



# CSWCRTI



## News

No. 3

[www.cswcrtiweb.org](http://www.cswcrtiweb.org)

Oct. 2012 to March 2013

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*Aromatic Grass based Conservation Farming for Erosion Control in Western Himalayan Region*

### From the Director's Desk..



The impacts of human activities on land degradation, availability of water, sustainability of production systems and upland-lowland linkages have been poorly addressed, despite implementation of several programmes by various State and Central agencies with a major focus on participatory watershed development and management. Significant research and developmental activities have been undertaken in different regions, but the experience of

farmers and end-users in the large scale adoption of technologies in soil and water conservation has been mixed probably due to their complexities and diversity. There is a strong need to have a co-ordinated and integrated approach for area specific and need based research, technology development and training involving local communities in natural resource management through capacity building and institutional support. For forming recommendations and policy framework based on synthesis of farmers' views to improve the efficiency and efficacy of ongoing and forthcoming resource conservation programmes, a series of conferences has been planned in five regions, out of which the first conference on "Farmers First for Conserving Soil and Water Resources in Southern Region" was organized by CSWCRTI in association with the Indian Association of Soil and Water Conservationists (Dehradun) and University of Agricultural Sciences (Bangalore) during March 14-16, 2013 for Southern India at Bangalore. This is in tune with the Indian Council of Agricultural Research (ICAR) motto of "Farmer First".

The salient recommendations made by the conference included use of new science tools like RS, GIS, and GPS for farmers' participatory appraisal and scientific assessment of water harvesting structures; monitoring of water quality in bore wells being recharged artificially through harvested water; documentation and evaluation of farmers practices (ITKs) for developing simple, cost effective, productive and protective conservation measures as modern technical knowledge (MTKs); up-scaling of custom hiring centres of farm machineries for timely operation by small and marginal farmers at village level; promotion of model village in watershed mode following all improved practices as learning and technology dissemination centre; capacity building and awareness creation at farm and watershed level for resource conservation and livelihood generation in which unemployed rural youth and farm woman get priority; all existing NRM schemes should be converged with MGNREGA programme through a single window system for developing appropriate land use plan and creating additional assets and employment opportunities; incentive should be given to farmers for ecosystems services through effective soil and water conservation measures along with tax exemption to households who have constructed roof water harvesting ground water recharge structure, compost pits, waste water recycling etc. in a scientific manner; and strong policy support is needed to conduct participatory research in the farmer's field by compensating the yield loss to farmers (if any) through a MOU between the researchers and farmers. Also incentive mechanism for scientists and technicians involved in outreach programmes may be initiated. These recommendations are envisaged to improve quality of life of rural masses in southern states.

**P.K. Mishra**

## New Initiatives

- (i) Prototype field study on “Application of potentially important jute geotextiles for hill slope stabilization”, funded by National Jute Board, Ministry of Textiles, Govt. of India, Kolkata initiated at CSWCRTI, Research Centre, Udhagamandalam. A land slide affected area was treated with Jute geotextiles for first time in South India.
- (ii) An MoU for the consultancy project on “Assessment of river bed material (RBM) for extraction in river Ganga and its tributaries near Haridwar (Uttarakhand)” was signed with Van Nigam, Dehradun.
- (iii) A consultancy project on “Mid-term Evaluation of NABARD Supported Holistic Watershed Development Programme (NHWD) in Vidarbha Region of Maharashtra” was initiated. Six cluster of watersheds namely, (a) Dudhlam, developed by Dilasa Janvikas Pratishthan, Akola; (b) Asoli, Taluka Ghatanji, District Yeovatmal developed by Maharashtra Institute of Technology Transfer for Rural Areas (MITRA), Nasik; (c) BeralaYeota, Taluka Chikhli, District Buldana developed by Savata Mali Samaj Vikas Shaikshanik & Bahuddeshiya Mandal, Buldana & Berala-Yeota Cluster Level Watershed Committee, Buldana; (d) Mothegaon, Taluka Risod, District Washim, developed by SEVA, Ahmednagar; (e) Dharampur, Taluka Nangaon Khandeshwar, District Amravati developed by Sanjeevani Institute for Empowerment & Development (SIED), Aurangabad; and (f) Dahegaon, Taluka Arvi, District Wardha were extensively surveyed.
- (iv) **CSWCRTI signs MoU with HARC, Dehradun:** A Memorandum of Understanding was signed between the Institute and Himalayan Action Research Centre (HARC), Dehradun on December 7, 2012 for transfer of technologies to farmers and to understand the field conditions and problems faced by the farming community. Dr. P.K. Mishra, Director and Shri Mahendra Singh Kunwar, Secretary signed the MoU on behalf of CSWCRTI and HARC, respectively in the presence of Heads of Divisions, CAO, SFAO, representatives of HARC and other officials. This

collaboration is to undertake action research in soil and water conservation and related thematic areas and work jointly towards transfer of site specific technologies for natural resource management and sustaining productivity in the Himalayan region, and building capacities of the farming community.

- (v) Multiprotocol Label Switching-Virtual Private Network (MPLS-VPN) is being established among the Institute Headquarter and its eight Research Centres on BSNL network. This will extend the digital resources, including in-house web server, available at the Institute Headquarter to its Centres. This network infrastructure will also support subsequent efforts to strengthen communication like VOIP, video-conferencing among the Centres. Six Centres have already been connected on 1 Mbps leased lines.

## Important Events

### Farmers First Conference Organized for Southern Region

A Conference on “Farmers First for Conserving Soil and Water Resources in Southern Region” (FFCSWR-2013) was organized by CSWCRTI Research Centres (Bellary and Udhagamandalam), Indian Association of Soil and Water Conservationists (Dehradun) and University of Agricultural Sciences (Bangalore) to bring together farmers, researchers, policy makers, planners, administrators, NGOs and stakeholders on a common platform for sharing and discussing technological advancements, experiences and other issues related to adoption of soil and water conservation practices in Southern India (Andhra Pradesh, Karnataka, Kerala and Tamil Nadu). In all, about 160 registered delegates including 32 farmers and many invited resource persons, experts, research managers and policy planners participated in the three days deliberations held at Karnataka Veterinary Council (KVC), Hebbal Campus, Bangalore, Karnataka during March 14-16, 2013. A total of 76 papers, including key note addresses and posters were presented. The deliberations of the conference were expected to form recommendations and policy framework based on the synthesis of farmers' views for improving the efficiency and efficacy of ongoing and forthcoming resource conservation programmes in southern states.





## National Consultation Workshop for Upgrading Training

A National Consultation Workshop on “Planning Capacity Building Programmes for Soil and Water Conservation in India” was conducted at CSWCRTI, Dehradun during February 1-2, 2013 to review the existing module of 5½ months regular training programme, finalization of contents and duration of revised training module, and establishment of Advanced Skill Development Centre (ASDC) for Soil and Water Conservation - A Centre of Excellence. The workshop was attended by various State and Central stakeholders, including eminent policy planners, researchers, trainers and field functionaries. They were represented by National Rainfed Area Authority (NRAA); Department of Agriculture and Cooperation (Ministry of Agriculture, Govt. of India); Indian Institute of Remote Sensing (Dehradun); Department of Agriculture and Soil Conservation, and Directorates of Watershed Management of state governments of Kerala, Tamil Nadu, Andhra Pradesh, Maharashtra, Uttarakhand, Jammu & Kashmir, Chhatisgarh, Nagaland, Madhya Pradesh, Gujarat and Odisha; and Heads of Regional Centres and Divisions and Scientists of CSWCRTI.



In his inaugural address, the Chief Guest Dr. J.S. Samra, CEO, NRAA stressed that the modification in existing training programme was a long felt need to be in tune with the updated policies and programmes prevailing in the field of land and water management. He further added that many organizations / agencies / NGOs are imparting training on the subject and they are strong competitors for institutions like CSWCRTI. Dr. P.K. Mishra, Director, CSWCRTI, while welcoming the august gathering, apprised the dignitaries with the genesis of the initiative for organizing this workshop. Dr. R.K. Avasthe, Head (Division of HRD & Social Sciences) presented an overview of the existing training programme and the proposed revision in the form of training modules. Dr. P.K. Ghosh, Director,



Indian Grassland and Fodder Research Institute, Jhansi and Shri C. M. Pandey, Additional Commissioner (NRM), Department of Agriculture and Cooperation (Ministry of Agriculture, Govt. of India) also shared their experiences.

## DDG (NRM) Visited CSWCRTI

Dr. A.K. Sikka, Deputy Director General (NRM), ICAR who recently joined the ICAR on February 5, 2013 after serving as a Technical Expert in National Rainfed Area Authority (NRAA) and as a Member of several expert committees at national level dealing with watershed management, visited CSWCRTI, Dehradun during February 10-12, 2013. Dr. Sikka, on his maiden visit to an ICAR Institute under the Division of Natural Resources Management as Deputy Director General (NRM), was heartily welcomed by one and all at the Institute. He took keen interest in the various R&D activities and facilities of the Institute. He visited the Museum, Hydraulic Flume Lab, Soil Lab, Research Farm and the Hydrology & Engineering Lab. He also visited the ARIS Cell of the Institute. The concerned scientists and staff appraised him about the latest activities and developments at each location of his visit. Among the outreach programmes of the Institute, he visited village Langha where he interacted with the beneficiary farmers and got acquainted with all the R&D activities such as water harvesting, crop improvement etc. At the Institute headquarter, he interacted with the scientists and staff of the Institute to know their aspirations and problems faced by them. He expressed his happiness about the achievements of the Institute and wished all cooperation from it to take the NRM Division and ICAR forward to



achieve greater heights for agricultural development of the country.

### Farm Innovators Day Celebrated

Farm Innovators Day was celebrated on February 28, 2013 at Dehradun and Research Centres at Agra, Datia, Koraput, Kota and Vasad, while at Udhagamandalam and Chandigarh it was celebrated on March 1 and 5, 2013, respectively. CSWCRTI has been engaged in service of the nation for the past 58 years by providing technological backstopping to farmers and also conducting numerous capacity building programmes for different stakeholders in the field of natural resource management. In the process, Institute has conducted several outreach programmes at the farmers' fields, which facilitated many farmers to adopt innovative ideas for advancement of agriculture. The objective of the celebrations was to honour deserving hard working farmers who contributed to the development of agriculture through adoption and dissemination of modern agricultural technologies.

More than 665 leading, progressive and innovative farmers from diversified agricultural sectors representing different villages and districts participated in the functions at various locations. These farmers had direct interaction with scientists of CSWCRTI and through field visits got acquainted with new outstanding technologies of soil and water conservation for crop productivity enhancement without deteriorating natural resources in agricultural fields. Films and powerpoint presentations were made on research activities of the Institute. At Koraput, a script play on watershed programme was also performed by Watershed Secretary and CLWs. Various queries raised by the farmers were answered by the concerned scientists.

The Chief Guests at the various locations, in their inaugural addresses highlighted the importance of soil and water conservation as important component of rapidly deteriorating natural resources of the nation and lauded the efforts and achievements made by some entrepreneur farmers in various fields of agriculture. At Dehradun, Dr. P.K. Mishra, Director of the Institute emphasised upon upscaling technologies through participatory approach for larger benefits of the farming



community. At Agra, Dr. S.K. Agarwal, Director, Central Institute of Research on Goats, Mathura advised the farmers to integrate agriculture with animal husbandry as an essential component in general and goat rearing in particular because goats are more remunerative and resistant to climatic changes. At Chandigarh, Dr. B.S. Duggal, Additional Director Agriculture, Haryana emphasised upon need for adoption of innovative agricultural technologies and also enlightened the farmers about the different ongoing developmental schemes. At Datia, Shri Subodh Dixit, Chief Executive Officer, Janpad Panchayat along with Shri D.R. Rajput, Deputy Director Agriculture informed the farmers about various schemes running in Madhya Pradesh and suggested to benefit from them. At Koraput, Shri Raghuram Padal, MLA, Koraput spoke about his own experience as a farmer, and emphasised upon development of sustainable production technologies. At Udhagamandalam, Shri R. Ambalavanan, IAAS, Executive Director, Tea Board (South Zone), The Nilgris reiterated that research and development in the farm sector should focus on cost effective technologies which are simple to adopt by the farmers and opined that only then their ultimate purpose would be served. He mooted the importance of conserving soil, water and energy, rainwater harvesting, and integrated farming approach to reverse the trend of depleting soil fertility and also help farmers to reap economic benefits.

This year, more than 44 innovative farmers, who have adopted soil and water conservation technologies on their land, were honoured with Kissan Samman / Farm Innovator Award, mementos and a Certificate of Appreciation by the Institute. Out of these, five farmers who actively participated in various programmes, viz. IWDP, NWDPR, TOT, FPARP etc. were also gifted with a handy "back neck sprayer" at Datia as a token of encouragement. Other farmers also interacted with these innovative farmers and enquired about many issues practically being faced by them.

### Agricultural Education Day Celebrated

For imparting knowledge about the importance of agriculture in our day to day life, in general, and conservation of our precious natural resources for achieving sustainability in our agriculture for







meeting the ever growing food demand of the nations' teeming population, in particular, Agriculture Education Day was observed on October 16, 2012 coinciding with the World Food Day at Dehradun as well as at Bellary, Chandigarh, Koraput, Kota and Udhagamandalam. In the functions organized at these locations for celebrating the occasion, school students and their teachers were made aware about various avenues of agriculture education and job opportunities within India and abroad. For this, documentary film shows on cause and effects of soil erosion/land degradation processes and their mitigation measures followed by visits to research farm and museum, essay and debate competitions were organized for the students and prizes were distributed. The school children had an opportunity to interact with the scientists/technical staff of the Institute on various aspects of soil and water conservation and watershed management.

### Agriculture Technology Week Observed

The Institute also observed Agriculture Technology Week from February 28 to March 5, 2013 at Dehradun and Kota. The beginning of the Week coincided with the National Science Day, which is celebrated in India on February 28 each year to mark the discovery of Raman Effect by Indian physicist Sir Chandrasekhara Venkata Raman on February 28, 1928. The Institute and Research Farm, Dehradun were open to visitors during this Week to share soil and water conservation technologies and create awareness amongst



the visitors on the importance of natural resource management. About 100 farmers from 12 villages of Dehradun and Uttarkashi and 300 students visited the Museum and Research Farm. At Kota, local farmers and students from different institutions visited the Centre with enthusiasm. They were exposed to ravine reclamation works at Research Farm in the Chambal catchment and Museum to see different conservation measures and their potential for reclamation of ravines.

### Research Advisory Committee Meeting Held

This year, for the first time, the Research Advisory Committee (RAC) meeting of CSWCRTI was held at a Research Centre. The meeting was held at Bellary during January 24-25, 2013. The RAC comprising of Dr. S.R. Singh as Chairman along with Members Dr. R.S. Narang, Dr. I.D. Tyagi, Dr. M.M. Agarwal, and Dr. B. Mohan Kumar, ADG (Agronomy & Agroforestry) representing ICAR, attended the meeting. The Research Programme Implementers, viz. Dr. P.R. Ojasvi (P-1), Dr. N.K. Sharma (P-2.1), Dr. O.P. Chaturvedi (P-2.2), Dr. G.P. Juyal (P-3), Er. K.P. Tripathi (P-4), Dr. D.R. Sena (P-5) and Dr. Pradeep Dogra (P-6) attended the meeting and presented research achievements to the RAC. Dr. O.P.S. Khola, Dr. S.K. Dubey, Dr. A. Raizada and Dr. M. Madhu, Head of Research Centre at Udhgamandalam, Agra, Bellary and Koraput, respectively and Dr. B.L. Dhyani, OIC(PME) also participated in the meeting.

Dr. P.K. Mishra, Director thanked the RAC for agreeing to have this meeting outside the Institute headquarter. The Chairman, Dr. S.R. Singh advised that younger scientists should be exposed to traditional water management systems (Hydrology etc.) at places like Chittorgarh and Hampi. He expressed that water is going to be a major constraint for development in India. Researchers should strive to develop generalized mathematical formulation from limited measurements so that the tested models at one location are applicable to other location. CSWCRTI should design experiments to precisely quantify the effects of treatments on soil and water conservation, strive to develop tools for computer aided design of soil and water conservation measures in a watershed and develop predictive tools to estimate their effects on the conservation of resources. Further, human resource development in this particular field should be given due attention. In this direction, he advised the



Director to encourage scientists for completion of Ph.D. an early stage in their career. He also stressed that every scientist should have a minimum of one project as leader on a regular basis. He appreciated that considerable research facilities and infrastructure has been created in CSWCRTI despite difficulties faced in doing so, and hoped that this will continue so that the Institute gets well equipped to cope up with the future research challenges.

### CSWCRTI Research Centres' Foundation Days Celebrated

CSWCRTI Research Centres at Bellary, Kota and Udhagamandalam celebrated their Foundation Days on 20<sup>th</sup> October, 19<sup>th</sup> October and 20<sup>th</sup> October, respectively. At Bellary, on this occasion, *Kissan Mela* was organized at Nentaranahalli watershed. Participants were briefed about the history of the centre and various activities carried out here. A film on Centre's activities was also shown to them. Dr. Virupakshappa, Deputy Director (Horticulture) of Molakalmuru Taluk participated as Chief Guest and emphasized the importance of farmers' participation in Centre's activities in the watershed. At Kota, about 80 serving and retired employees of the Centre with their families participated in the celebration. Mrs. Verma, W/o late Shri Balvir Verma (Former Head of the Centre) presided over the function and shared her memories with the staff members. Several other retired persons also shared their experiences at the Centre.

At Udhagamandalam, in the function organized for celebrating the occasion, all the staff of the Centre and scientists from CPRS (Muthorai), IARI (Wellington), and UPASI-KVK (Coonoor), extension officials from Karnataka Sericulture Board (Ooty) and farmers from Nilgiris participated. During the interaction session, the scientists from CPRS emphasised upon the farmers to follow scientific cultivation practices for potato. UPASI-KVK scientists requested the farmers to follow mechanisation in tea cultivation to manage the labour problem. Dr. Sivasamy, Principal Scientist, IARI, Wellington in his speech highlighted that wheat cultivation will give good remuneration to farmers, and hence it needs to be promoted in Nilgiris. The farmers also interacted and gave their feedback regarding the problems faced by them due to banning of JCB in agricultural operations. Cultural and sports activities were also organised for the staff and their children.



### Groundnut Field Day Organized

As part of the convergence approach in Ayalur Watershed Project sponsored by NWDPR (Ministry of Agriculture), a groundnut variety (ICGV 00351) developed by International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and promoted by the Tamil Nadu Agricultural University (TNAU), Coimbatore was introduced by CSWCRTI Research Centre, Udhagamandalam to farmers of Ayalur watershed along with integrated nutrient management as a crop demonstration activity, to increase groundnut productivity. To promote this intervention, a field day was jointly organized by ICRISAT and TNAU in the watershed with help of CSWCRTI on October 11, 2012. During the programme, Dr. Emmanuel Monyo, Project Co-ordinator, Tropical Legume II (TL II), ICRISAT and Dr. Upadhyaya, Assistant Research Program Director and Principal Scientist and Head Gene Bank, ICRISAT insisted the farmers to preserve the seed after the harvest for further multiplication and reuse in the watershed. This intervention increased groundnut yield by 48% over local practice.



### ASEAN Countries Farmers Exposed to NRM Activities

A group of farmers from ASEAN Countries visited CSWCRTI, Dehradun during December 27-28, 2012. The delegation comprised of 30 participants including 20 farmers and 10 officials from these countries accompanied by three officials from ASEAN Secretariat / ICAR. The delegation visited the Institute Museum and its projects at Sahastradhara and Participatory Water Resource





Development at Kalimati and Sainji Watershed (Tehri Garhwal) to get an exposure of NRM activities. They were highly impressed from reclaimed mine spoil area near Sahastradhara by employing appropriate soil and water conservation technologies for slope stabilization as well as drainage line treatment. Participants from some countries showed their keen interest in technologies such as crib structures, staggered gabion works, geojute, etc. as they would be useful in reclaiming the mined spoil area in their countries because such kind of mine spoil areas are causing environmental problems at a large scale, not only in non-arable but also in arable lands in their countries.

### Director CSWCRTI Visited Research Centre Koraput

Dr. P.K. Mishra, Director visited the Research Centre, Koraput during February 4-5, 2013. As the Chief Guest in valedictory session of training programme on "Skill Development for Watershed Secretary and CLWs under IWMP" (January 31 to February 4, 2013), he interacted with the participants and received the feedback on the quality training imparted. He advised the trainees to implement soil and water conservation works as per technical suitability by making use of knowledge gained during the training programme. He distributed the certificates to the participants. Dr. Mishra visited the Research Farm and suggested to develop various soil and water conservation models for demonstration. He also visited Lachhaputraghati Watershed (implemented under NWDPR) and MSSRF (Jeypore), where he interacted with Dr. K.U.K. Nampoothiri, Director, MSSRF about various activities taken up by MSSRF in the region for improving livelihood of tribal population.

### ASRB Examination Conducted

ASRB NET Examination - 2012 and Prelim ARS Examination - 2012 were successfully conducted by CSWCRTI for Dehradun Centre at the Kendriya Vidyalaya No. 1, Salawala, Dehradun on Feb. 24, 2013 in which 522 and 324 personal participated out of 718 and 503 registered candidates for NET and Prelim ARS Examination, respectively.

### Awards and Recognitions

- Dr. O.P. Chaturvedi: Fellowship of Indian Association of Soil and Water Conservationists (IASWC), Dehradun at UAS, Bangalore on March 14, 2013.
- Dr. R.C. Jakhmola: Fellowship of ISSGPU at CIRG, Makhdoom from December 22-23, 2012; Nominated as Vice President (West Zone) of Animal Nutrition Association 8<sup>th</sup> Biennial Conference at Bikaner from Nov. 28-30, 2012.
- Dr. A. Raizada: Fellowship of IASWC, Dehradun at UAS, Bangalore on March 14, 2013.
- Dr. S.K. Dubey: Fellowship of Indian Society of Seed Species at Jaipur on February 2, 2013; Gold Medal from IASWC, Dehradun at UAS, Bangalore on March 14, 2013.
- Dr. N.K. Sharma: Environmentalist of the Year-2012 in field of NRM by NESI at New Delhi on Nov. 29, 2012; Facilitated by MBD Group for scientific work in field of NRM at Dehradun on Oct. 7, 2012.

- Er. R.N. Adhikari: Fellowship of IASWC, Dehradun at UAS, Bangalore on March 14, 2013.
- Dr. Debashis Mandal: Dr. B.C. Deb Memorial Award for Popularization of Science for the Year 2012-13 by Indian Science Congress Association; Dr. K.G. Tejwani Award for Biennial 2010-11 by IASWC, Dehradun at UAS, Bangalore on March 14, 2013.
- Dr. Shakir Ali: Fellowship of Indian Association of Hydrologist on November 17, 2012.
- Dr. M. Muruganandam: Certificate of Felicitations by OMICS Group of Publishers, USA at International Conference on Water Technologies, Mumbai on February 13, 2013.
- Dr. Kuldeep Kumar Bisnoi: Ph.D. degree by IARI, New Delhi on November 28, 2012.
- Dr. B.K. Sethy: Ph.D. degree by MPUAT, Rajasthan on November 30, 2012.
- Dr. Rajeev Ranjan: Ph.D. degree by IARI, New Delhi on November 28, 2012.
- Dr. Raj Kumar: Ph.D. degree by Dr. YSPUHF, Nauni, Solan on December 7, 2012.

### Sports

- Mr. Naveen Kumar Pundir: Gold Medal in 200 m race in ICAR North Zone Sports Meet at IISR, Lucknow, March 19-22, 2013.
- Dr. Ramanjeet Singh, Dr. Daleep Kumar, Dr. M.N. Ramesha and Mr. Naveen Kumar Pundir: Bronze Medal in 4 x 100 m relay race in ICAR North Zone Sports Meet at IISR, Lucknow, March 19-22, 2013.

**Congratulations to all the awardees.**

### Important Publications

#### Research Papers

- Adhikary, P.P., Dash, J., Chandrasekhar, H., Rajput, T.B.S. and Dubey, S.K. 2012. Evaluation of ground water quality for irrigation and drinking using GIS and geostatistics in a Peri urban area of Delhi, India. *Arabian Journal of Geosciences*. 5:1423-1434.
- Ali, S., Ghosh, N.C., Singh, R. and Sethy, B.K. 2013. Generalized explicit models for estimation of wetting front length and potential recharge. *Water Resource Management*. DOI 10.1007/s11269-013-0295-2.
- Basak, B.B., Pal, S. and Datta, S.C. 2012. Use of Modified Clays for Retention and Supply of Water and Nutrients. *Current Science*. 102(9): 1272-1278.
- Datta, S.C., Singhal, S.K. and Mandal, D. 2012. Development of resin disc soil testing in rice crop in relation to kinetics of nutrient adsorption on resin. *Communications in Soil Science and Plant Analysis*. 43:1109-1120. DOI: 10.1080/00103624.2012.662560.
- Ghosh, B.N., Dogra, P., Bhattacharyya, R., Sharma, N.K. and Dadhwal, K.S. 2012. Effects of grass vegetative strips on soil conservation and crop yield under rainfed conditions in the Indian sub-Himalayas. *Soil Use & Management*. 28: 635-646.

- Ghosh, B.N., Dogra, P., Sharma, N.K. and Dadhwal, K.S. 2012. Soil erosion-productivity relationship assessment in sloping lands of north-west Himalayas. *Ind. J. Agricultural Sciences*. 82 (12): 1068-71.
- Kumar, A., Avasthe, R.K., Pandey, B., Lepcha, B. and Rahman, H. 2012. Effect of fruit load on yield and quality of peach (*Prunus persica*) in mid hills of Sikkim Himalaya. *Indian Journal of Agricultural Sciences*. 82 (3): 267-269.
- Kumar, A., Avasthe, R.K., Borah, T.R., Lepcha, B. and Pandey, B. 2012. Organic mulches affecting yield, quality and diseases of ginger in mid hills of North Eastern Himalayas. *Indian Journal of Horticulture*. 69(3): 439-442.
- Pal, S. and Panwar, P. 2013. Interrelationship of carbon sequestration, soil fertility and microbial indices as influenced by long term land-uses in lower Himalayan region, India. *Communications in Soil Science and Plant Analysis*. 44: 869-883.
- Patil, S.L. 2013. Winter sorghum (*Sorghum bicolor*) productivity as influenced by tillage practices and nitrogen management in Vertisols of SAT, India. *Soil & Tillage Research*. 126: 183-192.
- Raizada, A., Jayaprakash, J., Rathore, A.C. and Tomar, J.M.S. 2013. Distribution of fine root biomass of fruit and forest tree species raised on old river bed lands in the North West Himalaya. *Tropical Ecology*. 54(2): 251-261.
- Rao, B.K., Kumar, G., Kurothe, R.S., Pandey, V., Mishra, P.K., Vishwakarma, A.K. and Baraiya, M.J. 2012. Determination of crop coefficients and optimum irrigation schedules for bidi tobacco and pearl millet crops in central Gujarat. *Journal of Agrometeorology*. 14(2): 123-129.
- Sharda, V.N., Mandal, D. and Ojasvi, P. R. 2013. Identification of soil erosion risk areas for conservation planning in different states of India. *Journal of Environmental Biology*. 34: 219-226.
- Singh, R.J. and Ahlawat, I.P.S. 2012. Dry matter, nitrogen, phosphorous, and potassium partitioning, accumulation and use efficiency in transgenic cotton based cropping systems. *Communications in Soil Science and Plant Analysis*. 43: 2633-2650. DOI:10.1080/00103624.2012.716125.
- Singh, R.J. and Ahlawat, I.P.S. 2012. Lint yield, fibre quality and its nutrient uptake in Bt cotton (*Gossypium hirsutum*) groundnut (*Arachis hypogaea*) intercropping system using different fertility levels. *Indian Journal of Agricultural Sciences*. 82(12): 1039-43.

## Books

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- Koul, Divy Ninad, Panwar, P. and Shukla, G. 2012. *Carbon sequestration and land use*. Lambert Academic Publishing Co., Germany: 82 p.
- Palanisami, K., Sharda, V.N. and Singh, D.V. 2013. *Water Management in the Hill Regions-Evidences from Field Studies*. IWMI-Tata Water Policy Research Program. Bloomsbury Publishing India Pvt. Ltd. ISBN: 978-93-82563-49-5 : 288 p.
- Sharma, N.K., Singh, H.P. and Samra, J.S. 2013. Poplar and wheat agroforestry system. Lambert Academic Publishing Company, Germany. ISBN No. 978-3-659-35366-6.

- Singh, D.V., Sharda, V.N., Selvi, V., Bartholic, J. and Maredia, K. 2012. *Water Management for Sustainable Agriculture: Indo-US Experiences*. Jointly published by CSWCRTI, Research Centre, Udhagamandalam, Tamil Nadu, India and Michigan State University, East Lansing, USA. ISBN: 978-81-924172-0-2 : 318 p.
- Tripathi, K.P., Singh, N., Gehlawat, J.K. and Kumar A. 2012. *Abhiyanta Bandhu*. The Institution of Engineers (India), Uttarakhand State Centre: 112 p.

## Technical Reports/Bulletins

- Khola, O.P.S., Manivannan, S., Dhyani, B.L., Singh, D.V., Selvi, V., Kannan, K., Sundarambal, P., Hombe Gowda, H.C., and Mohanraj, R. 2012. *Impact Evaluation Study of Watershed Development Programmes in Lower Bhawani Catchments Implemented under River Valley Project*. CSWCRTI R.C, Udhagamandalam: 110 p.
- Mandal, D. and Dadhwal, K.S. 2012. *Land evaluation and soil assessment for conservation planning and enhanced productivity*. CSWCRTI, Dehradun: 90p + i-x.
- Narayan, D. and Tiwari, S.P. 2013. *Lal mittiyon mein sansadhan sanrachan evam jowar ki upaj barhane hetu unnat bhu pariskaran tatha palwar vidhiyan* (in Hindi). Tech. Brochure, CSWCRTI, Research Centre, Datia: 8p.
- Narayan, D., Biswas, H. and Tiwari, S. P. 2013. *Ardha susk chhetra ki lal mittiyon mein versa jal sangharan evam upyog takniki* (in Hindi). Tech. Brochure, CSWCRTI, Research Centre, Datia: 8p.
- Sidhu, G.S., Pal, S., Tiwari, A.K., Sarkar, D. and Sharda, V.N. 2012. *Soil erosion status of Punjab*. Bulletin No.151. NBSS&LUP, Nagpur.
- Tiwari, A.K., Panwar, P., Pal, S., Bhatt, V.K. and Sharda, V.N. 2013. *Resource conservation analysis of hilly forest watershed in Shivaliks*. Bulletin No. T-61/C-14. CSWCRTI, Chandigarh.

## Radio Talks

- Dr. H. Mehta on “Rabi faslotpadan hetu sichai prabandhan” at AIR, Najibabad on October 30, 2012.
- Dr. Ambrish Kumar on “Parvatiya kshetron mein varsha jal sanchay ki vidhiyan” at AIR, Najibabad on July, 17, 2012.
- Dr. Ambrish Kumar on *Watershed management* at AIR, Najibabad on November 21, 2012.
- Sh. H.R. Meena, Scientist Kota on “Rabi mausam ke sabjiyon ki kheti” at AIR, Kota on October 13, 2012.
- Sh. H.R. Meena, Scientist Kota on “Zaid ki phasalon ki taiyari” at AIR, Kota on February 6, 2013.
- Dr. Kuldeep Bisnoi, Scientist Kota on “Organic Farming” at AIR, Kota on February 7, 2013.

## Distinguished Visitors

- **Dehradun:** Dr. J.S. Samra, CEO, NRAA, New Delhi; Dr. V.N. Sharda, Member, ASRB; Dr. Alok K. Sikka, DDG (NRM); Sh. C.M. Pandey, Addl. Commissioner (NRM); Dr. P.K. Ghosh, Director, IGFRI, Jhansi; Sh. Suresh Ambulgekar, Director, SCWM, Pune, Maharashtra; Dr. S.R. Chaudhari, Managing Director, GSLDC, Gandhinagar, Gujarat; Dr. P.M. Premachandran, Director, Soil Survey and Soil Conservation, Kerala.



- **Agra:** Dr. R.K. Singh, IRRI, Philippines; Miss Rosemary Murori, IRRI, Africa Rice Office, Dar-es-Salaam, Tanzania; Dr. Chanda Nimbkar, Member, Governing Body, ICAR; Dr. A. Subbarao, Director, Indian Institute of Soil Science, Bhopal; Dr. S.K. Agrawal, Director, CIRG, Makhdoom.
- **Bellary:** Dr. S.R. Singh, Chairman RAC; Dr. R.S. Narang, Dr. I.D. Tyagi and Dr. M.M. Agarwal, Members, RAC; Dr. B. Mohan Kumar, ADG Agronomy/ Agroforestry.
- **Chandigarh:** Dr. J.S. Samra, CEO, NRAA; Dr. V.N. Sharda, Member, ASRB; Dr. A.K. Sikka, Technical Expert, NRAA; Dr.(Mrs.) B. Meena Kumari, DDG (Fisheries), ICAR; Dr. Mannu Lal, University of Columbia, New York (USA); Dr. S.P. Sharma, Director Research, Palampur, H.P.; Dr. B.P. Singh, Director, CPRI, Shimla; Dr. R.K. Sharma, Director, National Horticulture Board, New Delhi; Dr. K.A. Sarif, Director, Central Silk Board; Dr. S.K. Nanda, Project Coordinator, CIPHET, Ludhiana.
- **Koraput:** Sh. Raghuram Padal, Honourable MLA, Koraput; Sh. R.C. Kadam, Honourable MLA, Pottangi; Sh. Anoop O.F. Bakhla, Regional C.C.F, Koraput; Dr. K.V.K. Nampoothiri Director, MSSRF, Jeypore; Sh. Raghu Prasad, Joint Project Director, OFSDP, Bhubaneswar; Dr.S. Behera, Project Coordinator, KVK, Semiliguda.
- **Udhagamandalam:** Dr. Sathyanarayana, Associate Dean, College of Agricultural Engg., Madakasira, Andhra Pradesh; Sh. V.B. Bhat, Secretary to GOI, Member of Space, Atomic Energy and Earth commission; Prof. A.V.K. Iyengar, Director, Kotagiri Agricultural Management Centre, Tamil Nadu with 13 foreign participants from Zimbabwe, Maldives, Sri Lanka, Bangladesh and Myanmar; Sh. S.B. Biradar, Joint Director Agriculture, Dharward, Karnataka.

## Personalia

### Joinings/Transfers

- Sh. Dileep Kumar, Scientist (Agronomy) joined Agra.
- Dr. Kuldeep Kumar, Scientist (Agronomy) joined Kota.
- Dr. Sathiya K., Scientist (Agronomy) joined SS&A Division, Dehradun.
- Sh. Prem Singh, T-9, joined Vasad.
- Sh. S. Rukman, LDC, Bellary transferred to NRCon Meat, Hyderabad.

### Promotions

- Dr. M. Madhu, Koraput promoted to Principal Scientist.
- Dr. V.K. Bhatt, Chandigarh promoted to Principal Scientist.
- Dr. Pradeep Dogra, Dehradun promoted to Principal Scientist.
- Dr. Charan Singh, Dehradun promoted to Principal Scientist.
- Dr. A.K. Parandiyal, Kota promoted to Principal Scientist.
- Dr. G.L. Bagdi, Vasad promoted to Principal Scientist.
- Dr. Ashok Kumar, Kota promoted to Principal Scientist.
- Dr. B.N. Ghosh, Dehradun promoted to Principal Scientist.
- Dr. Bankey Bihari, Dehradun promoted to Principal Scientist.
- Dr. Ambrish Kumar, Dehradun promoted to Principal Scientist.
- Dr. D.V. Singh, Dehradun promoted to Principal Scientist.
- Dr. R.M. Samarth, Bellary promoted to T-9.

- Sh. Surinder Singh, Chandigarh promoted to T-9.
- Dr. Prem Singh, Vasad promoted to T-9.
- Sh. Nirmal Kumar, Dehradun promoted to T-9.
- Dr. J.P. Singh, Dehradun promoted to T-9.
- Dr. S.C. Saxena, Agra promoted to T-9.
- Sh. A.P. Gawande, Agra promoted to T-9.
- Sh. D.P. Gupta, Dehradun promoted to T(7-8).
- Sh. Roopak Tandon, Dehradun promoted to T(7-8).
- Sh. Anil Chauhan, Dehradun promoted to T(7-8).
- Sh. S.K. Sharma, Dehradun promoted to T(7-8).
- Sh. V.K. Dwivedi, Datia promoted to T(7-8).
- Sh. Laxmi Kant Sharma, Dehradun promoted to T(7-8).
- Sh. Suresh Kumar, Dehradun promoted to T(7-8).
- Sh. C.N. Damor, Vasad promoted to T-5.
- Sh. Govind Singh, Dehradun promoted to Assistant.
- Sh. M.K. Kureel, Kota promoted to Assistant.
- Sh. Tajwar Singh, Dehradun promoted to AF&AO.

### Retirements

- Dr. H.P.S. Tomar, T-9, Sh. A.N. Mohin, T(7-8), Sh. Ram Kumar, AAO, Sh. P.K. Sharma, Assistant, Sh. Naresh Chand, Assistant and Sh. Ayodhya Prasad, SSS, Dehradun; Sh. P.B. Thapa, AAO, Datia; Sh. Udekar Pande, AAO, Koraput; Sh. K. Hari Babu, UDC; Smt. Durugamma, SSS; Sh. D.N. Solomon, SSS, Bellary.

**CSWCRTI wishes them a happy retired life.**

### Obituaries

- Sh. Manik Chandra, SSS, Research Centre, Agra (Nov. 28, 2012).  
**CSWCRTI expresses heartfelt condolences to the bereaved family.**

### Workshops/Meetings/Trainings Attended

- Training on Statistical Models for Forecasting in Agriculture, N. Delhi (Sep. 11-Oct.1, 2012): Dr. N.M. Alam.
- International Conference on Legume Genetics and Genomics, Hyderabad (Oct. 2-7, 2012): Dr. H. Mehta.
- Training on Use of Simulation Modelling in Climate Change Research: Special Reference to Natural Resources Management, Bhopal (Oct. 3-12, 2012): Dr. Shakir Ali and Dr. P.P. Adhikary.
- Meeting on Water Harvesting in Maldeota Valley, (Oct. 6, 2012): Dr. G.P. Juyal.
- 37<sup>th</sup> Working Group Meeting of National Institute of Hydrology, Roorkee (Oct. 29, 2012): Dr. G.P. Juyal.
- Brainstorming Session-cum-Workshop on Action Plan for Sustainable Himalayan Agro Ecosystems, Solan (Oct. 10-11, 2012): Dr. J.M.S. Tomar, Dr. A.C. Rathore, Dr. J. Jayparkash and Dr. Raj Kumar.
- 51<sup>st</sup> Foundation day Golden Jubilee Celebration of IGFR, Jhansi (Nov. 1, 2012): Dr. Dev Narayan and Dr. Om Prakash.
- XII meeting of ICAR Regional Committee No. VI, Jodhpur (Nov. 15-16, 2012): Dr. R.K. Singh.
- Training on Climate Change and Carbon Mitigation, Dehradun (Nov. 19-23, 2012): Dr. J. Jayaprakash and Dr. Raj Kumar.

- Training Workshop on Scientific Report Writing and Presentation, Hyderabad (Nov. 20-23, 2012): Dr. Ashok Kumar, Dr. J.M.S. Tomar.
- NNRMS Sponsored RS and GIS Application in Natural Resource Management, Kolkata (Nov. 21-Feb. 27, 2013): Dr. D.G. Durbude.
- 3<sup>rd</sup> International Agronomy Congress on Agriculture Diversification, Climate Change Management and Livelihoods, N. Delhi (Nov. 26-30, 2012): Dr. Dev Narayan, Dr. A.K. Vishwakarma, Dr. Raman Jeet Singh, Dr. Kuldeep Kumar.
- International conference on Environment and Human Health, N. Delhi (Nov. 28-29, 2012): Dr. N.K. Sharma.
- International Conference on Sustainable Agriculture for Food and Livelihood Security, Ludhiana (Nov. 27-29, 2012): Dr. H. Mehta.
- International Conference on Environment and Human Health, N. Delhi (Nov. 28-29, 2012): Dr. N.K. Sharma.
- 8<sup>th</sup> Biennial ANA Conference, Bikaner (Nov. 28-30, 2012): Dr. R.C. Jakhmola.
- Training on a Primer on Administration and Management for Scientists, LBSNAA, Mussorie (Dec., 3-7, 2012): Dr. K.K. Sharma.
- Training on Assessment of Soil Quality Indicator, Dehradun (Dec. 3-7, 2012): Dr. Rajeev Ranjan.
- Workshop cum Training Programme of National Stakeholders for creating Awareness on Non-Legally Binding Instrument (Forest Instrument) on All Types of Forests, New Delhi (Dec.12-14, 2012): Dr. Raj Kumar.
- Meeting on Capacity Building Program at Watershed Directorate, Dehradun (Dec.13, 2012): Dr. G.P. Juyal.
- XVI IMC meeting of Directorate of Water Management, Bhubaneswar (Dec. 14-15, 2012): Dr. P.K. Mishra.
- Executive Development Program on Leadership Development, Hyderabad (Dec. 17-21, 2012): Dr. P.K. Mishra.
- National Seminar on Strategies to Rationalize and Reduce Consumption of Water Soluble Phosphorus in the Country to Minimize Import, Bhopal (Dec. 18-19, 2012): Dr. B.N. Ghosh.
- Training on Climate Change, Forest Ecosystem and Biodiversity: Vulnerability and Adaptation Strategies, Dehradun (Dec.19-23, 2012): Dr. J.M.S. Tomar and Dr. Rajesh Kaushal.
- Inter-Medium Publicity Coordination Committee Meeting, Haridwar (Dec. 21, 2012): Dr. J.P. Singh.
- National Seminar on Future challenges and Opportunities to Improve Health and Production of Small Ruminants, Makhdoom (Dec. 22-23, 2012): Dr. R.C. Jakhmola.
- Group meeting of AICRP on Arid Zone Fruits, Jhalawar (Dec. 27, 2012): Dr. R.K. Singh.
- National Seminar on Jute and Allied Fibres in Changing Times: Issues and Strategies, Kolkata (Jan. 3-5, 2013): Dr. P.K. Mishra and Dr. G.P. Juyal.
- 100<sup>th</sup> Indian Science Congress, Kolkata (Jan. 3-7, 2013): Dr. P.K. Mishra, Dr. Dev Narayan and Dr. D. Mandal.
- Administrative Training-cum-Workshop, Chandigarh (Jan. 9-11, 2013): Sh. Vishwa Ranjan, Smt. Saroj Semwal, Smt. Manjula Dobhal, Sh. Sanjay Kumar Pant, Sh. Mohd. Abbas Rizvi, Km. Neha Sharma, Sh. Anil Bagasi, Sh. Laxman Singh Rawat, Sh. Manish Negi, Sh. Santosh Kumar, Sh. Satvinder Singh Bhatia, Smt. Kamla Bargali, Sh. Kuldeep Kumar, Sh. A.S. Bimli, Smt. Pramila Rathore, Sh. K. Natraj, Smt. Veena Gusain, Sh. Krishan Kumar, Sh. Sunil Kumar, Sh. Krishan Kumar, Smt. Sarabjeet Kaur, Smt. Nirmala Sarhadi, Sh. Fakir Chand, Sh. M.K. Kureel, Sh. Mohd. Irfan, Sh. R. Siva Prasad, Smt. Arnapurna Nayak, Smt. N. Revathy, Sh. Ramesh Kanchanagoudar.
- RFD meeting of NRM Division, New Delhi (Jan. 11, 2013): Dr. P.K. Mishra.
- National Conference on Environmental Pollution, Soil Health and Sustainable Agriculture, Noida (Jan. 15-17, 2013): Dr. B.N. Ghosh
- Winter School on Application of Remote Sensing and GIS in Natural Resources Management, New Delhi (Jan. 16- Feb. 05, 2013): Sh. R.B. Meena.
- International Symposium on Bio-energy: Challenges and Opportunities and 47<sup>th</sup> Annual Convention of ISAE, Hyderabad (Jan. 28-30, 2013): Dr. Ambrish Kumar and Dr. B.K. Rao.
- Apex Advisory Committee - Sustainable Development meeting of THDC, Ghaziabad (Feb. 2, 2013): Dr. G.P. Juyal.
- Workshop on Environmental and Social Guidelines for UDWDP (Phase-II), Dehradun (Feb. 5, 2013): Dr. Ambrish Kumar and Dr. M. Muruganandam.
- Brainstorming workshop on "Post Adoption Behaviour of Farmers Towards Soil and Water Conservation Technologies of Watershed Management, Vasad (Feb. 4-7, 2013): Dr. R.K. Avasthe, Dr. Bankey Bihari, Dr. A.K. Singh.
- Workshop on Environmental and Social Guidelines for Watershed Development, Dehradun (Feb. 05, 2013): Dr. Ambrish Kumar.
- International Conference on Bio-Resource and Stress management, Kolkata (Feb. 6-9, 2013): Dr. B.N. Ghosh.
- Inaugural function of Agricultural Science Congress, Bhubaneswar (Feb. 7, 2013): Dr. P.K. Mishra.
- DST Training on Role of Scientists in Natural Resources and Environment Management, Bhopal (Feb. 28-March 1, 2013): Dr. O.P. Chaturvedi.
- DST Training on Financial Management in Scientific Organizations, IIPA, New Delhi (March 4-8, 2013): Sh. Nirmal Kumar.
- Management Development Programme on Sustainable Livelihood and Integrated Watershed Management, Anand (Feb. 8-15, 2013): Dr. R.K. Avasthe, Dr. Bankey Bihari, Dr. D.V. Singh, Er. S. Patra, Dr. Raj Kumar, Sh. Suresh Kumar, Dr. Ashok Kumar, Dr. G.L. Bagdi, Dr. K.K. Sharma and Dr. P. P. Adhikary.
- Workshop on Groundwater Management in Uttarakhand, Dehradun (Feb. 15, 2013): Dr. P.K. Mishra, Dr. P.R. Ojasvi, Dr. Ambrish Kumar, Er. S.S. Shrimali, Dr. D.R. Sena, Dr. N.M. Alam, Dr. J.M.S. Tomar and Dr. R. Kaushal.
- Training programme on "Hyperspectral Remote Sensing in Agriculture HYPERAGRI 2013, New Delhi (Feb. 8-27, 2013): Dr. D.G. Durbude.
- International Exhibition and Conference on Water Technologies, Environmental Technologies and Renewable Energy, Mumbai (Feb. 13-14, 2013): Dr. M. Muruganandam.



- International 6<sup>th</sup> GEOSS Asia-Pacific Symposium, Ahmedabad (Feb. 25-27, 2013): Dr. B.K. Sethy and Dr. G.L. Meena.
- Training Course on Aquifer Information System and Aquifer Management Plan, Dehradun (Mar. 1-5, 2013): Dr. Ambrish Kumar.
- Web Based Hydrological Tools, Roorkee (Mar. 12-15, 2013): Er. S. Patra.
- ICAR Directors Conference, N. Delhi (March 19-20, 2013): Dr. P.K. Mishra.
- Farmer First for Conserving Soil and Water Resources in Southern Region, Bangalore (March 14-16, 2013): Dr. P.K. Mishra, Dr. O.P. Chaturvedi, Er. K.P. Tripathi, Dr. N.K. Sharma, Dr. D. Mandal, Dr. A. Raizada, Dr. O.P.S. Khola, Dr. R.S. Kurothe, Dr. G.L. Bagdi, Dr. V.C. Pande, Dr. M. Madhu, Dr. S.K. Dubey, Dr. A.K. Singh, Dr. B.K. Sethy, Dr. A.K. Parandiyal, Dr. A.K. Tiwari, Er. R.N. Adhikari, Dr. S.L. Patil, Dr. B. Mondal, Ms. M. Prabhavathi, Dr. N. Loganandhan, Dr. S. Manivannan, Dr. K. Kannan, Dr. (Ms.) P. Sundarambal, Dr. K. Rajan, Er. (Ms.) V. Selvi, Dr. S. Manivannan, Dr. D. Dinesh.

## Technology

An interactive decision support system (DSS) has been developed to present design, layout and construction techniques for continuous contour trenches (CCT) and contour staggered trenches (CST) under varied land forms and climatic conditions for helping users to make accurate decisions for optimizing cost and deriving maximum benefit from scarce resources. Trenching is the most efficient practice for *in-situ* conservation of moisture, soil, nutrients and energy fluxes for restoration of degraded non-arable lands, and has been given the highest priority for treatment of sloping lands in national and international watershed rehabilitation programmes. Government and various agencies spend lot of money and energy for rehabilitation of degraded lands by carrying out trenching to improve the establishment and growth of forestry and horticultural plantations to meet rural requirements. However, in absence of clear scientific guidelines for computation of trench specifications (spacing, cross section and density), many such activities do not produce desirable results, leading to wastage of scarce financial resources. Wide fluctuations

in trench specifications have been noticed in different regions of the country, which are bound to occur due to a highly diverse land forms. The user friendly software can be used by any person with little computer knowledge having required data to obtain desired results without wasting time in search for literature and tedious calculations and estimations, which often suffer from mistakes. For using the DSS, the user needs to follow the following steps:

**Step 1:** The programme opens with a main menu in which after selecting the choice of information one can access the desired menu.

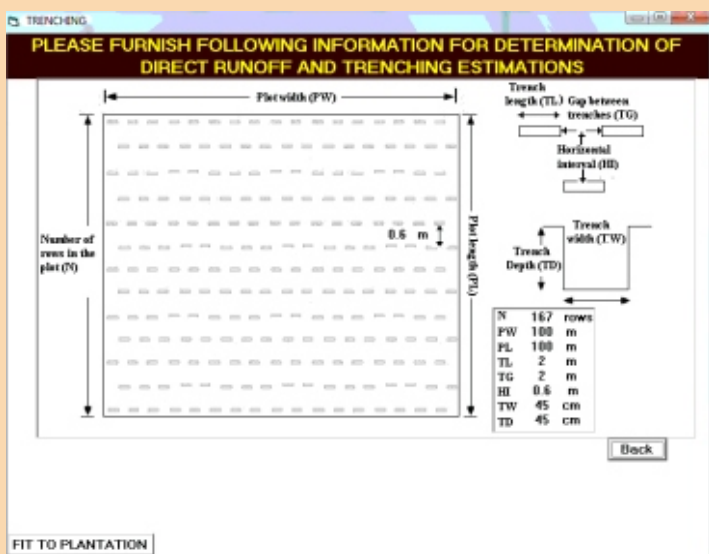
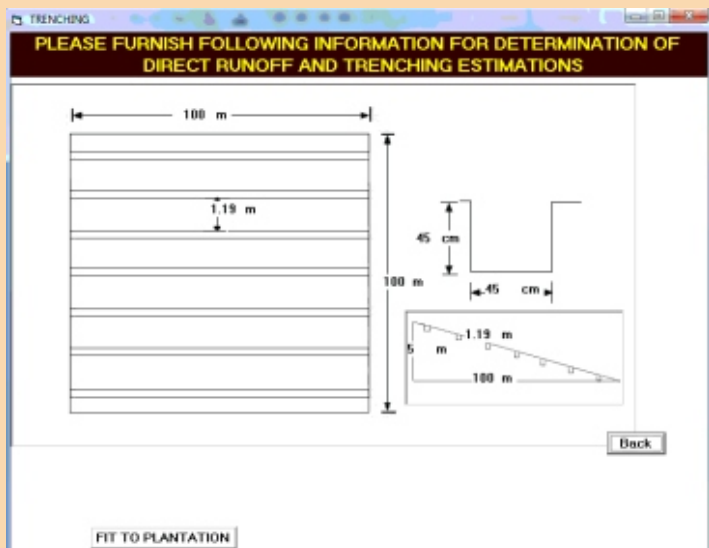
**Step 2:** For trenching estimations, watershed information related to rainfall for desired return period, slope and curve number are entered. In the absence of information on rainfall, 28 stations' data for four years return period and 6 hours duration is available in the software, which can be utilized by the user. In case the user does not have curve number, the software can generate curve number for any location using information provided by the user related to land use, practices adopted, hydrologic condition and hydrological soil group.

**Step 3:** On selecting soil type, information related to amount of direct runoff expected along with choice of trenches to be constructed is generated.

**Step 4:** On selecting continuous contour trenches with rectangular or trapezoidal sections, estimations are made based on runoff amount to be trapped, trenches dimensions, plot size and cost

## In News





of earth work. Information related to horizontal and vertical intervals, number of trenches, trench length, earth work volume and cost estimations can be generated for specific information along with amount of surface area covered by the trenches.

**Step 5:** If the user desires to redesign the structure either to reduce or increase the surface area covered by the trenches, one can submit the desired surface area and can redesign the trenches to trap the desired quantity of runoff by modifying trench dimensions. Similarly if there is cost constraint, the user can submit the available fund in the window and redesign the trench specifications by modifying the runoff to be trapped.

**Step 6:** After optimizing for all the parameters, finally if the user wishes to redesign the trench specifications so that it may fit to support plantations at desired spacing and utilize conserved moisture in trenches, a “fit to plantation” option has been provided, which will modify trench dimensions to fit the trench layout to plantation spacing. If trench dimensions exceed critical limits, the software will automatically guide the user to proceed so that it will fit to plantation spacing within critical limits.

**Step 7:** After this, a printable trench design in form of a sketch diagram with dimensions for different parameters to be constructed in the field is obtained.

**Step 8:** Similarly, information related to estimation and design of staggered trenches with rectangular and trapezoidal dimensions can be generated. The software is provided with strong inbuilt warning system, which becomes automatically active as soon as any critical limit is violated or the estimations made by the software exceeds critical limit. The software is also provided with an inbuilt document which the user can refer for more information related to trenching technology.

The DSS bridges knowledge gap between experts and actual field level implementers of the technology by helping the user to accurately draw design and layout for continuous contour trenches and contour staggered trenches under varied land forms and climatic conditions to optimize cost and derive maximum benefit from scarce resources. It provides opportunity to get rid of tedious calculations and avoid chances of miscalculations. The DSS will be of immense importance and practical use for persons working in watershed development projects, State government agencies, NGOs and forest departments implementing plantation activities on watershed basis.



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**Published by : P.K. Mishra, Director**

**Editorial Board :** Pradeep Dogra, Principal Scientist  
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**Design & Photographs :** L.K. Sharma, Technical Officer

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