie
3	Abdullah Ibr	M	Community of KPH I	Lhoong, Aceh Jaya
4	Husaini AR	M	Community KPH I	Sigli, Pidie
5	Edison, A.Md	M	KPH TAHURA PMI	Saree, Aceh Besar
6	Lukman	M	Community of KPH Tahura PMI	Saree, Aceh Besar
7	Arif Saifudin	M	TNGL	Tapak Tuan, Aceh Selatan
8	Reza Arizqi, S.H.I	M	Community of KPH III	Langsa, Aceh Timur
9	Irhamna, S.Hut	M	KPH II	Takengon, Aceh Tengah
10	Kurnia Setiawan, S.Hut	M	KPH II	Takengon, Aceh Tengah
11	Arpidar	M	Community of KPH II	Takengon, Aceh Tengah
12	Dedi Aprianto	M	Community of KPH II	Takengon, Aceh Tengah
13	Lola Adres Yanti, S.Hut., M.Si	F	Lecturer of Forestry Department, USK	Banda Aceh
14	Tuti Arlita, S.Pi., M.Si	F	Lecturer of Forestry Department, USK	Banda Aceh
15	Khairul Husna	F	Student Forestry department, USK	Banda Aceh
16	Opi Faradilla	F	Student Forestry department, USK	Banda Aceh
17	Puji Asi Asih, S.P	F	Instiper Yogyakarta	Jagjakarta
18	Izhar Pauzi, S.Hut	M	KPH III	Langsa, Aceh Timur
19	Agus Rinaldi, S.P.	M	KPH III	Langsa, Aceh Timur
20	Akhyar	M	Community of KPH III	Langsa, Aceh Timur
21	Mulia Wardi	M	Community of KPH III	Langsa, Aceh Timur
22	Subhan, S.Hut., M,Si	M	Lecturer of Prodi Hut USK	Banda Aceh

Pre- and Post-Training Questionnaire

Participants completed a 10-question pre-training test at the start of the training and then repeated the test on the final day. English versions of the test questions are provided in the report appendix section. Session 1 had 16 participants who took both the pre- and post-training tests; however, 8 participants who arrived after the start of the training only completed the post-training test. Session2 18 participants took the pre-training test. One of these was not present for the post-test and there were an additional 4 participants who took the post-training test that were not present for the pre-training test.

Test results for the Session 1 participants are detailed in tables 3 – 7. In tables 3, 4 and 5 we report the number and percent of correct answers for each question in the pre- and post-training tests for the 16 participants and then again for all 24 participants (includes 3 supports staff). The majority of questions saw an improvement in the number correctly answered (Qs 1, 2, 3, 7, 8, 10). However, several questions saw a decline (Qs 4, 5, 6 and 9). The overall average increased from 74% to 77% correct between the pre- and post-training tests.

TABLE 3: SESSION 1 PRE-TRAINING TEST ANALYSIS OF QUESTIONS (N=16)

Pre-Training Test	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Total Correct (n=16)	15	11	7	13	9	15	10	14	12	13
% Correct	94%	69%	44%	81%	56%	94%	63%	88%	75%	81%

TABLE 4: SESSION 1 POST- TRAINING TEST ANALYSIS OF QUESTIONS (N=16)

Post-Training Test	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Total Correct (n=16)	15	14	8	11	8	14	14	15	12	15
% Correct	94%	88%	50%	69%	50%	88%	88%	94%	75%	94%

TABLE 5: SESSION 1 POST- TRAINING TEST ANALYSIS OF QUESTIONS (N=24)

Post-Training Test	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Total Correct (n=24)	22	21	14	17	12	21	20	23	14	21
% Correct	92%	88%	58%	71%	50%	88%	83%	96%	58%	88%

Table 6 reports, for the 16 participants present for both the pre- and post-training tests, the number of individuals whose score increased, decreased, and stayed the same. Three quarters of the participants (12) saw an increase in the score or stayed the same. Only 4 individuals saw a decrease.

TABLE 6: SESSION 1 PRE- AND POST-TRAINING ASSESSMENT

	n=	%
No Change	6	38%

Increase	6	38%
Decrease	4	25%
	16	100%

Table 7 is a frequency table showing the number of individuals and the percent of the total number of participants whose test scores were less 50%, or 50 to 100 in 6 bins. In all cases except those who scored 100 % did the percent increase, but this is an artifact of the different number of participants taking the pre- and post-training tests. Of all participants taking the pre-training test 75% of them scored at least 70%. Of all participants taking the prost-training test 83% of them scored at least 70%.

TABLE 7: SESSION 1 SCORE FREQUENCIES

Pre-Training			Post-Training		
Score %	**N=**	**% of Tot**	**Score %**	**N=**	**% of Tot**
< 50	2	13%	< 50	2	8%
50	2	13%	50	0	0%
60	0	0%	60	2	8%
70	3	19%	70	5	21%
80	4	25%	80	7	29%
90	2	13%	90	5	21%
100	3	19%	100	3	13%
	16	100%		24	100%
>= 70	12	75%	>= 70	20	83%

Test results for the Session 2 participants are detailed in tables 8 – 12. In tables 8, 9 and 10 we report the number and percent of correct answers for each question in the pre- and post-training tests for the initial 18 participants and then again for the 17 and 22 participants who completed the post-training test. All but two of the questions saw an improvement in the number correctly answered by the 17 participants who to both tests.

TABLE 8: SESSION 2 PRE-TRAINING TEST ANALYSIS OF QUESTIONS (N=18)

Pre-Training Test	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**
Total Correct (n = 18)	18	11	11	13	10	17	17	17	7	17
% Correct	100%	61%	61%	72%	56%	94%	94%	94%	39%	94%

TABLE 9: SESSION 2 POST-TRAINING TEST ANALYSIS OF QUESTIONS (N=17)

Post-Training Test	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**
Total Correct (n = 17)	17	17	14	15	14	17	15	16	11	17

% Correct	100%	100%	82%	88%	82%	100%	88%	94%	65%	100%

TABLE 10: SESSION 2 POST-TRAINING TEST ANALYSIS OF QUESTIONS (N=22)

Post-Training Test	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Total Correct (n = 22)	21	21	17	19	16	21	16	20	13	21
% Correct	95%	95%	77%	86%	73%	95%	73%	91%	59%	95%

Table 1 reports, for the 17 participants present in session 2 for both the pre- and post-training tests, the number of individuals whose score increased, decreased, and stayed the same. Fourteen of the seventeen individuals saw an increase in the score or stayed the same. Only 3 individuals saw a decrease.

TABLE 11: SESSION 2 PRE- AND POST-TRAINING ASSESSMENT

	n=	%
No Change	3	18%
Increase	11	65%
Decrease	3	18%
	17	100%

Table 12 is a frequency table for the session 2 participants showing the number of individuals and the percent of the total number of participants whose test scores were less 50%, or 50 to 100 in 6 bins. In the post-training test no individual scored less than 70%. Of all participants taking the pre-training test 78% of them scored at least 70%. Of all participants taking the prost-training test 100% of them scored at least 70%.

TABLE 12: SESSION 2 SCORE FREQUENCIES

Pre Traing			Post Training		
Score %	N=	% of Tot	Score %	N=	% of Tot
< 50	1	6%	< 50	0	0%
50	0	0%	50	0	0%
60	3	17%	60	0	0%
70	4	22%	70	4	19%
80	5	28%	80	5	24%
90	2	11%	90	3	14%
100	3	17%	100	9	43%
	18	100%		21	100%
>= 70	14	78%	>= 70	21	100%

Field Training

Participants from each session experienced two days of hand-on field training to practice establishing plots and take measurements for use in the ecosystem services tools. Session 1 field practicums were in forest areas east of the city of Meulaboh, West Aceh Regency. The first day the participants were in a tropical secondary forest in Ujong Tanoh Darat where they established five plots for their practicum. The second day the participants were in a 5-ha city forest in Lueng Baro, Suka Makmue Nagan Raya Regency (12 plots). The goal is to draft a report from the data collected in the city forest to present to the city government. Figure 2 shows the locations of the two session 1 field training sites.

FIGURE 2: SESSION 1 FIELD TRAINING SITES

Session 2 field practicums were in forest areas within and near to the city of Langsa. The first day the participants were in a 40-ha mangrove forest that is a part of KPH Wilayah III, where they established five plots for their practicum. The second day the participants were in a 2.38-ha city forest in the northeast part

of Langsa city (12 plots). Again, the goal is to draft a report from the data collected to present to the city government. Figure 3 shows the location of the two session 2 field training sites.

FIGURE 3: SESSION 2 FIELD TRAINING SITES

The data collected from the field training practicums show a small sample of the diversity of forest types and conditions. Table 13 reports a few of the key outputs from the three Ecosystem Services Tools and the data collected during the field practicums.

TABLE 13: FOREST ECOSYSTEM METRIC FROM FIELD DATA TRAINING

	Forest Carbon		Tree Biodiversity			FIA
Forest Area	**tC/ha**	**No Plots**	**Richness**	**Evenness**	**Dominant Species**	**Health**
Ujong Tanoh Darat	93.20	5	10	0.59	*Dilenia excelsa*	30.60
Nagan Raya Regency	70.74	12	33	0.84	*Vitex pubescens*	24.92
Mangrove Langsa	158.61	5	3	0.31	*Rhizopora apiculata*	25.40
City Forest Langsa	119.07	12	33	0.79	*Shorea platyclados*	25.50

The range of forest carbon in terms of the average $tCha^{-1}$ varies from a low of 70.74 in the 5-ha, secondary tropical forest of the Nagan Raya Regency city forest to a high of 158.61 in the mangrove forest area northwest of Langsa City. The tree species richness is lowest in the mangrove forest system (3 species) and highest in the secondary tropical forest of the two cities (33 species). Likewise, evenness is lowest in the mangrove forest (0.31) indicating the dominance of one species and is highest in the two city forests indicating a more even distribution of the species present (0.79 and 0.84). Each forest area is dominated by a different tree species. The health of the forest ecosystems ranges from a low of 24.92 to a high of 30.60. These are all within a range of values indicating "mostly healthy" forest ecosystems.

The complete set of field data collected and input to the tools are archived in a Dropbox folder and can be accessed with this link.

Participant Feedback and Comments

On the final day of each session participants were asked to give feedback regarding the tools. There were several good observations and recommendation for improving the tools. Below we list several of these:

- Rename the Biodiversity Tool to Tree Biodiversity Tool to reflect the nature of the tool more accurately.
- Revise the Forest Carbon Tool to include two 2x2 seedling plots for each tree plot inventory.
- Update the Tool Protocol Guides to include more explanation about the tool reporting function.
- Include plot dimension flexibility for the Tree Biodiversity Tool like that of the Forest Carbon Tool.

Participants also suggested:

- There is a need for a species identification tool.
- The desire for an on-line system for computing these Ecosystem Services.

There are some challenges in using the tools, which are Excel-based, for individuals that have not had significant experience with Excel. Therefore, more practice is required for those individuals to become more comfortable inputting data to the tools. And additional point noticed by a few participants is that the tools use a period (.) to denote values less than a whole number rather than a comma (,) which is more common in Indonesia.

One observation by a participant in the second session highlights the way some are thinking of advanced methods to use the Forest Carbon Tool. Since the Forest Carbon Tool includes functionality to implement different size fixed-area nested plots for the field measurements, one individual is thinking of implementing data collection in the forest with a single large plot and measuring trees in medium and large size classes of trees throughout the large plot. This will speed up the data collection process and will give a conservative estimate of forest carbon which is perfectly adequate for reporting and planning purposes. This is especially true for more mature, intact forests were 80 % or more of the AGB biomass in in the medium and large-sized tree classes.

The participants also provided feedback regarding several questions pertaining to the ease or difficulty of the tools, their self-assessment regarding using the tool and collecting field data and their interest in participating in the final project training later this year. Table 14 reports the results of this brief survey. More than 50% of the participants indicate they plan to use all three tools as part of their work. More participants indicated that the FIA Plus tool was the hardest to use and the hardest to understand of the three tools. Nearly three-quarters of the participant feel they received enough training to be able to use the tools but only half felt that had enough field training. All the participants indicated they wish to participant in the final APN project training later this year.

TABLE 14: PARTICIPANT FEEDBACK

	Forest Carbon	Tree Biodiversity	FIA Plus	All Three	Carbon & Bio
Which tool was the easiest to use?	26%	35%	30%	4%	4%
Which tool was the hardest to use?	57%	10%	33%	0%	0%
Which tool was the easiest to understand?	52%	26%	17%	4%	0%
Which tool was the hardest to understand?	29%	14%	57%	0%	0%
Which tool will be most useful for you or your work?	14%	10%	0%	57%	19%

	Yes	No
Do you feel you have enough training to be able to use the tools?	73%	27%
Do you feel you have enough training to be able to collect data in the field?	50%	50%
Would you like to participate in a third training under this project later this year?	100%	

Training Leaders and Support Staff

The success of this training rests on the shoulder of several individuals who carried out the logistics and planning as well as the day-to-day necessities for each session. As co-leaders of this project, we wish to recognize their hard work. Below, we list these individuals.

TABLE 15: TRAINING SUPPORT STAFF

1	Arif Habibal Umam	USK, Banda Aceh	Translator
2	Ilham Hanafi	Student Forestry Department, USK	Support
3	Abdullah Ahmad NST	Student Forestry Department, USK	Support
4	Ali M. Muslih	Lecturer of Forestry Department, USK	Support
5	Subhan	Lecturer of Forestry Department, USK	Support

The three lead trainers were Anhar Asabul (USK), Siti Maimunah (Instiper), and Jay Samek (MSU).

Appendix

Presentation

A copy of the PPT slide deck is available from Dropbox at this link.


MICHIGAN STATE UNIVERSITY
Ecosystem services measurement and monitoring tools supporting KPH and community forest management in Aceh, Indonesia
APN Project CBA2020-10SY-Samek
Phase 1 and Phase 2 Training
February 2021 | Aceh, Indonesia
APN

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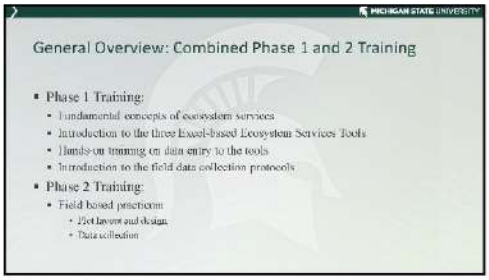
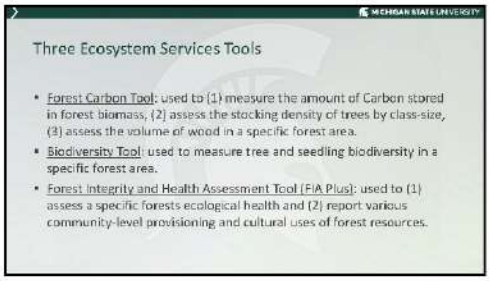

MICHIGAN STATE UNIVERSITY
General Overview: Combined Phase 1 and 2 Training
Phase 1 Training:
Fundamental concepts of ecosystem services
Introduction to the three Excel-based Ecosystem Services Tools
Hands-on training on data entry to the tools
Introduction to the field data collection protocols
Phase 2 Training:
Field based practicum
Plot layout and design
Data collection

2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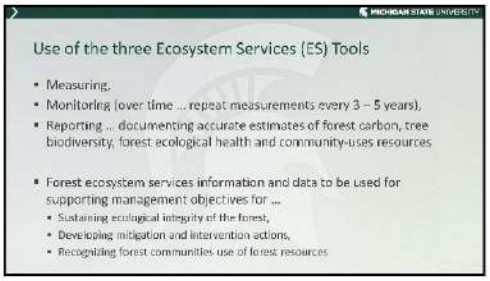
Three Ecosystem Services Tools
Forest Carbon Tool: used to (1) measure the amount of Carbon stored in forest biomass, (2) assess the stocking density of trees by class-size, (3) assess the volume of wood in a specific forest area.
Biodiversity Tool: used to measure tree and seedling biodiversity in a specific forest area.
Forest Integrity and Health Assessment Tool (FIA Plus): used to (1) assess a specific forests ecological health and (2) report various community-level provisioning and cultural uses of forest resources.

3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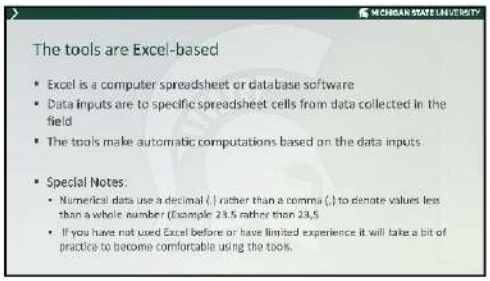
Use of the three Ecosystem Services (ES) Tools
Measuring,
Monitoring (over time ... repeat measurements every 3 – 5 years),
Reporting ... documenting accurate estimates of forest carbon, tree biodiversity, forest ecological health and community-uses resources
Forest ecosystem services information and data to be used for supporting management objectives for ...
Sustaining ecological integrity of the forest,
Developing mitigation and intervention actions,
Recognizing forest communities use of forest resources

4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The tools are Excel-based
Excel is a computer spreadsheet or database software
Data inputs are to specific spreadsheet cells from data collected in the field
The tools make automatic computations based on the data inputs
Special Notes:
Numerical data use a decimal (.) rather than a comma (,) to denote values less than a whole number (Example 23.5 rather than 23,5
If you have not used Excel before or have limited experience it will take a bit of practice to become comfortable using the tools.

5


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Introduction to Ecosystem Services

6

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What is an "Ecosystem"

- a biological community of interacting organisms and their physical environment
- Question to the Participants: **What are some examples of ecosystems?**

7

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Marine

8

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Mountain

9

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Desert

10

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Coastal

11

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Urban

12

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An evolving term: "Ecosystem" used beyond physical environments for less-natural environment

- A social ecosystem
- A political ecosystem
- A computer ecosystem
- … information ecosystem, venture ecosystem, etc.

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Forest Ecosystems

Another definition of "ecosystem": Self-sustaining structural and functional interaction between living and non-living components

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How may types of Forest Ecosystems are there in Aceh?

- Mangrove
- Peat / Swamp / Heath
- Dry Land (Mineral soil) / Dipterocarp / Tropical Evergreen
- Primary and Secondary classes

- What determines these sub-types of forest ecosystems?

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Forest Carbon Tool
  Regulating service
Biodiversity Tool
  Supporting Service
FIA Plus Tool
  Supporting (some biodiversity)
  Provisioning Services
  Cultural Services

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Questions or comments?

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Mapping Ecosystem Services: Forest Resources

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On-Line Learning Management System

- Free On-line course: **Ekosistem Hutan Gambut dan Ilmu Perubahan Iklim**
  - Five modules; Completion Certificates (MSU, UPR, UMP)
  - Login and Password

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Forest resources

For your forest area (KPH or Social Forest Area)

1. Describe the condition of the forest.
2. List the forest resources in your forest area.
3. List the different human impacts on your forest area.
4. Is access to the forest easy or difficult?

10 - 15 minutes

5. How much carbon is stored in your forest area?
6. What is range of carbon per hectare in different areas of your forest area?
7. How many trees per ha (density) are there in your forest area?
8. What is the total number of tree species in your forest area?
9. What are the top three most abundant tree species in your forest area?
10. On a scale of 0 – 10 (0 = very poor and 10 = excellent) rate the health of your forest ecosystem.

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Valuation of your forest: The benefits

- Carbon storage is valuation for health of the Earth (mitigate climate change) and benefit to whole world
- Forest health is a benefit to the local community and a potential for monetary benefits ($$) from ecotourism
- Forest resources are a benefit to local livelihoods … how best to sustain this?
  - Timber for construction of houses and furniture
  - Honey
  - Rattan
  - Spices and herbs
- Forest biodiversity can also be a potential for monetary benefits ($$) from ecotourism

22

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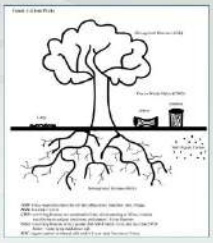
Forest Carbon

Five Pools of Forest Carbon



D'Amore, T.L., Remage, B.S., Evans, S.G., Pyle, M.D. Accountable Accounting: Carbon-Based Management on Marginal Lands. *Forests* **2014**, *5*, 847-861.

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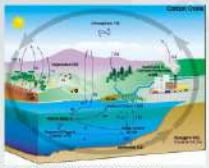
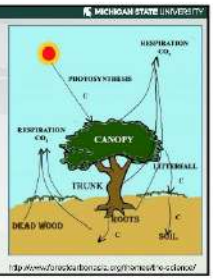
Carbon Cycle





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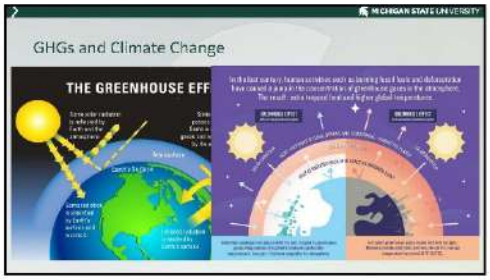

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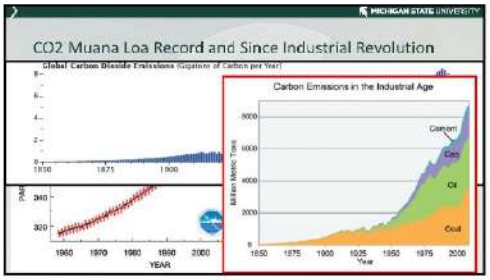

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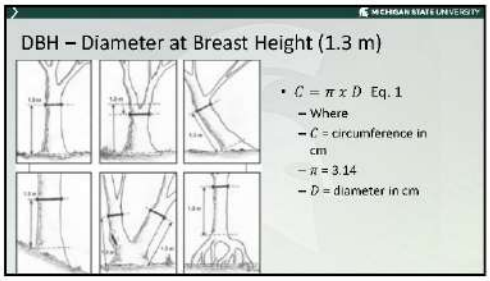

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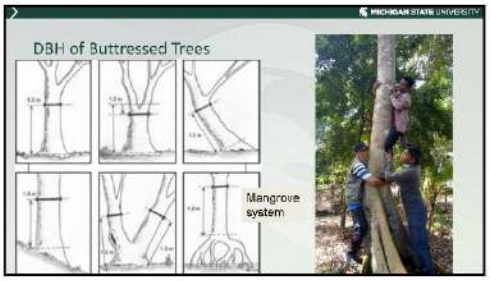

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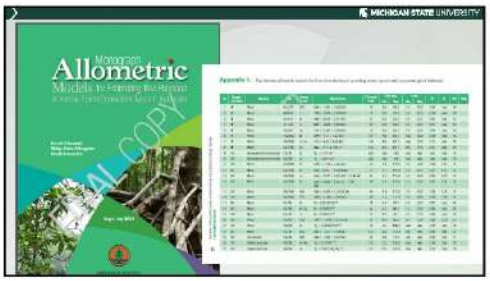

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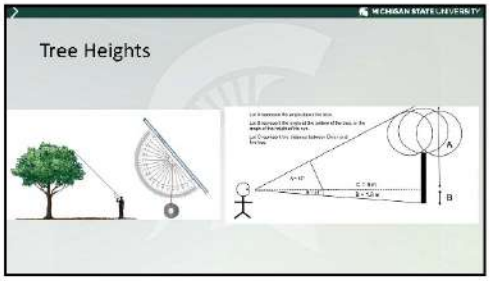

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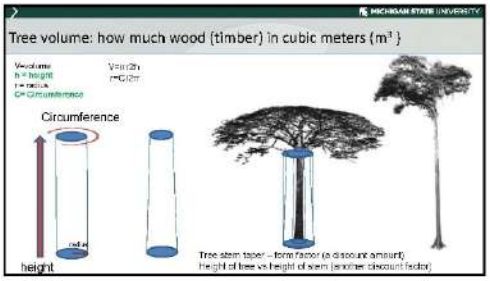

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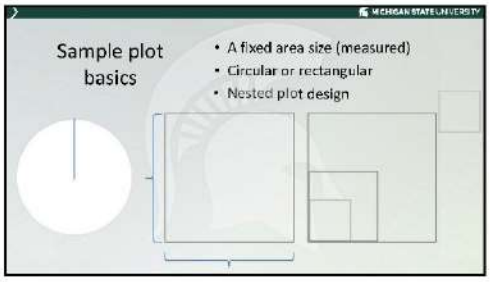

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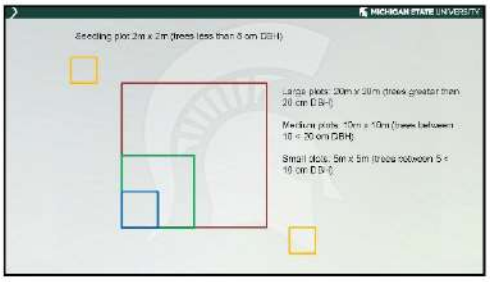

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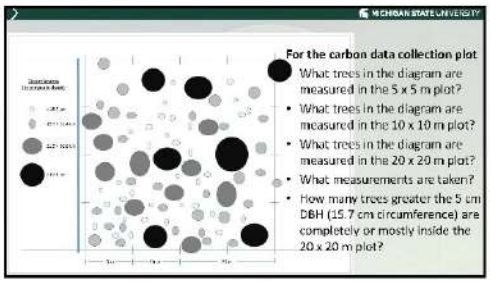

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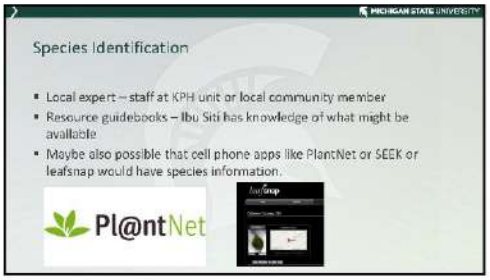

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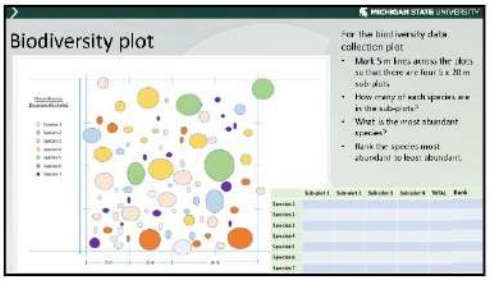

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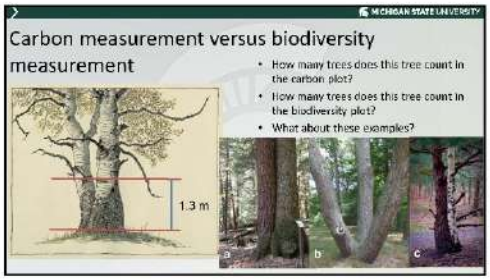

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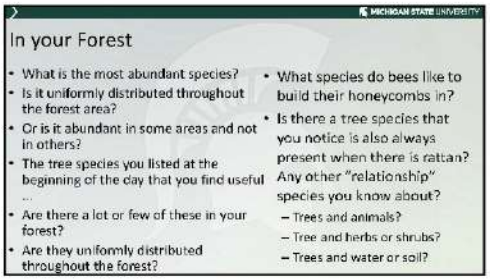

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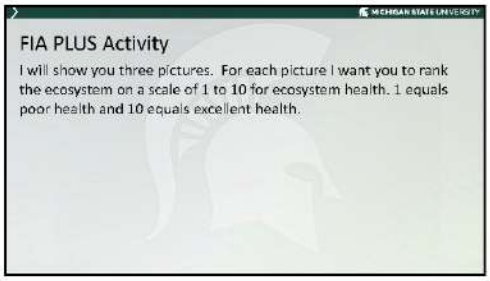

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How did you score each picture?

- Picture 1
- Picture 2
- Picture 3



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FIA PLUS Tool

- Index of indicators for scoring the health of your forest
  - Indicators are observed by field data collectors
- Shows what areas may be less healthy than others within the forest boundary
- Over time shows if your forest in improving or being degraded (declining health)

What is the PLUS for?

- Assess the forest resources specific to your communities'
  - Provisioning and
  - Cultural benefits

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- FIA PLUS Tool

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FINAL DAY OF TRAINING

Ecosystem services measurement and monitoring tools supporting KPH and community forest management in Aceh, Indonesia

APN Project CBA2020-106Y-Samek
Phase 1 and Phase 2 Training
February 2021 | Aceh, Indonesia

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Agenda today

- Mangrove size class distribution – smallest tree size 2 cm DBH
- Mangrove vs Palm allometry and biomass
- How to count Palm clumps
- Species identification
- Forest stratification and plot allocation
- Questions and comments
- APN project next steps
- Post-training Test
- Closing

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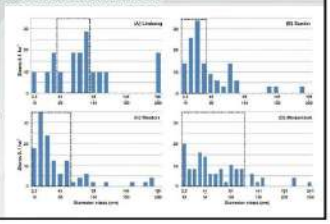
Mangrove Forest size class distribution

Example from Brunei Bay in the East Malaysia

Allometric Eq
HM (*Rhizophora apiculata*)
W = 0.75 D^2.71
min 1.1 max 38.2



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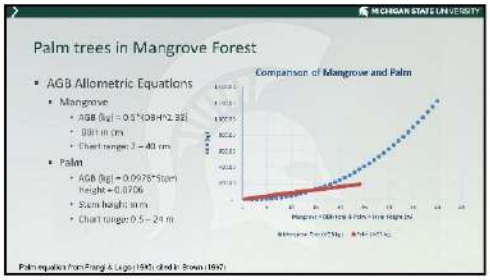

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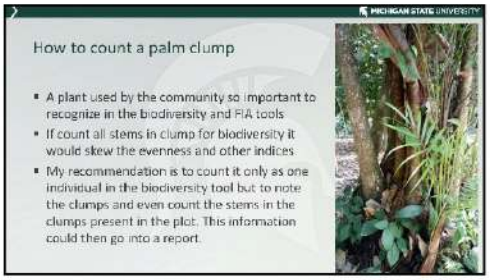

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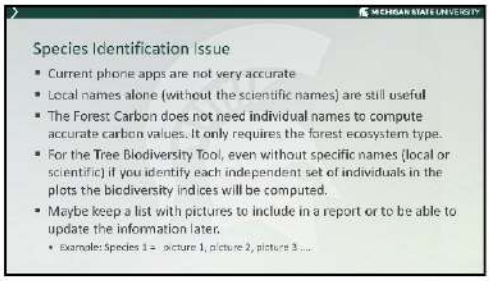

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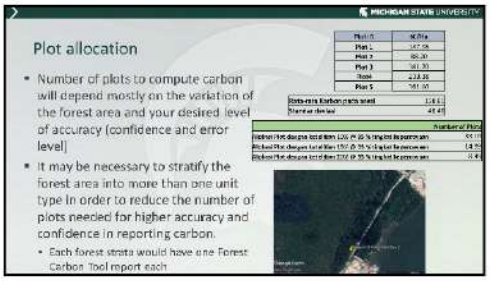

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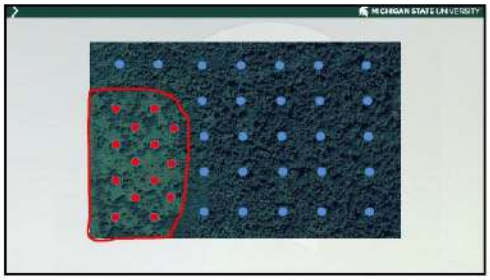

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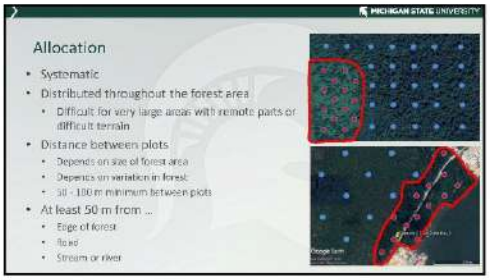

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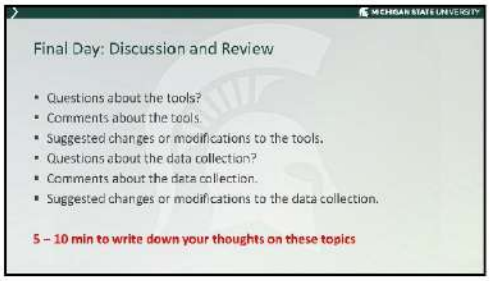

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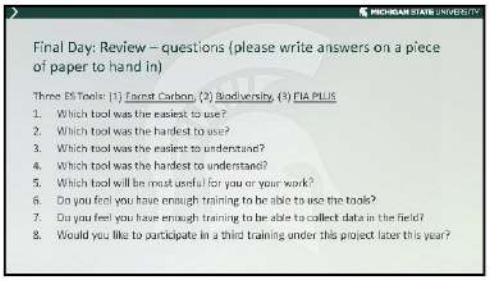

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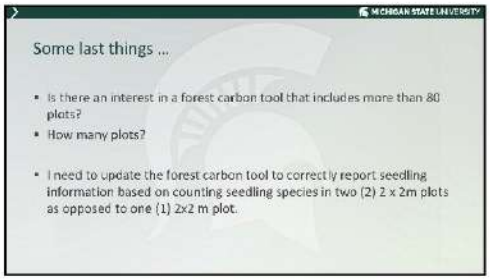

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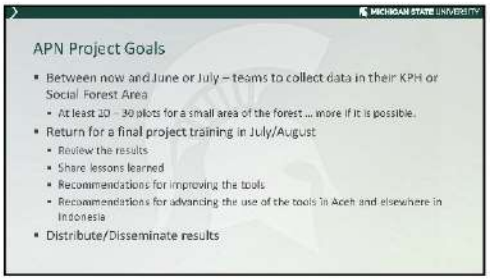

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February 2021

APN Aceh Ecosystem Services (CBA2020-10SY-Samek)

Community-Based Ecosystem Services Measurement, Monitoring and Reporting Tools

Pre- and Post-Training Questionnaire

NAME _____

Please complete the following questionnaire.

Multiple-Choice. Please circle the letter of the correct answer.

Q1. Which item is NOT considered an example of a forest ecosystem service?
a. rattan or bamboo used to make fish traps and baskets
b. honey collected from honey bee hives in trees
c. plants or parts of plants gathered in the forest used for food or spices in cooking
d. electricity used for lights in your house
e. carbon, a greenhouse gas, stored in the forest biomass

Q2. What two measurements of a tree can be used to estimate the tree wood volume?
a. height of the tree and the number of branches
b. the circumference of the root collar (ground level) and the height to the first branch
c. circumference of the tree at 1.3 meters above the ground and the height of the tree
d. the circumference of the root collar (ground level) and the circumference of the tree at 1.3 meters above the ground
e. the width of the tree crown (branches) and the height of the tree

Q3. Which item is NOT a measure of biodiversity?
a. species richness index
b. evenness index
c. Simpson index of diversity
d. Shannon index of diversity
e. carbon index

Q4. Which item present in a forest is an indicator of good forest health?
a. logging trails
b. large trees greater than 80 cm DBH
c. tree stumps from cut trees
d. land clearing for agriculture
e. cleared areas for mining

Q5. Forests that store carbon in its biomass provides what kind of benefit?

a. Mitigates climate change

b. Enhances climate change

c. Encourages climate change

d. Supports climate change

e. Protects climate change

True or False – Circle either True or False

Q6. Collecting honey from honey bee nests in the forest is a type of non-timber forest products (NTFP).

a. True

b. False

Q7. If a person knows the circumference of a tree at 1.3 meters above the ground, then they can estimate how much carbon is in the tree's biomass using an allometric equation.

a. True

b. False

Q8. Sample plots throughout the forest, where data are collected and recorded, provide an estimate of our forest resources. This is useful because it would take too long to observe and record a full inventory of all our forest resources.

a. True

b. False

Q9. The height of a tree can be calculated by measuring the tree's circumference at 1.3 m above the ground.

a. True

b. False

Q10. The absence of a focal species, like the orangutan, in a forest is an indicator of a healthy forest.

a. True

b. False

Pictures

The complete set of pictures from the Phase 1/Phase2 training are archived on Dropbox and can be accessed through this link. Below are several pictures from the four field practicum days.


Ecosystem Services Measurement And Monitoring Tools Workshop
4°9'55", 96°11'28", 9,9m, 356°
11 Feb 2021 12:24:36


Ecosystem Services Measurement And Monitoring Tools Workshop
4°10'0", 96°11'51", 9,9m, 138°


Ecosystem Services Measurement And Monitoring Tools Workshop
4°9'59", 96°11'55",


Ecosystem Services Measurement And Monitoring Tools Workshop
4°9'54", 96°19'28", -7,1m, 338°
11 Feb 2021 10:44:34

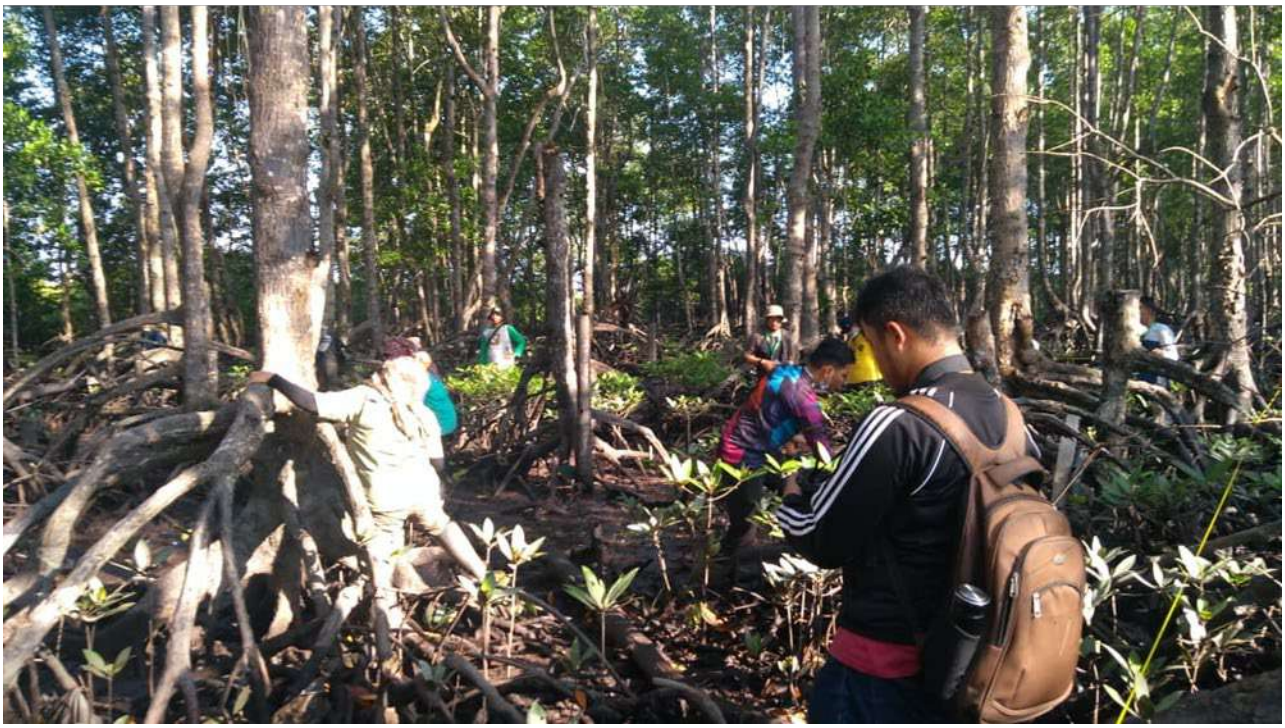

Ecosystem Services Measurement And Monitoring Tools Workshop
4°10'1", 96°11'5", 21,4m, 216°
10 Feb 2021 11:53:04


Ecosystem Services Measurement And Monitoring Tools Workshop
4°10'1", 96°11'51", -16,5m, 6°
10 Feb 2021 13:28:44


Ecosystem Services Measurement And Monitoring Tools Workshop
4°10'1", 96°11'52", -17,4m, 42°
10 Feb 2021 12:54:50


Ecosystem Services Measurement And Monitoring Tools Workshop
4°10'1", 96°11'56", -16,2m, 330°
10 Feb 2021 11:53:26


17 Feb 2021 09:03:39
4°31'9"N 98°0'55"E
Unnamed Road
Kuala Langsa
Langsa Barat
Kota Langsa
Aceh
Ecosystem Services Measurement And Monitoring Tools Workshop

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Unnamed Road
Kuala Langsa
Langsa Barat
Kota Langsa
Aceh
Ecosystem Services Measurement And Monitoring Tools Workshop


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Kuala Langsa
Langsa Barat
Kota Langsa
Aceh
Ecosystem Services Measurement And Monitoring Tools Workshop


Jl. Kolam Renang, Paya Bujok Seuleumak, Langsa Baro,
Kota Langsa, Aceh 24375, Indonesia
Latitude
4.49096383°
Longitude
97.94519174°
Local 09:19:12 AM
GMT 02:19:12 AM
Altitude -4 meters
Kamis, 02-18-2021

Participant Contact Lists

Session1 Training: 7 – 12 Feb 2021 Kota Melaboh, West Aceh Regency, Aceh

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Press Article

A press article was published in two local on-line outlets in Aceh on 17-Feb and 18-Feb-2021 regarding the training and project. Below is the article.

ACEHKINI

NEWS · 17 Februari 2021 20:21

USK Aceh dan Michigan Universtiy Gelar Pelatihan Hitung Karbon Hutan

Konten ini diproduksi oleh ACEHKINI

Peserta pelatihan di Langsa, Aceh. Dok. Subhan Bakri

Michigan State University (MSU) Amerika Serikat (AS) bersama Program Studi Kehutanan Fakultas Pertanian-Universitas Syiah Kuala (USK) Banda Aceh, dan Institut Pertanian (Instiper)-Yogyakarta melaksanakan pelatihan perhitungan cadangan carbon (*carbon stock*) dan *biodiversity* yang dimiliki oleh hutan di Aceh.

Ketua Panitia Pelaksana Pelatihan, Subhan Bakri, mengatakan kegiatan tersebut digelar selama 2 minggu, 7-19 Februari 2021. "Pesertanya sekitar 60 orang dari perwakilan stakeholder bidang kehutanan, akademisi dan kelompok masyarakat yang terlibat dalam berbagai program Perhutanan Sosial," katanya, Rabu (17/2/2021).

Pelatihan bertema *'Ecosystem Service Measurement and Monitoring Tools Workshop'* ini disponsori oleh Asia Pasific Network (APN).

Menurut Subhan, kegiatan dipusatkan di dua lokasi berbeda di Kota Langsa dan Kabupaten Nagan Raya. Mewakili berbagai tipe ekosistem yang dimiliki hutan Aceh, yaitu kawasan pesisir pantai barat Aceh,

yang mewakili kawasan ekosistem rawa gambut dan tanah mineral serta kawasan pesisir pantai timur Aceh yang mewakili kawasan ekosistem *mangrove*.

Subhan menyebutkan pelatihan ini bertujuan memperkenalkan teknik pengumpulan data pengukuran *carbon stock, biodiversity* dan kondisi kesehatan hutan (*forest integrity*) Aceh kepada para pemangku kepentingan dalam upaya mengelola dan mempertahankan kelestarian hutan di Provinsi Aceh.

Hutan di Gayo Lues. Foto: Abdul Hadi/acehkini

Ketua Prodi Kehutanan FP USK, Dr Ashabul Anhar, mengatakan kegiatan tersebut penting sebagai upaya mengetahui, menggali dan menghitung secara akurat berbagai potensi yang dimiliki dan tersimpan di dalam kawasan hutan Aceh.

Data hasil perhitungan dengan menggunakan metode yang dikembangkan oleh Michigan State University, dapat dipertanggungjawabkan secara ilmiah dan digunakan oleh berbagai pihak untuk berbagai kepentingan. "Pengelolaan hutan Aceh membutuhkan konsistensi, sumber daya manusia dan dukungan pendanaan yang besar serta keseriusan Pemerintah Aceh terutama

untuk secara kontinyu memantau perkembangan pengelolaan dan perlindungan hutan yang masih tersisa," katanya.

Saat ini, kata Ashabul, Aceh memiliki lebih dari 3 juta hektar kawasan hutan. Namun dalam pengelolaannya belum dapat menyajikan secara akurat dan aktual berbagai potensi yang dimiliki. Salah satu persoalannya adalah keterbatasan SDM dan pendanaan yang tidak memadai untuk melakukan aktivitas tersebut.

Salah seorang narasumber kegiatan tersebut, Dr. Jay Samek dari MSU, dalam penyampaian materi secara daring, mengatakan tools yang dikembangkan pihaknya tidak hanya berguna untuk mengetahui carbon stock yang dikandung oleh suatu kawasan hutan, namun dapat digunakan untuk merancang pengelolaan hutan secara lestari.

Misalnya untuk melakukan rehabilitasi, maka dapat menggunakan data ketersediaan anakan yang sesuai dengan kondisi lokal dan kelimpahan jenis yang tersedia secara alami di wilayah atau kawasan hutan setempat, tanpa harus mendatangkan jenis dari luar kawasan. "Hal ini penting diperhatikan untuk menghindari rendahnya keberhasilan rehabilitasi hutan dan lahan akibat salah dalam memilih jenis tanaman," katanya.

Peserta pelatikan saat berada di Hutan Kota Suka Makmue, Nagan Raya. Dok. Subhan Bakri

Pelatihan ini juga menghadirkan Siti Maimunah sebagai narasumber penting yang turut serta mengembangkan tools yang dipakai menghitung karbon. Siti Maimunah merupakan sosok penting dalam bidang lingkungan hidup, peraih penghargaan Kalpataru dari Kementerian Lingkungan Hidup dan Kehutanan (KLHK), atas inisiatifnya mengembangkan model hutan pendidikan di Kalimatan Tengah.

Menurut Siti, pelatihan ini dapat berguna bagi KPH untuk mengetahui potensi hutan yang mereka kelola. Target di masa mendatang, KPH

dapat melanjutkan pengumpulan data potensi ini secara mandiri sehingga akan sangat membantu pengelolaan hutan di tingkat tapak, termasuk di dalamnya menyusun rencana kegiatan pengelolaan hutan lainnya. []

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