Sustainable Management of Peatland Forests in Southeast Asia

SEApeat Project - Myanmar Component

Case studies, Specific achievements and Lessons learned

10 - 12 November, 2014
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European Union

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A. Case Studies

1. Title - Experience of Agriculture on Peatland:
A Case Study of Taung Poe Gyi Village

2. Title - Carbon Stock Determination in Peat Soil:
A Case Study of Heho Valley Peatland

B. Main Achievement

C. Lesson Learned

Case Study 1

1. <u>Title</u> : **Experience of Agriculture on Peatland: A Case Study of Taung Poe Gyi Village**

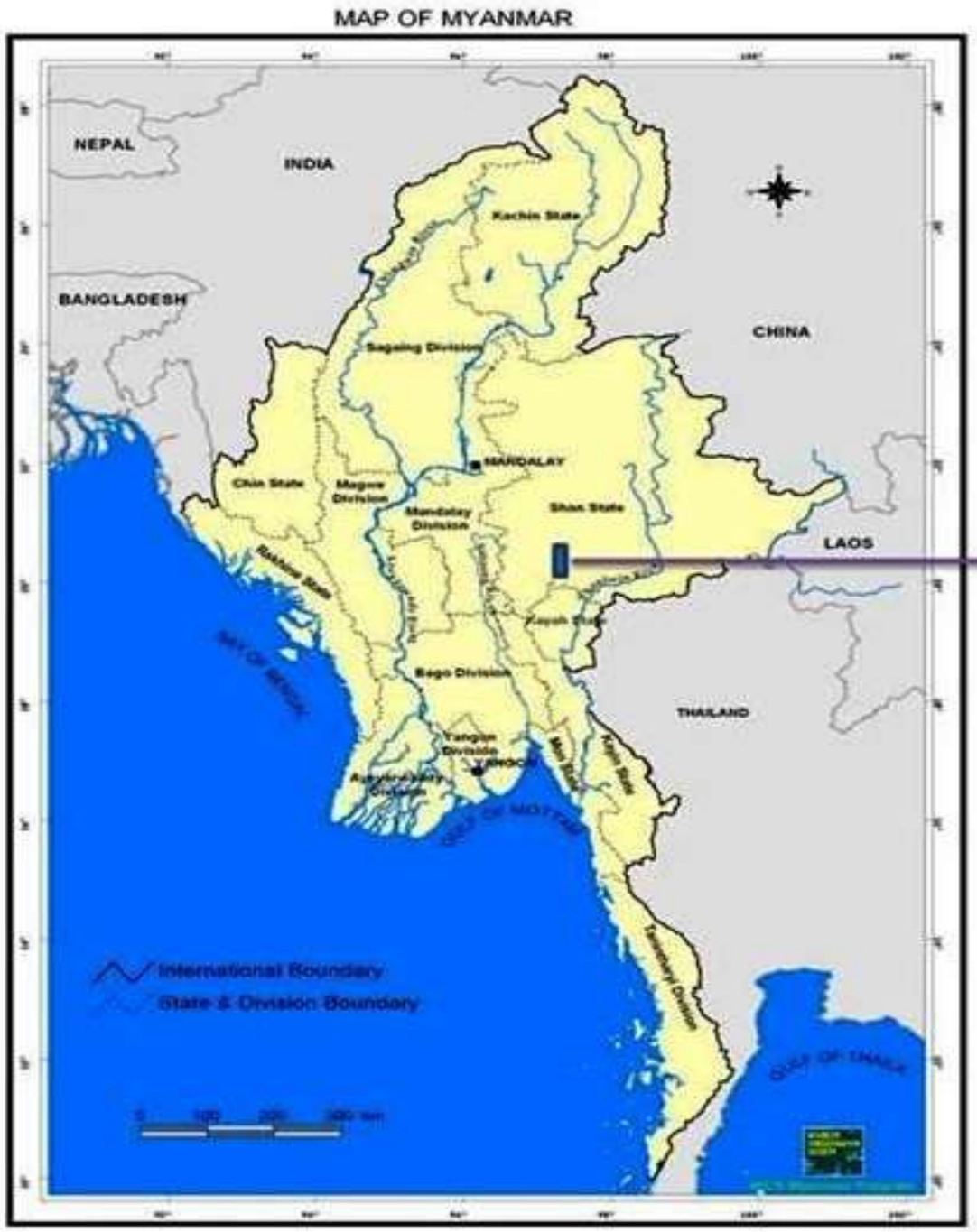
2. <u>Researcher</u> : **Dr. Aung Kyaw Myint**
Assistant Lecturer, Dept. of Agric. Chemistry
Yezin Agricultural University

3. <u>Objective</u> : **To study the agriculture practice of local communities around peatland in Inle area.**

4. Location

Taung Poe Gyi in Inle Lake area

- One of the villages on north-western part of Inle Lake.



Inle Lake

- Second largest inland lake in Myanmar
- Globally important for fish diversity, endemism and highest macrophyte diversity in Myanmar
- The flora of the lake is very diverse and has a very high biomass.
- Much of the lake bottom is covered by water plants.

5. Site description

Taung Poe Gyi - situated on north-western shore of Inle Lake

- 124 households with a population of 360
- Main livelihood is agriculture and fishing
- Major cultivating crops: vegetables such as tomato, cabbage, onion, eggplant, flower, etc.
- Surrounding area is covered with floating peat at the lake side and, on the other hand, the agricultural lands on peat soils.
- In the ancient time, the whole village area was assumed to be under the water level of the Inle Lake.

Agriculture around peatland in Inle area

6. Methodology

(a) Collection of Information

- collected general information of Inle Lake area and Taung Poe Gyi village in March, April and June, 2013.
- conducted a questionnaire-based survey with some households in the village, to explore their socio-economic situation, educational levels, and incomes.
- conducted in-depth interview with local farmers in order to understand how peatland played an important role in their agriculture practices.

(b) Collection of Soil and Water samples

- **11 water samples were collected from Inle Lake, stream near the village, natural water resources around the village in March, 2013.**
- **23 soil samples were collected during March-June, 2013. Water and soil samples were sent to the laboratory of Department of Agricultural Research (DAR) for lab analysis**
- **The physiochemical properties of the soil and water sample were analyzed**

7. Finding

1. Taung Poe Gyi Peat mound was found under protection for water source
2. Some peatlands are under agriculture as main source of income
3. Available Nitrogen, Phosphorus and trace elements accumulation was high due to excessive fertilizer application
4. The upper layer of peat profiles are most heavily contaminated by human action for agricultural procedure
5. Small drainage is done in the agricultural fields for better crop production
6. Generally, the analysis results of physiochemical properties of the soil samples are suitable for agricultural crop production

8. Recommendation

1. Water table should not be lower than 30-45 cm below the soil surface; depth of drainage canal 1-1.5 m; and not closer spacing than 100 m.
2. Timing of fertilizer application should be so that plant uptake is maximized and any potential effects on the environment are minimized.
3. Selection of suitable crops that grow well with minimum cultivation and drainage is necessary.
4. Suitable method of cultivation such as direct sowing should be applied in order to reduce direct effect on soil
5. Burn anything should be avoided near or on peatland in dry season
6. It is important to study heavy metals concentrations in peatlands of Taung Poe Gyi as a future perspective.

Case Study 2

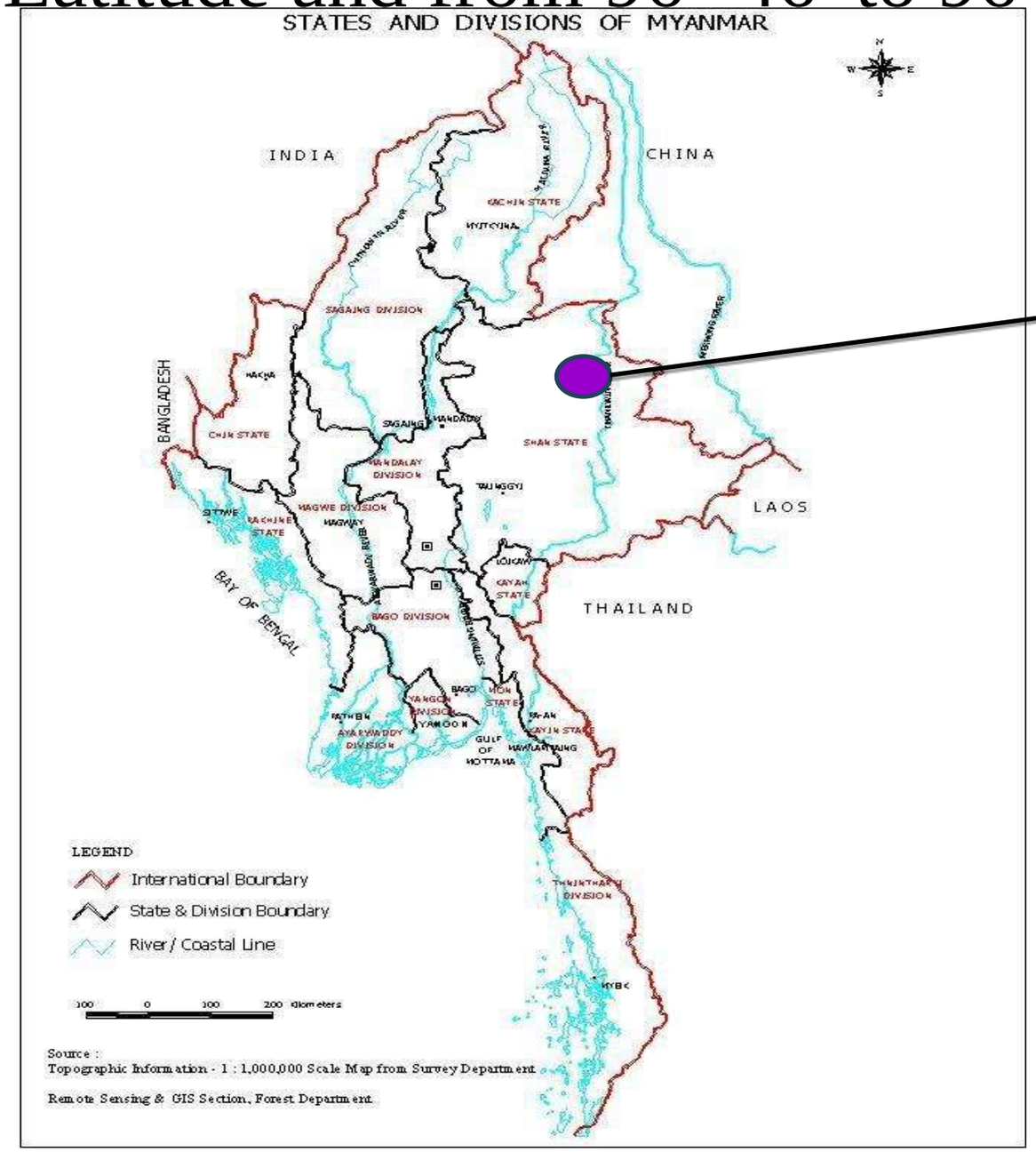
1. <u>Title</u> : Carbon Stock Determination of Peat Soil
A Case Study of Heho Valley Peatland

2. <u>Researcher</u> : Daw Thida Swe
Research Assistant (II)
Forest Research Institute, Forest Department

3. <u>Objective</u> : The main objective of this study, is to assess the carbon storage and carbon density of peatland area in Heho Valley.

4. Location

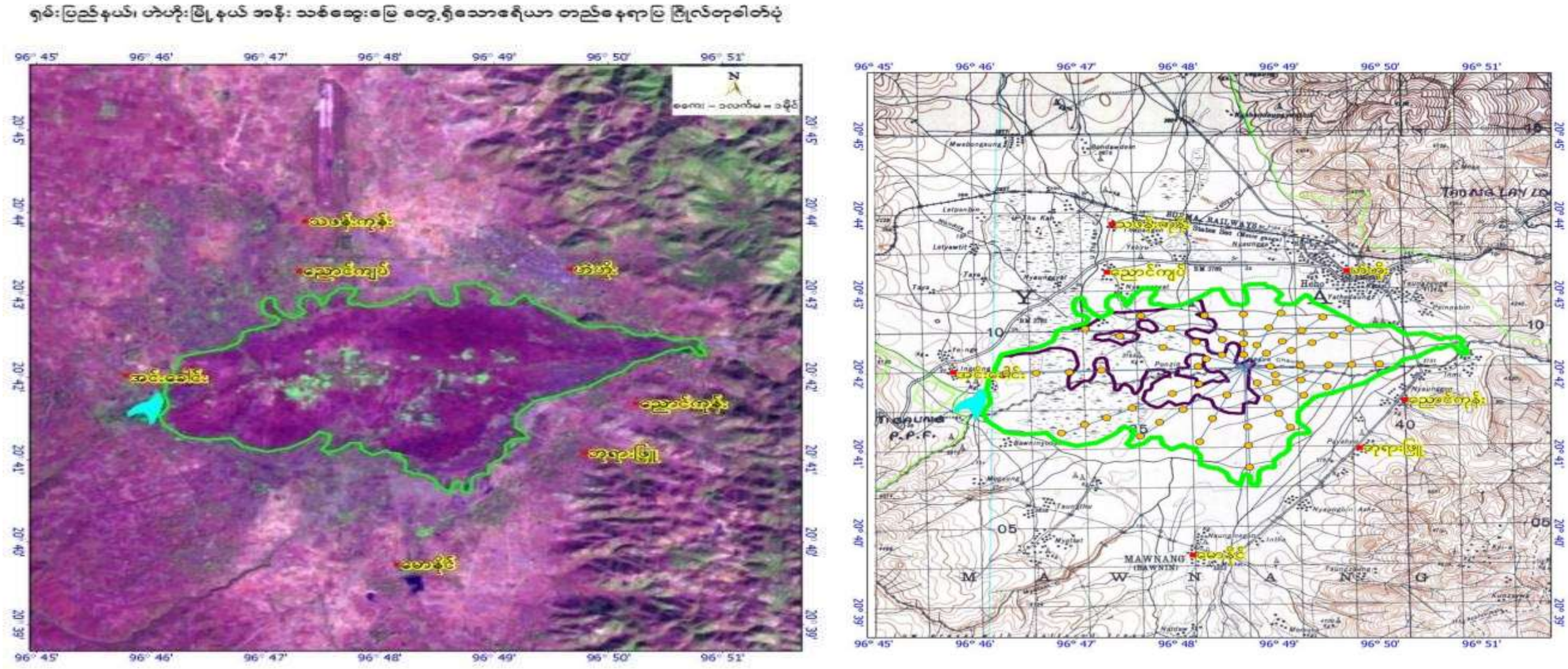
The study area is situated in Heho valley, Kalaw township, Southern Shan State which lies from 20° 40′ to 20° 43′ North Latitude and from 96° 46′ to 96° 50′ East Longitude.



5. Site description

The Heho valley peatland is 1684 ha in area and hidden underneath a layer of mineral soil and currently used as an agricultural land for growing cabbage, garlic, onion, potato, corn, mustard etc.

Elevation = 1320 m a.s.l.
Temperature = 15° to 35° C
Annual rainfall = 800 – 1010 mm



6. Methodology

(1) Field survey

(a) Sampling design - Sampling points were distributed on a grid system of transects across the area to have evenly distribution on the whole study area. Peat soil data were collected in every point at 400 m interval along the base line and side line transects.

(b) Peat depth - It was measured at 1m depth increment and measured using Edelman auger. A total of 91 soil samples were collected for lab analysis of variables such as carbon concentration, bulk density and peat maturity.

(2) **Lab methods**

(a) ***Peat maturity*** **-** The fibre content was calculated by using the following equation;

$$\text{Fibre content} = \text{Vol 2} / \text{Vol 1} \times 100\ \%$$

where as Vol 1 = volume of soil filled and pressed in syringe
Vol 2 = volume of coarse fibres left after washing out on 0.0059 inch sieve

Then peat maturity was estimated based on the following criteria:

- Sapric peat or well decomposed peat with a fibre content less than 15 %
- Hemic peat or half-decomposed peat with fibre content 15-75 %
- Fibric peat or immature peat with fibre content greater than 75 %

(b) ***Bulk density*** **-** Peat BD was determined in the laboratory by a gravimetric method.

$$BD = M_{ds} / V_s$$

Where M_{ds} is dry weight (g) of sample and V_s is the sample volume (cm^3)

(c) ***Moisture content*** **-** It was determined by drying a peat soil sample at 105°C as described by ASTM standard.

$$\text{Moisture Content \%} = [(A–B)\times 100] / A$$

Where:

A= mass of the as-received test specimen,g, and

B= mass of the oven-dried specimen,g

(d) ***Organic matter content*** **-** The carbon concentration was measured as a proportion of organic matter content by using loss-on-ignition method.

$$LOI\ (g / kg) = (Weight_{dry} - Weight_{ignition}) / Weight_{dry} \cdot 100 \quad (1)$$

(e) ***Organic carbon stock*** **-** The organic carbon stock based on the survey and laboratory data, peatland organic carbon stock (OCS) was estimated using the following equation.

$$\text{Peatland Carbon Stock } (kg\ C\ m^{-2}) = C_{g/kg} \times BD \times Ds \times A \quad (2)$$

Where:

$C_{g/kg}$ = carbon concentration on gravimetric basis ($g\ kg^{-1}$)

BD = bulk density ($g\ soil\ cm^{-3}$ or $kg\ soil\ m^{-3}$)

D_s = peat depth (m)

A = area (m^2)

7. Findings

Total carbon stored at the study area

	Range	Average
Peat thickness (cm)	15 - 295	110 (77)
Bulk Density (g/cm^3)	0.11 - 0.34	0.23 (0.06)
Moisture Content (%)	52 - 86	71 (8)
Peat Maturity		Hemic
Carbon Density (kg/m^2)	0.39-8.02	2.9 (1.7)
Total Carbon stock (t/ha^1) of thickness < 200 cm > 200 cm	60 - 817 217 - 476	268 (168) 285 (97)
Total Carbon stock (t/ha^1)		287 (214)
Total Carbon stock (M tons/area)		0.48 (0.35) *
tCO_{2e} (t/ha^1) 287×3.67		1053
tCO_{2e} (M tons/area) 1054 t × 1684 ha = 1773252		1.8 *

8. Conclusions

- TOC contents were relatively lower than that of peatlands in other SE Asia countries, which may be due to the historical (peat extraction, drainage) and current land uses.

- The higher bulk density and lower organic carbon in this study area may be due to the lowering of the water table and the subsequent increased aeration of the peat due to drainage preparation for agriculture purpose.

- Although carbon stocks of the peatland in Heho valley are relatively low, they can be a significant source of vulnerable C which will be able to be transformed to carbon dioxide to release into the atmosphere if the peatlands is drained or converted to agriculture for a long period.

- Therefore, planning the wise use of the peatland with low carbon emissions is urgent needed.

B. Key Achievement in Phase I

Activity	Completion	Achievement
1. Peat Assessment	Collected (385) soil samples at (159) locations in 27 townships in 9 States/Regions	(36%) is peat soil Inle Lake = 9106 ha Heho Valley = 1626 ha Htu Lake = 502 ha
2. TOT, Replicated training workshop, and Technical workshop	TOT at Nyaung Shwe (Inle Area) 7 Replicated trainings (Townships) Technical workshop (at Nay Pyi Taw)	262 trainees from FD, ECD, AD, SLRD, ID, and NGOs
3. Awareness of Community	18 villages in Inle Lake Area and 17 Villages in Htu Lake Area, Ayeyarwady Region	320 villagers attended in Inle Lake Region and 330 villagers attended in Htu Lake region
4. Case Studies for BMP	2 Case studies in 2013 1 Case Study in 2014	3 case studies conducted
5. Translation and publication of hand-outs	-APMS and Training Module were translated and printed for Departmental use - Publication of booklets, pamphlets, hand-outs, and posters, etc.	Distributed about (400) copies of APMS and Training Module and about (700) sets of awareness materials to the communities

C. Lessons Learned

1. Peatsoil is a new subject and both technical staff and communities have only a few knowledge about Peatsoil. Training and awareness campaign are essential in other remaining areas.
2. Peatland project could not be successfully implemented without cooperation of local authorities with full understanding on important function of peatland.
3. More departments such as Irrigation Department, Fishery Department need to get involved in addition to Forest Department, Agricultural Department, Settlement and Land Record Department since some lake also concerns with those departments.
4. Most of the communities would like to conserve the peatland without affecting their livelihood and hence sustainable livelihood improvement should be given priority.
5. Some of the peatland were seriously degraded and need rehabilitation and effective conservation activities in future.
6. Specific rules and regulation need to be initiated for sustainable development of peatland and its livelihood.