Assessing the ecological effectiveness of community forests for forest conservation in Inle Lake Watershed, Myanmar

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I. Introduction

Community forestry is the modified forest management system to conserve forests with the participation of local communities. As the majority of the studies focus on the socio-economic perspectives, scientific understanding on the progress of community forest has been limited or lacked. Besides, the resilience of the community forests is utmost important for the implementation of community forestry enterprises in the future.

Objectives

1. To observe and compare the species diversity and stand structure of community forests with other two stands
2. To recommend the appropriate silvicultural and management practices for successful restoration of community forests

II. Material and methodology

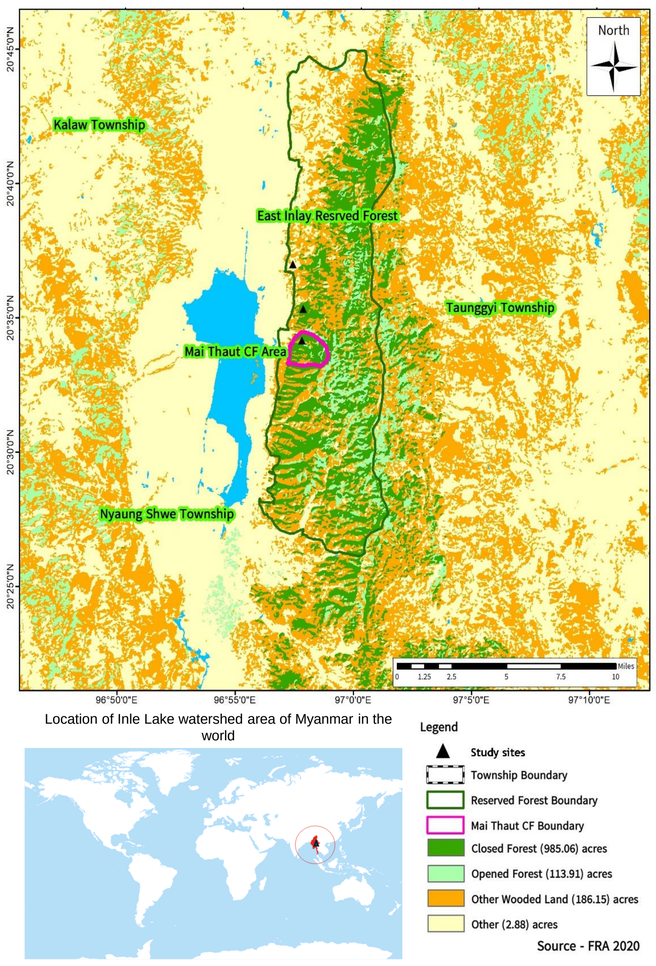

Figure 1. Forest cover status of the eastern side of the Inle Lake watershed, Nyaung Shwe Township, Myanmar.

Methodology

- Systematic sampling design was used to lay down plots.
- Total 25 plots (20 m × 20 m) were laid out to measure trees (DBH > 10 cm).
- Each plot was divided into four subplots (10 m × 10 m) to measure saplings (3 cm < DBH< 10 cm and height > 1.3 m).
- Then, seedlings were measured inside the four compartments (5 m × 5 m) at the four corners of each single plots.
- The collected data were put into Microsoft excel 365 and analyzed by using R studio 1.3.
- Descriptive statistics, non - parametric Kruskal wallis test and other required statistics tests were used to analyze the collected information.

III. Results

i. Sampling accuracy (Contd.)

Species-aera curve

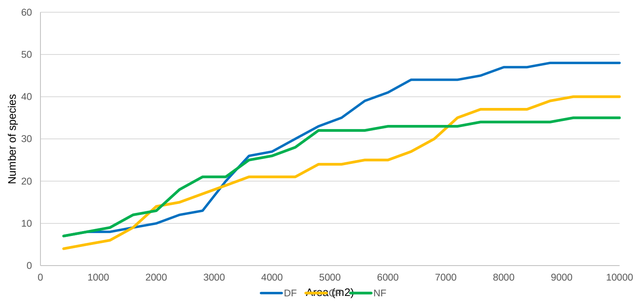

Figure 2. Species-area curves of the three study sites

1. Sampling accuracy (Contd.)

1.2. Standard error of mean basal area

Table 1. Standard errors of the mean basal area of the three study sites

Study Sites	No of plots per site	Mean Basal area per plot (400 m²) ± SD	Standard error of the Mean Basal Area (%)
DF	25	0.61 ± 0.06	6.4
CF	25	0.78 ± 0.06	6.5
NF	25	0.86 ± 0.07	7.1

ii. Species composition

Species Composition

Table 2. Important Value Indices (IVI) of trees in the three study sites

Rank	Species	Abun (n/ ha)	Domin (m2/ ha)	Freq	IVI
	Degraded forest				
1	*Shorea siamensis*	257	8.26	21	110.01
2	*Wendlandia tinctoria*	63	0.95	15	25.61
3	*Dalbergia cultrata*	47	0.67	18	22.80
4	*Dioecrescis erythroclada*	32	0.45	12	15.32
5	*Quercus brandisiana*	29	0.76	8	14.52
	6-47 species	161	4.10		111.24
	Total	**590**	**15.20**		**300.00**
	Community forest				
1	*Shorea siamensis*	484	11.01	23	128.50
2	*Melanorrhoea usitata*	87	2.15	22	34.52
3	*Quercus kerrii*	53	1.40	15	22.44
4	*Dalbergia cultrata*	27	0.47	12	12.79
5	*Quercus brandisiana*	28	0.31	8	9.69
	6-40 species	151	4.13		92.07
	Total	**830**	**19.47**		**300.00**
	Natural forest				
1	*Shorea siamensis*	334	10.18	25	116.43
2	*Melanorrhoea usitata*	107	2.95	22	45.18
3	*Quercus kerrii*	60	2.84	13	31.29
4	*Dalbergia cultrata*	20	0.64	9	12.11
5	*Quercus brandisiana*	7	0.80	6	8.82
	6-35 species	109	4.10		86.62
	Total	**637**	**21.51**		**300.00**

Species diversity

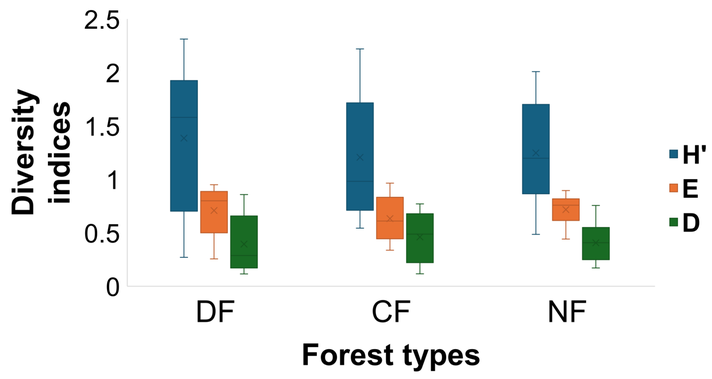

Figure 3. Comparison of species diversity indices of the three study sites (H' = Shannon's index, E = Species evenness, D = Simpson's index)

Similarity of species

Table 3. Comparison of coefficient of similarity of the three study sites

K_s	DF	CF	NF
DF	-	54.12	45.00
CF	54.12	-	57.53
NF	45.00	57.53	-

K_d	DF	CF	NF
DF	-	87.68	87.92
CF	87.68	-	90.91
NF	87.92	90.91	-

Ks = Sὸrensen's coefficient of similarity and Kd = Sὸrensen's coefficient of similarity based on IVI

iii. Stand structure

Table 4. Comparison of the parameters of measuring stand structure of the three study sites

Parameters (per ha)	DF	CF	NF
No of species	47	40	35
Stand density	590	830	637
Arithmetic diameter (cm)	15.9±8.62	16.2±6.21	18.4±9.55
Basal area (m2)	15.2±0.03	19.5±0.02	21.5±0.05
Mean height	7.8±2.8	8.5±2.2	9.2±3.7
Volume (m^3)	22.8±0.07	38.3±0.06	40.9±0.10

Diameter frequency distribution

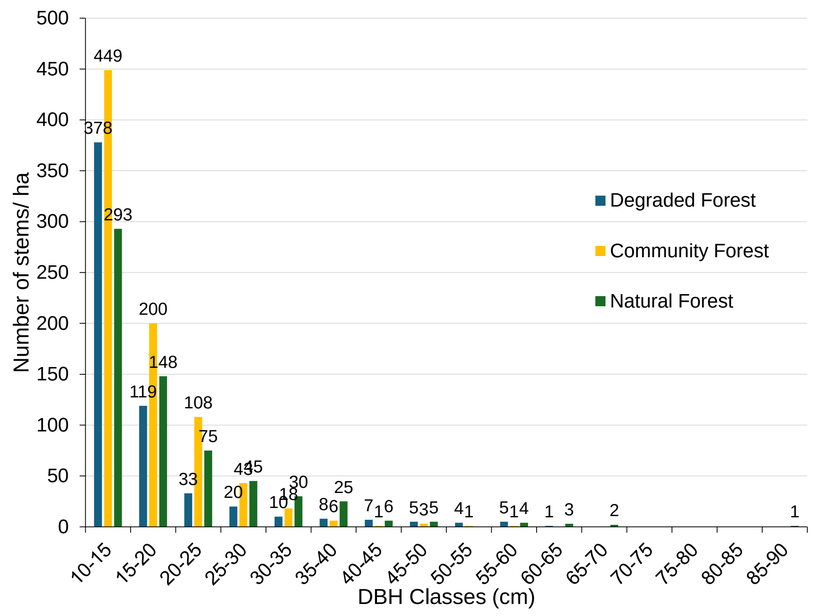

Figure 4. Diameter Frequency Distribution of the three study sites

iv. Natural regeneration

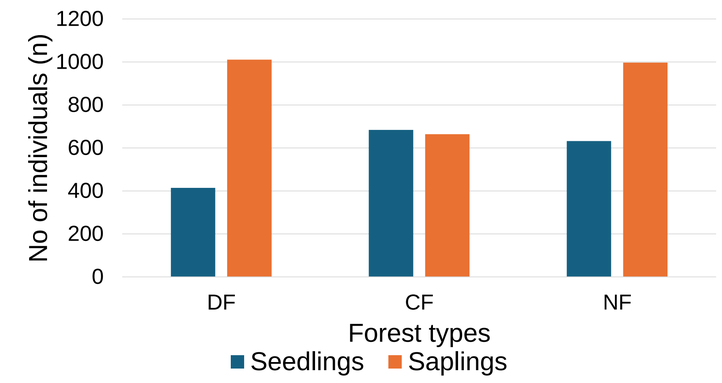

Figure 5. Natural regeneration status of the three study sites

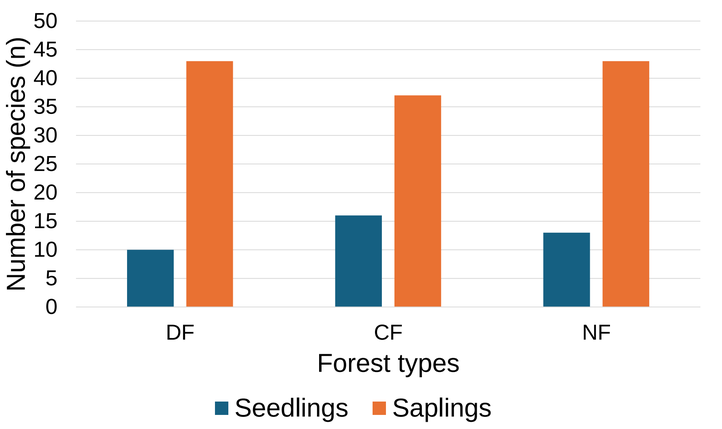

Figure 6. Number of tree species found at the natural regeneration state across the three study sites

IV. Conclusion

- No significant difference was observed in terms of the species diversity indices of all investigated stands.
- The stand structure of the community forest approached similar to that of the natural forest sites.
- On the other hand, the community forest had the least number of the natural regeneration than the other two stands by means of the number of species and individuals.
- It suggested that silvicultural activities for improving natural regeneration were utmost important for sustainable use of forest. Besides, regular monitoring, research in broader context and institutional and legal framework should be promoted in the future.
- Therefore, community forestry practice is the forest management system with higher potential to restore degraded natural forests.

V. Acknowledgements

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