

Identification of Floral Species in the Coal Mines Ecological Restoration Site of Barora Area, BCCL, Dhanbad, Jharkhand, India

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ABSTRACT

The Eco Restoration Site of Barora Area hosts a diverse range of trees, herbs, and flowers that play a vital role in revitalizing and enriching the ecosystem's ecological, cultural, and economic significance. The plant species that had planted at the time of plantation have their own ecological, medical, economic, and cultural importance. The growth of native species and its increasing biodiversity shows the steps of succession on the overburden dumps. Increasing plant diversity helps to reduce the soil erosion and water retention capacity of the soil. Community involvement and awareness support biodiversity protection, and sustainable practices like responsible timber harvesting and eco-friendly landscaping maintain ecological balance.

Key words: *Eco restoration, plantation, Sustainable development, Biodiversity production.*

Introduction

Restoration is the process of retaining up the degraded ecosystem. For the increasing demand of energy source in Industry and developmental projects, coal has become the primary choice of energy (Maiti, 2013). The increase in mining activities degrades land, water, soil, and biodiversity. (Ghosh and Maiti, 2021). These degraded lands require more measures for its restoration (Mukhopadhyay *et al.*, 2016). Planting of different plants in the areas leads to restore the degraded land. It controls the following of overburden dumps, check soil erosion and increases the beauty of land (Sebelikova *et al.*, 2019;

Sukla and Lal, 2005). The lands should be planted with appropriate plant species so that the process should be faster. (R. Kumar, *et al.*, 2021) Various plant species like including shrubs, woody plants, herbs, grasses etc. uptake the pollutants and accumulate it in its different plants (Ram *et al.*, 2008, Juwarkar and Jambulkar, 2008; Jambulkar and Juarkar 2009; Kumari *et al.*, 2013, Pandey *et al.*, 2016a,b ; Singh *et al.*, 2020b).

Many research shows that there are some species which itself grows on the degraded land (Pandey 2015, Pandey *et al.*, 2016 a, b; Singh *et al.*, 2020 b). Generally woody shrubs are widely used as ecorestoration species, among them the *Praccaeis* one

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of the major fastest growing woody grass species that have highest yielding renewable natural resource (Ram *et al.*, 2010; Hogarth and Belcher, 2013, Sawarkar *et al.*, 2020; Singh *et al.*, 2020a.). Also, its minimum maintenance leads to its growth in adverse condition. (Nath *et al.*, 2015).

Dhanbad is known for its high content bituminous coal. Industries and household have high demand because of its high calorific value. Excavation and washeries contribute a large percentage in biodiversity degradation. Although BCCL had put a lot of effort in restoring the overburden dumps (Paryawaran Darpan, 2017) Plantation programme had been organized every year in the month of July and August (monsoon Season) on these overburden dumps (Paryawaran Durpan, BCCL, 2017). Several plant species had been planted on these coal mines overburden areas. Exotic plant species like the woody plants, woody shrubs, herbs etc are planted by using seed balls and saplings. These species have several benefits like high growth rate, high survivability rate. Also, the species have the ability of rapid stabilization, which made them favourable for ecological succession (Carla *et al.*, 2002). The presence of exotic species also indicates the steps for succession (Carla *et al.*, 2002). But the growth of native species provides the clear picture for ecosystem system. The use of native species helps to restore the environment soil and degraded land and enhances the carbon sequestration. It also enhances the water retention capacity and increases the aesthetic value. (Sikha U Gloria *et al.*, 2023).

The aim of the study is to identify the different plant species (i.e exotic and native) in ecologically restored areas of Barora area. The presence and comparison of the species at the time of plantation and present provide us the information about the succession process.

Study area

Barora area is situated in the Western part of Jharia Coal fields. It has longitude and latitude of 23° 45'05'' E and 86° 15'16'' N with approximately 1459.59 hectares of colliery land. The area have sub humid region with maximum 48 °C temperature in summer and minimum 6° C during winter season. The area receives an average rainfall of 1400mm, mostly between (June to September). The drainage and topography of the study area is mainly controlled by Damodar River.

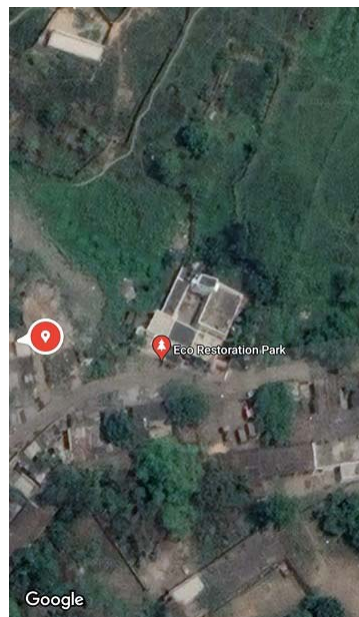


Fig. 1. Satellite image of Eco restoration site Barora Area

Plantation

The eco restoration programme was started in the year April 2015 by TERI University. The plant saplings like sheeshum, sal, mango, bamboo etc.

Methodology

The area had been sampled by plotting 10 (Ten) quadrats randomly with measurements of 50x50 sq. m. The different types of species have been noted. The photographs of different species present over there are taken and taken to laboratory for further identification. The identification of Species is done with the help of Key provided by botanical Survey of India and experts from BBMKU, Dhanbad.

Results and Discussion

1. Trees

The list of plant species at the time of Plantation in 2015

(Source BCCL Display Board of Barora Area)

- Sheeshum (*Dulbergiasisso*)
- Sal (*Shorearobusta*)
- Bael (*Aegle marmelos*)
- Arjun (*Termmlia arjuna*)
- Gamhar (*Gmelina arborea*)
- Kanchnar(*Bauhinia variegata*)



1.a. Shisham (*Dalbergia sissoo*)



1.b. Sal (*Shorea robusta*)



1.i. Mango
(*Magnifera indica*)



1.j. Amla
(*Phyllanthus emblica*)



1.c. Bael (*Aegle marmelos*)



1.d. Arjun (*Termmlia arjuna*)

2. Shrubs



2. a. Olive (*Olea europaea*)



2.b. Tulsi (*Ocimum sanctum*)

3. Herbs



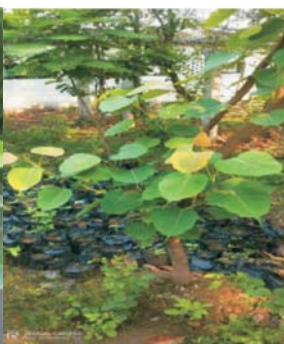
1.e. Gamhar
(*Gmelina arborea*)



1.f. Kanchnar
(*Bauhinia variegata*)



1.g. Dita bark
(*Alstoniascholaris*)



1.h. Peepal
(*Ficus religiosa*)



3. a. Golden Bamboo
(*Bambusa vulgaris Fami*)



3.b. Lemon grass
(*Cymbopogon citratus*,
Stapf)



3. c Touch-me-not Plant (*Mimosa pudica*)

3.d Lobstar Claw (*Heliconia*)

4. Flowering Plants



4.a Aprajita (*Clitoria ternatea*)

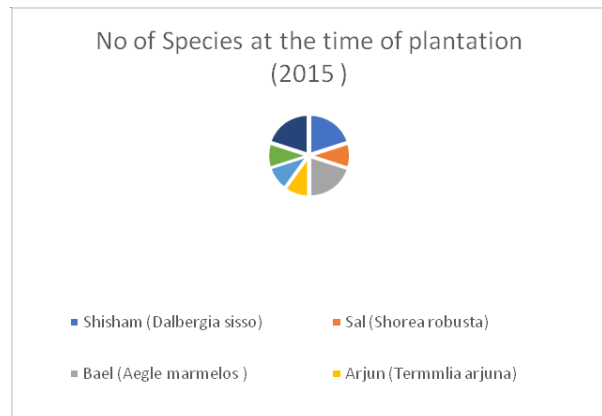
4.b Crape Jasmine (*Tabernaemontana divaricate*)



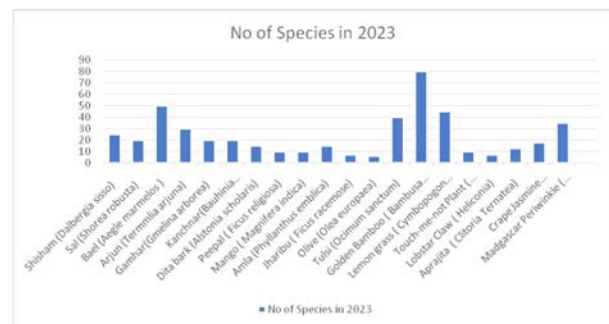
4.c Madagascar Periwinkle (*Catharanthus roseus*)

Discussion

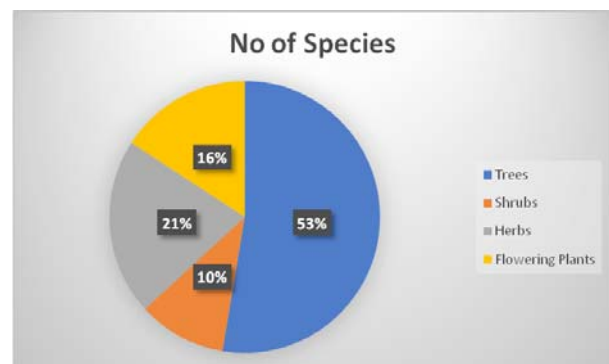
The ecological restoration area of Barora area stands an exemplary approach of ecological conservation of overburden dams. Graph 1 shows about the number of species at the time of plantation. There are five to six plant species that are planted at the time of plantation. The tree have high biomass and timber pro-



Graph 1. The number of species at the time of Plantation



Graph 2. The list of species present in 2023



Graph 3. Percentage of different species present in the eco restoration area at present

Table 1. The species reported in Ecological Restoration Park

Sl. No.	Species	No. of Quadrats										Total no of quadrats in which species occurred
		1	2	3	4	5	6	7	8	9	10	
1.	TREES											
1. a.	Shisham (<i>Dalbergia sissoo</i>)	+	+	+	+	+	+	+	+	-	-	08
b.	Sal (<i>Shorea robusta</i>)	+	+	+	+	-	+	-	+	+	+	08
c.	Bael (<i>Aegle marmelos</i>)	-	+	+	-	-	-	-	+	+	+	05
d.	Arjun (<i>Terminalia arjuna</i>)	+	+	+	+	+	+	+	-	-	-	07
e.	Gamhar (<i>Gmelina arborea</i>)	+	+	+	+	-	-	+	-	+	+	07
f.	Kanchnar (<i>Bauhinia variegata</i>)	-	-	-	-	+	+	+	-	+	+	05
g.	Ditabark (<i>Alstonia scholaris</i>)	+	-	-	-	-	-	+	-	-	+	03
h.	Peepal (<i>Ficus religiosa</i>)	+	+	-	-	-	-	-	+	-	-	03
i.	Mango (<i>Mangifera indica</i>)	+	+	+	+	-	-	-	+	+	+	07
j.	Amla (<i>Phyllanthus emblica</i>)	+	+	-	-	-	-	-	+	-	+	04
k.	Jharibu (<i>Ficus racemosa</i>)	+	-	+	-	-	-	-	-	+	+	04
2.	Shrubs											
a.	Olive (<i>Olea europaea</i>)	-	+	+	-	-	-	+	-	+	-	04
b.	Tulsi (<i>Ocimum sanctum</i>)	+	+	+	+	+	-	-	-	+	-	06
3.	Herbs											
a.	Golden Bamboo (<i>Bambusa vulgaris Fami</i>)	+	+	+	+	+	+	+	+	+	+	10
b.	Lemon grass (<i>Cymbopogon citratus, Stapf</i>)	+	+	+	+	-	+	+	+	-	+	08
c.	Touch-me-not Plant (<i>Mimosa pudica</i>)	+	+	+	+	+	-	+	-	+	-	07
d.	Lobstar Claw (<i>Heliconia</i>)	-	-	+	-	+	-	-	-	-	-	02
4.	Flowering Plants											
a.	Aprajita (<i>Clitoria ternatea</i>)	+	-	-	-	-	+	-	-	+	+	04
b.	Crape Jasmine (<i>Tabernaemontana divaricate</i>)	-	-	+	-	-	+	-	+	-	+	04

ducing plants. The plants also have high growth rate in the tropical climate and helps to holds the soil firmly. Sheshum and Sal have high timber content and act as a natural habitat for many birds and insect species. Bael have its cultural significance and known for its medicinal properties. Gamhar and kachnar have flowers which act as a nector source for butterflies and other pollinators. They help to dispersion of seeds and enhances biodiversity. Many new species like palash, Gamhar, kachnar, lantana camera etc helps to restore the land . New species including lemon grass, Tulsi, have high medicinal value. It helps in the colonization of first degree consumers which further leads to a development of high degree consumers. The species like bamboo and lemon grass acts as a catalyst and enhances the rate of restoration. The presence of many flowering plants like aprajita, crape jasmine etc adds aesthetic value to the overburden land. Presence of native species indicates that the land is sustain for the new species and accelerated the ecological suc-

cession.

Conclusion

The Barora Ecological Restoration site exhibits a wide variety of trees , herbs, shrubs and flowers that contribute a lot in the recolonization of ecosystem. The Plantation programme started in 2015 on the overburden dumps with five- six species. These species have their medicinal, cultural, economic and aesthetic value. At present the park is developed with a wide variety of trees, shrubs and herbs. The park had been divided in three zones according to its medicinal, aesthetic and economical values of trees. The native species on the over burden dump shows that the area had undergone succession process. This phenomenon is considered as a major step for the fulfilment of goals of sustainable development (SDG 15) to protect and conserve the ecosystem. The park managers and officers help nearby villagers about forestry, poultry, and goatry farm-

ing. This helps the nearby people an opportunity for livelihood and economy.

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