National scale sample grid for the National Forest Inventory in Myanmar & Analysis

Presented by

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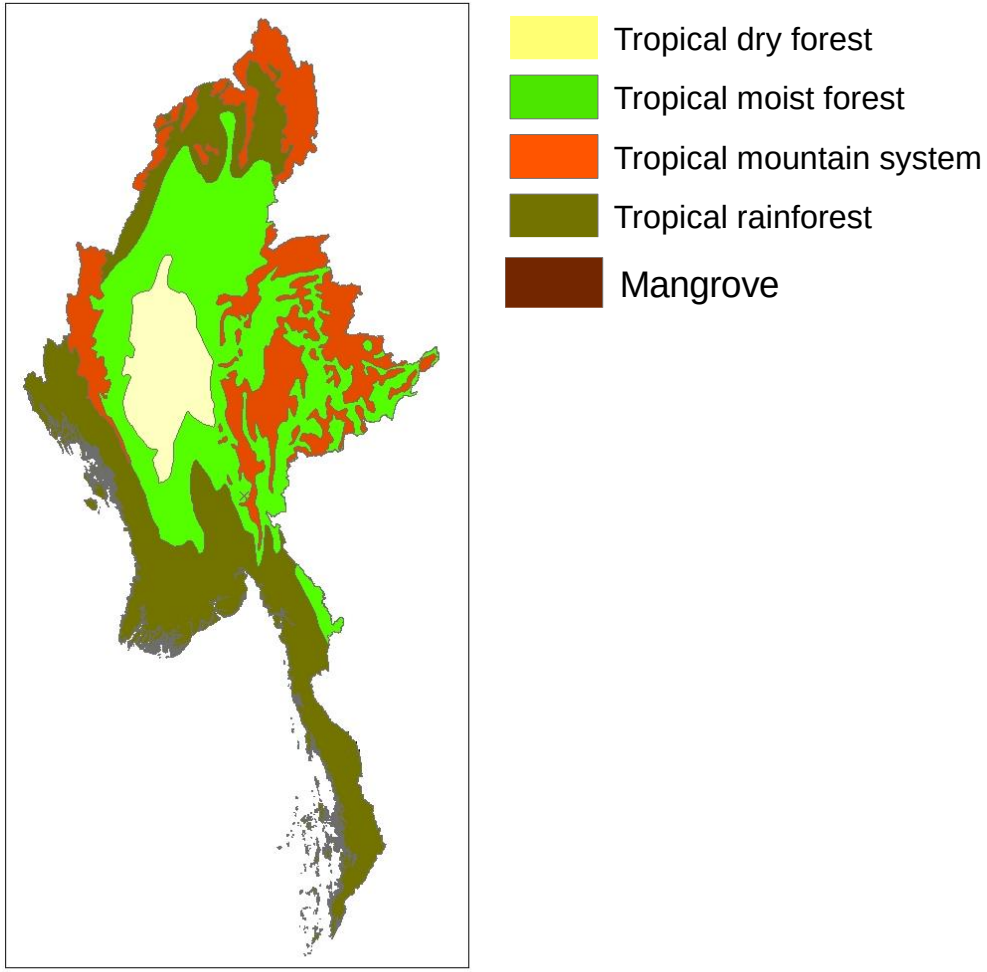
NFI-NFMIS Project: FAO

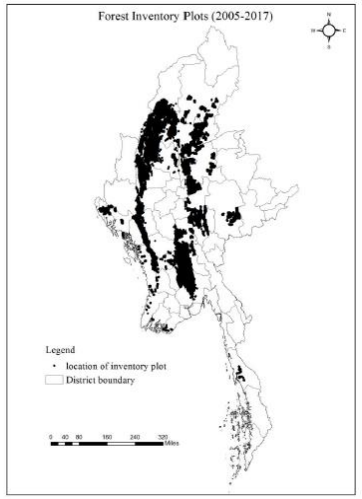
Contents

Cluster plot distribution based on five basic strata global eco-logical zone

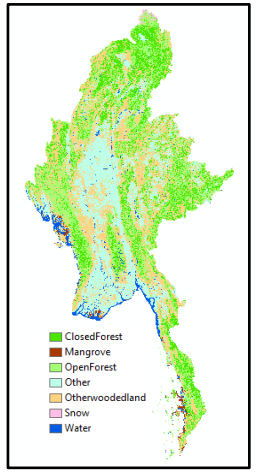
Sample sizes were originally calculated for five basic strata according to global ecological zones



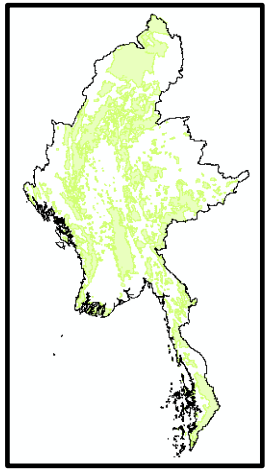
Previous 40 District Management Inventory data (2005-2015)



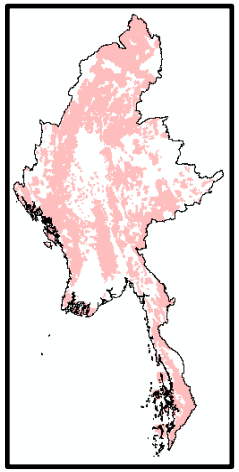
Land use & land cover (2015)



Permanent Forest Estate (PFE)

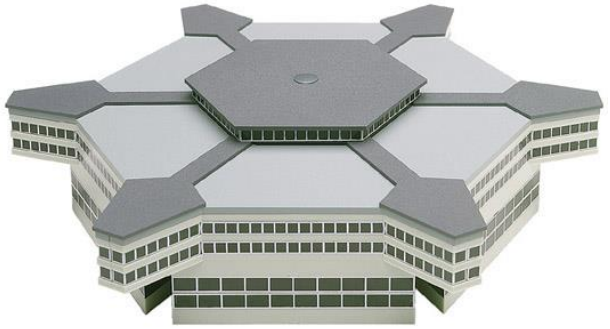


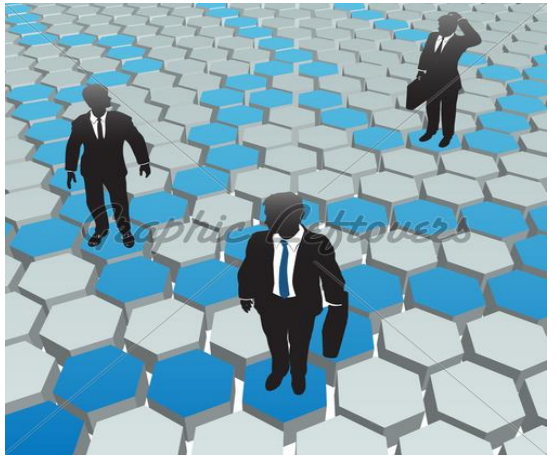
Production Working Circle (PWC)



Introduction to Hexagon

Hexagon shape by man made

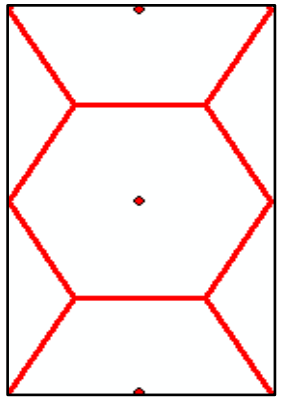




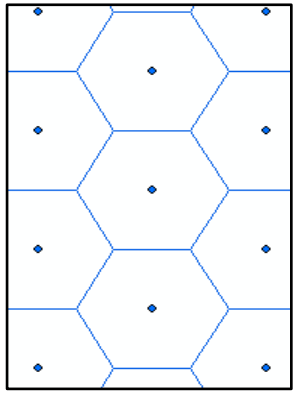
Hexagon shape by nature animal & fruit

Advantages of Hexagon Shape

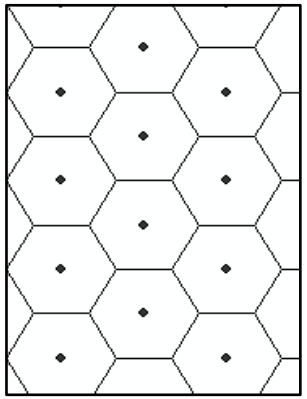
12 k distance
center to center Hexagon



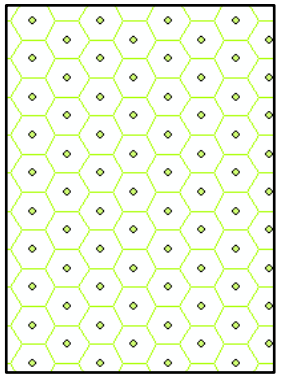
9 k distance
center to center Hexagon



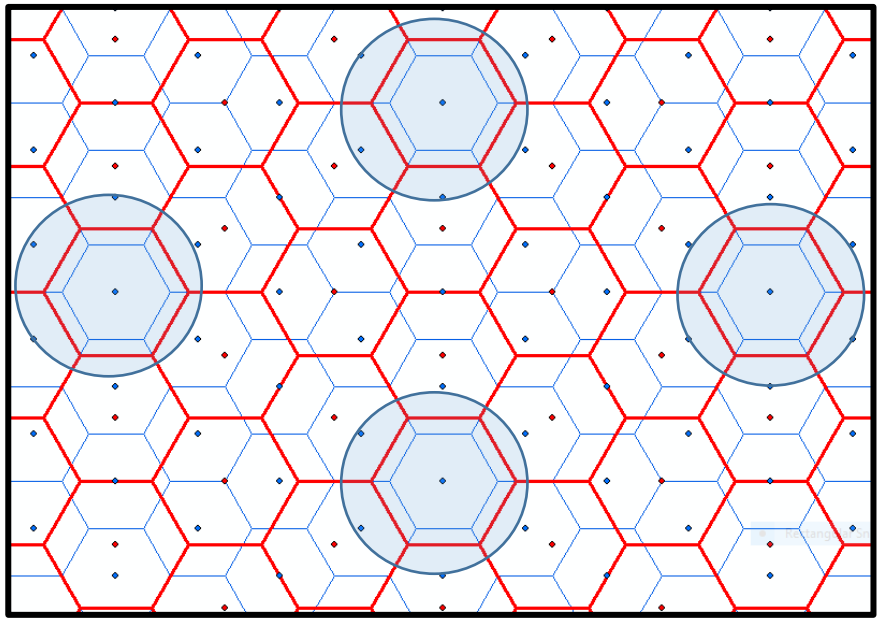
6 k distance
center to center Hexagon



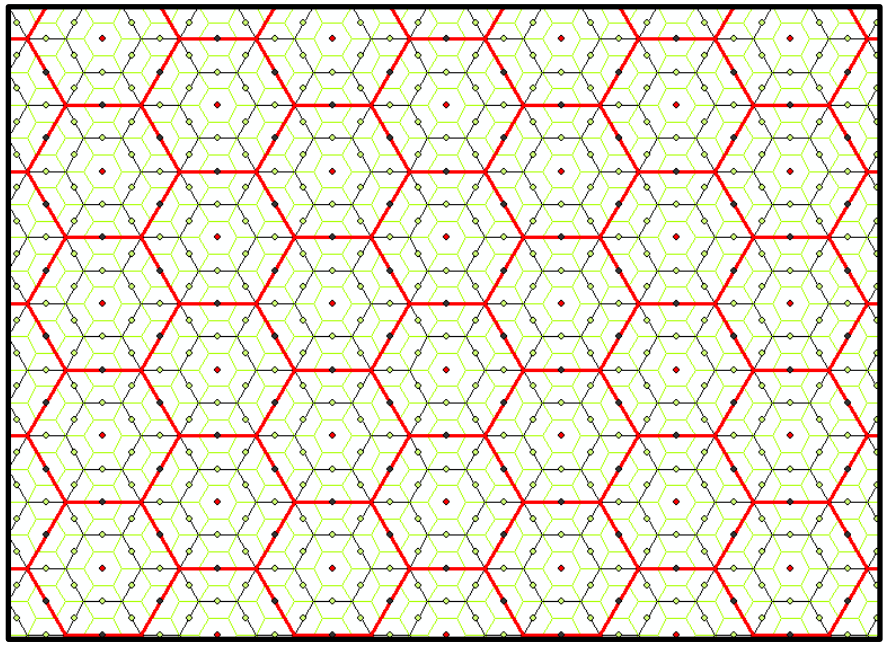
3k distance
center to center Hexagon



Overlap 12k & 9k

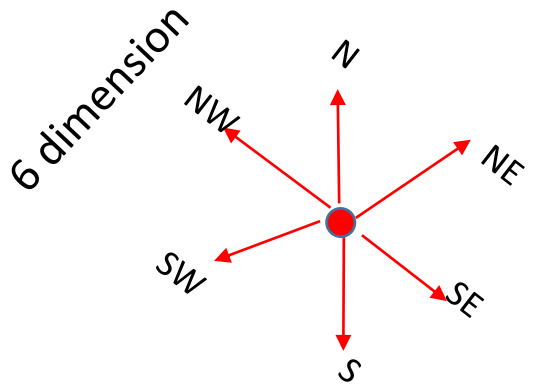


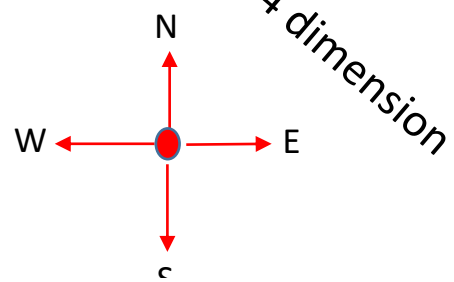
Overlap 12k, 6k & 3k



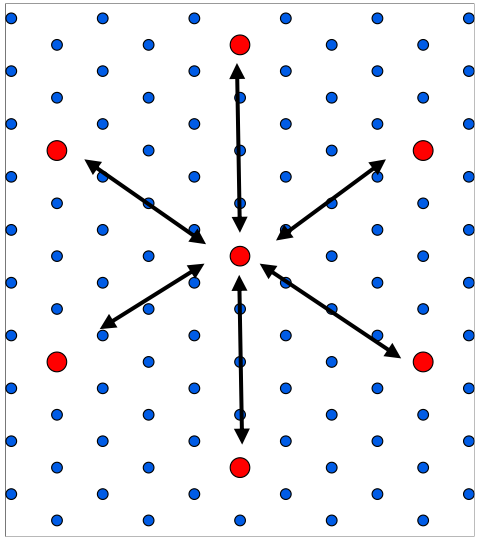
Advantages of Hexagon Shape

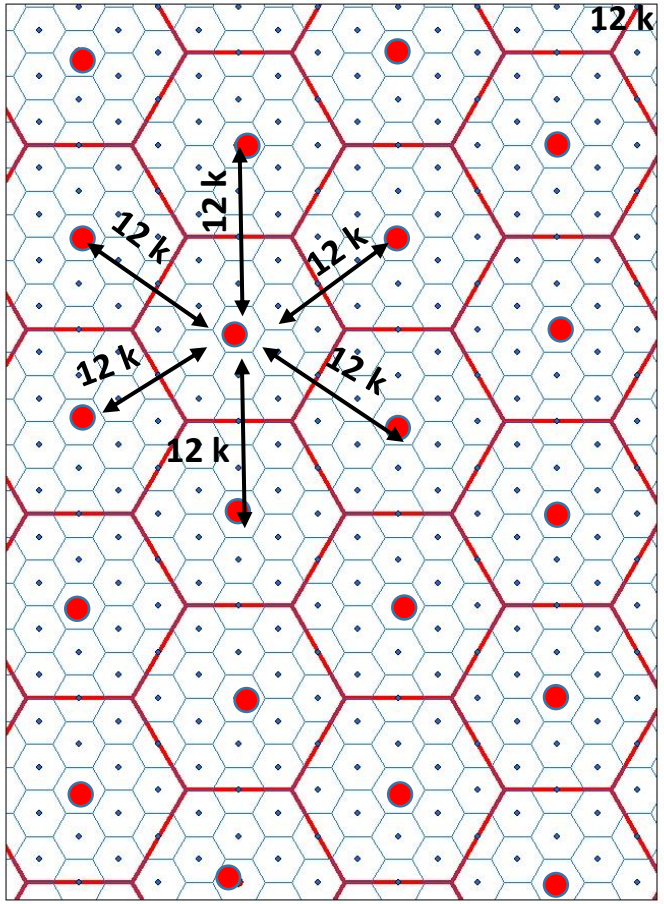
What makes a hexagon and rectangle different ?



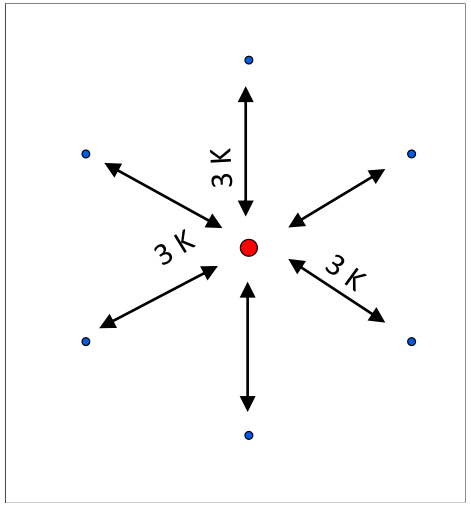


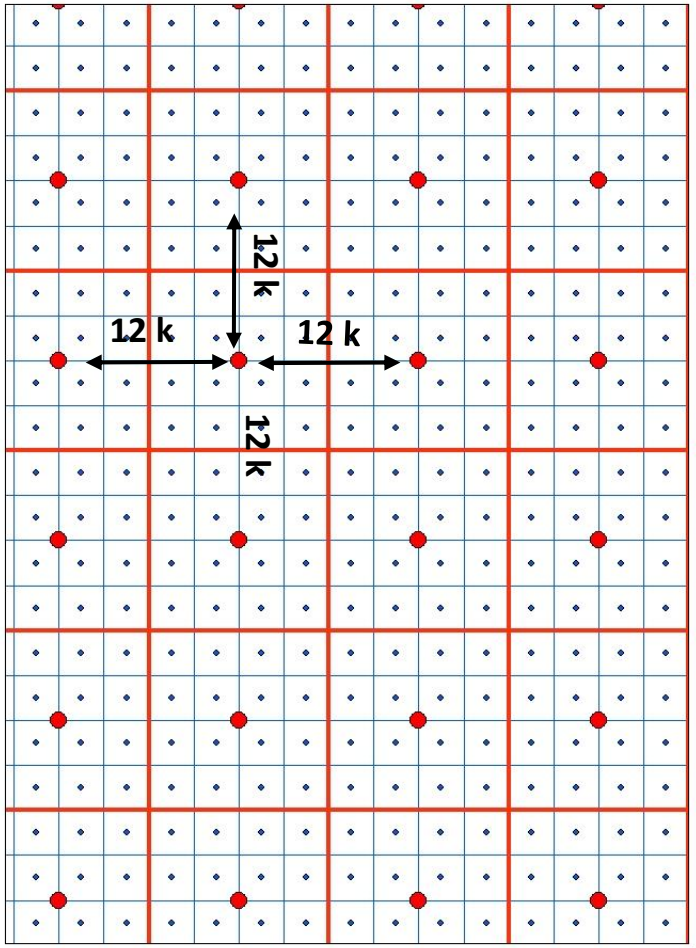
Each side to 12 K from centroid





Each side to 3 K from centroid

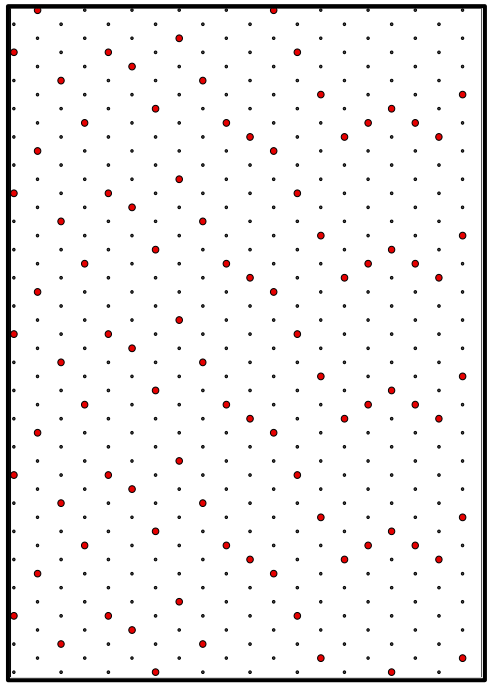




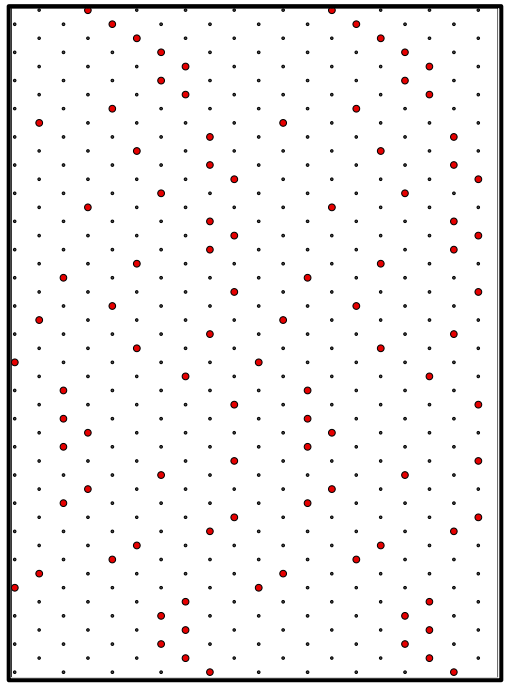
Selecting the permanent sample plots

- Every fifth cluster will be permanent
- 20% of the cluster plots will be permanent sample plots (PSPs)
- 80% will be temporary sample plots (TSPs)

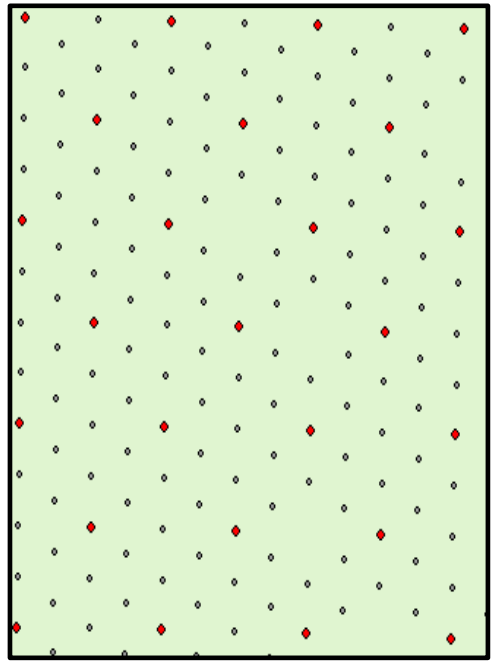
Vertically



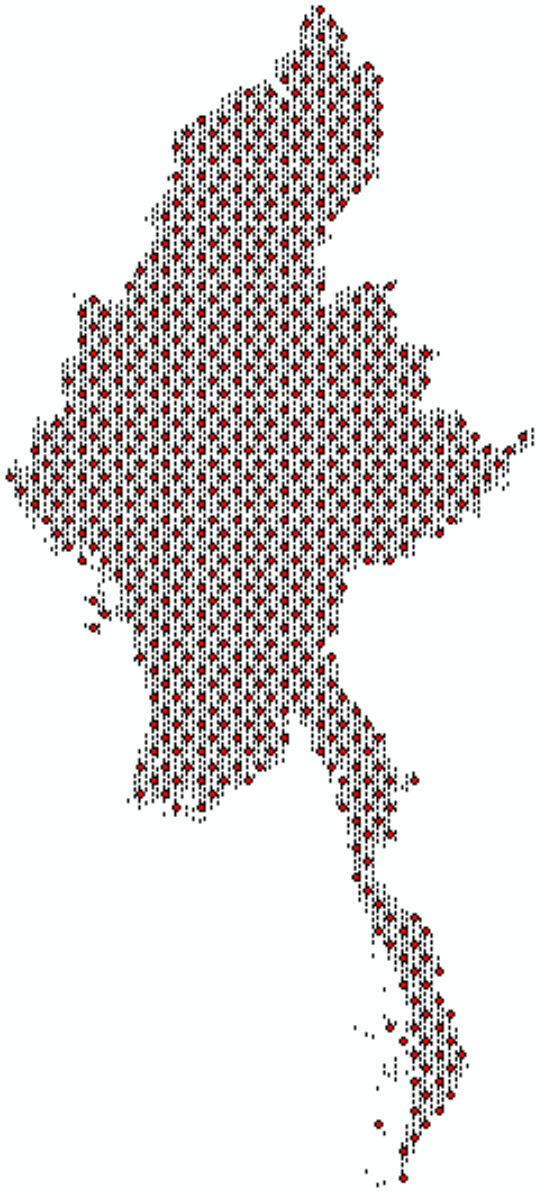
Horizontally



Vertical cross by Horizontal

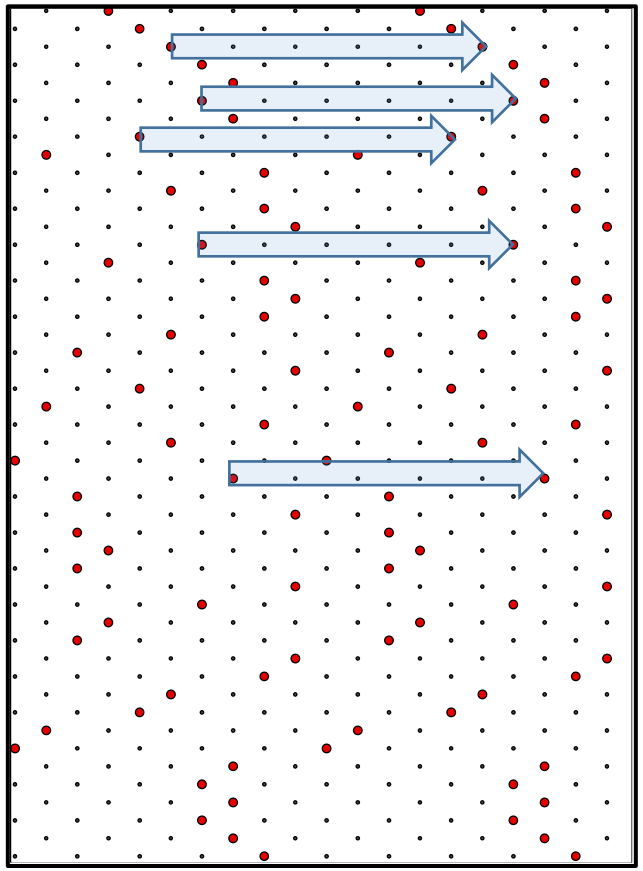


Cluster Plot Distribution



Selecting the permanent plots

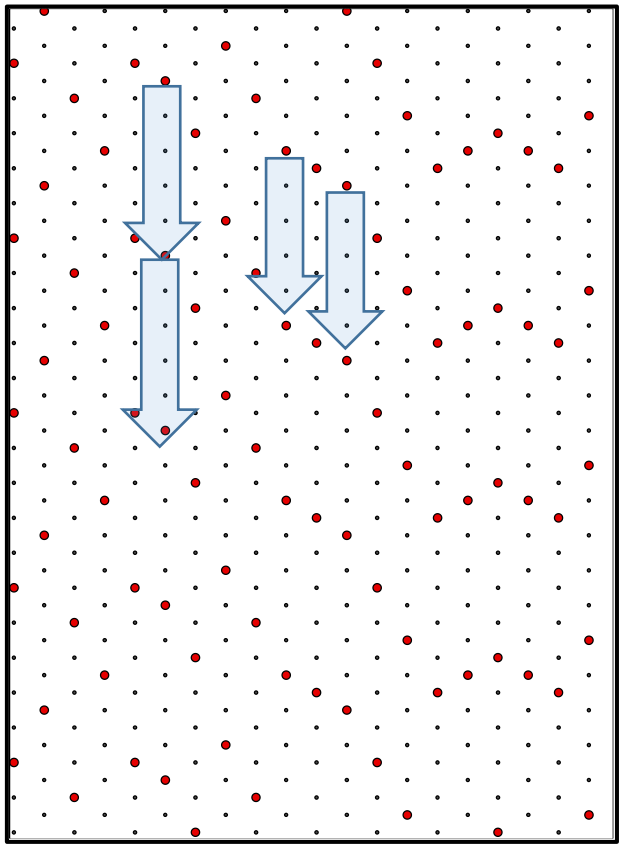
One dimension horizontally by systematic



20 % permanent plot

close to each other unequally

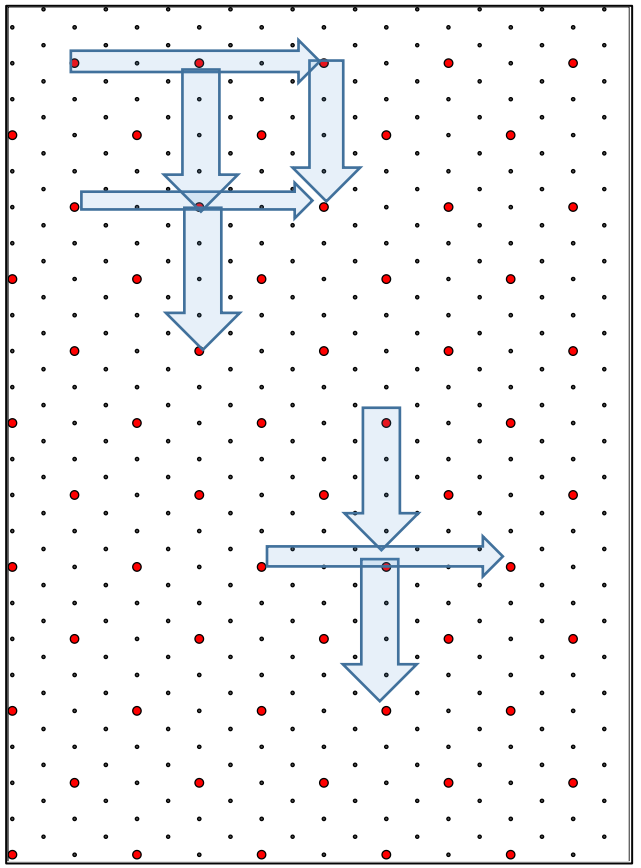
One dimension vertically by systematic



20 % permanent plot

close to each other unequally

Two dimension horizontal & vertical by systematic



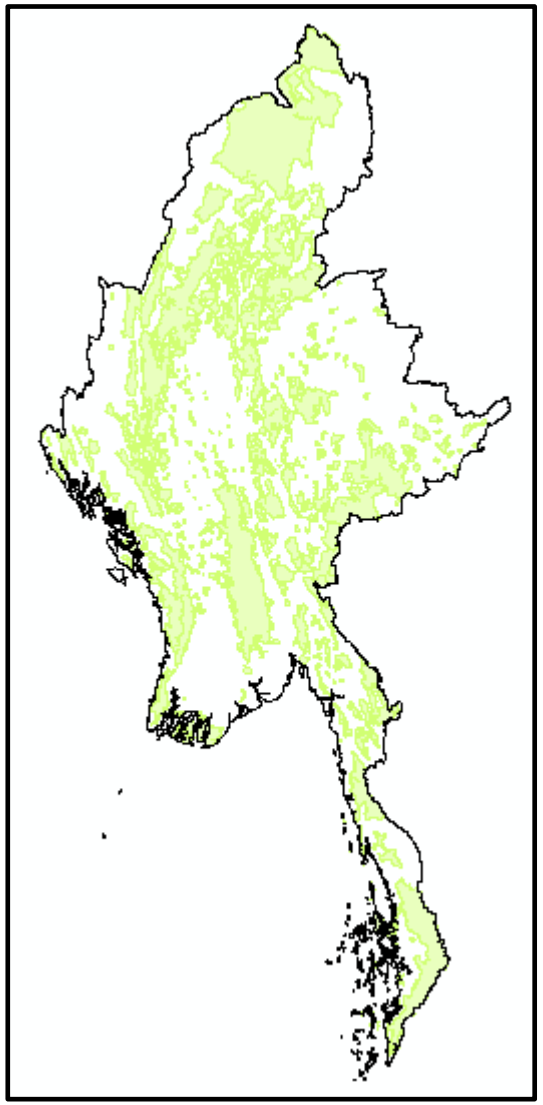
12.5 % permanent plot

equally distance each other

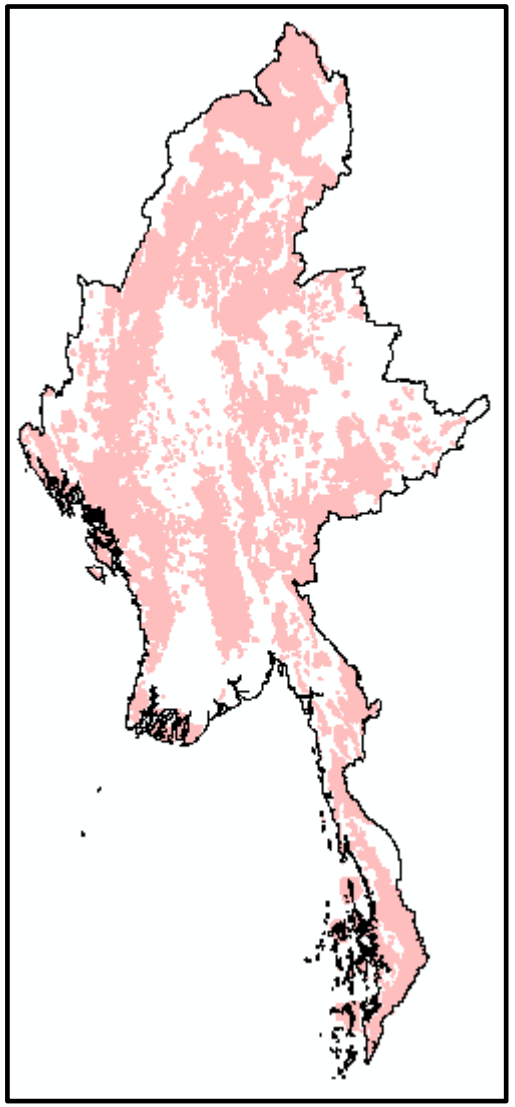
Selecting the permanent plots

Additional allocation of PSPs within the PFE and PWC.

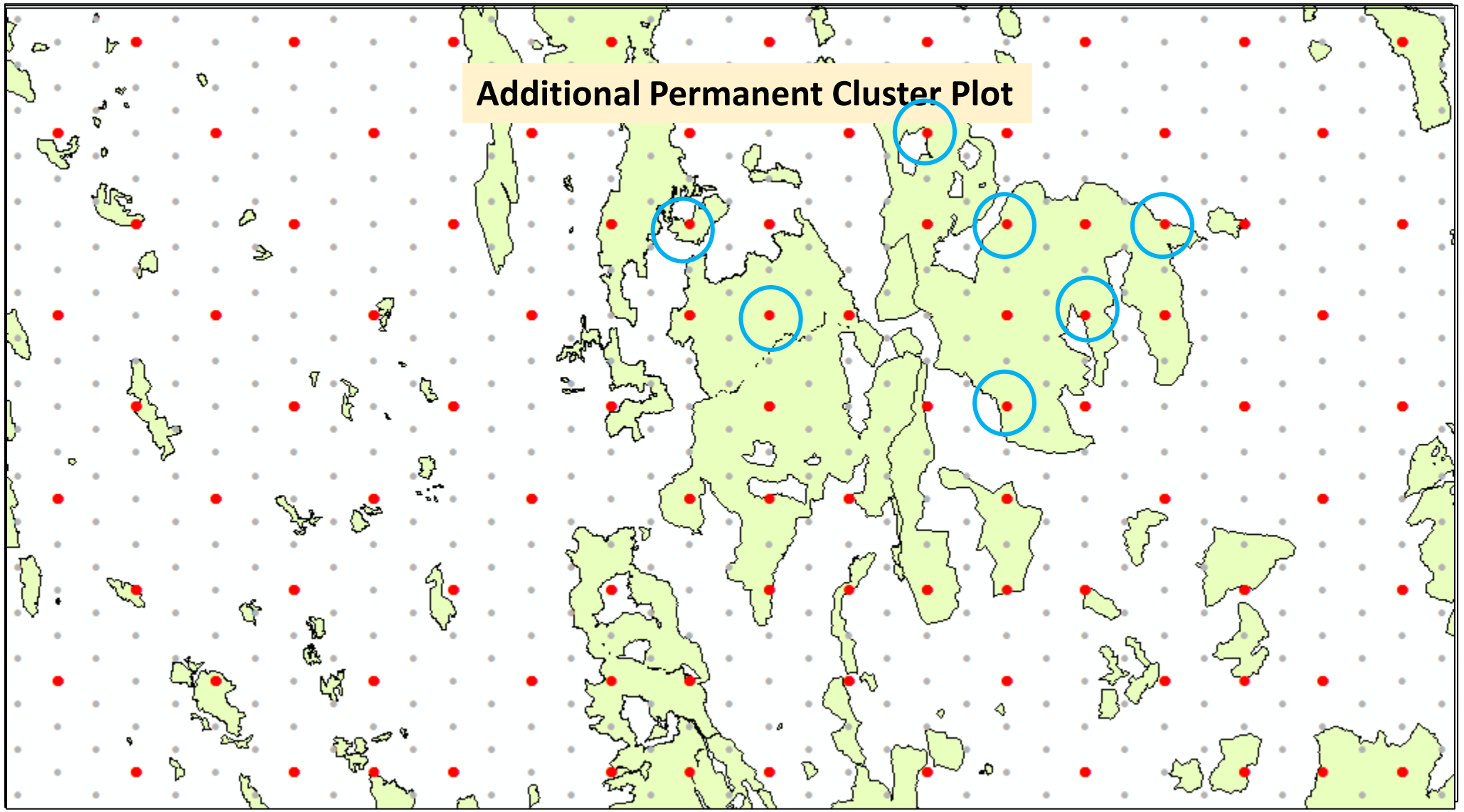
Permanent Forest Estate (PFE)



Production Working Circle (PWC)

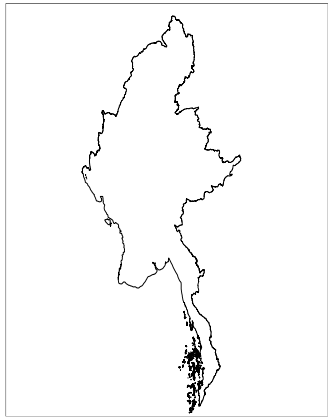


Upland Systematic Hexagon Cluster Plot, Permanent and Additional Permanent Cluster Plot



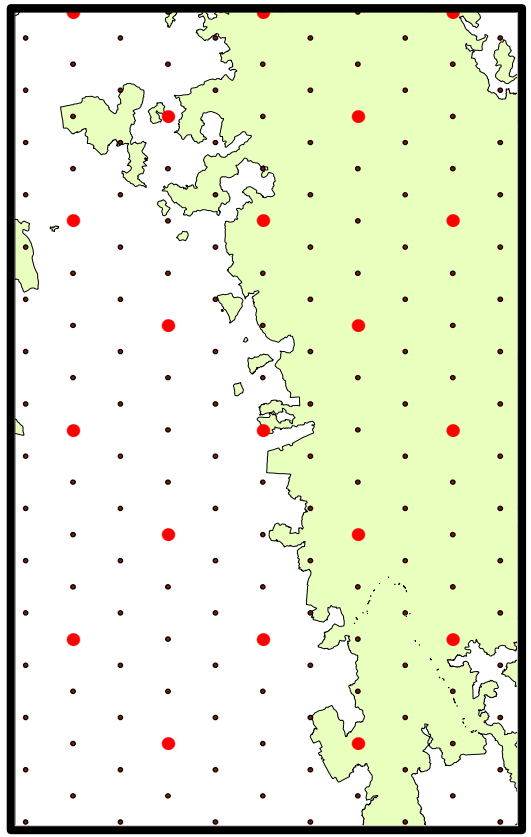
Additional permanent plot in upland area from working circle (production) & PFE

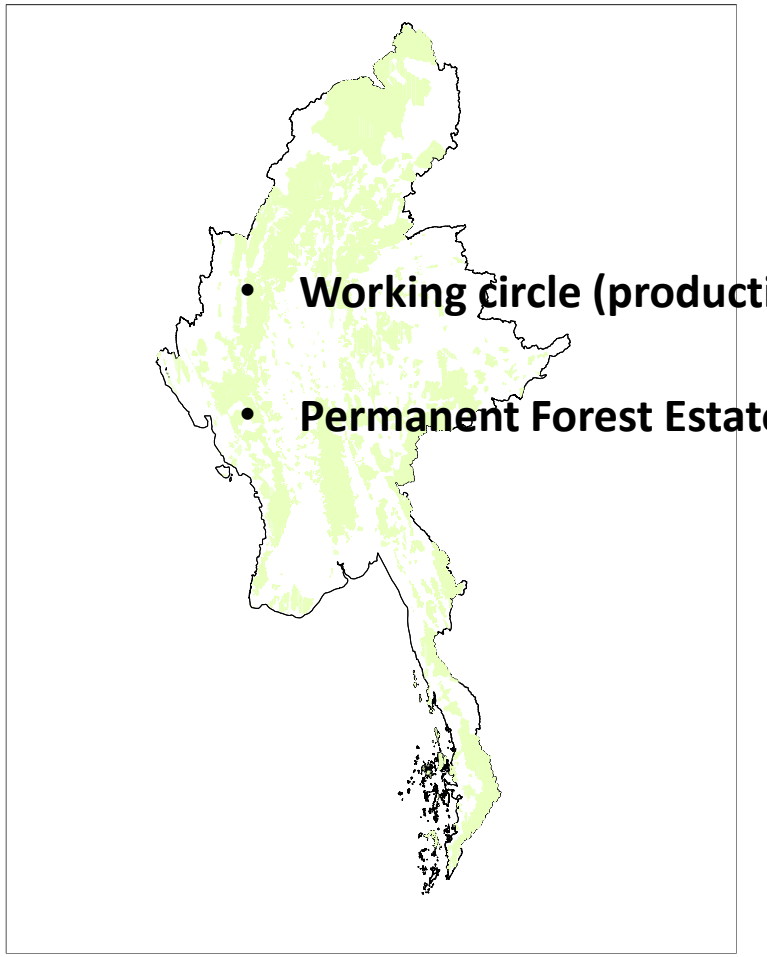
Two dimension horizontal & vertical by systematic



Permanent	Temporary	Total
671	4659	5330

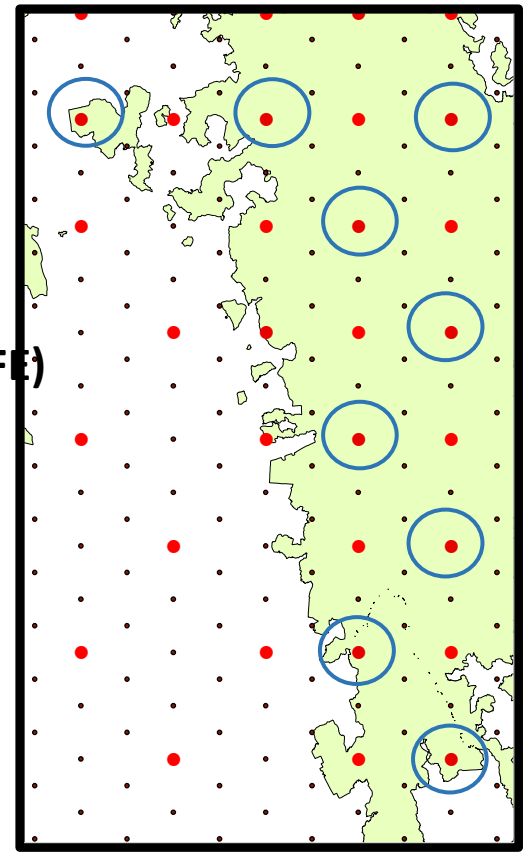
Permanent percent 12.5%





- Working circle (production)
- Permanent Forest Estate (PFE)

Additional plot by systematic



Up-in land

Permanent	Additional permanent in PFE & production area	Temporary	Total
671	246	4413	5330

Permanent percent 17.2% (Upland)

Mangrove

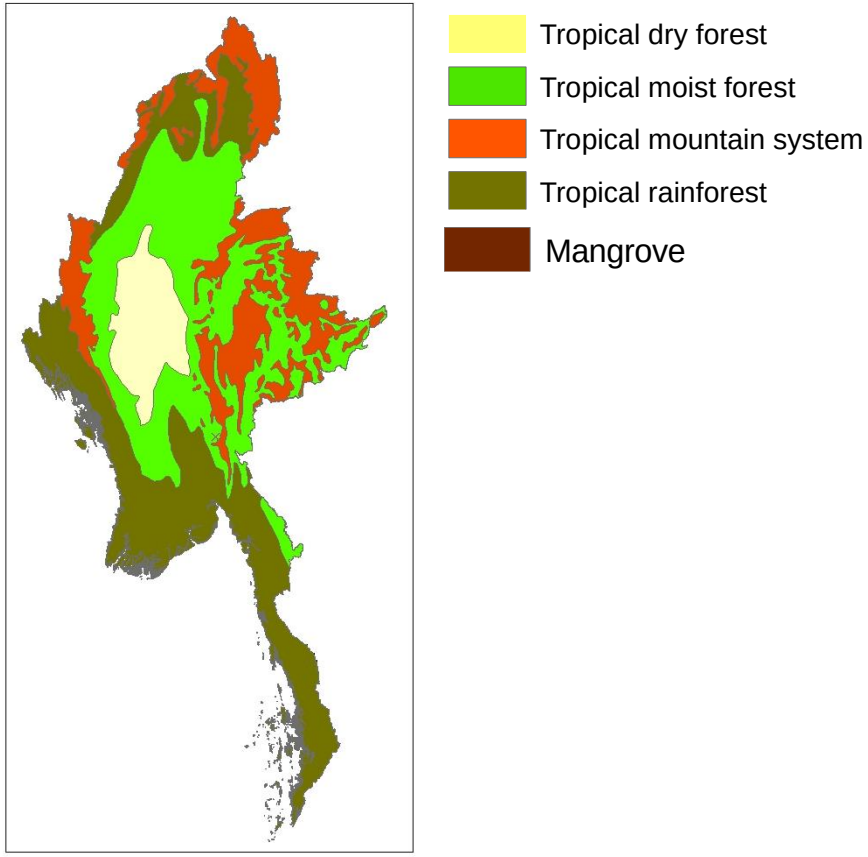
Eco Zone Type	Permanent	Temporary	Grand Total
Mangrove	126	503	629

Permanent percent 20% (Mangrove)

Permanent percent 17.5% (Total)

Cluster Plot Distribution for Myanmar National Forest Inventory

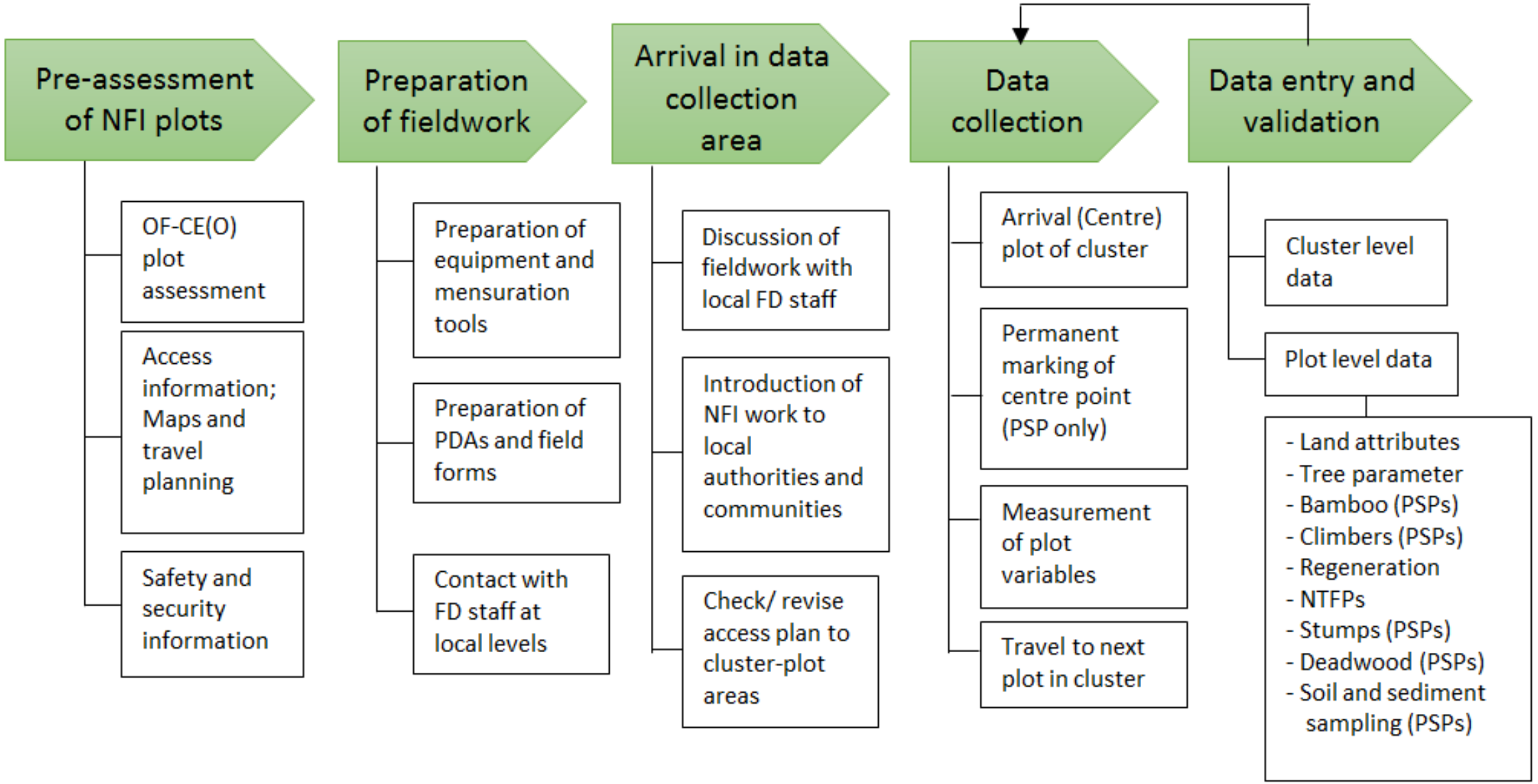
Sample sizes were originally calculated for five basic strata according to global ecological



Cluster Plot Distribution on Up-In Land & Mangrove				
Ecological Zones	**plot distance**	**Permanent**	**Temporary**	**Total**
Tropical dry forest	12 x 12 k	64	415	479
Tropical moist forest	12 x 12 k	352	1495	1847
Tropical mountain system	12 x 12 k	206	1000	1206
Tropical rainforest	12 x 12 k	326	1472	1798
Up-in land Total		**948**	**4382**	**5330**
Mangrove	3k x 3k	125	503	628
Grand Total		**1073**	**4885**	**5958**

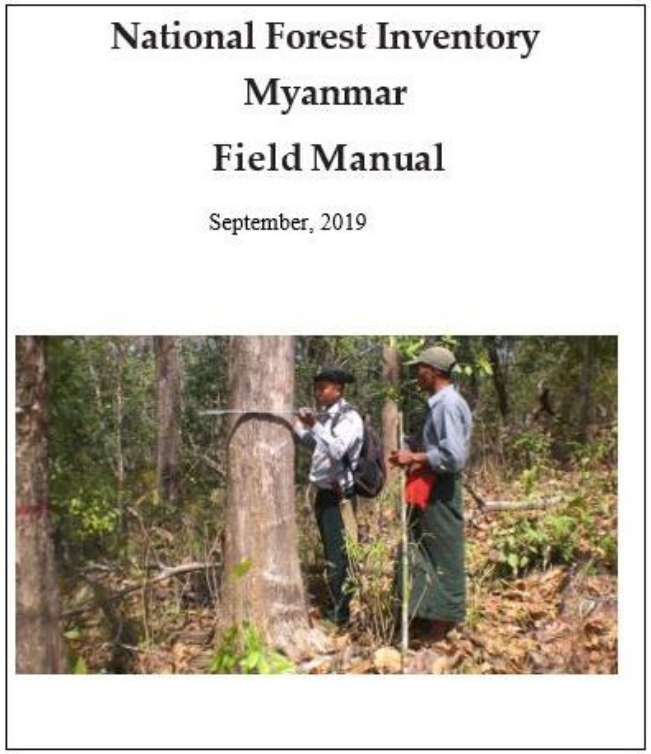
Procedure of the Data Collection

Procedure of the Data Collection



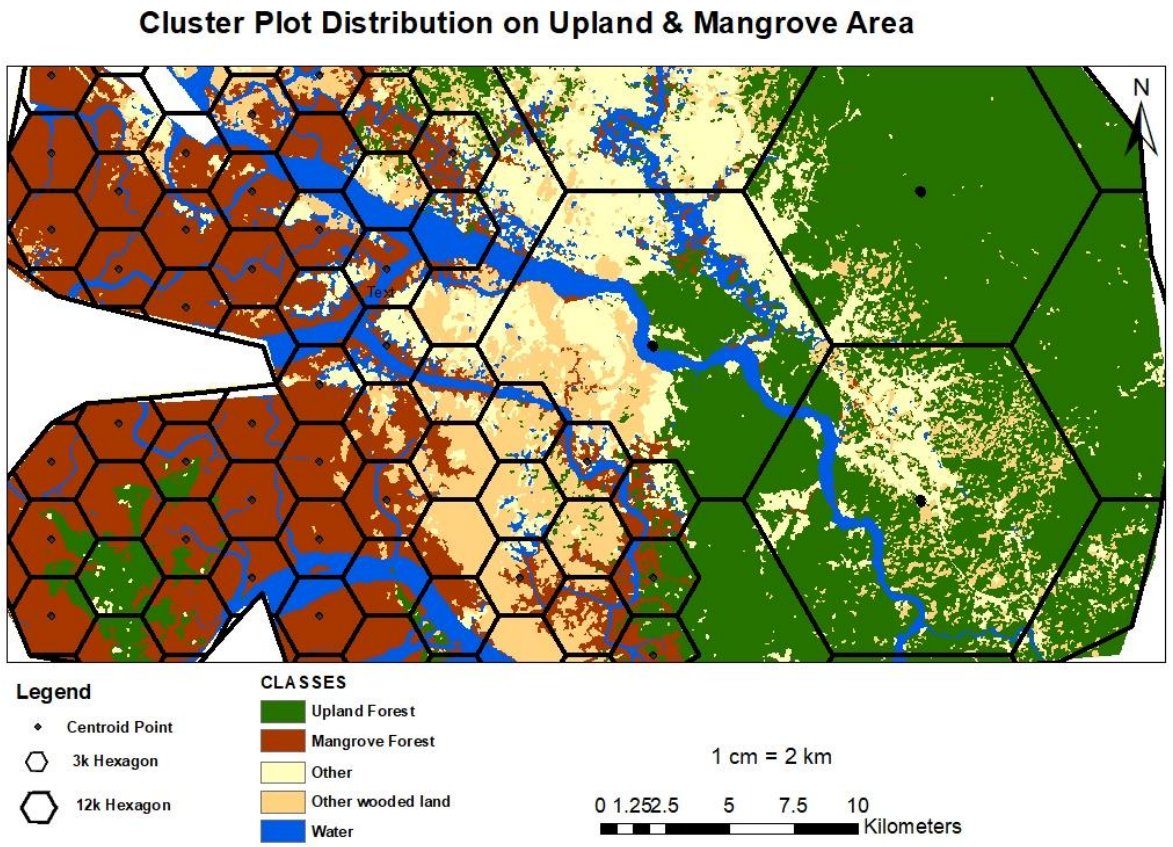
Field Manual & Sample Design

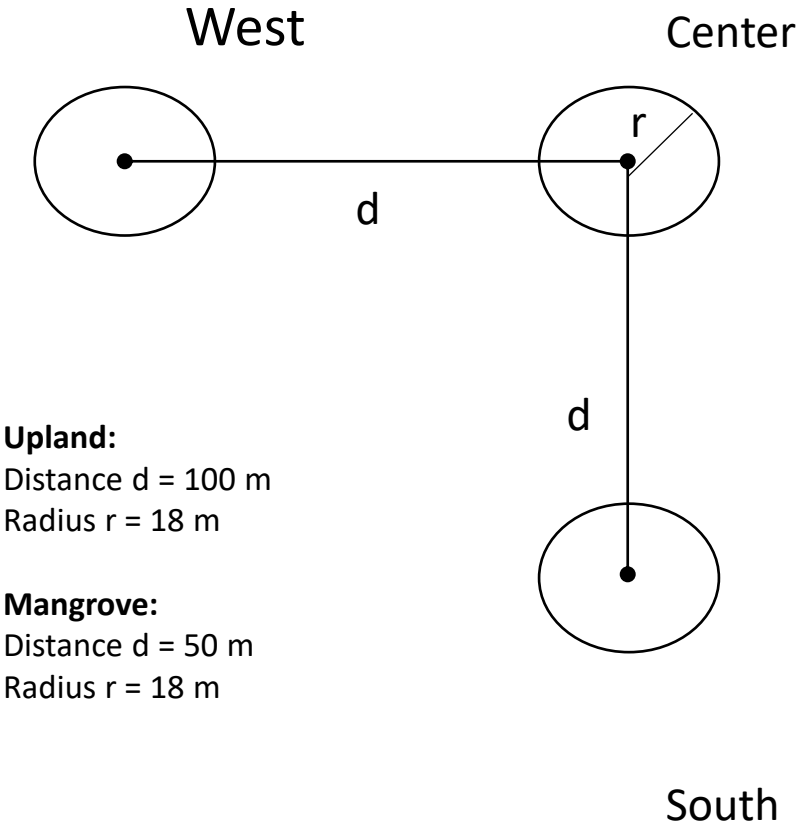
Content of the Field Manual & Sample Design



- Four Chapter
  - Introduction
  - Sampling Design
  - Preparing for the field work
  - Data collection in the field

Cluster/ Sample Plot Design

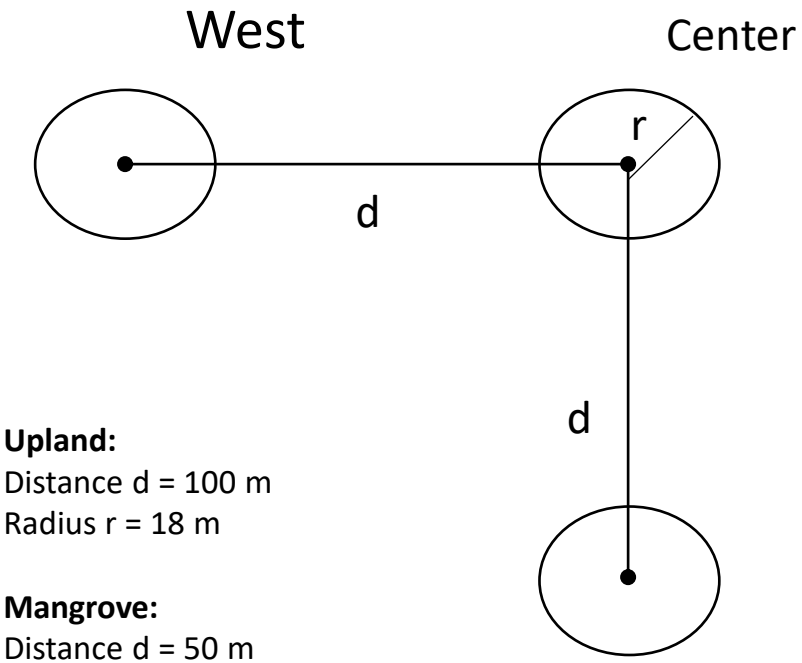




Upland:
Distance d = 100 m
Radius r = 18 m

Mangrove:
Distance d = 50 m
Radius r = 18 m

Cluster/ Sample Plot Design



Upland:
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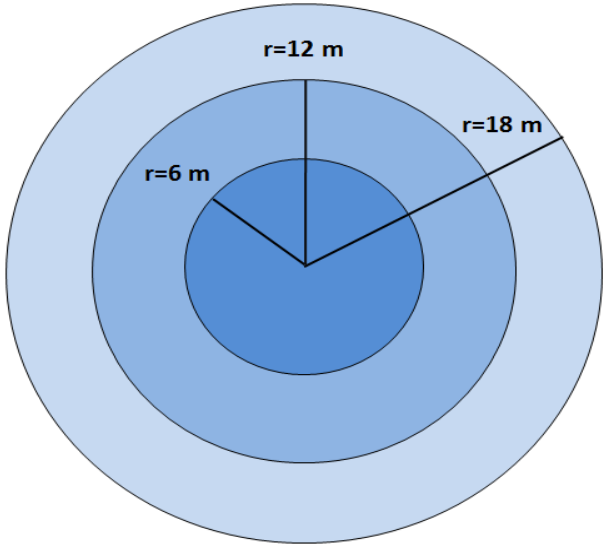


Collect Mobile

Cluster Information

Plot Information

Regeneration

Tree

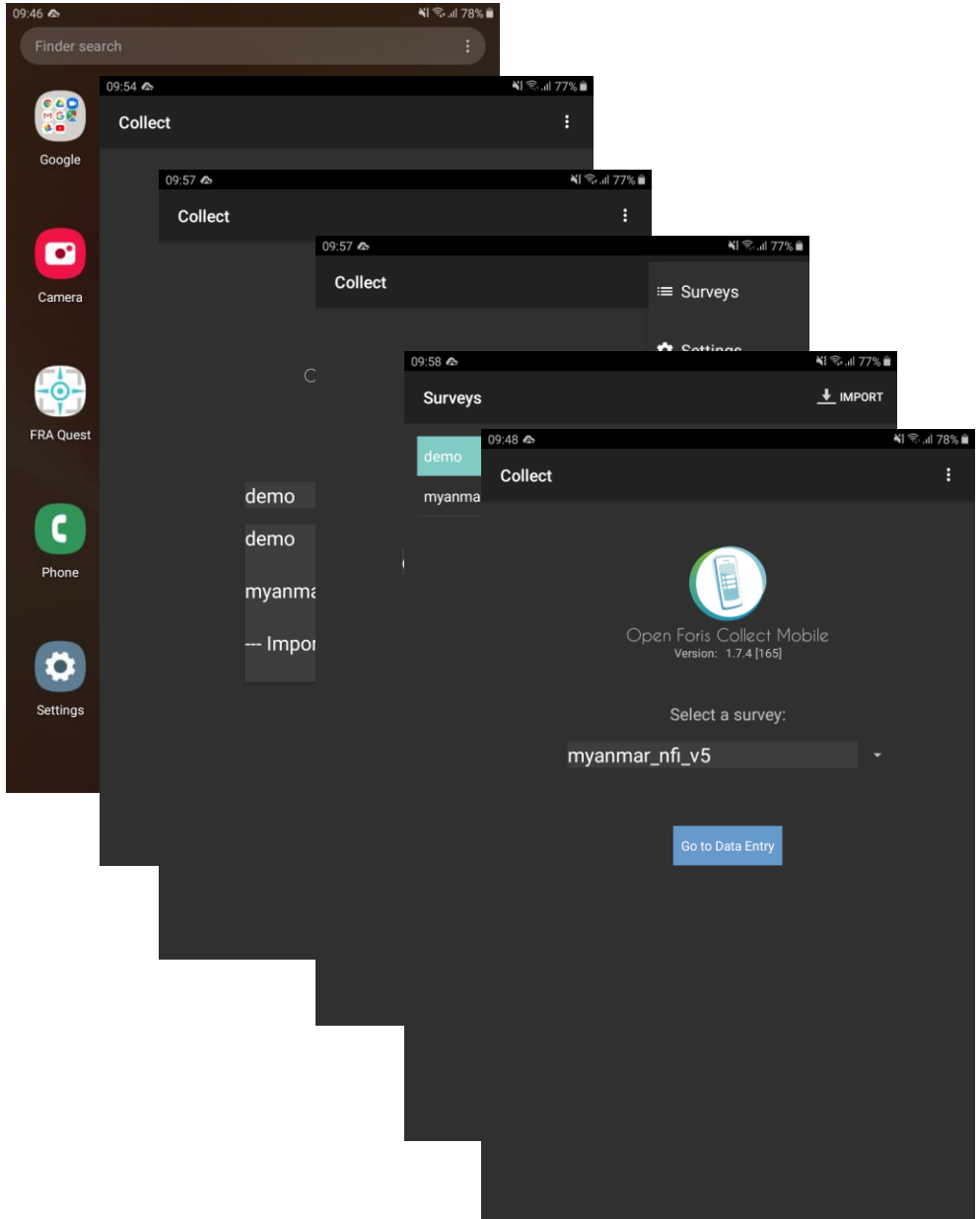
Bamboo

Climber

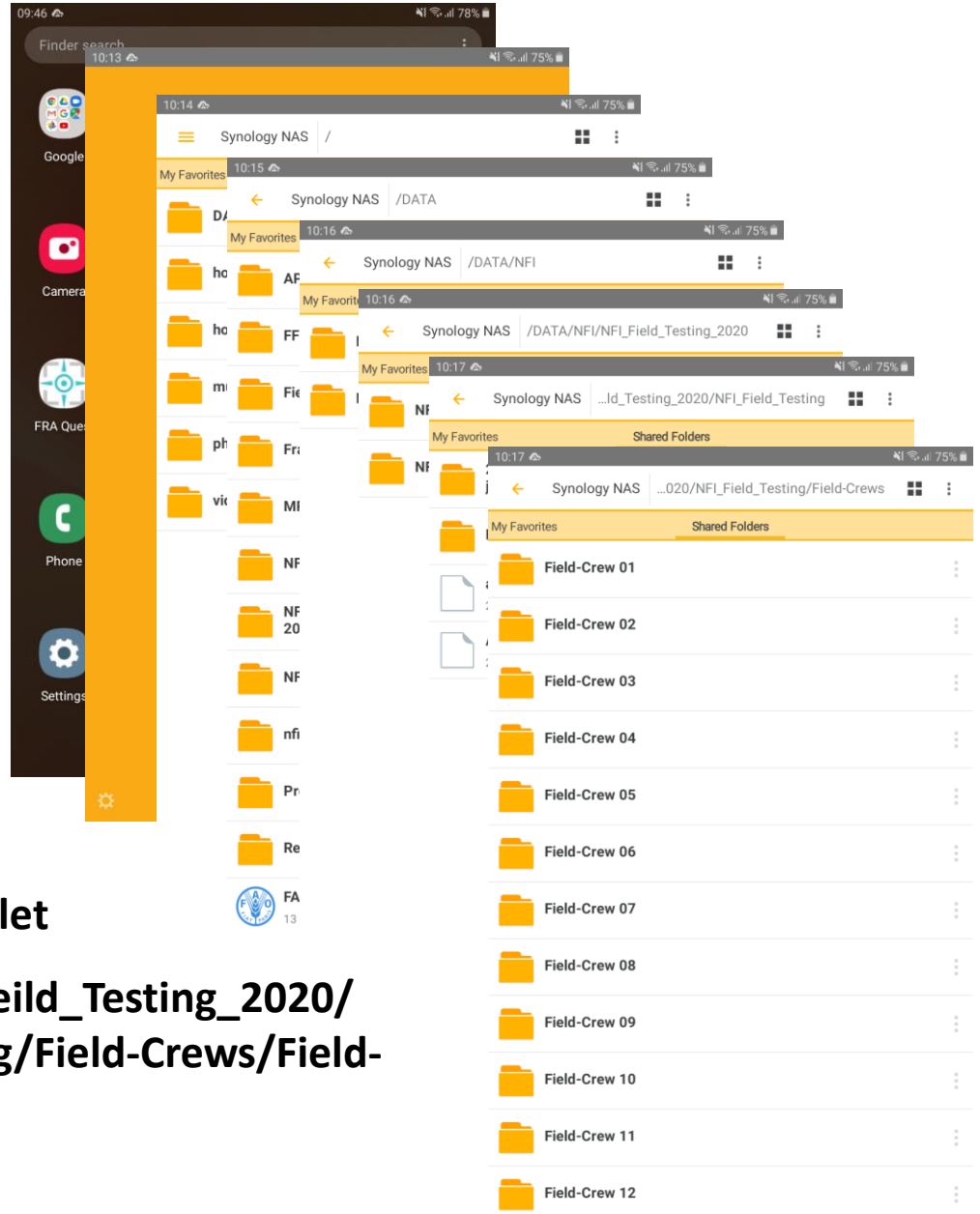
Stump

Lying Dead Wood

Soil/Litter



Upload file



Open DS file on Tablet

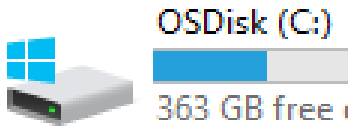
DATA/NFI/NFI_Feild_Testing_2020/ NFI_Feild_Testing/Field-Crews/Field-Crew 01 to 12

Available Data Source National Forest Inventory

Available Data Source National Forest Inventory

Synology

Laptop(local)



Samsung Galaxy Tablet

Memory Stick (64GB)

data (\\Mmunredd) (Z:) › NFI › NFI_Field_Testing_2020 › NFI_Field_Testing

Name

- 2020 NFI cluster plot distribution map in google kmz and jpeg
- ArcMap Package
- Field-Crews
- all_NFI_2nd_field_cluster_plot_csv
- All_NFI_2nd_testing_GPS_GPX

- 2020 NFI Ayeyarwady ArcMap Package
- 2020 NFI Dawei ArcMap Package
- 2020 NFI Kawthaung ArcMap Package

- Ayeyarwady cluster plot and map in google
- Ayeyarwady cluster plot Map
- Dawei cluster plot and map in google
- Dawei Cluster Plot Map
- Kawthaung cluster plot and map in google
- kawthaung cluster plot_Map

data (\\Mmunredd) (Z:) › NFI › NFI_Field_Testing_2020 › NFI_Field_Training_Myeik

Name

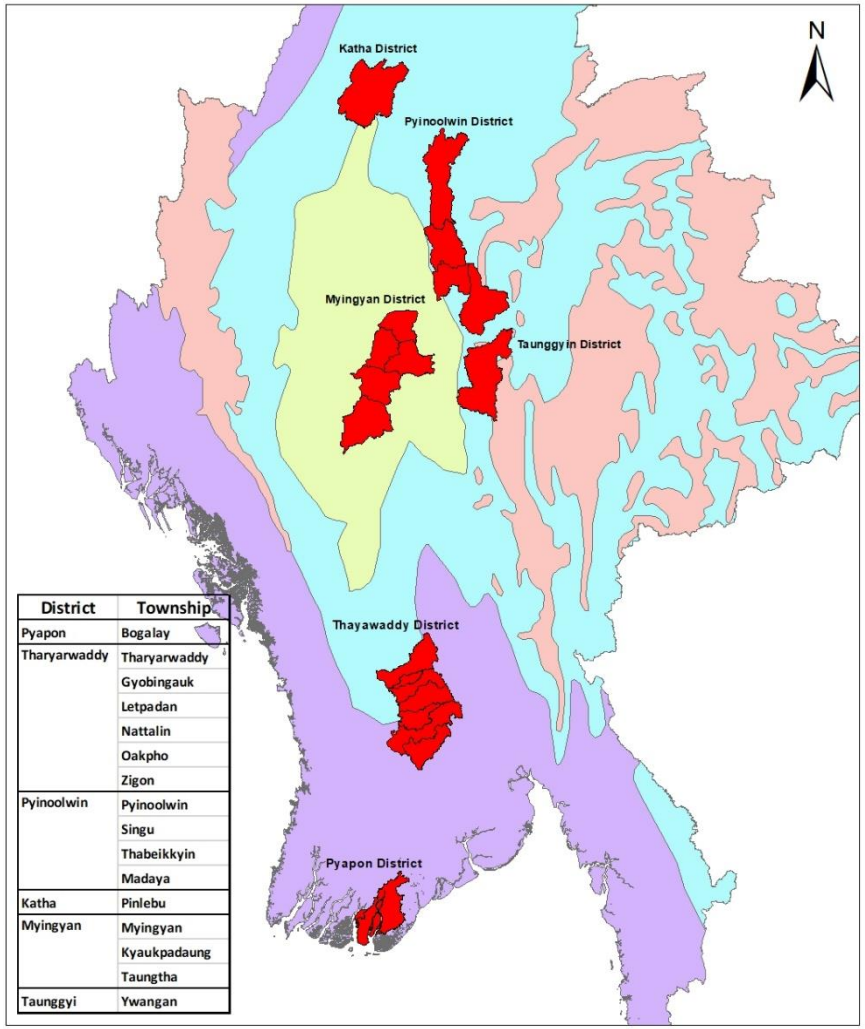
- NFI 2nd Field Testing Training Data at Myeik 6 - 10 Jan 2020

- Myeik_training_sample
- Myeik_training_sample

Learning from Previous 1st Field Methodology Testing for Myanmar National Forest Inventory (Feb-Apr 2019)

Field Testing for Myanmar National Forest Inventory

NFI Field Testing Site

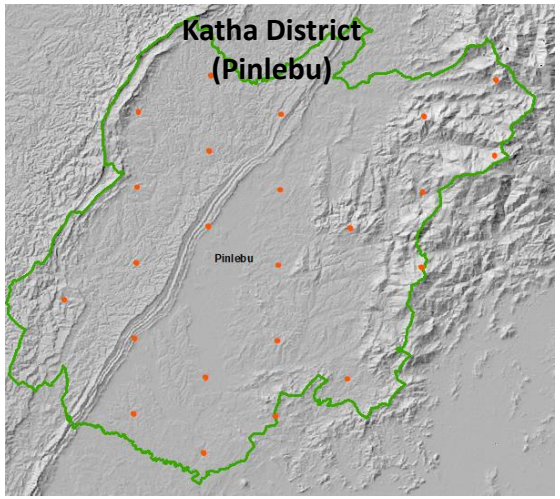


District	Township
Pyapon	Bogalay
Tharyarwaddy	Tharyarwaddy
	Gyobingauk
	Letpadan
	Nattalin
	Oakpho
	Zigon
Pyinoolwin	Pyinoolwin
	Singu
	Thabeikkyin
	Madaya
Katha	Pinlebu
Myingyan	Myingyan
	Kyaukpadaung
	Taungtha
Taunggyi	Ywangan

Region & State	District	Permantent	Temporary	Total
Sagaing Region	Katha	3	20	23
Mandalay Region	Pyinoolwin	2	22	24
Mandalay Region	Myingyan	2	8	10
Shan State	Taunggyi	5	18	23
Bago Region	Tharyarwaddy	4	13	17
Ayeyarwady Region	Pyapon	8	27	35
	Total	24	108	132

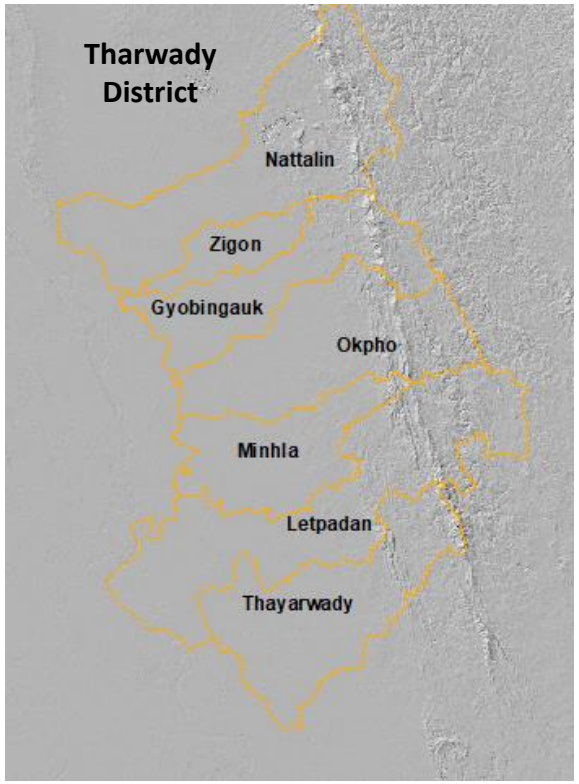
No	State and Region	District	Township	Forest Type	Forest Subtype	No. of Crews	Forest Cover: Closed Fores PSP	Closed Fores TSP	Open Forest PSP	Open Forest TSP	OWL PSP	OWL TSP	rest Plantati PSP	rest Plantati TSP	Total PSP	Total TSP	otal Cluste
1	Ayeyarwaddy	Pyapon	Bogalay	Mangrove	Mangroves	2	7	26	1	1	-	-			8	27	35
2	Bago	Tharyarwaddy	Tharyarwaddy	Tropical Rain Forest	Evergreen Hardwood Forests, Mixed Deciduous Forests	1	1	-	-	-	-	-			1	0	1
			Gyobingauk				1	-	-	-	-	2			1	2	3
			Letpadan				1	4	-	-	-	1			1	5	6
			Nattalin				-	1	-	-	1	1			1	2	3
			Oakpho				-	2	-			2			0	4	4
	BGO Total						3	7	0	0	1	6	0	0	4	13	17
3	Mandalay	Pyinoolwin	Pyinoolwin	Tropical Moist Forest	Mixed Deciduous Forests, Upper Moist, Hill Forests, Moist, Mixed	2	-	2	-	5	-	-	1	-	1	7	8
			Singu				-	2	-	3	-	-			0	5	5
			Thabeikkyin				1	5	-	2		1			1	8	9
			Madaya				-	-	-	2		-			0	2	2
	MDY-Pginoolwinn Total						1	9	0	12	0	1	1	0	2	22	24
4	Mandalay	Myingyan	Myingyan	Tropical Dry Forest	Tropical Dry Forest		-	-	-	-	-	2			0	2	2
			Kyaukpadaung				-	1	-		1	2			1	3	4
			Taungtha				-	-	-	-	1	3			1	3	4
	MDY-Myinggan Total						0	1	0	0	2	7	0	0	2	8	10
5	Sagaing	Katha	Pinlebu	Tropical Moist Forest	Indaing Forests	1	3	14	-	1	-	5			3	20	23
6	Shan(South)	Taunggyi	Ywangan	Tropical Mountain Fore	Hill Forest, Moist, Mixed; Hill Forest, Pine	1	4	12	-	-	1	6			5	18	23
	Total					7	18	69	1	14	4	25	1	0	24	108	132

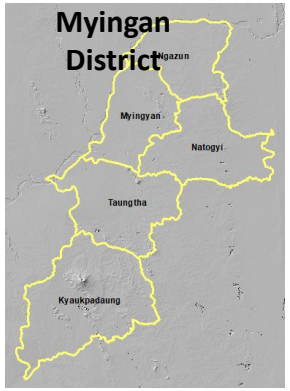
Average travelling time from Base Camp to Cluster Plot by Township

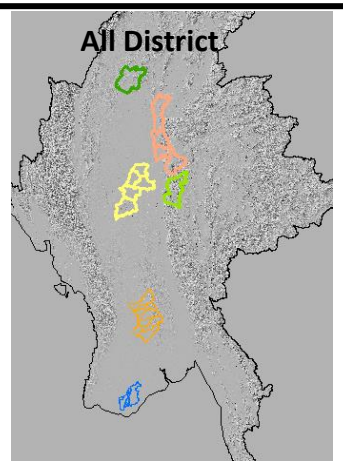


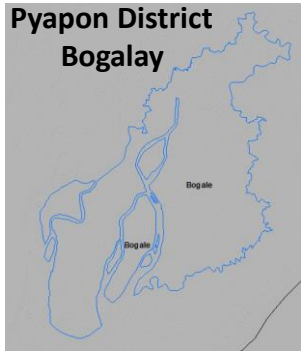
Region	District	Township	Hour	Minutes
Sagaing	Katha	Pinlebu	2	36
Mandalay	Pyinoolwin	Madaya	3	30
		Pyinoolwin	3	8
		Singu	3	36
		Thabeikkyin	2	32
	Myingyan	Myingyan	0	50
		Kyaukpadaung	1	41
		Taungtha	1	55
Shan_South	Taunggyi	Ywangan	3	25
Bago	Tharyarwady	Gyobingauk	1	22
		Letpadan	1	39
		Nattalin	2	28
		Oakpho	3	33
		Tharyarwady	1	47
Ayeyarwady	Pyapon	Bogalay	1	50

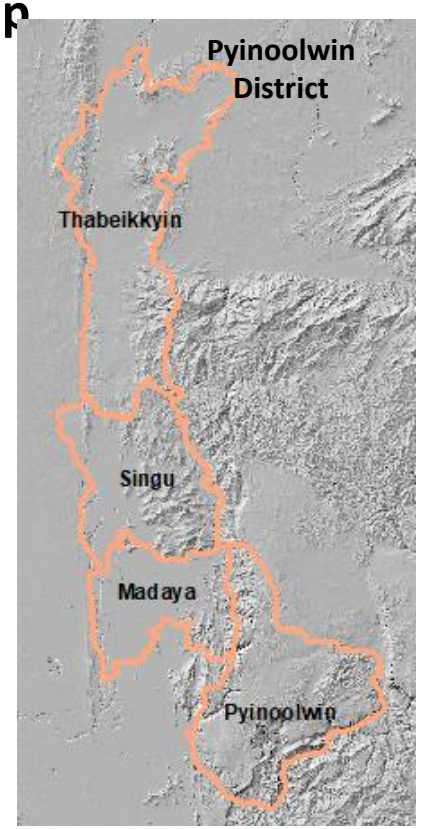
Average travelling time from base camp to cluster = 2 hr.

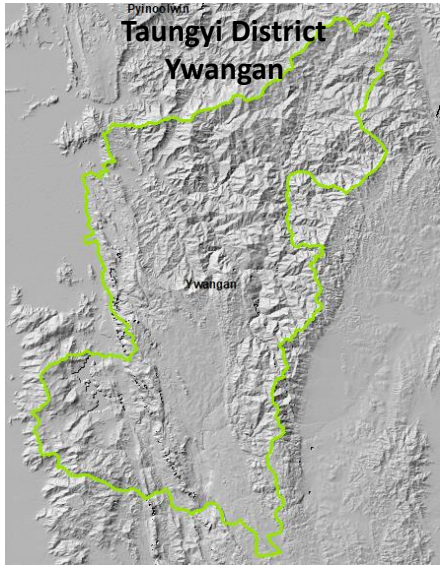












Working power and preparation days for cluster by township

Region & State	District	Township	Working in field		Total days long	Prepare & movement	Working days in field	no. of plot	plots/day	cluster/day
			Start Date	End Date						
Sagaing	Katha	Pinlebu	2-Mar-19	9-Apr-19	39	14	25	64	2.56	0.85
Mandalay	Pyinoolwin	All townships	28-Feb-19	1-Apr-19	33	12	21	60	2.86	0.95
Mandalay	Myingyan	All townships	26-Feb-19	11-Mar-19	14	4	10	27	2.70	0.90
Shan South	Taungyi	Ywagan	28-Feb-19	8-Apr-19	40	19	21	53	2.52	0.84
Bago	Tharwady	All townships	5-Mar-19	8-Apr-19	35	15	20	49	2.45	0.82
Ayeyarwady	Pyapon	Bogale	26-Feb-19	10-Apr-19	43	19	24	99	4.13	1.38
						83	121	352	2.91	0.94

Prepare & major movement days : Working days = 1: 1.4

Field measurement for one cluster is roughly enough in one day.

Working time on Permanent and Temporary at Up-in Land & Mangrove

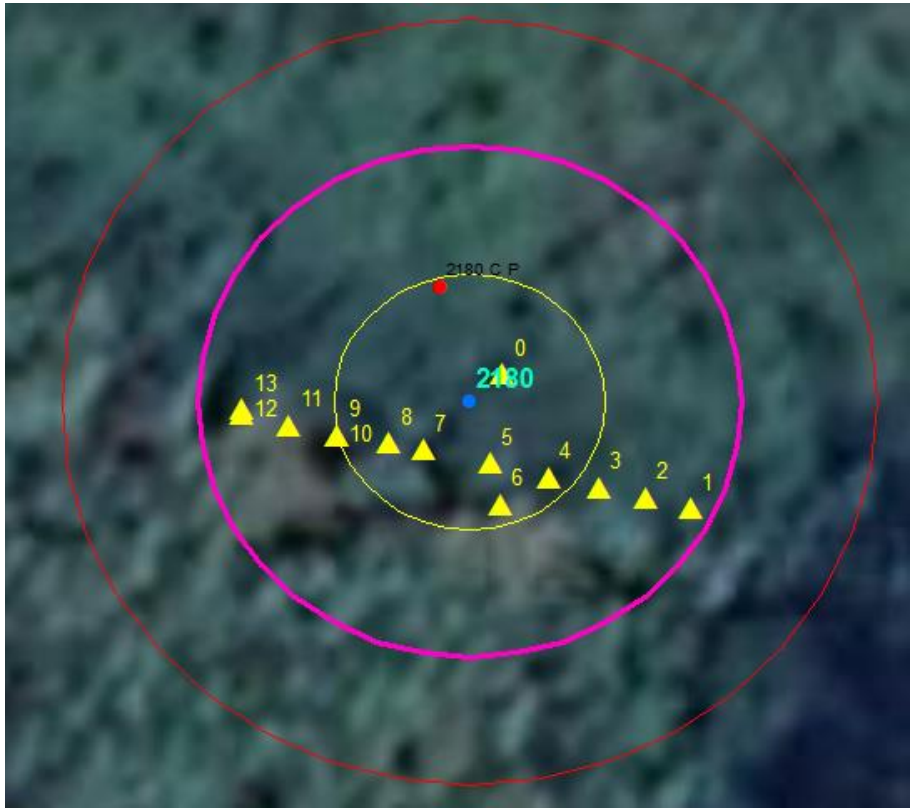
Time consume by up-in land & Mangrove by permanent & temporary

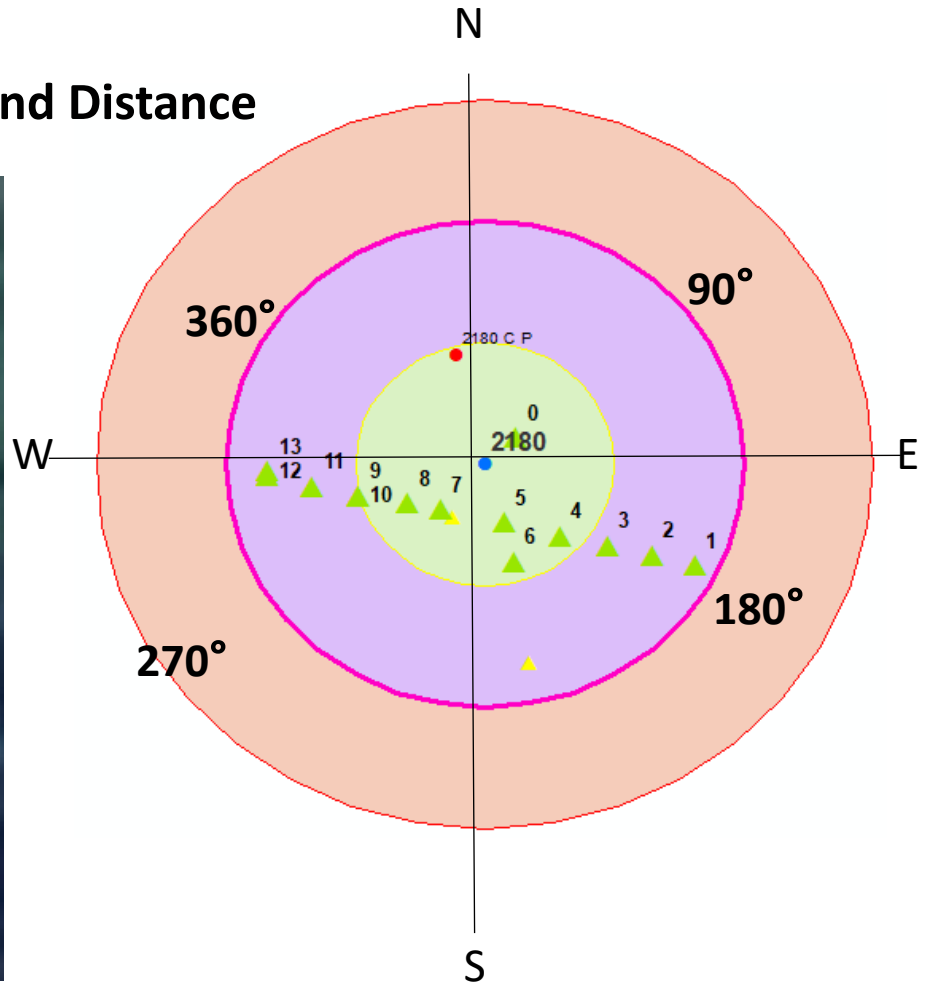
		Total no.of cluster	Total no.of tree trees	Total long min minutes	Time for one cluster	
					avg. tree	Time
Permanent	Up-in land	16	787	6635	50	6 hr. 54 min.
	Mangrove	7	86	1563	12	3 hr. 43 min
Temporary	Up-in land	75	4040	12705	54	2 hr. 49 min.
	Mangrove	17	425	1557	25	1 hr. 31 min.

Time Consume Permanent (Up-in land) > Permanent (Mangrove) > Temporary (Up-in land) > Temporary (Mangrove)

NFI sample cluster plot CWS location and Tree Position

Tree position calculated from Azimuth and Distance





Table

pol_2180C_trees

FID	Shape	t_azimu	distance
0	Point	49	2
1	Point	117	11
2	Point	120	9
3	Point	125	7
4	Point	135	5
5	Point	162	3
6	Point	164	5
7	Point	222	3
8	Point	241	4
9	Point	255	6
10	Point	255	6
11	Point	262	8
12	Point	267	10
13	Point	268	10

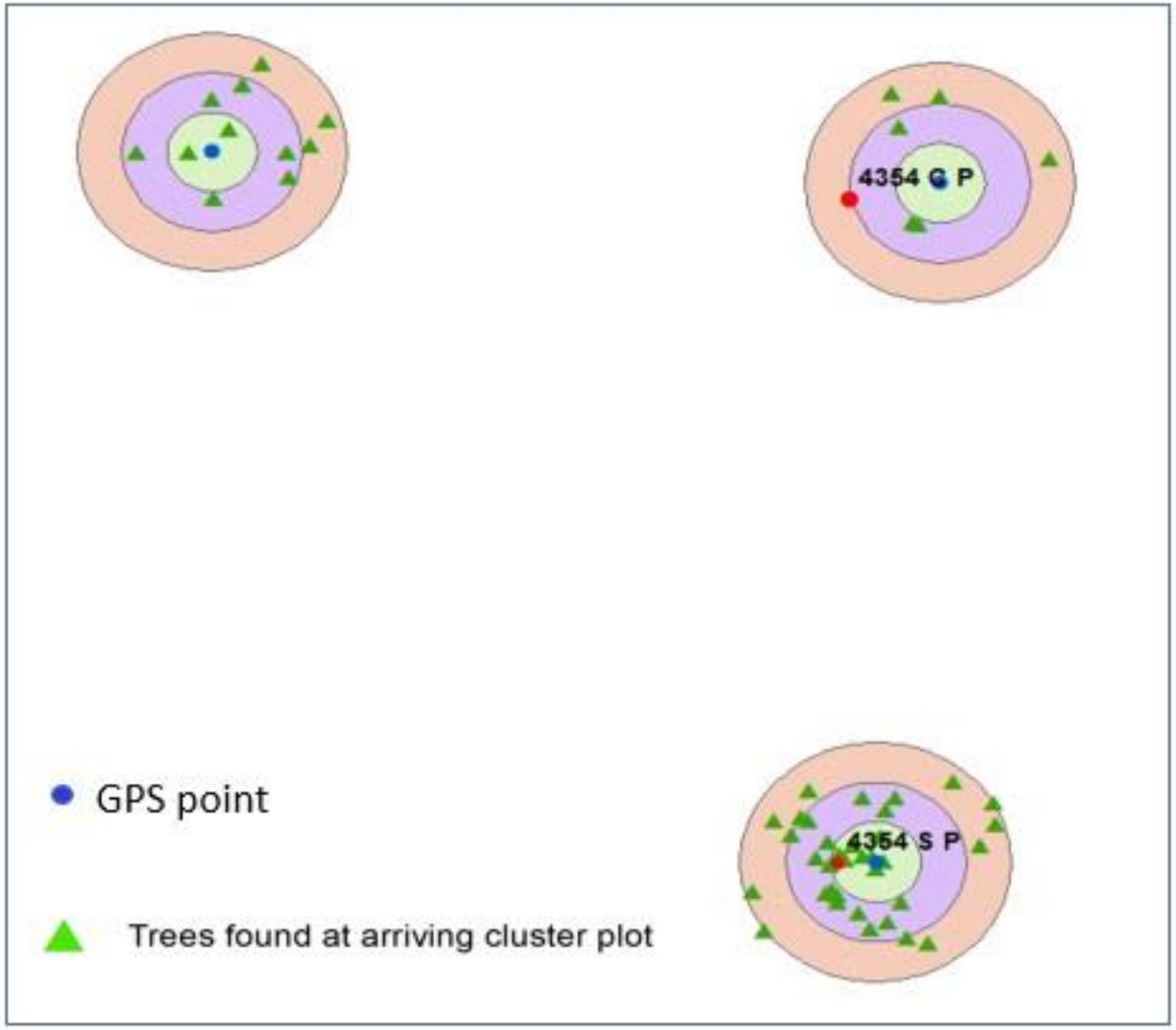
0

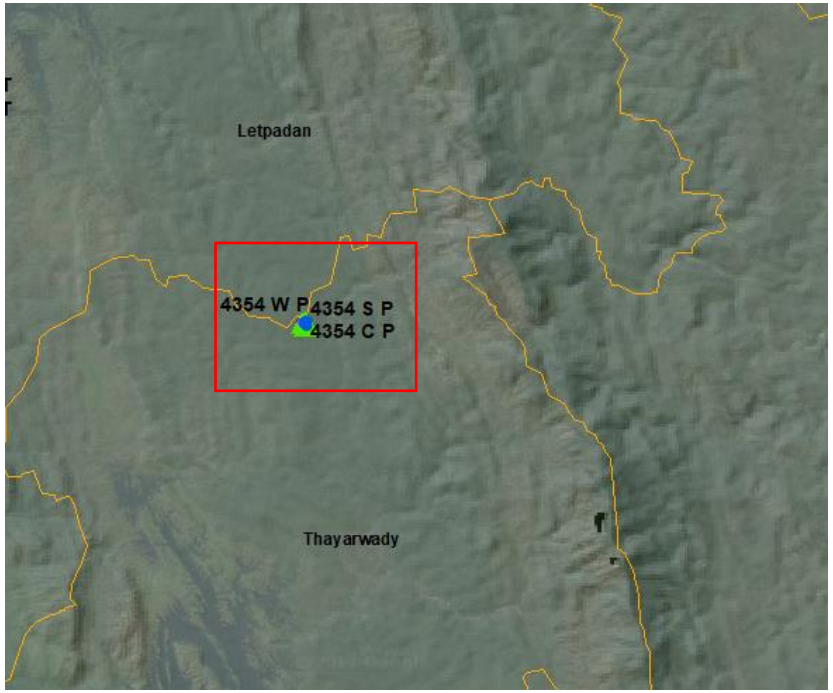
(0 out of 14 Selected)

pol_2180C_trees

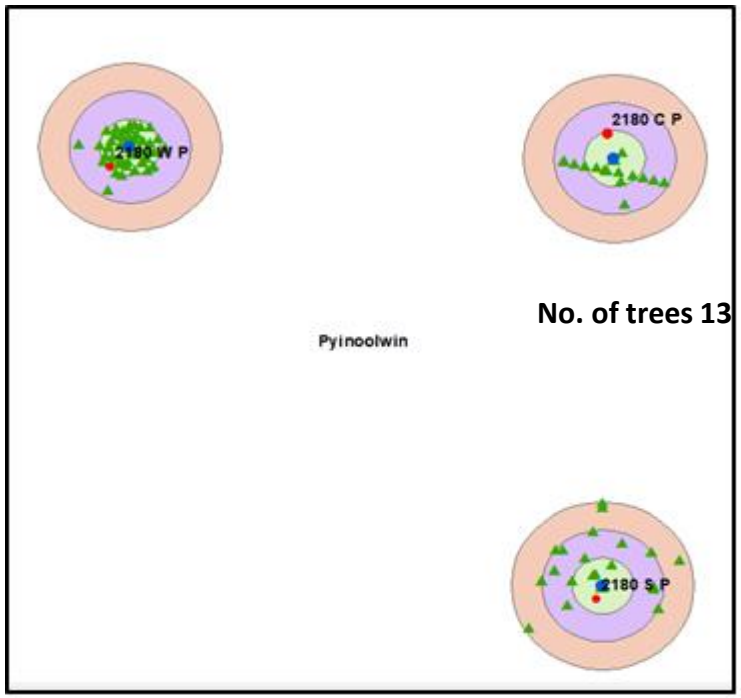
Nikon Laser Range Finder Hypsometer and Hagloef Vertex's tree position measurement accuracy is good.

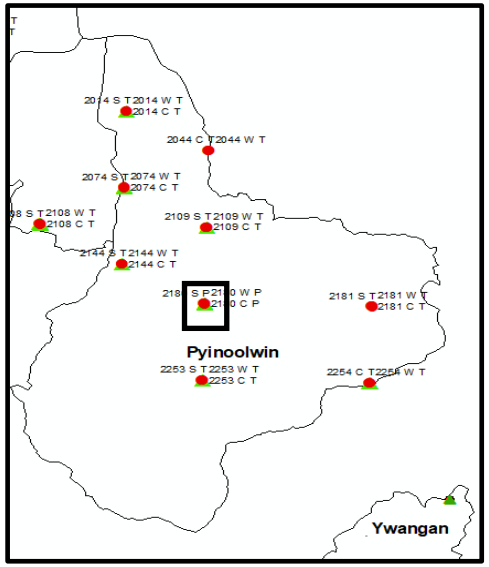
NFI sample cluster plot CWS location and arrived location



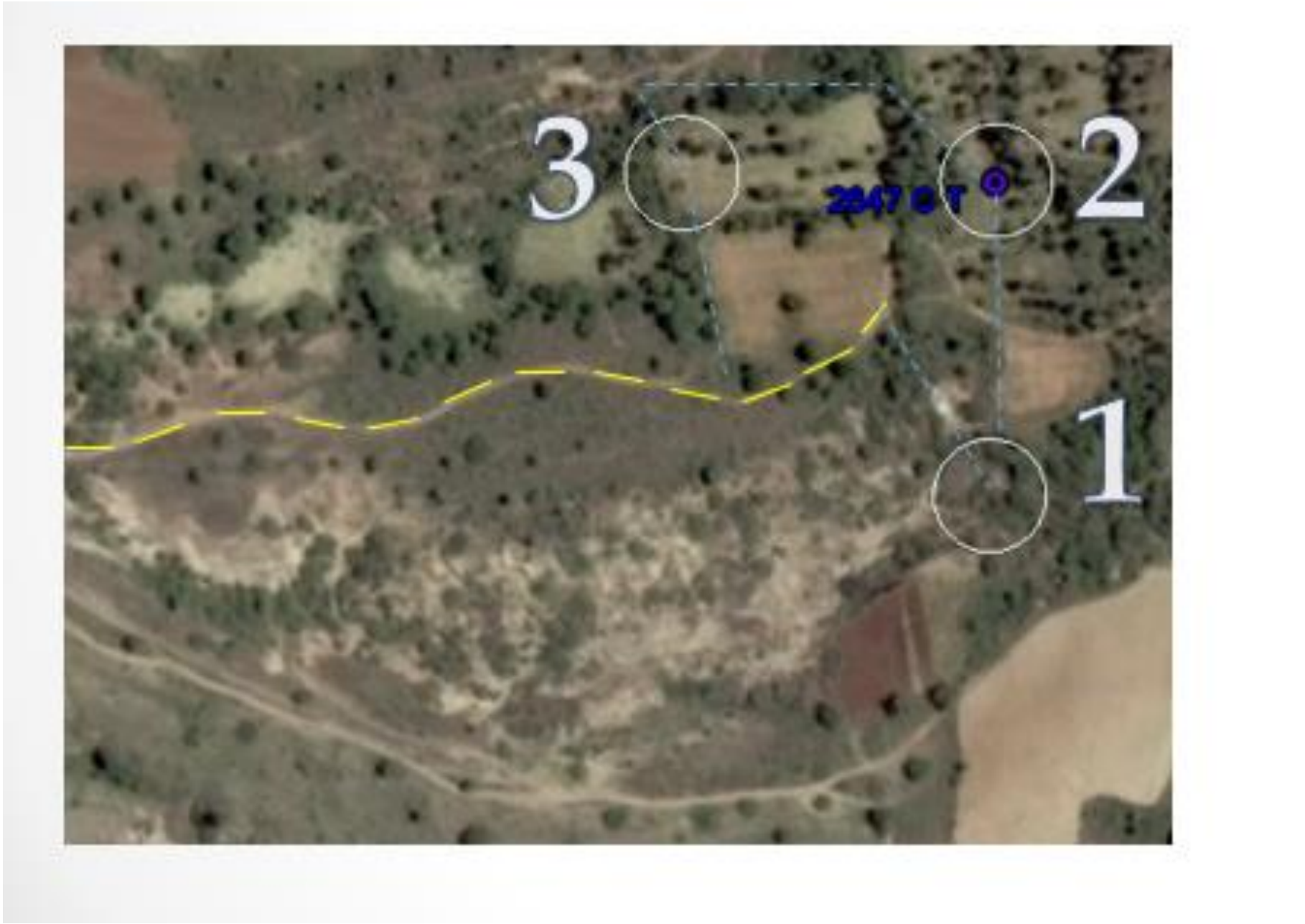


NFI sample cluster plot CWS location and GPS location





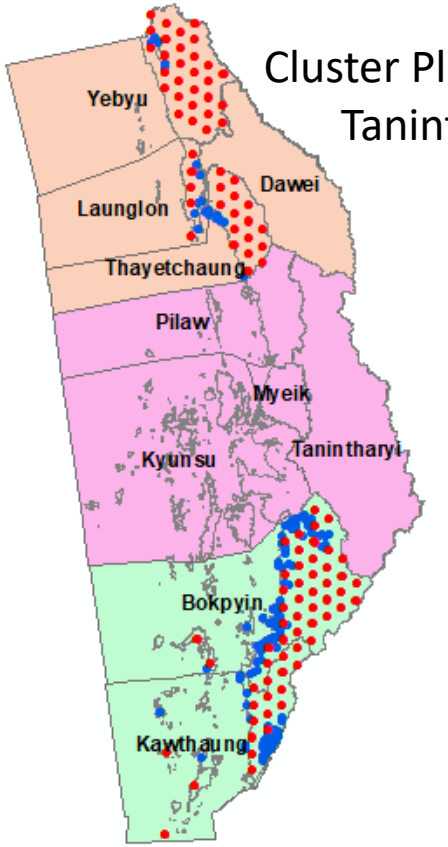
NFI sample cluster plot CWS location and GPS location



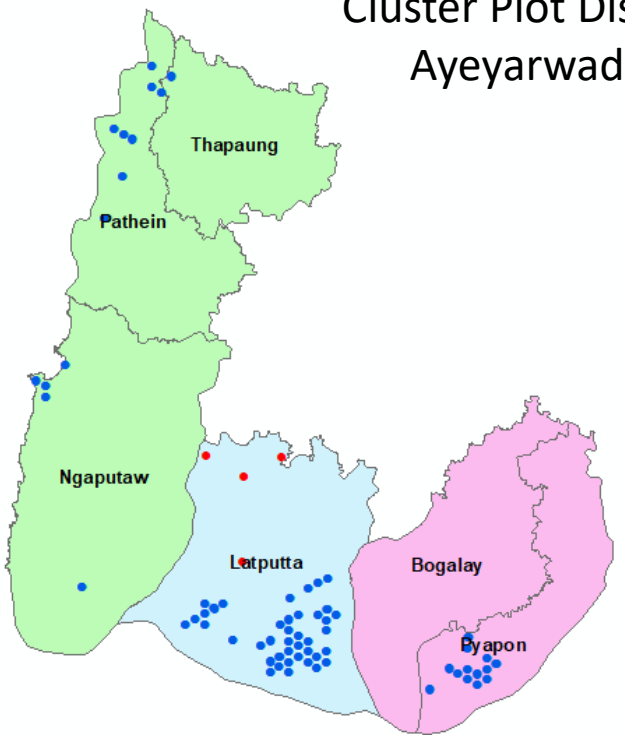
Cluster Plot Distribution of 2nd Field Methodology Testing for Myanmar National Forest Inventory (Jan-Mar 2020)

Cluster Plot Distribution of 2nd Field Methodology Testing for Myanmar National Forest Inventory (Jan-Mar 2020)

Cluster Plot Distribution at Tanintharyi Region



Cluster Plot Distribution at Ayeyarwady Region



Regipn	District	Township	Up-in land			Mangrove		
			Temporary	Permanent	Total	Temporary	Permanent	Total
Tanintharyi	Dawei	Launglon	5		5	5	1	6
		Thayetchaung	12	3	15	6	2	8
		Yebyu	23	6	29	4	1	5
	Dawei Total		40	9	49	15	4	19
	Kawthaung	Bokpyin	29	9	38	57	14	71
		Kawthaung	15	4	19	23	5	28
	Kawthaung Total		44	13	57	80	19	99
Tanintharyi Total			**84**	**22**	**106**	**95**	**23**	**118**

Regipn	District	Township	Up-in land			Mangrove		
			Temporary	Permanent	Total	Temporary	Permanent	Total
Ayeyarwady	Latputta	Latputta	4		4	33	8	41
	Latputta Total		4		4	33	8	41
	Pathein	Ngaputaw				4	1	5
		Pathein				7	1	8
		Thapaung				1		1
	Pathein Total					12	2	14
	Pyapon	Pyapon				11	2	13
	Pyapon Total					11	2	13
Ayeyarwady Total			**4**		**4**	**56**	**12**	**68**

Available Custer Plot Distribution Map by Google Earth & UTM

Kawthaung cluster plot and map in google

- Perment cluster plot (Up-in land)
- Temporary cluster plot (Up-in land)
- Perment cluster plot (Mangrove)
- Temporary cluster plot (Mangrove)

kawthaung cluster plot_Map

- Perment cluster plot (Up-in land)
- Temporary cluster plot (Up-in land)
- Perment cluster plot (Mangrove)
- Temporary cluster plot (Mangrove)

Cluster Plot Distribution for Training in Myeik

Data Collection from field

Plot Record

no	type	stratum	crew_info	crew_info	crew_info	crew_info	crew_info	crew_info	permaner	base_camp	base_loc_srs	base_loc_x	base_loc_y	visited	access	acc	start_pos_	start_pos_	start_pos
4857	P	1	2		2		2		FALSE	Labutta La Mir	EPSG:4326	94.75571794	16.14378331	TRUE	0		EPSG:4326	94.69119	16.3533
4858	P	1	2		2		2		FALSE	Forest Camp 4	EPSG:4326	94.756975	16.145524	TRUE	0		EPSG:4326	94.90191	16.3250
4873	P	1	2		2		2		FALSE	Forest Camp 4	EPSG:4327	94.756975	16.145524	TRUE	0		EPSG:4326	94.8031	16.2721
4927	P	1	3		3		3		FALSE	Tharyargone F	EPSG:4330	94.98536034	15.81914802	TRUE	0		EPSG:4326	94.79943	16.0539
5015	P	1	6		6		6		FALSE	Kalein aung fc	EPSG:4327	98.13790333	14.62311496	TRUE	0		EPSG:4326	97.88327	15.0337
5017	P	1	6		6		6		FALSE	Kalein aung fc	EPSG:4326	98.13790333	14.62311496	TRUE	0		EPSG:4326	97.99447	14.9899
5019	P	1	6		6		6		FALSE	Kalein aung fc	EPSG:4328	98.13790333	14.62311496	TRUE	0		EPSG:4326	97.86595	14.9188
5020	P	1	6		6		6		FALSE	Kalein aung fc	EPSG:4326	98.13790333	14.62311496	TRUE	0		EPSG:4326	98.07856	14.9238
5021	P	1	6		6		6		FALSE	Kalein aung fc	EPSG:4326	98.13790333	14.62311496	TRUE	0		EPSG:4326	97.97551	14.8701
5023	P	1	6		6		6		TRUE	Me tha taung	EPSG:4326	97.90487985	14.81685055	TRUE	0		EPSG:4326	97.87806	14.8218

cluster_nc	cluster_ty	_time_stu	date_year	date_mon	date_day	vehicle	from_clus	time_depcamp_	time_depcamp	time_depcar	time_dep	time_dep	time_dep	time_arr_	time_arr_minute	
5508	P	1	2020	1	13	TRUE	FALSE	7	40	9	0	11	55	12	32	
5509	P	1	2020	1	14	TRUE	FALSE	7	46	9	20	11	59	13	9	
5507	P	1	2020	1	15	TRUE	FALSE	9	49	12	2	13	55	14	40	
5506	P	1	2020	1	16	TRUE	FALSE	7	17	8	5	10	9	11	5	
5505	P	1	2020	1	16	TRUE	FALSE	10	35	11	21	15	30	16	31	
4873	P	1	2020	1	27	FALSE	FALSE	10	30					12	47	
5582	P	1	2020	1	20	TRUE	FALSE	9	28	10	12	12	6	12	36	

Conclusion

- **Crew have not move sample plot to another location to measure because of all are related to National Integrated System.**

- **Everywhere, it is better to wait some minutes (4 minutes) to take GPS coordinate.**

- **IF for any center to take GPS position at center, west & south plot are located by dense forest covered by big trees and wide canopy. If so, you can not have GPS good accuracy. It is better have a some place distance (e.g 12 meter) far away from center and which place must be good GPS accuracy. In that place, take measurement manually according to azimuth (direction) & distance shown in GPS to center point.**

Thanks you