กรมพัฒนาที่ดิน
LAND DEVELOPMENT DEPARTMENT

Soil Survey and Soil Mapping under the collaboration project of ACMECS: Case Study Sin Thay Sub-watershed Area, Tatkone Township, Nay Pyi Taw

Thin Nwe Htwe

Staff Officer

23rd October 2017

Soil Classification in Myanmar

- Agricultural Planning Commission made a classification mainly based on data of aerial photo interpretations in 1955-1957.

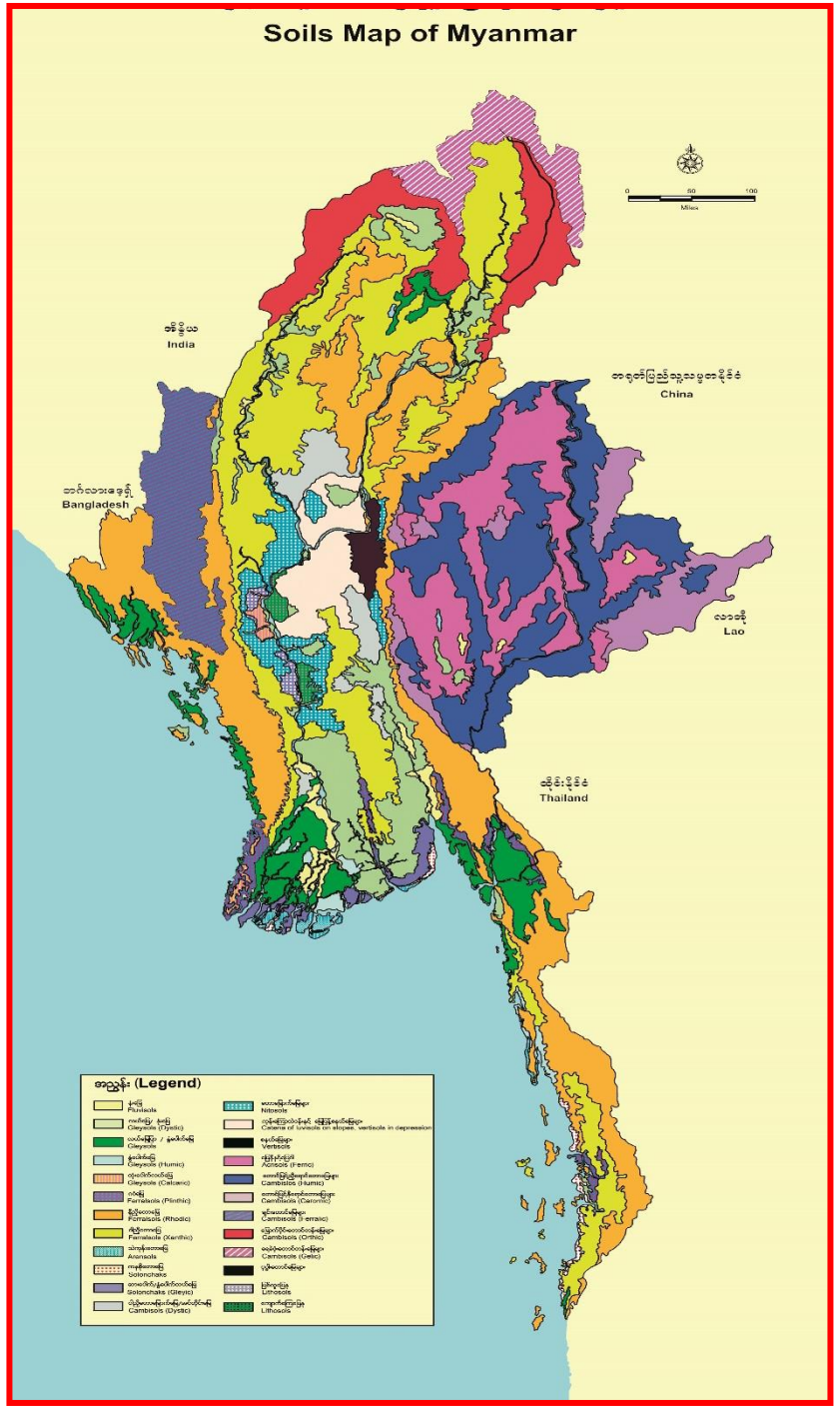
- Land Use Bureau made a general scientific classification with the help of Soviet Soil Expert in 1957 based on the Russian system.

- As it needs to revise, redefine for adoption, a new classification system was imperatively needed.

- The old classification system was modified in 1970 by Land Use Division of Myanmar Agriculture Service to correlate it with the FAO/UNESCO Classification.

- Currently, Land Use Division, DOA is doing soil survey and soil mapping for district and township level of Myanmar.

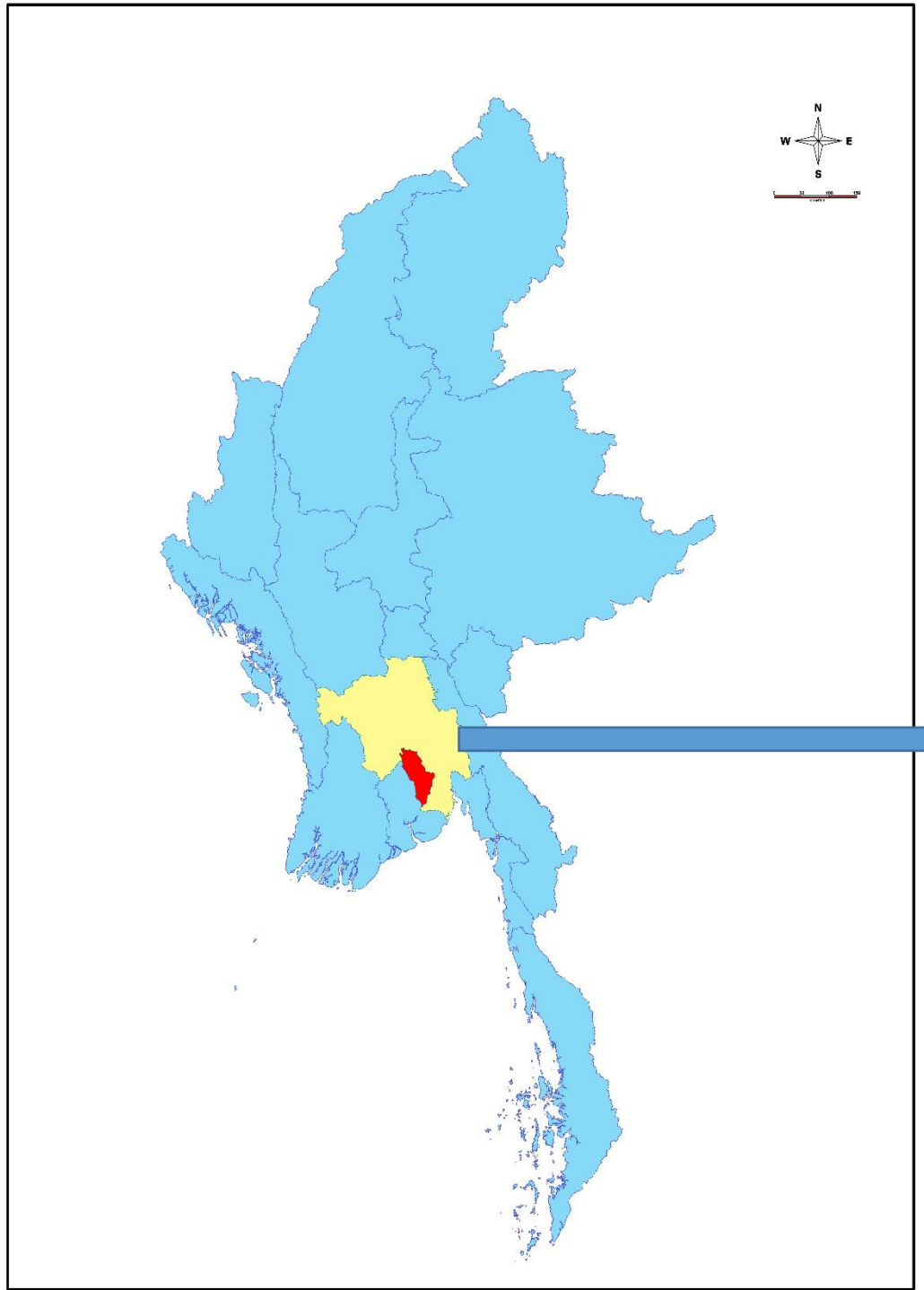
Main Soil types of Myanmar

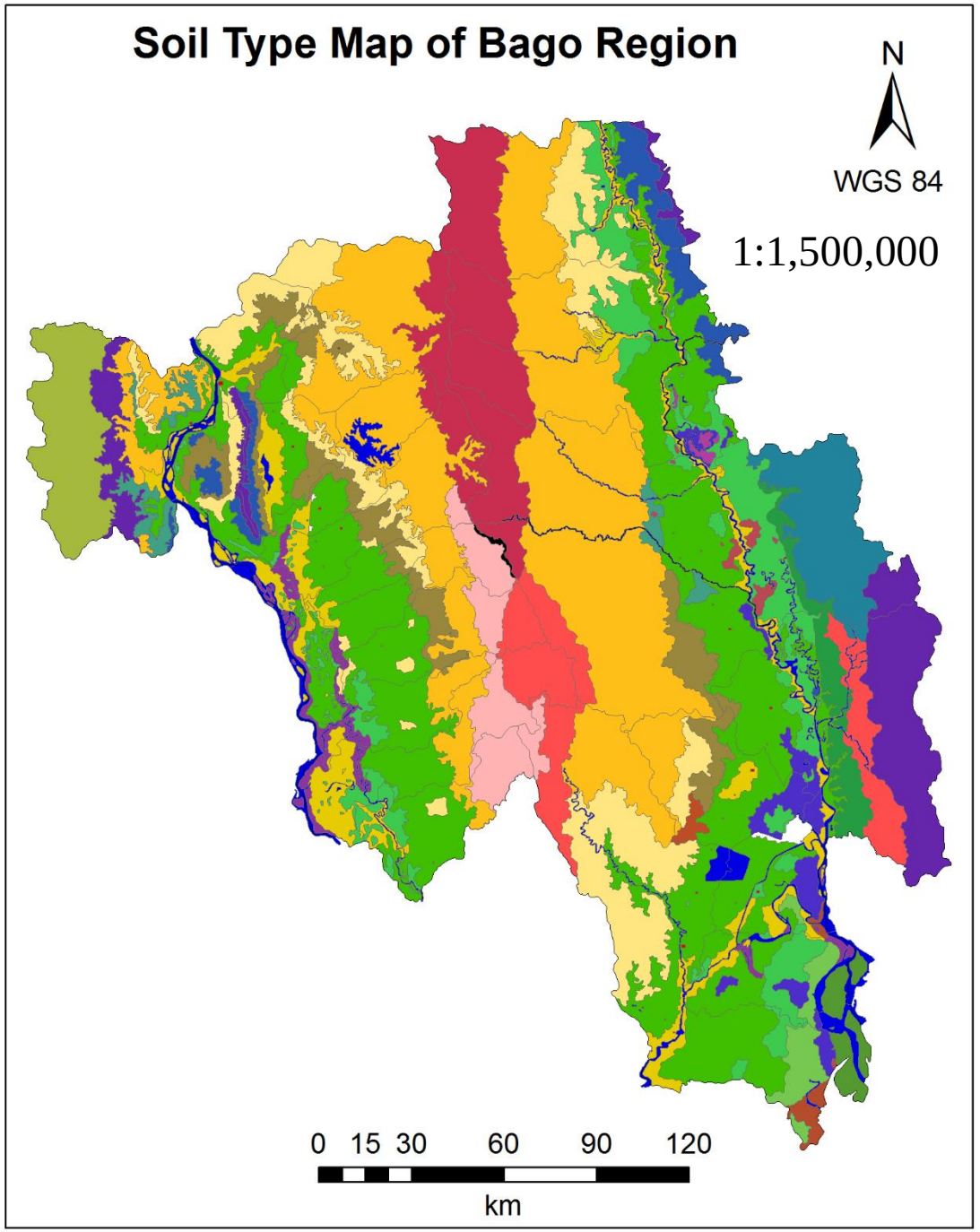


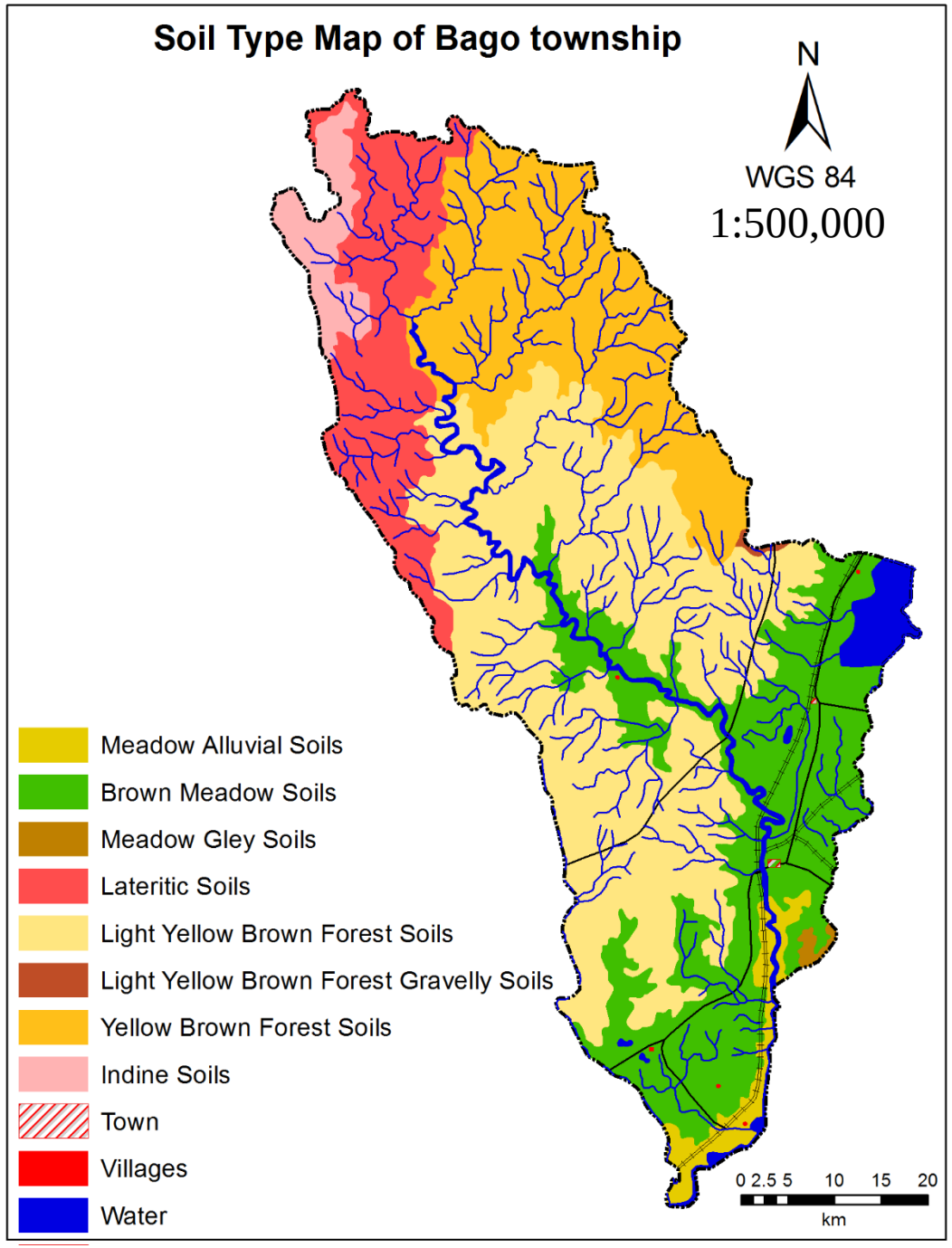
No.	FAO Classification	USDA Classification	Area (000 ha)	(%)
1	Fluvisol	Fluvents	736	1.1
2	Gleysol	Inceptisols & Fluvents	3051	4.5
3	Gley Gleysol	Inceptisols	555	0.8
4	Calcaric Gleysol	Inceptisols	55	0.1
5	Swampy Gleysol	Inceptisols	2241	3.3
6	Vertisol	Vertisols	482	0.7
7	Catena of Luvisol	Alfisols, Vertisols	1781	2.6
8	Acrisol	Ultisols	4130	6.1
9	Cambisol	Inceptisols	1085	1.6
10	Radic Ferralsol	Oxisols	9971	14.7
11	Xanthic Ferralsol	Oxisols	8363	12.4
12	Arenosol	Entisols	244	0.4
13	Othic Cambisol	Inceptisols	2461	3.6
14	Gelic Cambisol	Inceptisols	2596	3.8
15	Histic Cambisol	Inceptisols	6287	9.3
16	Chromic Cambisol	Inceptisols	1370	2
17	Plimthic Ferralsol	Oxisols	588	0.9
18	Lithosol	Lithic Sub Group	241	0.4
19	Andosol	Inceptisols	46	0.1
20	Humic Gleysol	Inceptisols	203	0.3
21	Solomchak	Inceptisols / Aridisol	42	0.1
22	Cambisol	Inceptisols	530	0.8
23	Lithosol(Purfy primitive crusted store)	Lithic Sub Group	290	0.4
24	Orthic Cambisol	Inceptisols	2188	3.2
25	Not suitable for crop		18123	26.8

Soil Survey

To prepare district/township level of soil type map


N
W
E
S


Soil Type Map of Bago Region
N
WGS 84
1:1,500,000
0 15 30 60 90 120
km

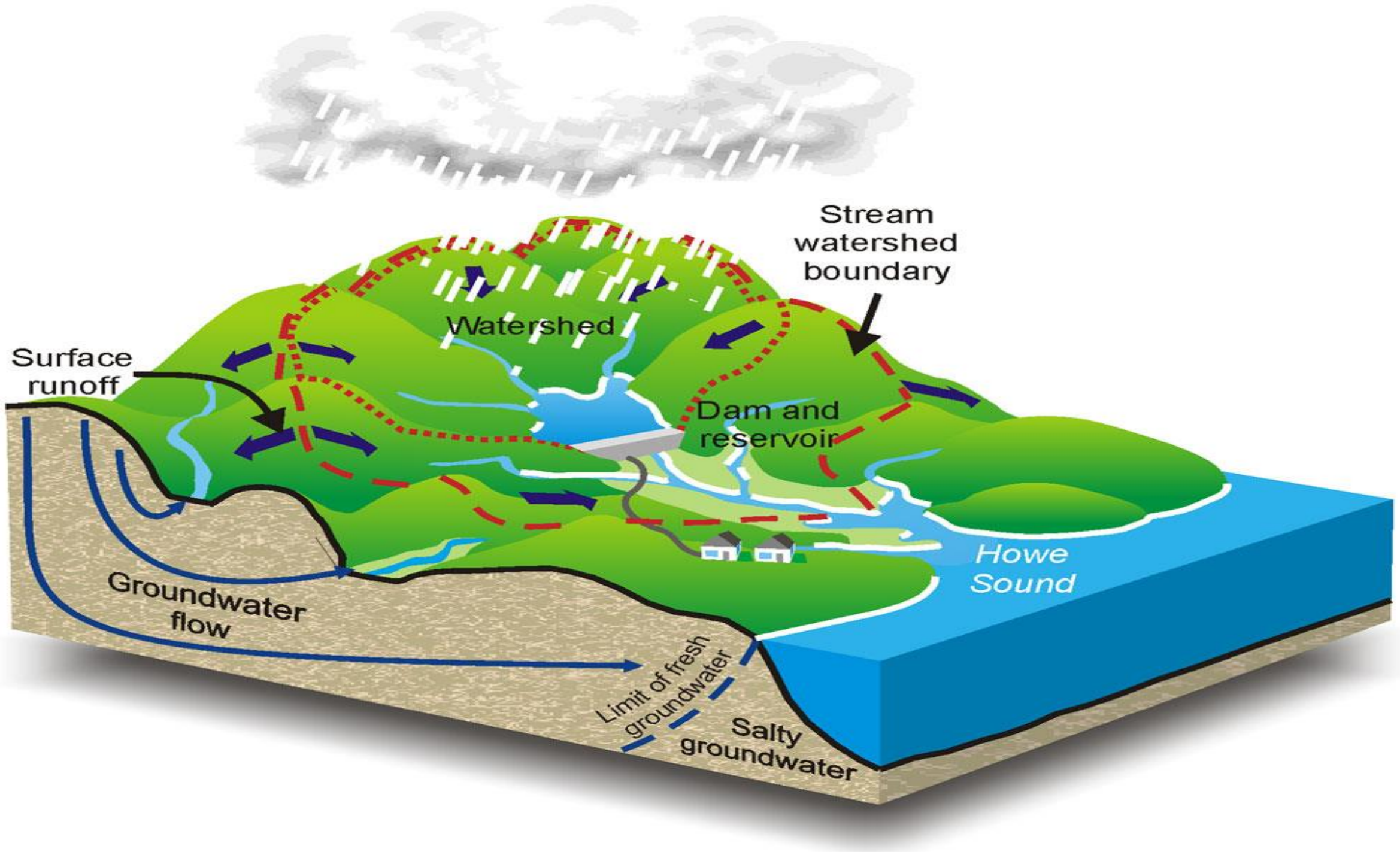

Soil Type Map of Bago township
N
WGS 84
1:500,000
Meadow Alluvial Soils
Brown Meadow Soils
Meadow Gley Soils
Lateritic Soils
Light Yellow Brown Forest Soils
Light Yellow Brown Forest Gravelly Soils
Yellow Brown Forest Soils
Indine Soils
Town
Villages
Water
0 2.5 5 10 15 20
km

No.	Zonal (Older) System	FAO/UNESCO Soil Classification	USDA Soil Taxonomy
1.	Meadow Alluvial Soils (နုံးရောလယ်မြေ)	Eutric Gleysol	Aquents / Aquepts
2.	Brown Meadow Soils (လယ်မြေ)	Eutric Gleysol / Humic Gleysol	Aquents / Aquepts / Histic Aquepts
3.	Meadow Gley Soils (လယ်မြေပြာ)	Eutric Gleysol / Humic Gleysol	Aquents / Aquepts / Histic Aquepts
4.	Lateritic Soils (ဂဝံမြေ)	Dystric Nitosol	Udults / Ustults
5.	Light Yellow Brown Forest Soils (ဝါညိုဖျော့တောမြေ)	Xanthic Ferralsol	Oxisol
6.	Light Yellow Brown Forest Gravelly Soils (ကျောက်ရောဝါညိုဖျော့တောမြေ)	Xanthic Ferralsol	Oxisol
7.	Yellow Brown Forest Soils (ဝါညိုတောမြေ)	Xanthic Ferralsol	Oxisol
8.	Indine Soils (အင်တိုင်းမြေ)	Orithic Cambisol	Tropepts

Soil Classification in Myanmar

- Agricultural Planning Commission made a classification mainly based on data of aerial photo interpretations in 1955-1957.
- Land Use Bureau made a general scientific classification with the help of Soviet Soil Expert in 1957 based on the Russian system.
- As it needs to revise, redefine for adoption, a new classification system was imperatively needed.
- The old classification system was modified in 1970 by Land Use Division of Myanmar Agriculture Service to correlate it with the FAO/UNESCO Classification.
- Currently, Land Use Division, DOA is doing soil survey and soil mapping for district and township level of Myanmar.

- In 2016, Land Use Division, DOA is collaborating with LDD, Thailand under the ACMECS project , WRB Soil Classification System is introduced in Sin Thay Sub-watershed area, Tatkone Township, Myanmar.


Stream
watershed
boundary
Watershed
Surface
runoff
Dam and
reservoir
Howe
Sound
Groundwater
flow
Limit of fresh
groundwater
Salty
groundwater

Objective

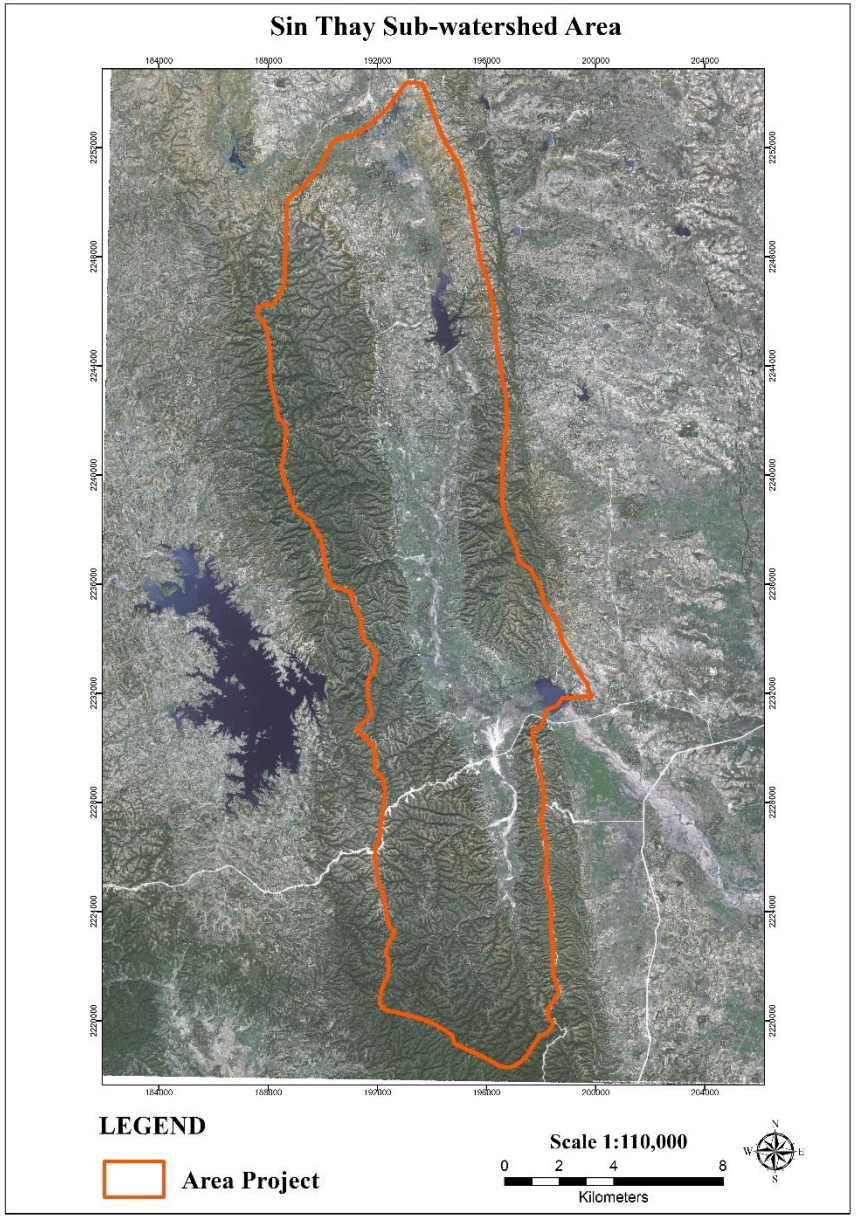
Strategy 1 Database for soil resource and land use planning

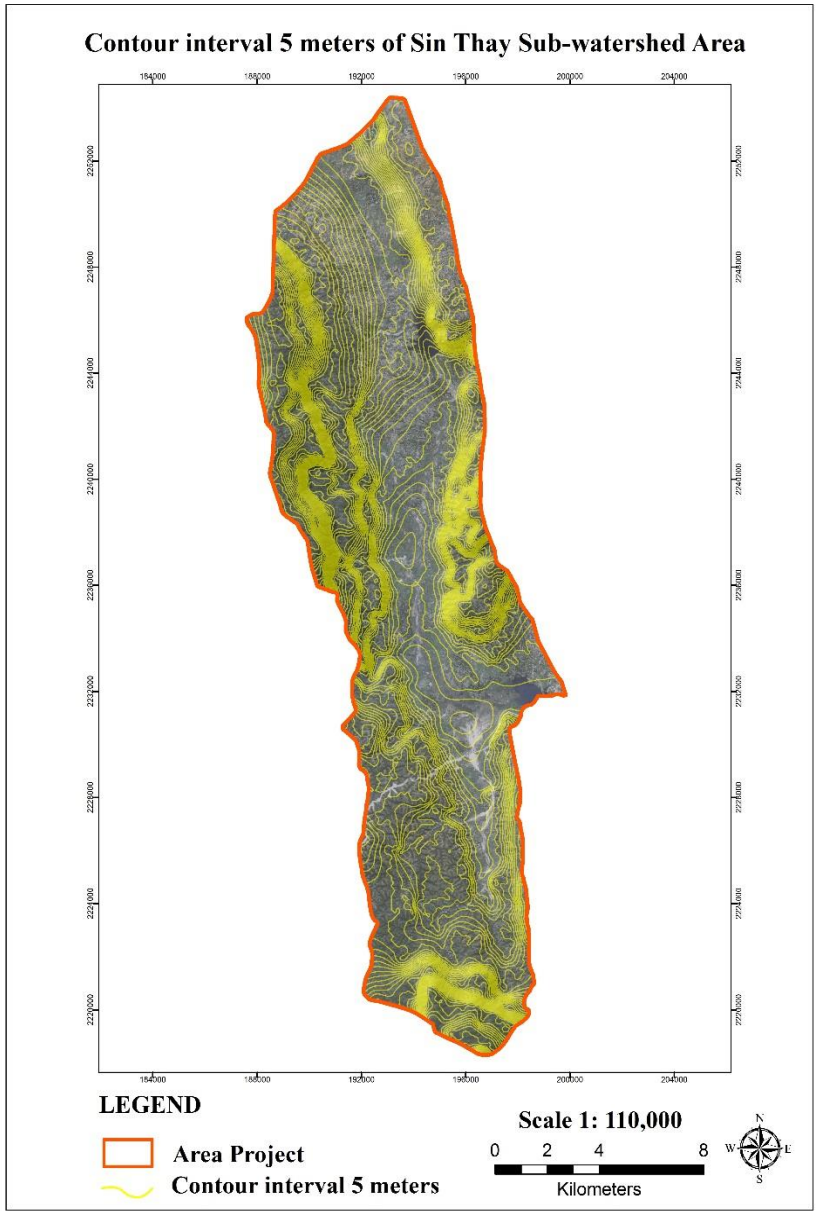
- 1. Soil survey: soil resources database/soil mapping/soil interpretation/soil analysis/soil monolith
- 2. Land area potential assessment: present land use mapping/socio-economic survey/land use planning/land evaluation

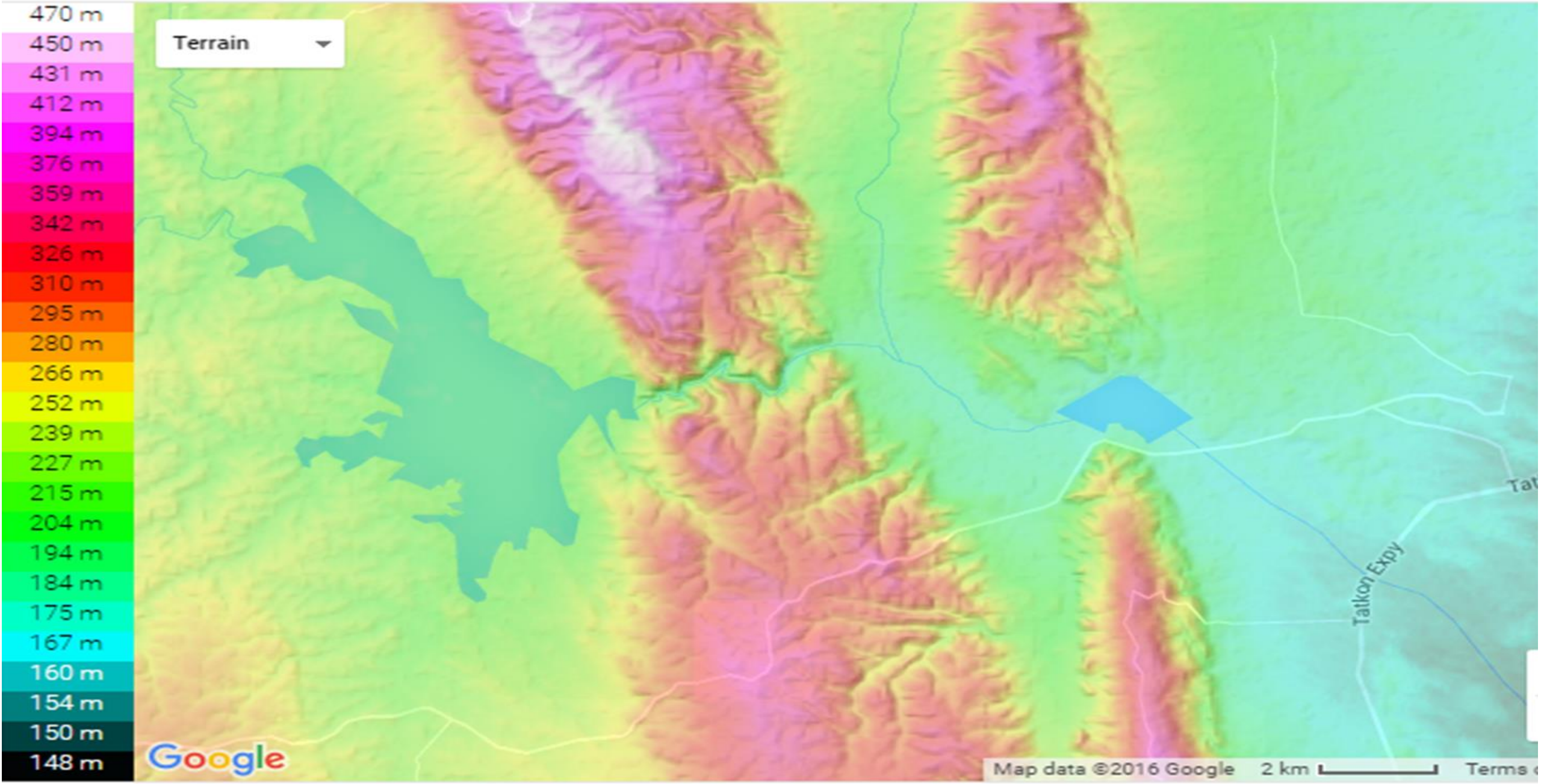
The Cooperative Project on Agricultural Development
Through Contract Farming (AC-4)
24 July 2015
Regent Chalet Hotel Cha-Am Petchaburi Thailand

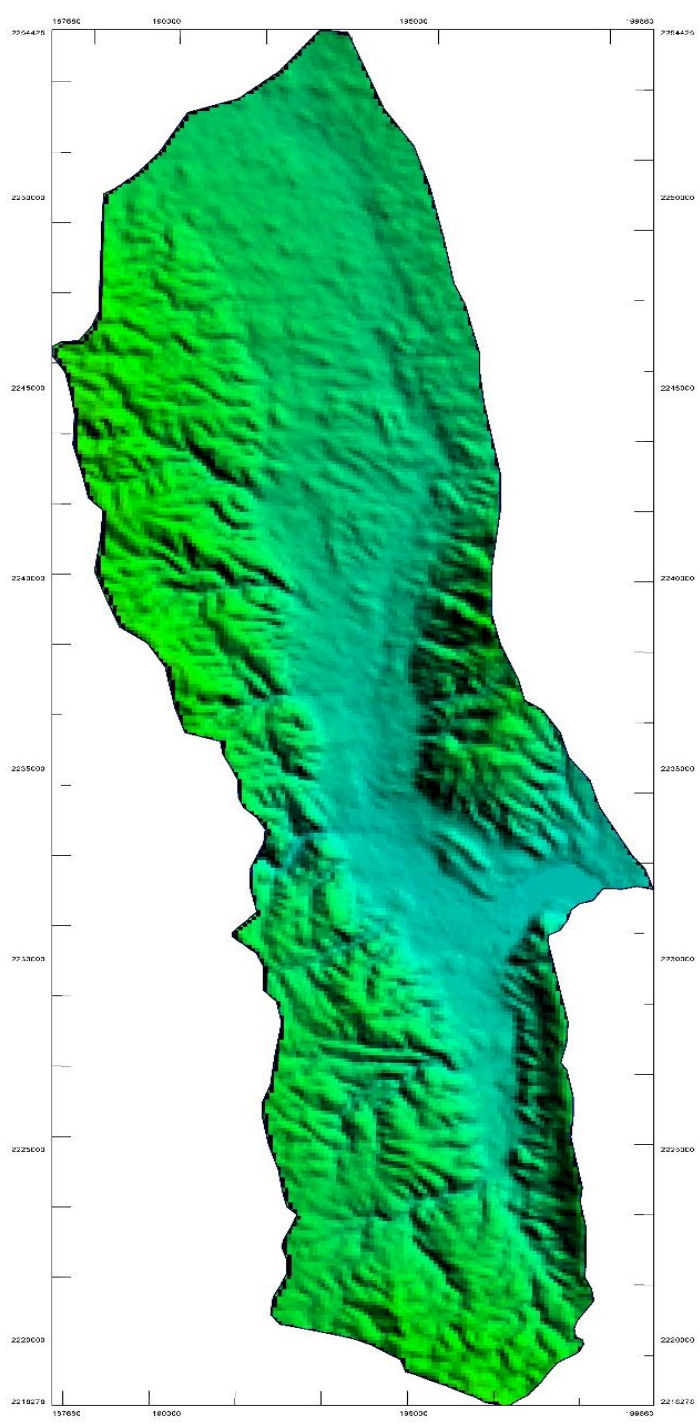
Training Course on
"Introduction to Soil Survey and Land Use Planning"
for Officials of Cambodia, Lao PDR and Myanmar
Under the collaboration project of ACMECS
14-24 March 2016
Thailand

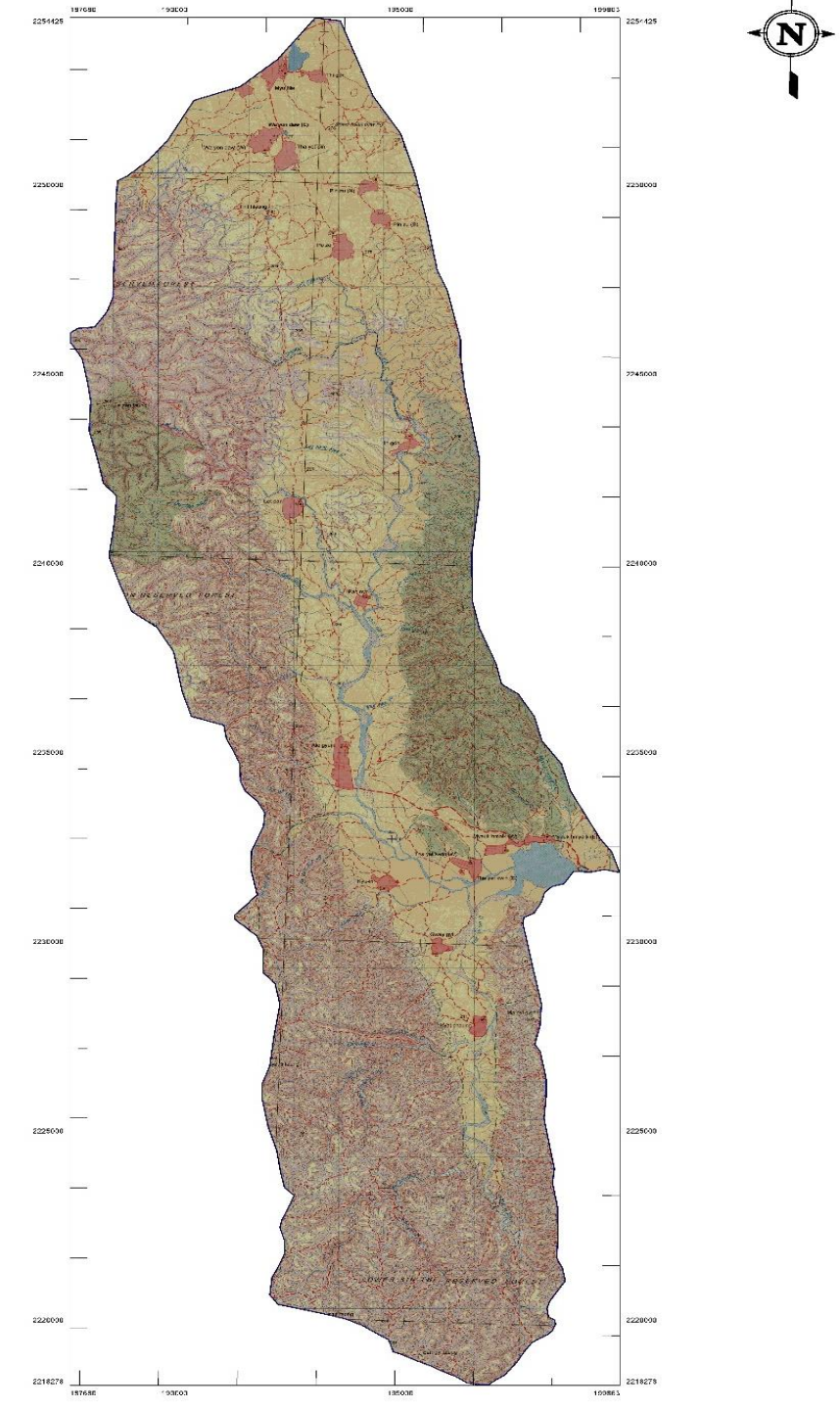
Mapping in San Thay Sub-Watershed area






470 m
450 m
431 m
412 m
394 m
376 m
359 m
342 m
326 m
310 m
295 m
280 m
266 m
252 m
239 m
227 m
215 m
204 m
194 m
184 m
175 m
167 m
160 m
154 m
150 m
148 m
Terrain
Google
Map data ©2016 Google
2 km
Tatkon Expy


157650
160000
195000
199860
2254425
2250000
2245000
2240000
2235000
2230000
2225000
2220000
2218278
N


157650
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2254425
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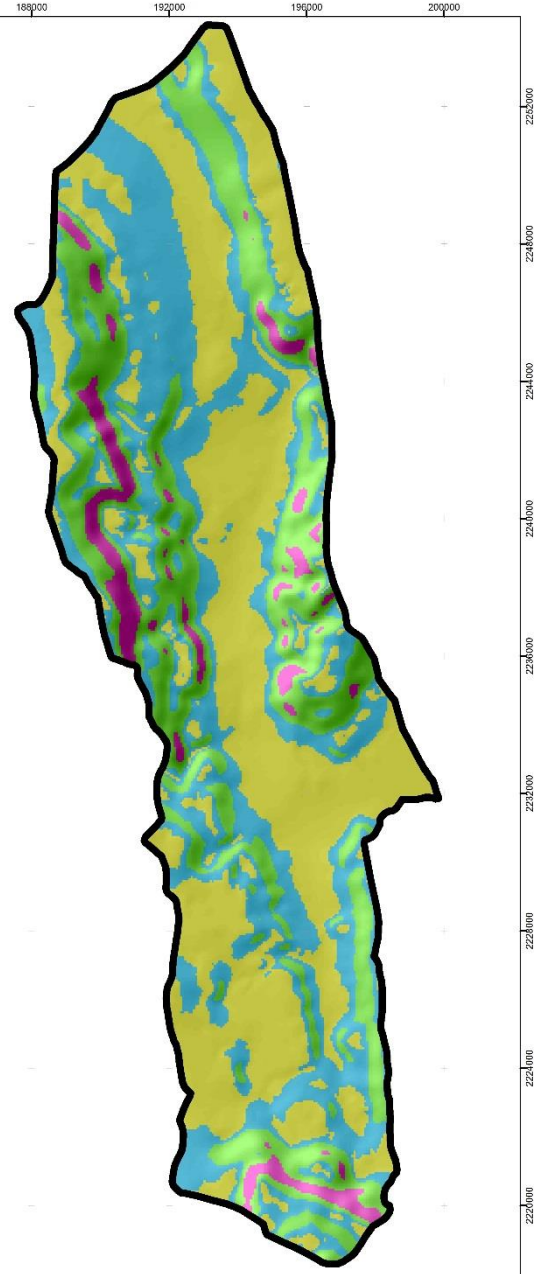
2245000
2240000
2235000
2230000
2225000
2220000
2218278
N

Slope Class Map of Sin Thay Sub-watershed Area



LEGEND

Area Project

Slope Class (%)

- 0-2 Flat to nearly flat
- 2-5 Gently undulating
- 5-12 Undulating
- 12-20 Rolling

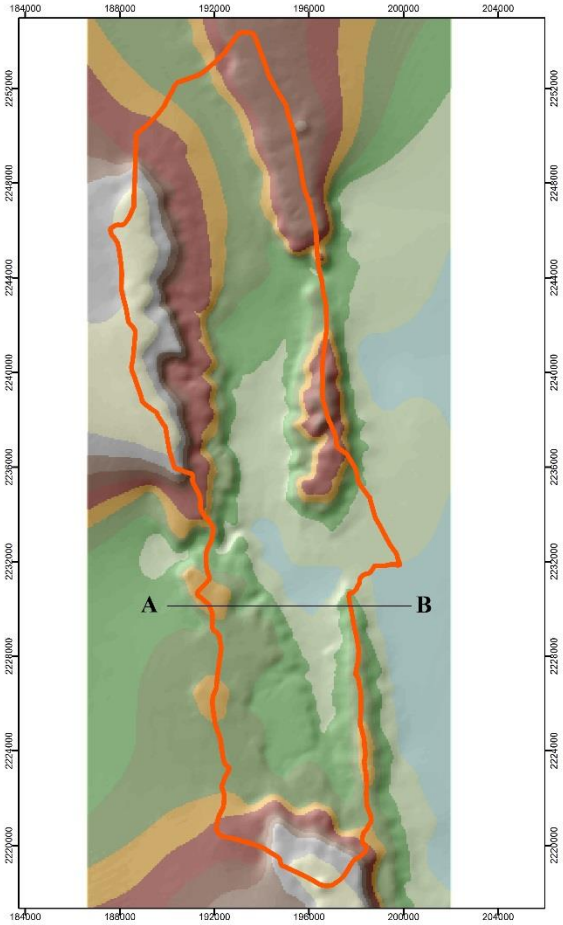
N
W E
S

Scale 1: 100,000

0 2 4 8

Kilometers

Elevation of Sin Thay Sub-watershed Area



LEGEND

Area Project

Elevation (m.)

- 156 - 191
- 191 - 216
- 216 - 244
- 244 - 270
- 270 - 295
- 295 - 323
- 323 - 353
- 353 - 386
- 386 - 421
- 421 - 479

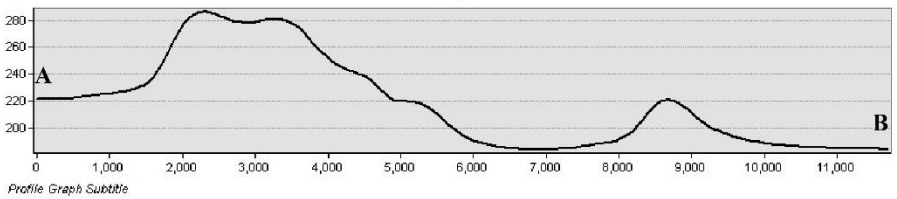
N
W E
S

Scale 1:145,000

0 2 4 8

Kilometers

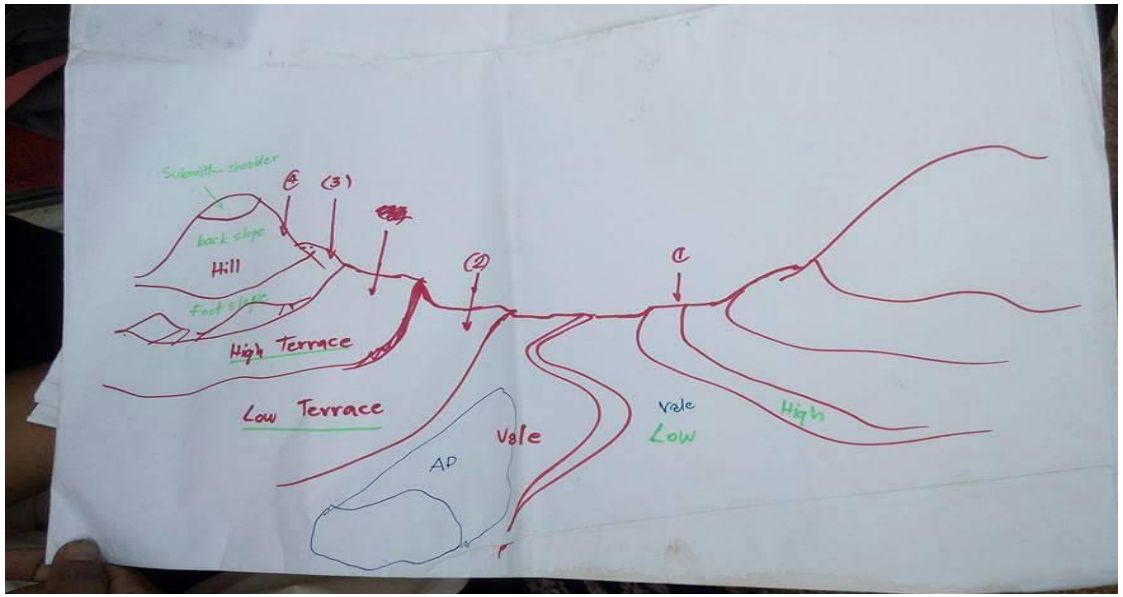
Profile Graph Title

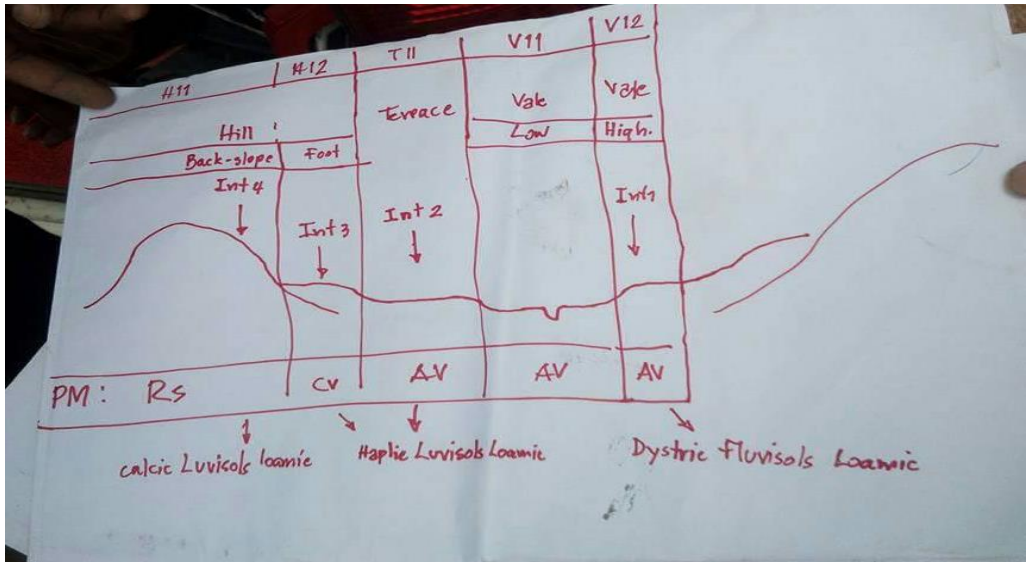


Profile Graph Subtitle

- **Soil survey and mapping : Technique**

Area Approach : Relation between soil and landform





Activity in Myanmar (10-16 july 2016):

- Soil survey and mapping : Process /Method

Soil Survey in Sin Thay Sub-Watershed Area

LDD pH Test Kit
pH

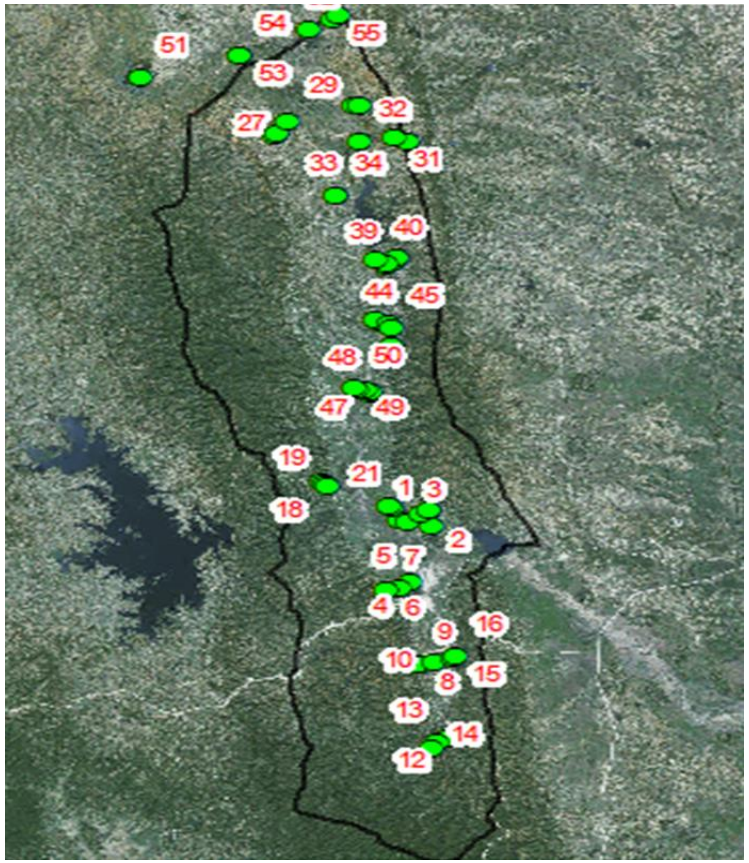
ST
GW(5)
110
130
150
170
190

ST 9
KK 2
130
150
170
190

ST 22
ALK 6
110
130
150
170
190

Activity in Myanmar (2016):

- Soil survey and mapping : Soil analysis results for soil classification base on WRB



DEPARTMENT OF AGRICULTURE (LAND USE)
SOIL ANALYTICAL DATA SHEET

Division - Nay Pyi Taw
Township - Tatkone

Sheet No. 5
Lab No. S 1506-1514 / 16-17

Sr. no.	Lab No.	Sample Plot	Depth in centimeter	Texture				INTERPRETATION OF RESULT
				Sand %	Silt %	Clay %	Total %	Texture
41	1506	Profile 9.	52-69	3.40	84.45	10.50	98.35	Silt
42	1507	Profile 9.	69-102	5.00	74.35	19.35	98.70	Silt loam
43	1508	Profile 10.	0-17	52.90	38.85	6.75	98.50	Sandy loam
44	1509	Profile 10.	17-45	67.95	24.80	5.45	98.20	Sandy loam
45	1510	Profile 10.	45-170	89.60	5.25	3.95	98.80	Sand
46	1511	Profile 11.	0-16	78.50	14.65	5.10	98.25	Loamy sand
47	1512	Profile 11.	16-62	79.85	11.15	7.15	98.15	Loamy sand
48	1513	Profile 11.	62-88	74.30	15.45	8.70	98.45	Sandy loam
49	1514	Profile 11.	88-120	67.50	18.35	12.90	98.75	Sandy loam

Physical

Division - Nay Pyi Taw
Township - Tatkone

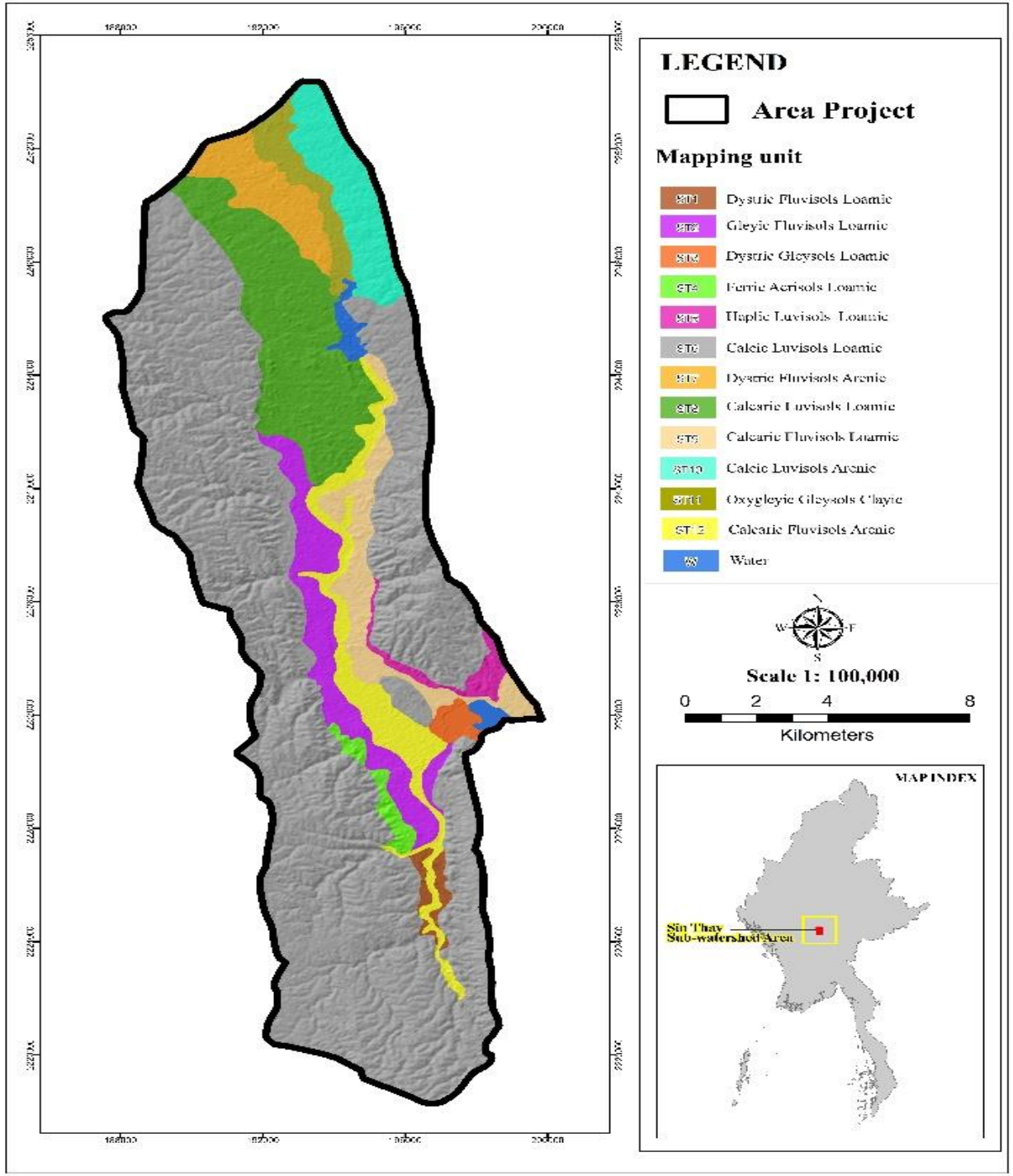
Sheet No. 1
Lab No. S 1466-1475 / 16-17

Sr. no.	Lab No.	Sample Plot	Depth in centimeter	Moisture %	pH Soil : KCl 1:2.5	EC Soil:Water 1:5	Organic Carbon %	Humus %	Total N %	CEC meq/100gm	Exchangeable cations meq/100gm						Available Nutrients	
											Ca^{++}	Mg^{++}	K^{+}	Na^{+}	H^{+}	Al^{+++}	P ppm	K_2O mg/100gm
1	1466	Profile 1.	0-30	0.51	7.12	-	0.15	0.26	0.09	9.69	7.37	2.01	0.24	Not detected	0.07	Not detected	2.24 (O)	11.45
2	1467	Profile 1.	30-68	0.16	7.84	-	-	-	0.09	6.84	5.34	1.34	0.14	Not detected	0.02	Not detected	2.37 (O)	6.61
3	1468	Profile 1.	68-90	0.48	7.34	-	-	-	0.07	7.66	6.70	0.67	0.24	Not detected	0.05	Not detected	2.24 (O)	11.45
4	1469	Profile 1.	90-105	0.83	6.92	0.23	-	-	0.09	13.32	8.74	4.03	0.50	Not detected	0.05	Not detected	2.25 (O)	23.58
5	1470	Profile 2.	0-30	1.84	5.93	-	0.42	0.72	0.09	13.97	12.90	0.68	0.32	Not detected	0.07	Not detected	5.93 (B)	15.27
6	1471	Profile 2.	30-48	1.13	6.34	-	-	-	0.07	17.01	8.76	8.09	0.14	Not detected	0.02	Not detected	9.66 (B)	6.67
7	1472	Profile 2.	48-69	2.29	5.83	-	-	-	0.13	17.97	16.38	1.36	0.18	Not detected	0.05	Not detected	3.25 (B)	8.59
8	1473	Profile 2.	69-105	3.27	5.84	0.07	-	-	0.11	22.34	19.99	2.07	0.21	Not detected	0.07	Not detected	12.83 (B)	9.92
9	1474	Profile 3	0-30	0.52	7.60	-	0.04	0.07	0.09	10.24	8.71	1.34	0.14	Not detected	0.05	Not detected	2.38 (O)	6.63
10	1475	Profile 3	30-70	1.34	7.50	-	-	-	0.09	19.72	17.56	2.03	0.12	Not detected	0.02	Not detected	2.26 (O)	5.47

B= Bray & Kurtz Method
O= Olsen Method

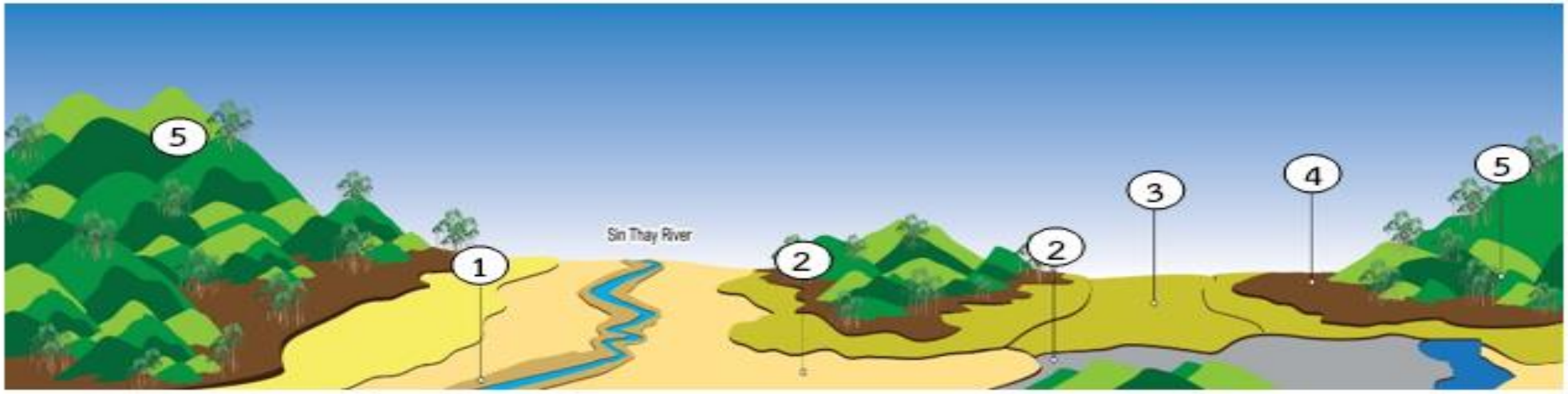
Chemical

Soil Map of Sin Thay Sub-watershed area



Satellite Image Interpretation to Watershed Management Workshop

Relation between soil and landform/topography



สัญลักษณ์แผนที่

(1) Flood Plain

(River Levee)

(2) Flood Plain

(River Basin)

(3) Low River Terrace

(4) Upper River Terrace

(5) Hill and Mountain

Activity in Myanmar (1-7july2017):
Soil Monolith

Equipment

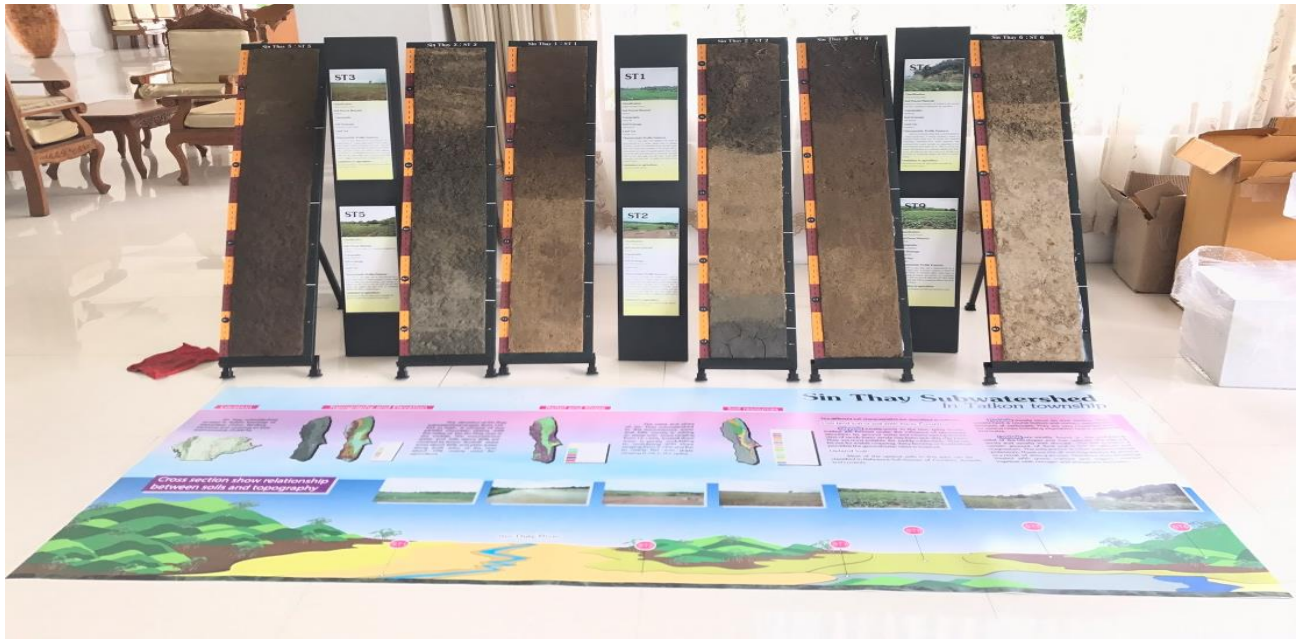
Sin Thay Subwatershed
In Tatkon township
Cross section show relationship between soils and topography
Sin Thay River

ST1
ST3
ST2
ST5

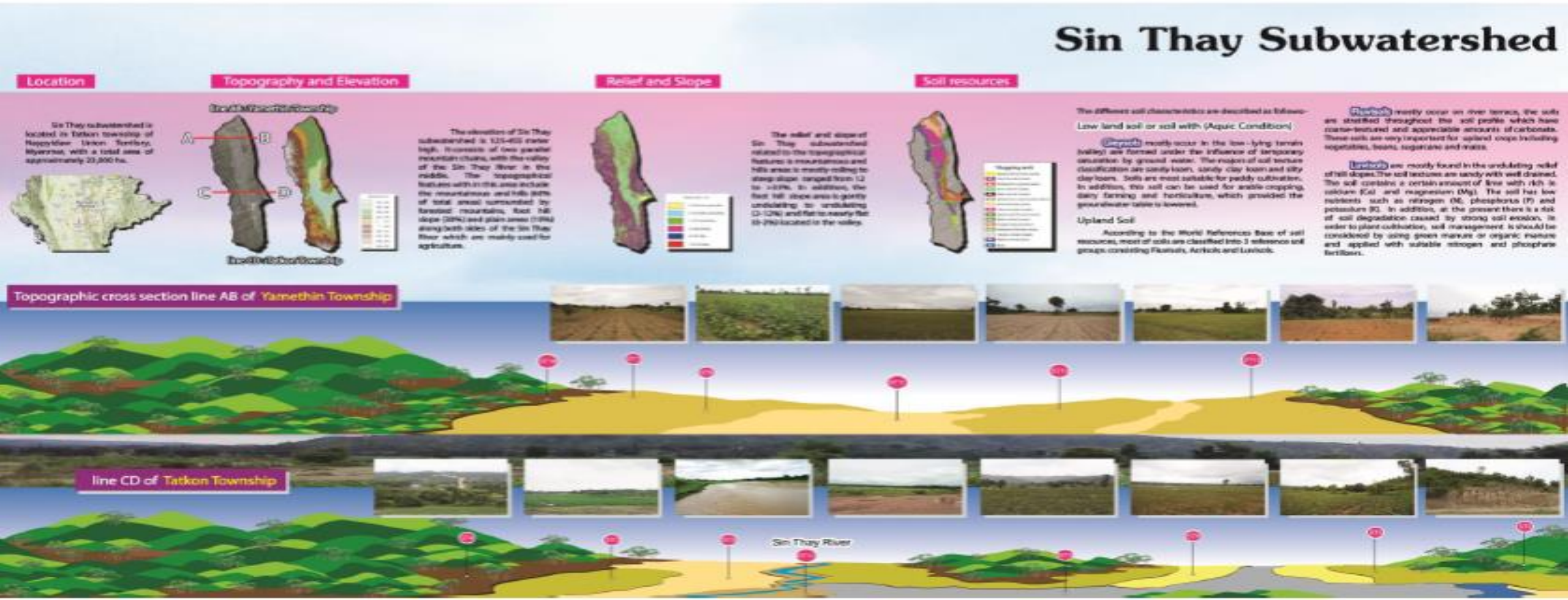
Activity in Myanmar (1-7 july 2017): Soil Monolith

Field check for representative soil sampling

Soil decoration for Soil monolith


ST3
ST5
ST1
ST2
Sin Thay Subwatershed
Cross section show relationship between soils and topography

ST1
ST2
ST3
ST5


Sin Thay Subwatershed
Location
Topography and Elevation
Relief and Slope
Soil resources
Sin Thay subwatershed is located in Tatkon township of Nappyidaw Union Territory, Myanmar, with a total area of approximately 23,000 ha.
A
B
C
D
The elevation of Sin Thay subwatershed is 125-455 meter high. It consists of two parallel mountain chains, with the valley of the Sin Thay River in the middle. The topographical features with in this area include the mountainous and hills (80% of total areas) surrounded by forested mountains, foot hill slope (30%) and plain areas (10%) along both sides of the Sin Thay River which are mainly used for agriculture.
The relief and slope of Sin Thay subwatershed related to the topographical features is mountainous and hills areas is mostly rolling to steep slope ranged from 12 to >30%. In addition, the foot hill slope area is gently undulating to undulating (2-12%) and flat to nearly flat (0-2%) located in the valley.
The different soil characteristics are described as follows-
Low land soil or soil with (Aquic Condition)
Gleysols mostly occur in the low-lying terrain (valley) are formed under the influence of temporary saturation by ground water. The majors of soil texture classification are sandy loam, sandy clay loam and silty clay loam. Soils are most suitable for paddy cultivation. In addition, this soil can be used for arable cropping, dairy farming and horticulture, which provided the groundwater table is lowered.
Upland Soil
According to the World References Base of soil resources, most of soils are classified into 3 reference soil groups consisting Fluvisols, Acrisols and Luvisols.
Fluvisols mostly occur on river terrace, the soils are stratified throughout the soil profile which have coarse-textured and appreciable amounts of carbonate. These soils are very important for upland crops including vegetables, beans, sugarcane and maize.
Luvisols are mostly found in the undulating relief of hill slopes.The soil textures are sandy with well drained. The soil contains a certain amount of lime with rich in calcium (Ca) and magnesium (Mg). The soil has low nutrients such as nitrogen (N), phosphorus (P) and potassium (K). In addition, at the present there is a risk of soil degradation caused by strong soil erosion. In order to plant cultivation, soil management is should be considered by using green manure or organic manure and applied with suitable nitrogen and phosphate fertilizers.
Topographic cross section line AB of Yamethin Township
line CD of Tatkon Township
Sin Thay River

Lowland soil : Gleysols

Limitation in agriculture

Risk for flooding in rainy season. Soil has low primary nutrient elements (N,P,K), very low organic matter and topsoil has coarse texture are influenced by flooding from river.

Upland soil

River

Terrace/Piedmont

Hill/Mountain

Conclusion

- Strategy 1 Database for soil resource and land use planning

- Land evaluation for land use planning

- Soil improvement: (Bio) technology for soil improvement and management (production and uses)

- Soil and water conservation

- Soil Education

Thank you for your attention