EXTENT, DISTRIBUTION, CONSTRAINTS AND TECHNOLOGIES FOR WASTELEND DEVELOPMENT

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- The Technical Task Group Report of the National Wastelands Development Board Defines the Wasteland as a Land Which is Presently Lying Unutilized due to Different Constraints.

- ICAR Proposed that Wastelands are Lands which Due to Neglect or Due to Degradation are not Being Utilized to Their Full Potential. These can result from inherent or imposed disabilities or both, such as location, environment, chemical and physical properties, and even suffer from management conditions

CULTURABLE WASTELANDS

The land which is capable or has the potential for the development of vegetative cover and is not being used due to different constraints of varying degrees, such as erosion, waterlogging, salinity etc.

UNCULTURABLE WASTELAND

The land that can not be developed for vegetative cover, for instance barren rocky areas and snow covered glacier areas.

ESTIMATED AREA UNDER WASTELANDS

Source	Area (m.ha.)
Ministry of Agriculture and the JNU, Deptt. Of Geography (1986)	175
National Land Use and Wasteland Development Council (First Meeting 1986)	123
National Remote Sensing Agency Hyderabad (1985)	53
Society for Promotion of Wasteland Development (1982)	145
Min.Rural Dev. & NRSA (2000)	64

WASTELAND SITUATION IN INDIA(m.ha)

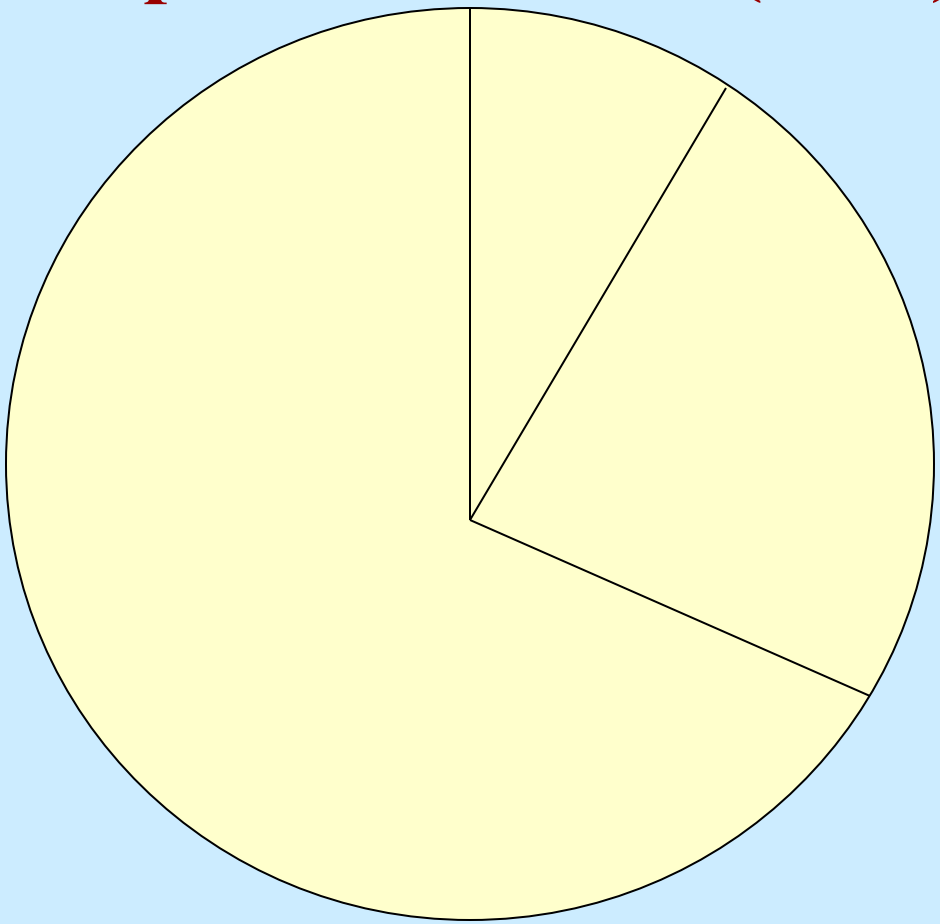
1. Geographical Area	329
2. Area Subjected to Water and Wind Erosion	150
3. Area Degraded Through Special Problems	25
a. Ravines & Gullies	3.97
b. Water Logged Area	6.00
c. Salt-Affected Area	8.00
d. Shifting Cultivation	4.36
e. Riverine & Torrents	2.37
TOTAL WASTELAND	175

WASTELAND CLASSIFICATION BASED ON CAUSATIVE AGENTS

Water	Wind	Man	Others
Sheet Erosion	Sand Dunes	Shifting cultivation	Shallow soils
Rill Erosion	Sand Bar		
Gullied Land and Ravinous Land	Coastal Sand	Mine spoils	Land slides
Water Logging		Industrial wasteland	
Saline Soil		Land affected by roads	
Alkali Soil			
Marshy Land		kilns and burrow pits	
Bouldery Land			

INDIA'S ANNUAL LOSS
(5,334 MILLION TONES)

Deposited in dams (10%)



Lost to sea (29%)

Shifted about 61% (much deposited in rivers)

THERE IS A NEED FOR SITE MATCHED TECHNOLOGY TO MAKE SOIL PRODUCTIVE AT A RAPID RATE BECAUSE IN NATURE THE CHANGES THAT OCCUR RAPIDLY TAKE 200 - 400 YEARS TO ATTAIN EQUILIBRIUM

GENERATE BASE LINE DATA

- **Climate** □ **Rainfall, Temperature, Evaporation, Wind Velocity**
- **Topography** □ **Angle & Length of Slope**
- **Erosion** □ **Extent & Intensity**
- **Soil** □ **Physical & Chemical Properties**

CONTROLL THE EROSION

- **USING CONSERVATION MEASURES**
- **MULCH APPLICATION**
- **GROWING GRASSES**

AMELIORATE SOIL PROPERTIES

PHYSICAL ATTRIBUTES

Structure	Add
Bulk Density	Organic
Texture	Residue
Loosen the soil	Tillage
if over compact	Pan Perforation

CHEMICAL ATTRIBUTES

pH

Nutrients

SALT AFFECTED SOILS

	SALINE	SODIC
pH	<8.5	>8.5
ESP	<15	>15
EC	>4dS/m	<4dS/m

SALT AFFECTED AREA
(GLOBAL VIEW)

- MASSOUD 932 m.ha.
- DREGNE 410 m.ha.
- BALBA 600 m.h
- DUDAL & PURNELL 7% OF WORLD AREA

SALT AFFECTED AREA (1000 ha) (SOME CONTINENTS)

- **AMERICA 1,46,883**
- **AFRICA 80,438**
- **ASIA 3,16,541**
- **AUSTRALIA 3,57,568**
- **EUROPE 30,757**

SALT AFFECTED AREA IN ASIA
(HIGHLY EFFECTED COUNTRIES)

- **INDIA** **23.79**
- CHINA 20.00
- INDONESIA 13.21
- PAKISTAN 3.50
- MALAYSIA 3.04
- BANGLA DESH 3.02
- THAILAND 1.46

SALT AFFECTED LAND IN INDIA (m.ha.)

- RAYCHAUDHRY 1965 6.1
- ABROL-BHUMLA 1975 7.0
- MASSOUD 1974 23.8
- SINGH 1992 8.5
- BHARGAVA 1999 10.0

DISTRIBUTION OF 3.6m.ha.of SODIC SOILS

STATE/UT	AREA (1000ha.)	STATE/UT	AREA (1000ha.)
• Uttar Pradesh	1900	Karnataka	123
• Punjab	298	A.P.	119
• Haryana	255	M.P.	68
• Rajasthan	280	Bihar	62
• Gujarat	265	J.&K.	40
Maharashtra	124	Delhi	8

DIAGNOSIS OF SODIC SOIL

1. White salt encrustation on the surface during summer, which often shows dark colour due to humus fraction
2. The soil develops thin and wide cracks on drying
3. Sticky, slippery and soft when wet; but cloddy, hard,compact and difficult to work when dry
4. Run-off water is turbid
5. Water does not move down in to the soil
6. Practically devoid of any crop.

Cracks during summer period

CONSTRAINTS EXPERIENCED

- PHYSICAL
- **IMPEDED DRAINAGE**
- **SLOW INFILTRATION**
- **DISPERSED SURFACE**
- **UNFAVOURABLE STRUCTURE**
- **PRESENCE OF CALCIC LAYER**

- CHEMICAL
- **HIGH pH**
- **HIGH ESP**
- **IMBALANCED AND IMPOVERISHED NUTRIENT STATUS**
- **POOR ORGANIC MATTER CONTENT**

THE PACKAGE OF SOIL TECHNOLOGY

- Earth work
- Amendments
- Drainage
- Mulch
- Source of Organic Residue
- Season of Planting
- Species Suitability

THE TECHNOLOGY

- Open 60cm x 60cm x 60cm pit at a spacing of 2m x 3m
- Mix 3kg gypsum, 2kg rice husk, 100g SSP, 25g MOP, 5g $ZnSO_4$ with the dug out soil and refill the pit.
- Select healthy seedlings and transplant in pre-monsoon or post-monsoon season.
- Top dress with 50g urea when 4 new leaves emerge, and again after 4 months of first top dress.
- Top dress with 50g urea, 25g MOP and 100g SSP after one year of planting followed by another 50g urea top dress after 6 months.
- Irrigate immediately after planting, after every treatment application, once a month during dry winter and twice a month during summer.

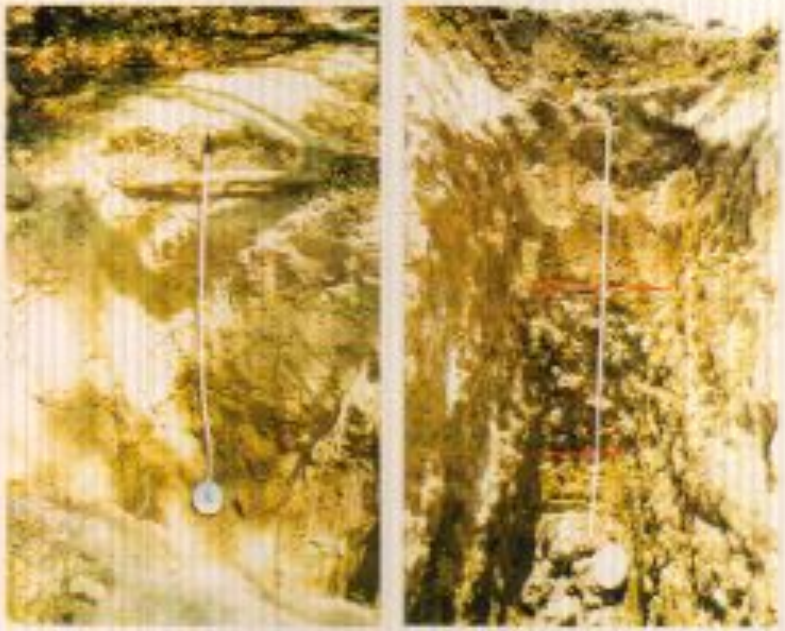
THE SPECIES PLANTED

- ***Prosopis juliflora*** **11,35,000**
- ***Eucalyptus tereticornis*** **3,03,000**
- ***Dalbergia sissoo*** **2,95,000**
- ***Terminalia arjuna*** **2,40,000**
- ***Pongamia pinnata*** **1,70,000**
- ***Leucaena leucocephala*** **1,55,000**
- ***Albizia procera*** **1,33,000**
- ***Acacia nilotica*** **1,10,000**
- ***Azadirachta indica*** **15,000**
- ***Ziziphus mauritiana*** **56,000**
- ***Psidium guava*** **42,000**
- ***Emblica officinales*** **28,000**
- ***Aegle marmelose*** **28,000**
- ***Carissa carandus*** **25,000**

SUITABILITY OF SPECIES

- **HIGHLY RESISTANT**
- *Prosopis juliflora*
- *Tamarix articulata*
- *Pongamia pinnata*
- *Acacia nilotica*
- *Albizia procera*
- *Terminalia arjuna*
- *Casuarina equisetifolia*
- *Callestemon citrinus*

- **MODERATELY RESISTANT**
- *Leucaena leucocephala*
- *Butea monosperma*
- *Azadirachta indica*
- *Pithecellobium dulce*
- *Haplophragma adenophyllum*
- *Dalbergia sissoo*
- *Eucalyp. camaldulensis*
- *Eucalyp. tereticornis*



TREES BIO-REJUVENATE THE SOILS BY

- Absorbing water from lower layers
- Adding organic matter
- Providing shade
- Enriching surface with nutrients
- Improving porosity and infiltration
- Dissolving calcic pan

RESULTS

- Three years old plantations do not make any significant amelioration.
- Six years old plantation bring about the soil amelioration, however, the amelioration is not significant below 50 cm depth.
- Nine years old plantation cause remarkable amelioration at the surface and the effect is predominant upto 60 cm
- Twelve years old plantation not only improved the physical and chemical condition of the soil but also turned the pan very soft and powdery

- **The mixed plantations are more efficient in improving the soil attributes in comparison to monoculture plantations.**

- **Amongst the monoculture plantations, *Leucaena leucocephala* has proved more efficient in ameliorating the sodic soil followed by *Prosopis juliflora, Dalbergia sissoo, Acacia nilotica, Eucalyptus* hybrid and *Terminalia arjuna*.**

COMPARATIVE EFFECT OF SPECIES

Species	pH	OM	N
Mixed	8.8(10.5)	2.04(0.44)	.081(.014)
L.leu.	9.0(10.5)	1.90(0.44)	.071(.014)
P.jul.	9.2(10.5)	1.58(0.44)	.065(.014)
D.sis.	8.0(9.0)	1.79(0.72)	.150(.039)
A.nil	9.4(10.5)	1.44(0.44)	.057(.014)
E.ter	9.6(10.5)	1.28(0.44)	.043(.014)

** Values in bracket are initial values

CHOICE OF SPECIES

- **DESERT LAND**
- 32 MILLION Ha.
- WATER STRESS
- SANDY PLAINS, SHIFTING SAND DUNES
- GRAZING STRESS

- **SPECIES**
- KEEKAR (T)
- SIRIS (T)
- KHOR (T)
- NEEM (T)
- KHEJDI (T)
- BER (T)
- CENCHRUS (L)

CHOICE OF SPECIES

- **DEGRADED FORESTS**
- **40 MILLION Ha.**
- **UNDULATING SHALLOW ROCKY SOILS**
- **MULTIPLE GROWTH STRESS**

- **SPECIES**
- **EUCALYPTUS (T)**
- **SUBABOOL (T)**
- **SHISHAM (T)**
- **SIRIS (T)**
- **BAMBOO (G)**
- **STYLOSANTHES (L)**
- **CHRYSOPOGON (G)**

CHOICE OF SPECIES

- CHO AREAS
- 2.5 MILLIOM Ha.
- SHALLOW HILL TORRENTS
- H.P. AND U.P. AS WELL AS IN NORTH EASTERN HIMALAYAS

- SPECIES
- SHISHAM (T)
- ARJUN (T)
- BABUL (T)
- KHAIR (T)
- BER (T)
- CHRYSOPOGON (G)
- DECANTHIUM (G)

CHOICE OF SPECIES

- **RAVINES**

- **4 MILLION Ha.**
- **GANGA, YAMUNA, CHAMBAL, BETWA RIVER AREAS**
- **EROSION STRESS SPECIALLY WATER**

- **SPECIES**
- **KEEKAR (T)**
- **BABUL (T)**
- **KHAIR (T)**
- **SUBABOOL (T)**
- **MAHARUKH (T)**
- **JAMUN (T)**
- **SACHHARUM (G)**
- **EUCALYPTUS (T)**
- **SHISHAM (T)**
- **BAMBOO (G)**

CHOICE OF SPECIES

- **JHUM LANDS**
- **4.36 million ha.**
- **1.0 million ha. Cycle**
- **North East, M.P., Orissa etc.**
- **Erosion Stress**
- **Burning Losses**

- **SPECIES**
- **Gamari**
- **Holock**
- **Fruit (Orange, Mango)**
- **Siris**
- **Toon**
- **Alder**
- **Pennisetum sp.**
- **Glycine sp.**