

## Distant Research Centres

### 1. Objectives:

- Resource conservation and rehabilitation of sodic lands.
- Screening of salt tolerant plant species and soil amelioration
- Performance evaluation of various crops, trees, communities of new biotypes

### 2. Goals:

Wastelands in India have been estimated to the extent of about 175 m ha by Ministry of Agriculture, Govt. of India. Most of the wasteland available in U.P. is salt affected, consisting of about 80% sodic soils. Sodic soils are commonly found in Indo-gangetic plains of UP, Punjab and Haryana states. About 2.5 m ha sodic soil has been estimated in Indo-gangetic plains. Of this, UP alone constitutes about 1.23 m ha sodic soils. The reclamation and utilization of sodic wastelands are of paramount importance in view of the ever-growing population pressure. The alternate proposition is searching for salt tolerant varieties or some non-traditional crops, which can withstand under such stress. Salt affected soils could be reclaimed successfully with suitable management practices. Several methods of reclamation have been found successful at Banthra Research Station of NBRI and other institutions.

The institute has its farm site located near Banthra at Lucknow\_Kanpur Highway. Its various units, viz., Banthra Research Station, Aurawan Research Centre, Biomass Research Centre, Gehru and Ranipur Centres are field experiment sites of the institute, belonging to sodic soils, found commonly in Gangetic alluvial plains. Different patches of the centres have pH ranging between 8.0-11.0.

The group has been working on development of appropriate agro-technology for economic plants in diverse cropping systems, aiming at economic utilization of partially reclaimed sodic lands. During last few years, the new activities taken up by the centre are R&D work related to dye and gum yielding plants, besides other non-traditional economic plants including medicinal and aromatic plants. Different activities to achieve these objectives involve germplasm collection from different afro-climatic conditions, their *ex-situ* conservation, selection of elite material with good growth and yield attributes, development of their propagation protocol for large scale multiplication and conducting field experiments for development of agro-techniques in different cropping systems including inter-cropping with trees and other economic crops.

### 3. Competencies : ( Skills and experience available with Groups in relevant areas of R&D)

The team of scientists has competencies in the area of sodic soil reclamation in diverse land use systems, monitoring soil improvement, plant growth, yield and quality, agronomical and horticultural management.

### 4. Facilities: ( Major and Important facilities available with the R&D Groups)

The facilities related to study of sodic land development and utilisation, study and inventorization of bio-resources in field gene banks and man-made forest, field experimentation for screening and evaluation of germplasm, large scale propagation of the germplasm are available. The centres are well equipped with farm machinery and equipments and under-

ground irrigation network. The laboratory facility for basic soil and plant analysis with internet and UPS backup is also available.

5. **Highlights of Current Research:** (Brief description of the ongoing R&D showing glimpses of objectives, and progress/achievements through good quality photographs, figures, graphs, etc.)

The soil of NBRI Farm sites belongs to Sodic Wastelands category, which has been subjected to various degrees of reclamation during the last few decades and put to diversified land use systems under different activities related to R&D projects and economic land utilization. The long term field experiments on sustainable development of sodic lands through biological means cover the maximum land area of the sites, mainly accommodating Man-made Forest, Tree Gene Bank of Indo-Gangetic Plains, Field Gene Banks of Medicinal & Aromatic Plants, Comparative Performance Evaluation Trials on various trees and shrubs in reclamation of sodic wastelands etc. The agro-technology and cropping systems research includes development of cropping systems with appropriate agro-technology for organic cultivation and conservation of medicinal and other economic plants, economically utilizing partially reclaimed sodic lands.

The current research includes following activities:

- Field Testing of CSIR-NBRI microbes in various economic crops in partially reclaimed sodic wastelands
- Studies on soil amelioration under diverse land use systems
- Evaluation of Grain Amaranth & Poppy accessions
- Germplasm collection, conservation and evaluation of *Curcuma*, *Bixa*, *Asparagus*, *Indigofera* & *Rosa damascena*

6. **List of Ongoing projects:**

(Title of the project, Funding Agency, Duration, contact name and e-mail ID of PI/Co-PI)

Title of the project	Funding Agency	Duration	Contact name of PI/Co-PI
Rural Development Programmes: (i) Sustainable Development and Utilization of Sodic Wastelands, adopting Green Technologies, using Schools as Knowledge Dissemination Centres (ii) Dissemination of dry flower/cut flower technologies (iii) Remediation of wastelands	CSIR	Apr 07 to Mar 12	PI- Dr. SK Tewari
Studies on relationship of the chemotypic variation of nine important highly threatened medicinal plant species and prospects of their cultivation	ICAR	July 08 To Mar 12	PI- Dr. AKS Rawat Co-PI- Dr. SK Tewari
Leads based drug development and genetic improvement of Ashwagandha ( <i>Withania somnifera</i> )	DBT	Apr 10 To Mar 13	PI- Dr. Prabodh Trivedi Co-PI- Dr. SK Tewari

Genetic improvement of <i>Jatropha curcas</i> for adaptability and oil yield (Field Component)	CSIR	July 05 To Mar 12	Co-PI- Dr. B. Singh
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7. **Significant achievements:** ( major achievements/outputs of the R&D Groups in bullet points)

- Recommendations on selection of sodicity tolerant plant species (wood, fuel wood, floriculture, medicinal, aromatic and other economic crop plants) for various categories of sodic soils
- Development and sustainable utilization (quick and sustainable amelioration) of sodic soils along with its effect on soil improvement, crop growth and yield.
- Popularization of use of bio-fertilizers and bio-control agents, especially phosphate solubilizing bacteria and *Trichoderma*
- Agro-technology for low input floricultural crops like marigold and tuberose for better income of marginal farmers
- Training about 100 unemployed educated rural youth from peri-urban areas as Professional Gardeners for providing employment in cities.
- Training programmes for farmers and school children on medicinal, aromatic and other economic plants, their use, propagation and cultivation, followed by plantation in farmer's wasteland and/or in their existing cropping systems
- Germplasm Conservation in Field Gene Banks for further R&D
  - Herb Garden- 75 medicinal herbs, and 150 shrubs and trees.
  - Tree Gene Bank- >70 tree species of IGP
  - Germplasm of several wood fuel, ornamental (marigold, tuberose) and industrial species (45), *Curcuma longa* (24), *Bixa orellana* (17), *Commiphora wightii* (5) *Piper betle* (20) and *Indigofera tinctoria* (17) have been conserved and maintained.
  - Germplasm bank of *Jatropha curcas*- 180 accessions collected from all over India

8. **Recent Publications:** ( Important publications reflecting the major outcomes/outputs of the R&D Groups )

Tewari, SK, Niranjana, A and Lehri, A. 2010. Variations in yield, quality and antioxidant potential of Kalmegh (*Andrographis paniculata* Nees) with soil alkalinity and season. Journal of Herbs, Spices & Medicinal Plants, 16:1, 41-50.

K. P. Tripathi and Bajrang Singh 2010. Reclamation of sodic soils through afforestation. The Indian Forester 136 (9):1195-1204.

Niranjan, A, Tewari, SK and Bhagwan Das. 2009. Phytochemical and Anti-oxidant Potential of *Chlorophytum borivilianum* (Safed musali) under Different Agronomical Management Practices. Int. J. Applied Agricul. Res. 4,1, 47-55.

Niranjan, A. and Tewari, S.K. 2008. Phytochemical Composition and Antioxidant Potential of *Desmodium gangeticum* (L) DC. Natural Product Radiance, 7(1), 35-39.

Goel, V. L. and B.Singh 2008. Growth and productivity potential of Dalbergia sissoo in short rotation coppice system on sodic soil. Indian Journal of Forestry 31 : 491-499.

Singh, B. and V.K. Garg 2007. Phytoremediation of a sodic forest ecosystem: Plant community response to restoration process. Notulae Botanicae Horti Agrobotanici 35: 77-85.

**9. Scientists:** (Name and Designation of Scientists working in the Research Area/R& D Groups)

Dr. S.K.Tewari	Group Leader
Dr. R.S. Katiyar	Scientist F
Shri. T.S. Rahi	Scientist EII
Dr. Lal Bahadur	Scientist B
Dr. Devendra Singh	Scientist B

**10. Technical Staff:** (Name and Designation of Technical / Lab Astts./TOs in the Research Area/R& D Groups)

Shri S.S. Tripathi	Tech. Officer
Shri R.K. Tripathi	Tech. Officer
Shri Bhagwan Das	Tech. Officer
Shri Suresh Kumar Sharma	TA
Shri Ram Kishore Yadav	Technician
Shri Ram Bux Singh	Technician
Shri Ram Sewak	Technician
Shri Sajeevan Lal	Technician
Shri R.S. Sachan	Technician
Shri S.K. Tiwari	Technician
Shri Rakesh Kumar	Technician
Shri Ram Shankar	Technician
Shri Moti Lal	Technician
Shri Krishna Chandra	Diesel Mechanic
Shri Prem Chandra Ram	Tube well Operator
Shri Ramesh Kumar	Tractor Driver

**11. Research Fellows/ Project Assistants:** (Name and Designation of JRF/SRF/RA/PAs working in the Research Area/R& D Groups)

Ms. Shweta Singh	PAII
Mr. Pramod Kumar	PAII
Mr. Lalit Kumar Sharma	PAII
Mr. Satendra Kumar	PAII