

Wastelands: rehabilitation and management approaches

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Wastelands are the degraded and unutilized lands except current fallows due to different constraints (CSIR, 1990). Poor land practices have led to malnutrition and decline in production capacity of the soil. It is estimated that in wastelands the biomass production is less than 20% of its overall potential. It includes areas affected by water logging, ravine, sheet and gully erosion, riverine lands, shifting cultivation, salinity and alkalinity, shifting and sand dunes, wind erosion, extreme moisture deficiency, coastal sand dunes etc. These degraded lands are ecologically unstable with almost complete loss of top soil and are unsuitable for cultivation due to decline in their quality and productivity. These can be categorized as:

i. Non-forest public degraded lands:

These are not lawfully defined as forest or which have not been legally included in government records. These are registered by different names in the revenue records. Ownership of these lands is vested with the government, such as revenue department, public works department, Railways, etc. These lands may be under the control of the village Panchayat and are meant for common use; no individual can occupy them for private use through encroachment.

ii. Degraded forestlands: These are legally constituted as forest and include reserved, protected or undefined forest. These are either completely devoid of trees and/or other vegetation, or contain trees in very low densities, or are simply shrubs.

iii. Private degraded lands: These are private marginal agricultural lands on which economic agriculture is not possible as productivity does not commensurate with labour employed. These lands may be subjected to heavy erosion and the soil is infertile.

Due to lack of irrigation or unfavorable climate, some lands are not cultivated and are categorized as either culturable or unculturable wastelands. Culturable wastelands include gullied and/or ravenous land, undulating upland, surface waterlogged land and marsh, salt

affected land, shifting cultivation area, degraded forest area, degraded non-forest plantation, sandy area, mining and industrial wasteland, and pasture and grazing lands. Compared to this, unculturable wastelands include barren, rocky, stony wastes, sheet rock area, steep sloping area and snow covered and/or glacial area.

Wastelands - precursor of desertification

District wise land use analysis in Karnataka state, India using collateral and remote sensing data reveals that about 35-40% of lands in arid and semiarid areas are either degraded or waste lands (<http://ces.iisc.ernet.in/energy>). Land degradation in arid, semi-arid and dry sub-humid areas has taken place mainly due to anthropogenic activities and climatic variations and this process is commonly known as desertification (UNEP, 1991). Analyses of desertification causes clearly indicate the human interferences, and natural calamities as the prime movers of desertification. Factors responsible for desertification are heavy pressure on land, underlying physical conditions, land shortage (due to increase in population), size and distribution of population, population growth, regional administrative policies and global climatic conditions. These causal factors can be grouped as immediate and indirect causes. Immediate include land use practices like exposing soil to greater risk. Indirect causes include the regional administrative policies, effectiveness of government to resolve the land conflict, and approaches of research and extension.

Processes that are closely linked to desertification are (1) drought – a period of one or two years with below average rainfall, (2) desiccation – a process of aridification resulting from a dry period lasting over decades, and (3) dryland degradation brought about mainly by inappropriate land use practices. These different processes need different management approaches as the level and severity varies. These processes could be prevented and reversed by integrated ecosystem approaches involving land and water by considering watershed as planning unit. This means that the planners' attention has to be shifted from combating desertification towards

improving natural resources management. Rehabilitation and sustainable management of land is essential to meet the gap between demand and supply; create employment in rural areas and strengthen rural infrastructure; check soil erosion and malnutrition; reduce runoff by water and wind; maintain biological diversity and the nutrient storage in soil matrix.

Goals in this regard are to check further degradation; sustainable use of degraded lands; increase biomass availability along with nourishing soil; and restore ecological balance. This can be done by participatory approach with the help of local people in the planning and management of lands. Ecosystem approaches in management considering watershed, would ensure integration of various ecological components (both biotic and abiotic). This would also help in enhancing the socio-economic status of a region. Similar approaches practiced in drier districts like Ananthpur (Andhra Pradesh), Tumkur, Bangalore rural (Karnataka) have yielded positive results with increase in land productivity and ground water levels in the respective watersheds.

People friendly action programme helps local people and organisations in rehabilitating and improving the degraded lands. In this regard, management aspects are:

- Fixing target areas (degraded forest area and pastures, public and private wastelands, farmlands with lower productivity).
- Assessing the infrastructure available to meet the requirement;
- Finding the possibilities of involving the government, NGOs, and local

Box 1: The policy guideline for managing desertification

Drought requires rapid provision of food, establishment of early warning system, storage and forms of insurance,

1. Desiccation requires a more complex series of response which might include helping people to adapt farming and livestock systems to drier conditions or supporting a spontaneous movement of population to water areas.
2. Dryland degradation needs policy response from legislative changes on tenure regulation and energy pricing to encourage substitution of gas for fuel wood, and developing appropriate means for retaining soil and water in a watershed.

people. The key elements of a participatory approach being local peoples' priorities; provision of secure rights and gains to the poor; flexible approaches; working with local groups and institutions, capacity building of motivated local people

- Government has to give priority in terms of funding, encouragement, and policy making (see box 1).
- Measures to strengthen local organisations, by delegating more power and responsibility to local communities, decentralised resource management etc.
- Research and information access to understand the causes for land degradation and effective means to address them.
- Wasteland monitoring and preparedness.
- NGOs have a pivotal task in the implementation of the action plan. (See box 2).
- Mechanisms by which local people, NGOs and other groups can contribute to implementation and monitoring of wasteland development programme on regular basis.
- Promoting conservation of natural resources through traditional knowledge.
- Promoting ideas to consider the village as an ecosystem and to maintain its integrity.
- Providing examples of the practices done at different places.
- Integrated village ecosystem planning with watershed approach needs to be espoused for sustainable development. This would enhance the total natural resource base by restoration and management of degraded lands, production of basic biomass needs of the village community and equity in distribution of biomass resource.

Rehabilitation of degraded lands

6,000 million tonnes of fertile soil containing 5 million tonnes of NPK nutrients are displaced each year (Vohra, 1978). Some of the degraded lands in the catchment of major irrigation reservoirs (Cauvery, Krishna, etc.) and hydro electric reservoirs (Uttara Kannada, Shimoga districts) are causing rapid sedimentation. Studies in Sharavathi river basin reveal the existence of streams with perennial water supply in watersheds with good vegetation of evergreen to semi-evergreen species (western part of the river basin), while degraded lands on the eastern side of the river basin are with seasonal streams (<http://ces.iisc.ernet.in/energy>). The

outcome of these analyses highlights the need to maintain vegetation of native species in order to ensure perennial water supply in streams and to meet the bioresource demand.

The rehabilitation of degraded lands through the management of soil and vegetation would minimise siltation and enhance the water yield in the catchment. It depends on soil capability, climatic conditions, plant species, infrastructure, and local policies, etc.

Species selection is based on local conditions, survival, adaptability and productivity. Thus, genetic quality of native species to withstand adverse environment becomes important for the growth and adaptability to soils with different depth and water retention capacities. The plant establishment primarily depends upon the development of good root system. The inherent characteristics of a species to propagate or regenerate itself vegetatively such as, by root suckers, when damaged, is also important for survival. The basic parameters for selection of species for wasteland adaptability can be

- Survival at nursery and transplantation level on site.
- High establishment rate.
- Good root and growth system.
- High reproductive fertility.
- Enhancement of soil nutrient status.
- Good regeneration.
- Recovery from damage through vegetative propagation or seed.
- Meet the local requirement of fuel, food and fodder.

The decisive factors in species selection for degraded land rehabilitation are:

- site-specific local species.
- silvicultural characteristics of the species.
- utilization potential of species.
- exotic species should be avoided as far as possible and be considered only when the indigenous species are unable to thrive in a degraded ecosystem.
- afforestation should involve a multi-species approach. This would be more advantageous from the point of resistance to pest and diseases, and more efficient utilization of environmental resource. This can also serve as a better cover to the soil and regeneration of soil.

The plant species suggested for reforestation of open, fallow, degraded lands of low rainfall zones in the eastern part of the catchment are: *Acacia catechu*, *Acacia concinna*, *Butea*

monosperma, *Pongamia pinnata*, *Schleichera oleasa*, *Madhuca latifolia*, *Emblia officinalis*, *Cassia fistula*, *Strychnos nux-vomica*, *Odina wodier*, *Dillenia pentagyna*, *Xylocarpa*, *Buchanania lanzan*, *Careya arborea*, *Terminalia chebula*, *Pterocarpus marsupium*, *Phoenix sylvestris*, *Mangifera indica*, *Dendrocalamus strictus*, *Bambusa arundinacea*, *Azadirachta indica*, *Cordia myxa*, *Aegle marmelos*, *Sapindus laurifolius*, *Spondias mangifera*.

Local people should be involved and decentralised farmer's nursery should be promoted, thus generating employment to the locals in the afforestation programmes.

Conclusion

The discussion highlights the need for an integrated ecosystem approach in watershed management considering all components to maintain sustainability. This would help in combating desertification. Rehabilitation of the degraded land through the sustainable management of soil and vegetation would minimise siltation and enhance the water yield in the catchment. Multi-species approach with native species in afforestation would be more advantageous from the point of resistance to pest and diseases, meeting

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Box 2: Role of NGOs in the implementation of action plan

- Consultation between NGOs, community based organisations and local population to create awareness and to ensure effective representation of local peoples' view at the time of decision making,
 - Discussion of issues and programme formulation,
 - NGOs have to provide an alternative view which reflects the position of ordinary people outside government structure,
 - Ensure maximum participation of local people by spreading the knowledge of the project along with ecosystem values,
 - Translating the information in the article into local language for better understanding,
 - Setting up a mechanism for community consultation,
 - Compiling an inventory of successful approaches to tackle land degradation,
- Ensure implementations, monitoring and evaluation.

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the local demand, perennial water source and more efficient utilization of environmental resource. This serves as a better cover to the soil and aids in regeneration of soil.

Acknowledgements

We thank the Ministry of Environment and Forests, Government of India and KPCL, Government of Karnataka for financial support.

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