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Regeneration Status of Babu Para Village Common Forest (VCF) in Bandarban District, Bangladesh

Md. Kamruzzaman*, Md. Akhter Hossain, Morgubatul Jannat, Mohammed Kamal Hossain

Institute of Forestry and Environmental Sciences, University of Chittagong, Chittagong, Bangladesh

Email address

kzregan@gmail.com (Md. Kamruzzaman)
*Corresponding author

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Abstract

Natural regeneration is an essential process that indicates self-restoration capacity of forests. This study investigated regeneration status of Babupara Village Common Forest (VCF) in Rowangchori Upazilla of Bandarban district, Bangladesh. Stratified random sampling was carried out with 5m × 5m sample plots to depict the regeneration status of the tree species of the VCF. The findings revealed occurrence of 35 regenerating tree species belonging to 20 families in the VCF, where seedlings of *Suregada multiflora* was dominant. Among the families Euphorbiaceae was most dominant with 5 species followed by Anacardiaceae (4 species) and Moraceae (3 species). *Suregada multiflora* showed the highest relative density (9.56%) followed by *Brownlowia elata* (8.09%), *Grewia nervosa* (7.35%), *Protium serratum* (7.35%), *Litsea glutinosa* (6.62%) and *Alstonia scholaris* (5.15%). *Syzygium fruticosum*, *Ficus* spp. and *Artocarpus heterophyllus* showed the highest (4.27%) relative abundance followed by *Grewia nervosa* (3.56%), *Morinda angustifolia* (3.56%) and *Anogeissus acuminata* (3.56%). A total of 89% species were regenerating from seed and 11% from coppice. The species diversity indices, i.e. Shannon-Wiener's Diversity (3.28), Simpson's Diversity (0.047), Margalef's Richness (6.92) and Species Evenness Index (0.92) indicate rich regenerating species diversity. As a whole the results indicate promising regeneration status of the native tree species at Babu Para VCF which also indicates effective functioning of community management for keeping the forest undisturbed and suitable environmental condition for natural regeneration. Conservation of the regeneration and recruitment in order to ensure maximum species diversity need protection of the regeneration. It will play important role for sustainable management of the Babu para VCF for the betterment the community.

1. Introduction

Village Common Forests (VCFs) are specially managed natural forest patches in Chittagong Hill Tracts (CHT) of Bangladesh other than the government forest. In most of the cases this kind of forests are situated around the households of the ethnic communities who used to get multiple services from these forests. Although the entire area of the CHT was covered with dense forest in the early 19th century; now most of the area has been denuded and covered with obnoxious weeds with some scattered trees and

shrubs "[1], [25]". The birth of community-managed VCF in the CHT is a direct result of resource constraints caused by deforestation and the prevention of entry into and use of the resources of the newly acquired reserved forests. These constraints led local communities to devise newer and more sustainable modes of the natural resources management. One such innovation, drawing upon indigenous traditional methods of forest fallow and jhum cultivation, gave birth to the VCF during the first quarter of the 20th century "[4], [23]".

Village Common Forests (VCFs) are smaller forest enclosures of around 100 acres each in size consisting of naturally grown or regenerated vegetation "[17]". The VCFs are managed, protected and utilized by indigenous communities under the leadership of the Mauza headman or *karbari or* by educational or religious institutions. Sometimes a committee is formed by leaders from one or more villages "[2], [8], [12], [24], [29]".

Despite continuous collection of forest resources, i.e. bamboo, fuel wood, timber, medicinal plants along with other non-timber forest products, the forests are rich with vegetative and faunal resources "[3], [13]". It is because of the suitable environmental condition supporting natural regeneration, growth and development of the plants as well as efficient management of the associate ethnic communities. Natural regeneration refers to the natural process by which plants replace or re-establish themselves by means of self-sown seed or vegetative recovery by sprouting from stumps, rhizomes or roots "[20]". The natural regeneration dynamics of the forest is an extremely complex process that depends on environmental factors such as distribution of rainfall, topographic, edaphic and light conditions, seed viability and dormancy, seed predation and herbivory "[5], [7], [15], [18]". Information on natural regeneration potential leads to conservation measures of biological diversity "[30]". It is an important indicator for evaluating overall condition of forest ecosystem "[22]".

Information on regeneration status of native plant species is of great importance in management and conservation measures. Quantitative inventories help in identification of economically useful species as well as species of special concern, i.e. rare, uncommon and vulnerable species, and thus to quantify conservation worthiness of the candidate sites "[14]". But, unfortunately there is great dearth of information about the natural regeneration status of the native tree species growing in the VCFs. Thus, present study is carried out in an aim to explore regeneration status of a VCF in Bandarban district which is locally known as Babu para VCF.

2. Materials and Methods

2.1. Study Area

The study was carried out in Babu Para Village Common Forest (VCF) in Rowangchori upazilla of Bandarban district, Bangladesh. More specifically, it is located in 9 no. ward of Alekkhayong mouza about 42 km away from the Rowangchori Upazilla Sadar. This VCF was established in 1985. It covers an area of 40 acres. People living around this VCF are lacking most of the modern citizen facilities including electricity. *Chora* (stream), in local language, is only water source for drinking and daily use.

2.2. Sampling Methods

The methods of the study consist of reconnaissance survey, field work and finally data analysis and report writing. To have an idea about the area including location, accessibility, communication means a field visit as well as formal discussion with Tahzingdong NGO (Non-Governmental Organization) was conducted prior to finalization of the sampling strategy.

After the reconnaissance survey, stratified random sampling was determined as the main sample strategy for inventorying the regeneration status. The sampling plot size was 5m × 5m. In each quadrat regenerating tree species were identified and recorded. Seedlings of each species were counted for seedling density and measured for height. All the seedlings having dbh of <5 cm was identified, measured and recorded. The relative density, relative frequency, relative abundance and Importance Value Index (IVI) were calculated following published paper "[27]". Four diversity indices, i.e. Shannon-Wiener's index (H), Simpson's diversity index (D), Margalef's species richness index (R) and Species evenness index (E) were analyzed following some published papers "[16], [21], [26], [28]," respectively to get a picture of tree species diversity in Babu para VCF. Several transact walks across the VCF was made "[6]".

3. Results and Discussion

3.1. Regenerating Species Composition

Findings of the study revealed that a total of 35 tree species under 20 families are regenerating naturally in the Babu para VCF. Euphorbiaceae was the dominant family with 5 species followed by Anacardiaceae (4 species) and Moraceae (3 species). Other families have only 1-2 species each (Table 1).

Table 1. *Naturally regenerated seedlings with family in Babu para VCF.*

Sl No.	Family	Scientific name	Local name
1	Anacardiaceae	*Lannea coromandelica* (Houtt.) Merr.	Bhadi
		Holigarana longifolia Buch.-Ham. *ex* Roxb.	Jhawa, Barola
		Spondias pinnata (L. f.) Kurz	JongliAmra
		Mangifera sylvatica Roxb.	Uriam
2	Apocynaceae	*Alstonia scholaris* (L.) R. Br.	Chatian
		Holarrhena antidysenterica (L.) Wall. *ex Decne*	Kuruch
3	Bignoniaceae	*Stereospermum colais* (Buch. *ex* Dillw.) Mabberley	Dharmara
4	Burseraceae	*Protium serratum* (Wall. *ex* Coelbr.) Engl.	Gutgutia
5	Caesalpiniaceae	*Tamarindus indica* L.	Jongli Tentul
		Senna siamea	Minjiri
6	Combretaceae	*Terminalia bellirica* (Gaertn.) Roxb.	Bohera
		Anogeissus acuminata (Roxb. *ex* DC.) Gull. & Perr.	Sikori
7	Dipterocarpaceae	*Dipterocarpus turbinatus* Gaertn.	Garjan
8	Elaeocarpaceae	*Elaeocarpus tectorius* (Lour.) Poir.	Jalpai
9	Euphorbiaceae	*Antidesma* sp.	Antidesma sp.
		Suregada multiflora (A. Juss.) Bail.	Bon-naranga
		Bridelia sp.	Bridelia sp.
		Aporosa wallichii Hook. F.	Kestoma
		Mallotus philippensis (Lamk.) Mull.-Arg.	Sinduri
10	Lauraceae	*Litsea glutinosa* (Lour.) Robinson	Menda
11	Leeaceae	*Leea macrophylla* Roxb. *ex* Hornem.	Chaigas
12	Meliaceae	*Azadirachta indica* A. Juss.	Neem
13	Mimosaceae	*Albizia chinensis* (Osb.) Merr.	Chakua Koroi
		Albizia procera (Roxb.) Benth	Koroi
14	Moraceae	*Ficus hispida* L.f.	Dumur
		Ficus sp.	Ficussp
		Artocarpus heterophyllus Lamk.	Jongli Kanthal
15	Myrtaceae	*Syzygium fruticosum* (Wall.) Masamune	Putijam
16	Rubiaceae	*Neonauclea sessilifolia* (Roxb.) Merr.	Kom
		*Morinda angustifolia*Roxb.	Ronggas
17	Sterculiaceae	*Sterculia villosa* Roxb. *ex* Smith	Udal
18	Tiliaceae	*Grewia nervosa* (Lour.) Panigr.	Assargula
		Brownlowia elata Roxb.	Moos
19	Ulmaceae	*Treama orientalis* (L.) Blume	Banjiyal, Banjiga
20	Verbenaceae	*Vitex peduncularis* Wall. *ex* Schauer	Goda

From the field observation it seems that there is a great competition among the regenerating seedlings for establishment since seedling density of some species, i.e. *Suregada multiflora*, *Brownlowia elata*, *Grewia nervosa* etc. are comparatively higher. The regenerating species composition is poor compared to the findings of "[3]" who found 173 floral species regenerating from the VCF in CHT. This result indicated comparatively poor regeneration status of the studied VCF. It may be due to smaller area of the studied VCF as well as some biotic disturbances, i.e. deforestation which resulted in degradation of VCF in the recent years.

3.2. Quantitative Structure of Regenerating Tree Species

Suregada multiflora, *Brownlowia elata*, *Grewia nervosa*, *Alstonia scholaris*, *protium serratum* were very dominant regenerating tree species that frequently occurred in the Babu para VCF. Seedling density was maximum for *Suregada multiflora* (21.67) followed by *Brownlowia elata* (18.33), *Grewia nervosa* (16.67), *Protium serratum* (16.67), *Litsea glutinosa* (15) and *Alstonia scholaris* (11.67). The highest relative density (9.56%) also found for *Suregada multiflora* followed by *Brownlowia elata* (8.09%), *Grewia nervosa* (7.35%), *Protium serratum* (7.35%), *Litsea glutinosa* (6.62%) and *Alstonia scholaris* (5.15%). Maximum relative frequency was showed by *Suregada multiflora* (8.33%) followed by *Brownlowia elata* (7.29%), *Protium serratum* (7.29%), *Grewia nervosa* (6.25%), *Litsea glutinosa* (6.25%) and *Alstonia scholaris* (5.21%).

Syzygium fruticosum, *Ficus* spp. and *Artocarpus heterophyllus* showed the highest (4.27%) relative abundance followed by *Grewia nervosa* (3.56%), *Morinda angustifolia* (3.56%) and *Anogeissus acuminata* (3.56%).

The highest Importance Value Index (IVI) was calculated for *Suregada multiflora* (21.36), *Brownlowia elata* (18.73), *Protium serratum* (17.69), *Grewia nervosa* (17.16), *Litsea glutinosa* (16.07) and *Alstonia scholaris* (13.34) (Table 2).

Table 2. *Quantitative structure of naturally regenerated tree seedlings in Babupara VCF [here, RD=Relative Density, RF= Relative Frequency, RA = Relative Abundance, IVI=Importance Value Index].*

Scientific Name	Seedling/ha	RD (%)	RF (%)	RA (%)	IVI
Antidesma sp.	1.67	0.74	1.04	2.13	3.91
Grewia nervosa	16.67	7.35	6.25	3.56	17.16
Treama orientalis	6.67	2.94	3.13	2.85	8.91
Lannea coromandelica	3.33	1.47	2.08	2.13	5.69
Terminalia bellirica	3.33	1.47	2.08	2.13	5.69
Suregada multiflora	21.67	9.56	8.33	3.47	21.36
Bridelia sp.	5.00	2.21	2.08	3.20	7.49
Leea macrophylla	1.67	0.74	1.04	2.13	3.91
Albizia chinensis	1.67	0.74	1.04	2.13	3.91
Alstonia scholaris	11.67	5.15	5.21	2.99	13.34
Stereospermum colais	3.33	1.47	2.08	2.13	5.69
Ficus hispida	5.00	2.21	2.08	3.20	7.49
Ficus sp.	3.33	1.47	1.04	4.27	6.78
Dipterocarpus turbinatus	5.00	2.21	2.08	3.20	7.49
Vitex peduncularis	6.67	2.94	3.13	2.85	8.91
Protium serratum	16.67	7.35	7.29	3.05	17.69
Elaeocarpus tectorius	1.67	0.74	1.04	2.13	3.91
Holigarana longfolia	3.33	1.47	2.08	2.13	5.69
Spondia spinnata	3.33	1.47	2.08	2.13	5.69
Artocarpus heterophyllus	3.33	1.47	1.04	4.27	6.78
Tamarindus indica	1.67	0.74	1.04	2.13	3.91
Aporosa wallichii	6.67	2.94	3.13	2.85	8.91
Neonauclea sessilifolia	3.33	1.47	2.08	2.13	5.69
Albizia procera	10.00	4.41	4.17	3.20	11.78
Holarrhena antidysenterica	6.67	2.94	3.13	2.85	8.91
Litsea glutinosa	15.00	6.62	6.25	3.20	16.07
Senna siamea	1.67	0.74	1.04	2.13	3.91
Brownlowia elata	18.33	8.09	7.29	3.35	18.73
Azadirachta indica	1.67	0.74	1.04	2.13	3.91
Syzygium fruticosum	6.67	2.94	2.08	4.27	9.29
Morinda angustifolia	8.33	3.68	3.13	3.56	10.36
Anogeissus acuminata	8.33	3.68	3.13	3.56	10.36
Mallotus philippensis	3.33	1.47	2.08	2.13	5.69
Sterculia villosa	5.00	2.21	2.08	3.20	7.49
Mangifera sylvatica	5.00	2.21	2.08	3.20	7.49
Total	226.68	100.00	100.00	100.00	300.00

Many regenerating tree species recorded from Babu para VCF under this study are similar to the species "[13]". Some of those species are *Alstonia macrophylla, Artocarpus heterophyllus, Dipterocarpus turbinatus, Ficus hispida, Leea macrophylla, Mangifera sylvatica, Protium serratum, Syzygium fruticosum* and *Terminalia bellirica.*

3.3. Mode of Regeneration

Natural regeneration was observed to occur from both the seeds and coppice. A total of 89% of the regenerating tree species were regenerated from seed and 11% from coppice (Figure 1).

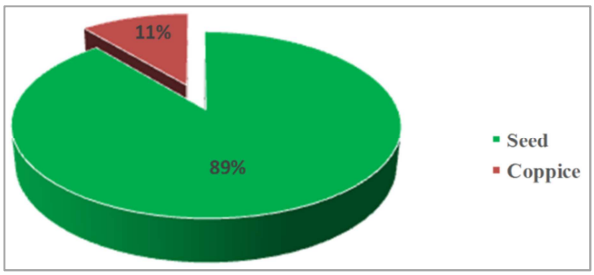

Figure 1. *Regeneration mode of the tree species in Babupara VCF.*

Natural regeneration mode in different natural forests of Bangladesh varies from area to area "[10], [19]". A total of 89% tree species were regenerated from seed and 11% from coppice (Figure 1). Most of the fruits and seeds become mature in May to September in the hill forests of CHT "[9]". They also reported that the advantages of the maturity of fruits or seeds in summer coincide with the monsoon rainfall that allowed germination of most of the fruits/seeds of the tree species in the forest sites.

3.4. Distribution of Seedlings into Different Height Classes

Percentage distribution of seedlings into different height classes showed that height range 100 - <180 cm holds maximum (38.97%) percentage of regeneration individuals. The number of seedlings was minimum (5.88%) in the height range ≥ 340 cm (Figure 2).

It indicates recent disturbances to the regeneration materials in the early stages of seedling development. In Chunati WS maximum seedlings were within height range of 50 - <100 cm **"**[11]". Collection of saplings and poles by local people for fencing resulted in reduced percentage in the higher growth classes.

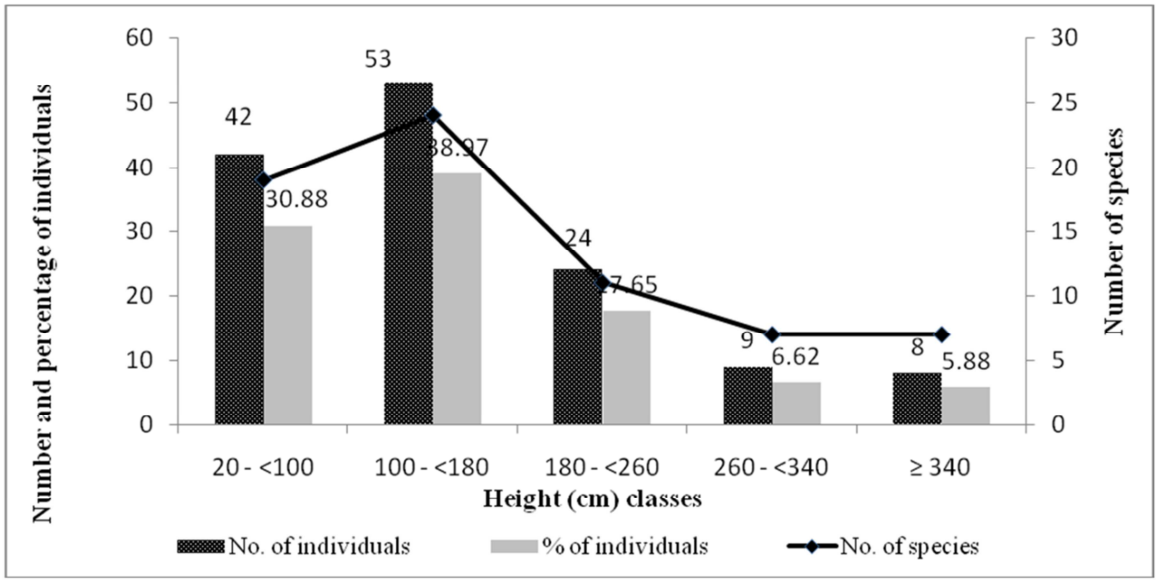

Figure 2. *Distribution of regeneration height (cm) classes in Babu para VCF, Bandarban.*

3.5. Diversity in Natural Regeneration

Several biological diversity indices were calculated to depict regenerating seedling diversity of the study area. Shannon-Wiener's Diversity Index was 3.28 where Simpson's Diversity Index was 0.047. Moreover, Margalef's Richness Index was calculated as 6.92 and Species Evenness Index was 0.92 (Table 3). All these indicates moderate to good diversity in regeneration of tree species in Babu para VCF.

Table 3. *Biological diversity indices for regenerating seedling in the VCF of Bandarban.*

No.	Name of the indices	Diversity index Values
1	Shannon-Wiener's Diversity Index (H)	3.28
2	Simpson's Diversity Index (D)	0.047
3	Margalef's Richness Index (R)	6.92
4	Species Evenness Index (E)	0.92

4. Conclusion

In developing countries, forest and conservation policies have traditionally been characterized by general distrust of local people's ability to manage the natural resources on which they depend. VCFs are necessarily small in size and managed, protected and utilized by indigenous village communities under the leadership of the Mauza headman or village ''Karbaris''.

This research presented a total of 35 regenerating tree species under 20 families from Babu para VCF which indicate poor to moderate regeneration status. The probable reasons are continued deforestation and land degradation. Population pressure combined with improved marketing facilities, ignorance, over exploitation, personal greed, tenure insecurity, faulty government policies regarding settlement of land and breakdown of the traditional systems are also exerting pressures on these VCF and the overall condition of these important biodiversity rich areas are degrading or shrinking in size and number gradually.

Natural regeneration is essential for conservation and maintenance of biodiversity in natural forests. Species composition of a forest is essential for its wise management in terms of economic value and natural regeneration potential. Plants maintain and expand their populations in time and space by the process of regeneration. It can be concluded that Babu para VCF still contains moderately dense forests containing moderate to rich biodiversity including some rare plants. So, there is an urgent need to protect and manage these VCF from being degraded for the sake of indigenous people and the ecosystem. This is also important for Bangladesh being the party to the Convention on Biological Diversity.

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