PROBABLE CONSTRAINTS AND STRATEGIES FOR REVEGETATING IRON ORE MINE WASTELANDS IN GOA

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ABSTRACT

Various probable constraints affecting plant growth and survival on iron ore mine wastelands in Goa have been recorded, and strategies for revegetating such degraded lands have been suggested. The paper also suggests various criteria to be followed while selecting plant species for re vegetating iron ore mine wastelands in Goa.

INTRODUCTION

Much of the world's wealth is derived from mining activities. Land surfaces are inevitably disturbed in seeking to win ores from the earth. Mechanization and improved technology has brought increasingly large tracts of land into state of disturbance. With increasing demands, land has been constantly exploited for raw materials from natural environment. Land is not a resource which automatically renews itself like rainfall or sunlight. It is a finite resource, being diminished by the spread of industry urbanisation (Coleman, 1979).

The state of Goa with area of approximately 3702 sq km lies on the west coast of India between 15° 48' 00" N and 14° 53" 54" 'N Latitude and 74° 20' 13" E and 75° 0' 33" E Longitude. Goa has been a prime exporter of iron ore since 1950, as much as 300 million tonnes of iron ore has been exported during all these years. Present production of iron ore is of the order of 15 mt/yr., which constitutes 40% of the total iron ore production in the country and 50% of its export. The estimated reserve of iron ore as on today is around 400 million tonnes and is expected to last for another 25-30 years, at the present rate of mining.

The excavation of iron ore exposes large chunks of earth's crust to the atmosphere that intrude upon the landscape. The mining operation is such that, two classes of waste are produced viz., Piles of surface overburden waste rock and lean ore, which constitutes the reject dumps, and a fine grained waste resulting from the ore beneficiation process and deposited in large man made basins called tailing ponds.

Mining is a serious threat to our environment if no proper measures are taken to re-establish vegetation on dumps

and tailings. Hence, the present paper lists the various probable constraints affecting plant growth and survival, and suggests some measures to overcome them.

(A) PROBABLE CONSTRAINTS AFFECTING PLANT GROWTH AND SURVIVAL ON THE IRON ORE MINE REJECTS :

1. High clay content in rejects and tailings gives undesirable compaction. This compaction tends to reduce moisture infiltration and results in poor plant growth. The unnatural assemblage of materials often renders the spoils liable to wind or water erosion.

2. The mine rejects and tailings are deficient in organic matter.

3. Acute deficiencies of available nitrogen, phosphorus and potassium.

4. Deficiency of micronutrients viz., calcium, magnesium, copper, zinc and nickel results in poor plant growth and survival.

5. Extremes of water and temperature are more severe on the rejects than at undisturbed locations within the same climatic region.

(B) POSSIBLE REMEDIES TO OVERCOME ADVERSE CONDITIONS :

1. The problem of soil compaction can be overcome by ripping the surface with deep lines drawn by a crawler tractor, followed by cultivation.

2. Reduction in the angle of slope of the reject dumps is essential. Terracing would help to bold water and improve the local microclimate.

3. Removal and storage of topsoil for re-use would make re-establishment of vegetation relatively easier as topsoil is known to contain organic matter, plant nutrients, seeds and useful microbes.

4. Rejects and tailings are deficient in organic materials. Hence, addition of organic materials like sewage sludge, seaweeds, green manure, etc. would improve the soil status, thereby help in plant establishment.

5. Development of a suitable microflora (Algae, fungi including VA mycorrhizae, bacteria, etc.) and microfauna on reject would result in successful rehabilitation of mine wastelands.

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6. Addition of normal agricultural fertilizers would result in considerable improvement in plant growth. The amounts to be applied can be calculated from a proper chemical analysis.

(C) CRITERIA FOR SELECTION OF PLANT SPECIES :

1. The establishment of a permanent cover of vegetation involves not merely growing plants. It necessitates bringing into being a plant community that will maintain itself indefinitely without further attention or artificial aid such as irrigation While selecting plant species for revegetation, the local conditions of the sit should be taken into account. Plant

selected should to tough, drought and high temperature resistant, and should adapt to the local conditions.

2. Native plant species demonstrating the ability to thrive to the post mining environment should be preferred.

3. Few exotic plant species may be used, provided they have very special characteristics. For example, some of the legumes. This should be made with great care and after consultation, as these species may be very successful and escape out into the neighbouring area, and may turn out to be a nuisance.

4. Naturally colonizing species have a wide ecological amplitude, phenotypic plasticity and genetic flexibility and are able to thrive and colonise the mine rejects. Hence, a survey of plants that appear on abandoned reject dumps and tailings would provide a source of potential species for revegetation.

5. Certain varieties of grasses and herbs that exhibit tolerance have a potential use in mine waste revegetation.

6. Leguminous plant species have nodulating ability and are able to fix atmospheric nitrogen. Hence, their selection would increase the nitrogen levels in the soil. This would help other plant species to grow and survive.

7. Non-native plant species like *Acacia auriculiformis*, *A. mangium* and *Casuarina equisetifolia* may be used as nurse plants. Initially, a thick plantation of these species would protect the land against erosion and help in soil stabilization and building up of soil organic matter. However, it is essential to replace these species by native species in the later stages. This is necessary to avoid monocultures and to bring about plant diversity.

CONCLUSION

The aim of almost all rehabilitation programmes of mine wastelands is to achieve a self sustaining ecosystem capable of developing by itself, even if it is left unattended. Achieving a self-sustaining ecosystem in degraded areas, requires careful planning prior to the start of mining activity. Thus mining industry need not lead to degradation of environment if a combination of imagination, care and scientific skill is applied by those who are involved in such programmes.

REFERENCES

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