Effect of Stone Mining Area Flora on Sustenance of Local People

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Introduction

From the prehistoric days man has been interested about earth's mineral wealth. The crude stone implements of the early Paleolithic period, post-Neolithic pottery, the Egyptian pyramids, iron and copper smelting in various civilizations, and the modern steel-age are all testimony of mining activities of man (Sarma, 2002). Plant species have long been used as principal ingredients of traditional medicine in the Vindhya region. Mining activities have caused the adverse effect on the medicinal plant as well as affected the whole flora of the region. (Anurag Singh *et al.*, 2014).Natural plant communities get disturbed and the habitats become impoverished due to mining. The Deverikala area - a part of Mirzapur District of Uttar Pradesh State of India - is known for its Stone mines. Stone, a mineral, is used in road, buildings etc. An extensive quarrying and open cast mining of the area have resulted into long barren, unproductive and deeply irregular sloppy lands, causing great damage to the forest as well as productivity of the region. Therefore the reclamation of this mining area becomes a priority to counter environmental hazards and to restore the ecological balance. Restorations of these mined areas are usually hampered by lack of basic information on the wide variety of native tree species that characterize these forests as well as insufficient understanding of the ecology of disturbance and natural recovery that can aid in the design of effective restoration programs (Dubey,K. *et al.*; (2013).stone mining area is refereed as the area where stone extraction can be done by the process of manual or mechanical. This stone is used as building material, road material basically, this mining process is exhaustively damage the floristic diversity, the flora of any area is the basic component of the rural livelihood. The local livelihood is dependent on flora for the food, fodder and fuel. Due to mining, degradation of the local forest has compelled thelocal populace to move to other alternatives forfood, fodder and fuel requirement. The present paper aimed to study the prevalent flora of mining area and its utility value to local people. The preference of local people for the species used for restoration of the area degraded due to mining and their preferred land uses have also been studied.

Ecosystem type

The forests of Mirzapur Forest belong to northern mixed dry deciduous forest type. The natural vegetation is dominated by *Butea monosperma, Anogeissus latifolia, Boswellia serrata, Lanneacoro mandelica, Hardwickia binata* and *Acacia catechu*. However, the project area is highly degraded and vegetation cover is very low.(Working plan report Mirzapur Forest Division Uttar Pradesh India)

Materials and Methods

The Mirzapur forest is natural, degraded and dry deciduous type of forest, located about 100 km in North east direction from Allahabad City, India. The soil is rich in stone, a major mineral used in road, buildings. Extensive open cast stone mining activities are being performed since over three decades, causing great damage to the forest as well as productivity of the region. An understanding of the impact of mining on the environment particularly on vegetation characteristics is a prerequisite for further management plan of these mining sites. Moreover, for reclamation works, proper selection of the species that will adapt with the climatic and local soil condition is a critical step. Since, the vegetation of the area is a direct expression of several important factors like altitude, rainfall, soil characteristics and biotic pressure, the

knowledge of floristic composition is valuable. The vegetation survey was conducted at undisturbed compartments of nearby forest of Stone mining site (at Deorikalan and Kotwa) and disturbed site both, by using standard quadrate method (Srivastava, 2001) during peak growth season in the month of September and October. For tree component a quadrate of 10m x 10m size was laid while for the shrub species it was 5m x 5m. For the herbaceous species the size of the quadrate was 1m x1m. The quadrates were laid randomly in nested form i.e. quadrates for shrubs and herbs were taken up inside tree quadrate. Ten replications were taken in both case i.e. disturbed and undisturbed. The species found in the quadrates were identified with the help of the taxonomists and herbaria of Botanical Survey of India, Allahabad and University of Allahabad. For studying the utility value of the species the questionnaire based method adopted and emphasized on the use of prevalent species as food, fodder and fuel by local people.

Results and Discussion

Climatic conditions

The climate of the Mirzapur forest is characterized by long and hot summers, monsoonal rainfall of about 800 mm and short winters. The project area mainly experiences three distinct seasons, the cold season starting from October to February, the summer starting from March to mid-June and the rainy season starting from June end to September. Average temperature in the region varies from 80 C in the month of December to 450C in the month of May. Maximum rains were observed during the month of July and August. While, from April onwards the region experiences severe heat. (Working plan report Mirzapur Forest Division Uttar Pradesh India)

Geographic conditions:

Most of the area is dry, hilly, and undulating with gentle slopes. The forest is broadly divided into three regions i.e. vast and fertile Gangetic plains, which spreads across north to south, Vindhyanhills and Kaimur plateau in the south of the forest division. Most of the hills in the region are undulating with gentle slopes towards the north as well as west direction. Towards the north in Gangetic plains, soil is fertile and suitable for agriculture practices, while towards the southern part the division has hilly and undulating terrains and soil is less fertile and unproductive. However, the entire land included in the project area is degraded on account of degraded land which is further exacerbated by excessive grazing. (Working plan report Mirzapur Forest Division Uttar Pradesh India)

Hydrology

Mirzapur is situated on the southern bank of River Ganga and many other perennial rivers i.e. Jargo, Chattar, Kalkaliya, Khajuri, Hrai, Kanravati, Belan etc. flow across the region. Ground water level at the river banks and surrounding areas are shallow. While, southern part of the forest is dry and face water scarcity for drinking as well as irrigation purpose. (Working plan report Mirzapur Forest Division, Uttar Pradesh India)

Soil conditions:

The major soil types in the region are black soils, sandy loam soil and red lateritic soil. In the northern part of the division at Gangetic plains the soil is fertile and alluvial type and suitable for agriculture practices. In the southern part of the region, the soil type is mostly quartzite. In alluvial plains with 0-1% slope, soil is deep, loamy, slightly eroded in some patches, which are moderately sodic and saline in nature. While, in active flood plains with 1-3% slope, soil is deep, sandy and stratified loamy in nature. (Working plan report Mirzapur Forest Division Uttar Pradesh India).

The vegetation characteristics of the disturbed area were compared with that of an adjacent undisturbed forest of the area. Plant species diversity at tree shrub, climber and herb levels was more in undisturbed forest of the area as compared to disturbed area. A total of 36 species representing 24 families of vascular plants (including trees, shrubs, climbers and herbs) occurred on the undisturbed forest site. At the undisturbed site the flora species like; *Boswellia serrata, Madhuca indica ,Acacia catechu, Haplophragma adenophyllum, Butea monosperma, Terminalia bellirica, Diospyros melanoxylon, Pongamia pinnata, Acacia nilotica,*

Table: 1 Prevalent Tree Vegetation of the Area and Utility Value:

S. No.	Tree	Common Name	Family	Food/ medicinal or commercial value	Fodder	Fuel	Utility Value
1	*Boswellia serrata*	Salai	Burseraceae	0	1	1	2
2	*Madhuca indica*	Mahua	Sapotaceae	1	1	1	3
3	*Acacia catechu*	Katha	Leguminosae	1	0	1	2
4	*Haplophragma adenophyllum*	Cut Sagwan	Lamiaceae	0	1	1	2
5	*Butea monosperma*	Dhak	Fabaceae	1	1	1	3
6	*Terminalia bellirica*	Behera	Combretaceae	1	1	1	3
7	*Diospyros melonoxylon*	Tendu	Ebenaceae	1	1	1	3
8	*Pongamia pinnata*	Karanj	Fabaceae	0	0	1	1
9	*Acacia nilotica*	Babool	Mimosaceae	0	0	1	1
10	*Azadirachta indica*	Neem	Meliaceae	0	1	1	2
11	*Lagerstroemia parviflora*	Asidh	Lythraceae	0	0	1	1
12	*Dalbergia sissoo*	Shisham	Fabaceae	0	1	1	2
13	*Albizia procera*	SafedSiris	Mimosaceae	0	0	1	1

Table 2 : Prevalent Shrub Vegetation of the Area and Utility Value

S. No.	Shrubs And Climbers	Common Name	Family	Food	Fodder	Fuel	Utility Value
1	*Nyctanthes arbor tristis*	Parijat	Oleaceae	0	1	1	2
2	*Ziziphus nummularia*	Jharber	Rhamnaceae	1	1	0	2
3	*Vernonia cinerea*	Sahdevi	Asteraceae	0	1	1	2
4	*Solanum nigrum*	Makoy	Solanaceae	0	1	1	2
5	*Sida cordifolia*	Bariyara	Malvaceae	0	1	1	2
6	*Indigofera tinctoria*	Sarphonk	Fabaceae	0	1	1	2
7	*Abrus precatorius*	Gumachi	Fabaceae	0	1	1	2
8	*Acacia concinna*	Shikakai	Fabaceae	0	1	1	2
9	*Dendrocalamus strictus*	LathiBaans	Poaceae	0	1	1	2
10	*Cocculus hirsutus*	Jamiti Ki Bel	Permaceae	0	1	1	2

Table 3 : Prevalent Herb Vegetation of the Area and Utility Value

S. No.	Herbs	Common Name	Family	Food	Fodder	Fuel	Utility Value
1	*Xanthium indicum*	Chotadatura	Asteraceae	0	1	0	1
2	*Tridax procumbens*	Musbhari	Asteraceae	0	1	0	1
3	*Semecarpus anacardium*	Bhilwa	Anacardiaceae	0	1	0	1
4	*Phyllanthus niruri*	Jaramla	Phyllanthaceae	0	1	0	1
5	*Oxalis corniculata*	KhatiButi	Oxalidaceae	0	1	0	1
6	*Evolvulus alsinoides*	Neeli Shankh pusphi	Convolvulaceae	0	1	0	1
7	*Eclipta prostrata*	Bhingraj	Asteraceae	0	1	0	1
8	*Cannabis sativa*	Bhang	Cannabaceae	0	1	0	1
9	*Boerhavia diffusa*	Punarnawa	Nyctaginaceae	0	1	0	1
10	*Cynodon dactylon*	Dub	Poaceae	0	1	0	1
11	*Digitaria adscendens*	Kreb Grass	Poaceae	0	1	0	1
12	*Solanum xanthocarpum*	Katai	Solanaceae	0	1	0	1
13	*Tribulus terrestris*	Gokhuru	Zygophyllaceae	0	1	0	1

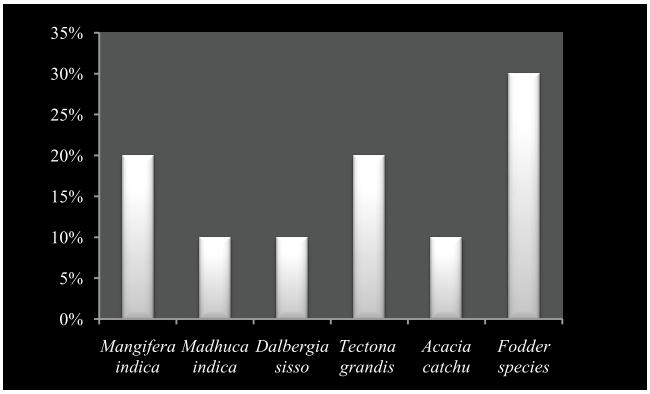

Fig 1: Species preferred by local people

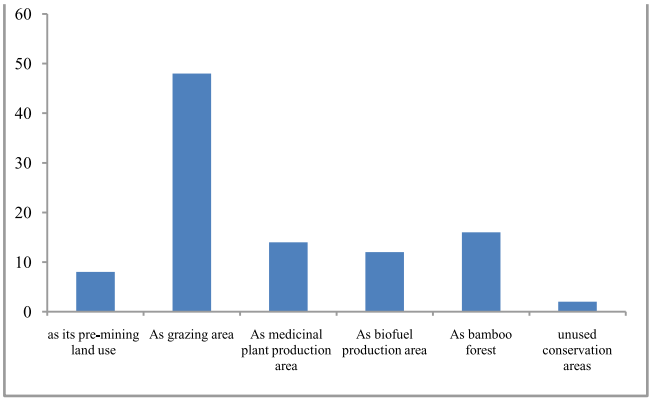

Fig 2: Preferred Land use after mining

Azadirachta indica, Lagerstroemia parviflora, Dalbergia sissoo, Albizia procera, Nyctanthes arbor tristis, Ziziphus nummularia, Vernonia cinerea, Solanum nigrum, Sida cordifolia, Indigofera tinctoria, Abrus precatorius, Acacia concinna, Cocculus hirsutus, Dendrocalamus strictus, Xanthium indicum, Tridax procumbens, Semecarpus anacardium, Phyllanthus niruri, Oxalis corniculata, Evolvulus alsinoides, Eclipta prostrata, Cannabis sativa, Boerhavia diffusa, Cynodon dactylon, Digitaria adscendens, Solanum xantho-carpum, Tribulus terrestris found (table 1, table 2 & table 3). Utility value of plant based on the based survey is also depicted in table 1, table 2 & table 3.As far as survey for utility of reported species in daily routine of local people was concerned, most of the shrubs and herbs are having fodder value to local people. Though these species are of

not having quality fodder value, in spite of that, due to absence of good fodder value grasses like stylo etc., theses locally available shrubs and herbs are being used as fodder for feeding/ grazing for their livestock.

As far as survey for preference of species for restoration was concerned, in the survey, plants species, preferred by local peopleare depicted in (Fig 1). Species preferred were *Mangifera indica, Madhuca indica, Dalbergia sissoo, Tectona grandis, Acacia catechu*, and any fodder grass species (Fig 1).These species are having food, fodder, fuel, timber and commercial values. The land use pattern of the local people preferred in the post mining activity use is depicted in (Fig. 2). The most preferred land use by local people was as grazing area for their livestock followed by bamboo forest and medicinal plant production area. These observations shows that major concern of local populace is fuel and fodder availability required for their sustenance of daily needs.

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