THEME:
CLIMATE CHANGE AND ENVIRONMENTAL MANAGEMENT

Title of the technology

Reclamation/rehabilitation of waterlogged soil in canal command area of IGNP using principle of biodrainage.

A. Nature of technology

Utilization of tree in reclamation water-logged area

B. Process in brief

An attempt was made to remove excess water from the land through bio-drainage and to increase vegetation cover and productivity of a waterlogged area in Indian desert. Seeds of four tree species viz. *Eucalyptus camaldulensis* Dehnh., *E. fastigata* Deane & Maid., *E. rudis* Endl. and *Corymbia tessellaris* (F. Muell.) K.D. Hill & L.A.S. Johnson. were procured from CSIRO, Australia. Raised bunds (60 cm high, 60 cm wide and 2 m apart) were prepared in waterlogged (inundated water of 15-25 cm) area to provide comfortable root zone for young seedlings. Seedlings were raised in the nursery and planted on the raised bunds at a spacing of 2 m in blocks.

Area protection, soil working and plantation of *Eucalyptus camaldulensis*, *E. fastigata*, *E. rudis* and *Corymbia tessellaris* on raised bunds, improved vegetation cover with simultaneous decrease in water table. Performance of *E. rudis* was best with respect to growth, biomass, transpiration rate and overall bio-drainage potential. *E. rudis* maintained uniform transpiration and photosynthesis rate throughout the year. Ground water level receded by 145 cm in *E. rudis* plot compared to 90 cm, 70 cm and 60 cm in *C. tessellaris*, *E. camaldulensis* and *E. fastigata*, respectively within a period of four and half year. Soil organic carbon, electrical conductivity, NH_4 and NO_3 – N were high in *E. rudis* and low in *E. fastigata*. The results suggests that *E. rudis* has high potential to be used as an efficient bio-drainage species in IGNP area. Apart from the planted species, *Prosopis juliflora*, *Tamarix dioca* and *Saccharum munja* also have come up in the area with recession of ground water table as natural succession and contributed significantly for further lowering of ground water table and increasing productivity.

Waterlogged are before treatment

Four & half year old *E. rudis* trees

C. Beneficiaries of the technology

1. Prominent beneficiaries/ user groups

State Forest departments of Rajasthan and Gujarat, Non-government organization working in the area and farmers in the canal command area are the main beneficiaries/user groups.

2. No. of clients to whom technology has been transferred/ sold

This technology has been discussed at many forums such as workshop/conferences, meeting/ stakeholder meetings, public forum, etc. The findings were presented in National and International conference/congress and PCR submitted to the funding agency (Ministry of Water Resources, Govt. of India, New Delhi)

Papers published in proceedings

1. N. Bala, G. Singh, N. K. Bohra and N. K. Limba. 2009. Increasing productivity of waterlogged zone of canal command area in Indian desert. *In:* 60th International Executive Council Meeting & 5th Asian Regional Conference: Improvement in efficiency of irrigation projects through technology up gradation and better operation & maintenance, 6-11 December, 2009, Ministry of Water Resources, Govt. of India. PDF No. 118.
2. N. Bala, G. Singh, N. K. Bohra and N. K. Limba. (2011). Strategies to reclaim canal command waterlogged area in Indian desert. *In:* 8th All India People's Technology Congress, 11th - 12th February 2011, Science City & Energy Park, Kolkata.

3. Potential for further dissemination

The growth behaviour, biomass accumulation by the plants and physiological parameters suggests that *E. rudis* has high potential to be used as an efficient bio-drainage species in Indira Gandhi Nahar Pariyojana (IGNP) command area with low salinity level. Apart from the planted species, *Prosopis juliflora*, *Tamarix dioca* and *Saccharum munja* also have come

up in the area with recession of ground water table as natural succession and contributed significantly for further lowering of ground water table and increasing productivity. Along with tree species, shrubs and bushes can also play a major role in increasing productivity of waterlogged area. Soil working may be a viable option in assisting regeneration of local species growing nearby. The result suggests that the technology has high potential for dissemination in canal command area.

D. Economic significance

1. Potential to address Livelihood issues and generate additional income

Water logging can result in severe degradation of land causing loss of productivity in canal command area threatening livelihood of local people. There are instances where, irrigated double-cropped area had gone out of cultivation and landowners started working as labourers and thousands had moved to other places in search of a livelihood. Reversal of this poverty linked resource degradation is possible through biodrainage. The impact of such efforts could be seen in farmers' field at Rawatsar. As per a conservative estimate, on an average, farmers were able to grow crops worth Rs. 17, 823 ha^{-1}, after one such restoration work, using both surface and biodrainage, in IGNP area.

Types of benefits associated with this practice

Environmental	Economic	Social
Restoration of waterlogged area.	Increased land productivity.	Economic return from increased biomass production.
Increase in biomass production per unit area.	Increased landscape value.	Increase in income from agricultural.
Improvement in soil status.	Increased land value.	Reduced time in fuel wood collection and diversion of children to education.
Increase in carbon stock both in soil and tree.	Increased fuel wood supply.	

2. Productivity enhancement and economic benefits over replaced technology

Biomass of the planted species varied between 24 kg $tree^{-1}$ in *Eucalyptus fastigata* and 196 kg $tree^{-1}$ in *Eucalyptus rudis*. Among the regenerated species population of *S. munja* was highest (860 plants ha^{-1}) followed by *P. juliflora* (710 plants ha^{-1}) and *T. dioca* (470 plants ha^{-1}). Total biomass per tree in *P. juliflora* was 71.5 kg. *S. munja* and *T. dioca* accumulated total biomass of 49.7 and 47.7 kg $tree^{-1}$, respectively.

3. Impact of the technology

Area protection, soil working and plantation of *Eucalyptus camaldulensis, E. fastigata, E. rudis* and *Corymbia tessellaris* on raised bunds, improved vegetation cover with simultaneous

decrease in water table. Ground water level receded by 60-145 cm in the experimental area within a period of four and half year. *Prosopis juliflora, Tamarix dioca* and *Saccharum munja* have come up in the area with recession of ground water table as natural succession and contributed significantly for further lowering of ground water table and increasing productivity.

E. Developed by (Name of Scientist(s)/Officer (s))

Sh. N. Bala, Scientist - E and Dr. G. Singh, Scientist F & Head, Forest Ecology Division.