



CSWCRTI

News



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In this Issue



Jhola Kundi : (P-8)

- ◆ Nuclear Science for Erosion Assessment
- ◆ Farm Innovator's Day Celebrations
- ◆ Sensitization Workshops
- ◆ QRT Meeting
- ◆ DDG (NRM) Visit
- ◆ Datia Celebrates 25 Years of Establishment

Next Issue



Integrated Farming System in the middle Himalayan watershed, Sainji, Tehri Garhwal, Uttarakhand

From the Director's Desk..

With the new assignment as Director of this prestigious institution, I feel proud to be a part of a team of responsible and dedicated scientific, technical, administrative and supporting staff located at nine locations all over the country.



Soil and Rainwater Conservation is the backbone for improving soils and must precede any efforts for improving soil quality and productivity with major bearing on rainfed agriculture. The watershed development and employment generation programs are investing on these.

ICAR is in the process of modernizing the thinking and processes in tune with the slogan "Farmers First". CSWCRTI's role is to conserve the natural resources for boosting the agricultural production and productivity of the country. The goal is to show the strength of the conservation technologies and put them in proper shape with innovative and usable products for up-scaling the technologies. This can be achieved by effective linkages between the farmers and the scientists through "Action Research" and "Participatory Development (Science-led)" programs involving the huge extension agencies and KVK network. The modern research tools in ICT mode will come handy in this endeavour. All our efforts and resources will aim at this national initiative of production enhancement without degrading the fragile ecosystem and the environment.

Considering the ICAR platforms, the new initiatives of CSWCRTI will be in the areas of Climate Change, Conservation Agriculture, Precision Farming, Water, AKM and Socio-economic dimensions of agriculture etc. The basic, applied and strategic research including technology up-scaling will now revolve around these priority areas with bigger challenges and higher responsibilities. Finally, the aim is to make soil and water conservation a peoples' program for addressing NRM and livelihood issues with a true "team spirit" for sustaining the country's progress.

I wish all the readers "A Happy and Productive New Year 2012".

P.K. Mishra

New Initiatives

Assessment of Soil Erosion Using Fallout Radionuclide

An externally funded three years project entitled “The assessment of soil erosion through redistribution analysis of ¹³⁷Cs fallout in humid subtropical region of India” has been granted to CSWCRTI Headquarters, Dehradun by Board of Research in Nuclear Science (BRNS) of Department of Atomic Energy (DAE), BARC, Mumbai with an outlay of Rs. 24.9 Lakhs. The project aims to estimate erosion rate from ¹³⁷Cs measurement by using conversion models leading to designing and targeting of effective soil and water conservation measures for different landforms. No such work using fallout radionuclides is being conducted in the country to estimate soil erosion. Standardized methodologies and guidelines for the use of fallout radionuclides for the assessment of erosion and the effectiveness of specific soil conservation measures to reduce soil erosion and improving crop productivity will be of immense value to the farmers and planners and policy makers as well.

Application of Jute Geo-Textile for Rehabilitation of Mass Eroded Hilly Slopes

A project under consultancy mode on 'Field Trial Application of Jute Geo-textile (JGT) for Hill Slope Management' under CFC funded project 'Development and Application of Potentially Important Jute Geotextiles' sponsored by National Jute Board (NJB), Kolkata has been undertaken by CSWCRTI, Dehradun to be operationalized at three Centres, viz.; Dehradun, Chandigarh and Udhagamandalam. The project aims to identify suitable JGT material for hill slope stabilization, study the performance of vegetation, and monitor environmental impacts in three hill eco-systems, viz.; North-West Himalayas, Shivaliks and Nilgiris. Soil characteristics of the sites selected for three hill systems have been studied and JGT material consisting of three types i.e. 500, 600 and 700 GSM installed at sites. Experts from NJB visited the project sites and inspected the installation of JGT. Stabilization of the slopes will help in mitigating mass movement of the top soil, improving soil moisture conditions and establishment of vegetation leading to further stabilization.



Conservation and Management of Kailana and Gadiser Lakes in Rajasthan

Two consultancy projects, namely preparation of Detailed Project Report (DPR) for conservation and management of Kailana lake in Jodhpur, Rajasthan with project cost of Rs. 2.51 lakh and preparation of DPR for conservation and management of Gadiser lake in Jaisalmer, Rajasthan with project cost of Rs. 2.52 lakh undertaken by Research Centre Kota from Alternate Hydro Energy Centre (AHEC), Indian Institute of Technology, Roorkee have been completed.

MoU Signed for Treatment of Mined Area in Eastern Ghats Highland Zone

Memorandum of Understanding was signed with Steel Authority of India Ltd. for preparation of treatment plan to prevent soil erosion in Barsua Taldish Kalta mining area in Bonai Forest Division of Sundargarh District of Odisha.

Important Events

Farm Innovator's Day Celebrated at CSWCRTI and Centres

“Farm Innovator's Day” was celebrated at Dehradun and Research Centres at Chandigarh, Datia, Kota and Udhagamandalam. At Dehradun, Dr A. K. Singh, Deputy Director General (NRM), Indian Council of Agricultural Research in his inaugural speech emphasized upon development of sustainable technologies based on farmer's problem as per the “Farmer's First” approach of ICAR. He advised the huge farmers' gathering to adopt climate resilient agriculture coupled with resource conservation technologies to offset the effect of adverse climatic conditions and meet the growing demand of ever increasing population in the face of scarce and inelastic land resources. The technologies must meet the challenge of providing sustainable and regular income to the farmer.

Dr P. K. Mishra, Director apprised the dignitaries and farmers about similar event being organized at regional centres for felicitating innovative farmers in their respective regions. He opined to organize



a sensitization workshop of these farmers at national level aiming at sharing the experiences towards adoption of innovative technologies in their respective states. Since CSWCRTI's role is limited to develop research based technologies and demonstrate them at a small scale, onus lies with the stake holders and the state government to upscale these technologies for further benefits. He also emphasized upon development of liaison between scientists and progressive farmers to meet the challenge of food security.

At the Regional Centres, the functions were presided by distinguished persons, namely Sh. H.S. Lohan, (Retd. Additional Director of Agriculture, Haryana) at Chandigarh, Sh. Ashok Deshwal (District Collector) along with Sh. R.P.S. Jadaun (CEO, Zila Panchayat) at Datia, Sh. Pritam Singh (Divisional Commissioner) along with Sh. Vidhya Shankar Nandwana (Zila Pramukh) at Kota, Mrs. Archana Patnaik (District Collector, The Nilgris) along with Sh. Srinivas R. Reddy (Project Director, Hill Area Development Programme) at Udhagamandalam, and Dr. A. M. Sheikh (Vice Chancellor, Anand Agricultural University, Anand) at Vasad. The Chief Guests motivated the farmers to utilize the expertise of CSWCRTI in soil and water conservation. They also emphasized that the farmers should not be satisfied with the existing conditions and they should aspire for innovative ideas. The innovative farmers should share the new approaches / techniques, which they are



practicing in their fields for wide spread dissemination with other farmers so that it will benefit them also.

Detailed enumeration of the location specific technologies developed by the Institute was done by Heads of Divisions and Research Centres to the well attended functions by farmers of different villages located in watersheds developed by the Institute and nearby areas. Visit to Research Farm and Museum, and showing of documentary films were also arranged to keep them abreast of the various ongoing research activities and technologies being developed by the institute. Technological brochures published by the institute were released on the occasion. This was followed by interactive session of scientists, state development department officials and farmers, where scientists and officials answered queries raised by farmers during the occasion. Farmers from various watersheds/projects shared their experiences and success stories with respect to adoption of institute developed various soil and water conservation technologies. Innovative farmers were felicitated for their outstanding contribution in adopting innovative resource conservation technologies to attain self sustainability.

Sensitization Workshops

Sensitization Workshops were organized at CSWCRTI, Dehradun and Research Centres at Chandigarh, Udhagamandalam and Koraput.

The state-level Sensitization Workshop cum Stakeholders' Consultation for Uttarakhand organized at Dehradun on March 30, 2012 aimed to showcase the technologies generated by the Institute and provide a platform for wide-ranging deliberations towards identifying the future research priorities of CSWCRTI. Dr V. K. Bahuguna, IFS, Director General, ICFRE, Dehradun presided as the Chief Guest while Dr Rajendra Dobhal, Director General, Uttarakhand Council of Science and Technology was the Guest of Honour. Officials of concerned State Line Departments, Universities, KVKs, NGOs and progressive farmers were in attendance.

The objectives of the state level workshop at Chandigarh, held on February 28, 2012, were to facilitate focused analysis and deeper understanding of problems of degradation of natural resources in Shivalik foothill region and setting up priorities for research and development in natural resources management. The technologies developed at the Centre for natural resource management and productivity enhancement in the region were discussed with stakeholders from Punjab and Haryana. Discussion was held to define future strategies for efficient natural resource management based research programme for XII plan in niche areas and to evolve agriculture practices resilient to changing climatic conditions. The workshop was inaugurated by Sh. A.K. Sondhi, Chief Conservator of Soils (Punjab) and was attended by 57 officers from Department State Line Departments, Punjab Council for Science and Technology, NABARD, Central Ground Water Board, and representatives of NGOs.



At Udhagamandalam, sensitization workshop sponsored by Western Ghats Secretariat, and Union Planning Commission, Govt. of India, New Delhi for "Integrated Watershed Management" was conducted during September 26-28, 2011 in which senior level officers from the states of Tamil Nadu, Karnataka, Goa, Assam, Delhi, Maharashtra participated. At Koraput, workshop for sensitization about resource conservation technologies for South Odisha was conducted on January 30, 2012. About 60 officers of different State Government Departments and farmers participated in the workshop and expressed their views on needs of resource conserving technologies in the region.

District Level Contingency Plans Discussed

Workshop on "District Level Contingency Plans (DLCP) for Weather Aberrations in India" was organized on March 22-23, 2012 at CSWCRTI, Dehradun to discuss the present status of the plans. About 27 participants from CRIDA (Hyderabad), Nodal Officers of SAUs from Jammu & Kashmir, Himachal Pradesh and Uttarakhand, and Scientists of different disciplines participated. Future course of action for bringing the plans up to the mark was chalked out.

Crops based Kissan Divas/Mela

CSWCRTI Research Centre at Agra participated in 18th Rastriya Sarsson (Mustard) Vigyan Mela at Bharatpur on February 3, 2012 to apprise the importance of soil and water conservation measures in yield enhancement along with effective natural resource conservation for livelihood security. The Chief Guest, Dr. R.B. Singh (President, NAAS), Dr. D.P. Singh (Ex-VC JNKVV, Jabalpur) and Dr. J.S. Chauhan (Director, DRM, Bharatpur) visited the Institute's stall. Dr. R.B. Singh appreciated the efforts of CSWCRTI in natural resource conservation and opined that there should be more awareness campaign to educate people for the same. Vasad organized Bajra (Pearl Millet) Kissan Divas and Kapaas (Cotton) Kissan Divas at Vejalpur-Rampura watershed on January 31 and March 24, 2012, respectively under crop demonstration activities.



Transfer of Technology

Under Transfer of Technology Project, CSWCRTI Centre Udhagamandalam (Nilgiris) demonstrated:

- Bench terracing with INM in 7.2 acres of 8 farmers' of Melkavatty, Appukodu, Kallakorai, Osahatti and Fernhill villages with 10, 17 and 12 per cent average increase in yield of potato, carrot and cabbage, respectively raised in demonstration fields compared to sloppy land.
- Soil and water conservation measures in new tea plantation in 5 acres of 4 farmers' fields of Ithalar, Kothumudi, Kenthorai and Melkavatti villages.
- Tea plantation for economic utilization and stabilization terrace risers in 0.5 acre of one farmer's field at Kenthorai along with INM for vegetables on terraces which provided extra yield of 14.2% in potato and 16% in carrot. With hybrid Napier (CO4) grass demonstrated in 2 acres of two farmer's field terrace risers at Kenthorai along with INM for vegetables on terraces, there was 36% increase in potato yield due to INM practices, in addition to expected fodder grass yield of 15 t ha⁻¹ from risers.



QRT Visit

Quinquennial Review Team (QRT) of CSWCRTI for the period 2006-2007 to 2010-2011 comprising of Dr. H.S. Chauhan (Chairman), Dr. S.G. Patil, Dr. S.K. Gupta, Dr. K.K. Jindal, Dr. R.S. Narang, and Dr. M.G.



Chandrakanth (Members) visited Dehradun on November 22-23, 2011. The QRT also visited Research Centres at Bellary, Chandigarh, Koraput, Kota, Udthagamandalam and Vasad with Er. K.P. Tripathi (Member Secretary). Various watersheds developed by Centres, Research Farms, Experiment Fields, Laboratories, Library, Training Facilities and other infrastructure facilities were visited. The QRT also interacted with the scientists and other staff of the establishment.

Research Centre Datia Celebrates 25 Years of Establishment

CSWCRTI Research Centre celebrated 25 years of its establishment. On this occasion, a meeting cum workshop was organized on September 17, 2011 with District Level Officers of State Departments. Dr A.K. Bisaria (IFS), Chief Conservator of Forest, Research and Extension Circle, Gwalior (MP) along with Dr S.K. Dhyani, Director, NRCAF (ICAR), Jhansi inaugurated the programme. About 58 participants pertaining to State Departments of Agriculture, Soil Conservation, Forest, Animal Husbandry, KVK, NGOs, farmers from watershed area, educationists etc. participated in the programme. Centre's R&D activities and adoptable soil and water conservation technologies were presented, displayed and discussed through live field demonstrations, power point presentation, documentary film, and exhibition organized at the occasion.

IFS Probationers Learn Participatory Integrated Micro-Watershed Planning

Seventy-six Indian Forest Service (IFS) Probationers of 2010-12 Course from the Indira Gandhi National Forest Academy (IGNFA), Dehradun underwent training during January 23-31, 2012 on Integrated Watershed Management, Participatory Rural Appraisal (PRA) and Micro-Watershed Planning leading to preparation of detailed project report (DPR) for a micro-watershed. The training module was especially designed by CSWCRTI in association with

IGNFA. The training comprised comprehensive orientation on PRA followed by field exercises for topographical survey of undulating hill terrain to prepare thematic maps (contour, slope, soils and land use) and identify soil and water conservation measures for controlling erosion and enhancing *in-situ* soil moisture leading towards sustainable rainfed agriculture systems. Profile and cross sectional maps were prepared by the probationers after intensive survey of 1 km long segment of torrent (hill stream) in order to prioritize the most erosive segment of the torrent and propose control measures with design and estimates. As a result, the probationers were able to discern the authenticity of information generated in comparison to their perception. The programme was organized at the IGNFA Campus and project area of CSWCRTI in Dehradun district.



Training Programmes Organized

Imparting training in the form of courses of different durations as per clientele need is an important activity of CSWCRTI. During September, 2011 to March, 2012, a total of 25 gazetted officers undertook training under two regular training courses of 22 weeks in soil and water conservation and watershed management at Dehradun. The Institute also conducts tailor made special short term training and sensitization courses for officers/officials sponsored by various agencies in India and abroad. During the same period, 96 gazetted officers 229 non-gazetted officers underwent such 4 and 12 trainings, respectively. At Chandigarh, 13 short term trainings were organized.

Awards and Recognitions

- Dr. K.S. Dadhwal: Best Personalities of India Award and Gold Medal, 2011 from FFI (New Delhi), and felicitated by Indian Society of Agroforestry for advancement of the Society.
- Dr M. Madhu: Norman E. Borlaug Agricultural Sciences Technology Fellowship to participate in Global Research Alliance Programme at Iowa State University, USA from September, 19 to December 22, 2011.

- Dr. P.R. Ojasvi: Fellowship of The Institution of Engineers (India), 2011 for outstanding contributions in Agricultural Engineering.
- Dr Ambrish Kumar: Fellowships of The Institute of Engineers (India), 2011 and Indian Association of Hydrologists (Roorkee), 2011 for outstanding contributions in Agricultural Engineering and Hydrology.
- Sh. M. Sankar: ICAR International Fellowship, 2011 for Ph.D. (Soil Science) at Ohio University, USA.
- Er. K.P. Tripathi and Dr. V.N. Sharda: Best Paper Award of Indian Society of Agricultural Engineers (ISAE) during 46th National Convention of ISAE and International Conference on "Grain Storage" at G.B. Pant University of Agriculture & Technology, Pantnagar during February 27–29, 2012.
- Dr. D.R. Sena, Dr. V.N. Sharda, Dr. R.S. Kurothe, Er. C.P. Arora, and Dr. Gopal Kumar: Best Poster Paper Award in the ISAE Convention, Nagpur.
- Dr. B.N. Ghosh and Dr. K.S. Dadhwal: Best Poster Paper Award of International Potash Institute, Switzerland and Indian Society of Agricultural Chemistry, Allahabad during 44th Annual Convention of ISAC & National Symposium at G.B. Pant University of Agriculture & Technology, Pantnagar on November 25, 2011.
- Dr. Pankaj Panwar and Dr. Sharmistha Pal: Best Poster Paper Award during National Symposium at National Research Centre for Agroforestry, Jhansi on December 3, 2011.
- Dr. B. Mondal: Ph.D. Degree in Agricultural Economics by Indian Agricultural Research Institute, New Delhi in 2012.

Important Publications

International Journals

- Kumar, A., Avasthe, R. K., Ramesh, K., Pandey, B., Tasvina, R., Borah, Rinchen Denzongpa and Rahman, H. 2011. Influence of growth conditions on yield, quality and diseases of strawberry (*Fragaria x ananassa* Duch.) var. Ofra and Chandler under mid hills of Sikkim Himalaya. *Scientia Horticulturae*, 130: 43-48.
- Bhattacharyya, P., Mandal, D., Bhatt, V. K. and Yadav, R. P. 2011. A quantitative methodology for estimating soil loss tolerance limits for three states of Northern India. *Journal of Sustainable Agriculture*, 35: 3, 276-292.
- Kishore, K., Homeshwar, K., Singh, M., Avasthe, R., Pandey, B. and Rinchen Denzongpa. 2011. Pollination studies in large cardamom (*Amomum subulatum* Roxb.) of Sikkim Himalayan region of India. *Scientia Horticulturae*, 129: 735-741.
- Pande, V.C., Sharda, V. N., Kurothe, R. S., Sena, D. R., Tiwari, S. P. 2012. An empirical assessment of on-farm water productivity using groundwater in a semi-arid Indian watershed. *Water Resources Management*, 26(2): 475-498.
- Sharma, V.K., Nagar, D.P., Dubey, S.K. and Singh, Y.P. 2011. Performance of different wheat cultivars supplemented with

differential irrigation under cold arid region of Ladakh (India). *Geobios*, 38: 153-56.

National Journals

- Mandal, D. and Sharda, V. N. 2011. Assessment of permissible soil loss in India employing a quantitative bio-physical model. *Current Science*, 100 (3):383-390.
- Kumar, A., Avasthe, R. K., Pandey, B., Lepcha, B. and Rahman, H. 2011. Effect of fruit size and orchard location on fruit quality and seed traits of mandarin (*Citrus reticulata*) in the Sikkim Himalayas. *Indian Journal of Agricultural Sciences*, 81(9): 821-824.
- Mehta, H., Tyagi, P.C. and Dadhwal, K.S. 2011. High-yielding provenances of bhimal (*Grewia optiva*) for fodder and fuelwood production in north-western Himalayas. *Indian Journal of Agricultural Sciences*, 81(8): 717-722.

Books

- Panwar, P., Tiwari, A.K. and Dadhwal, K.S. 2012. *Agroforestry Systems for Resources Conservation and Livelihood Security in Lower Himalayas*. New India Publishing Agency, Pitam Pura, New Delhi, 302p.
- Mandal, D. and Dadhwal, K. S. 2011). *Land Evaluation and Soil Assessment for Conservation Planning and Enhanced Productivity A Case Study of CSWCRTI Research Farm*. Bulletin No. T-59/D-38, Central Soil and Water Conservation Research and Training Institute, Dehradun, 90p + i to x.
- Sharda, V.N. and Mandal, D. 2011. *Priority Classes for Erosion Risk Areas in Different States and Regions of India*. Technical Bulletin. Central Soil and Water Conservation Research and Training Institute. Dehradun, 172p.
- Dubey, S.K., Dubey, R.K., Singh, A.K., Panda, P.K., Kala, S. and Sharda, V.N. 2012. *Conservation of Natural Resources for Food and Environmental Security*. Satish Serial Publishing House, New Delhi, 509p.
- Sobti, R.C., Singh, K.P. and Tiwari, A.K. 2011. *Shivalik at a Glance: Present Status and Future Strategies*. University Press, Panjab University, Chandigarh, 207p.
- Kurothe, R.S., Vishwakarma, A.K., Kumar, G. and Brajendra. 2011. *Watershed Management: An Encyclopaedia*. ISBN No. 978-81-7622-247-1.

Atlas

- Sharda, V.N. and Mandal, D. 2011. *Atlas of Priority Classes for Erosion Control in Different Agro-Ecological Regions (AERs) of India*. Central Soil and Water Conservation Research and Training Institute. Dehradun.
- Sharda, V.N. and Mandal, D. 2011. *Atlas of Priority Classes for Erosion Control in Different Agro-Climatic Zones (ACZs) of India*. Central Soil and Water Conservation Research and Training Institute. Dehradun.

Distinguish Visitors

- ▲ Dr A.K. Singh, DDG (NRM) visited Central Soil and Water Conservation Research and Training Institute, Dehradun on February 22, 2012 and Research Centre Bellary on November 18-19, 2011.
- ▲ Twenty-two visitors from Belgium, France, Finland, Burkina Faso, USA, Britain, Tanzania, Sri Lanka, Kenya, Uganda, Netherlands, Nepal and Cameroon visited Regional Centre, Agra in November, 2011.
- ▲ Mr Roy Newland and Mr Robert Read from National Soil Resources Institute (NSRI), Cranfield University, UK, Dr. Latifa Binte Lutfar from International Jute Study Group (IJSJ), Dhaka and Sh.A.K. Khastagir, Project Manager from National Jute Board (NJB), Kolkata visited Research Centre, Udhagamandalam on February 27, 2012.

Foreign Visits

- ▲ Dr M. Madhu, Head Research Centre, Koraput completed three months training programme on "Global Research Alliance Fellowship" at National Laboratory for Agriculture and Environment (NLAE), USDA, Iowa State University, USA from September 19 - December 17, 2011.
- ▲ Dr. Pawan Sharma, Principal Scientist (Soil Microbiology) participated in "Organic World Congress" held at Gyeonggi Paldang, Republic of Korea from September 28 - October 1, 2011.
- ▲ Dr. D.R. Sena, Senior Scientist (SWCE) participated in workshop "Developing Capacity in Cropping Systems Modelling to Promote Food Security and Sustainable Use of Water Resources in South Asia" at Dhaka, Bangladesh from August 8-10 and November 20-24, 2011.

Personalia

Joinings

- ▲ Dr. V.N. Sharda, Director, CSWCRTI, Dehradun joined as Member, Agricultural Scientists Recruitment Board, New Delhi on July 11, 2011.
- ▲ Dr. P.K. Mishra, Project Coordinator, All India Coordinated Research Project on Dryland Agriculture, Hyderabad joined as Director, CSWCRTI, Dehradun on January 18, 2012.
- ▲ Dr. D. Ramajayam, Scientist (Horticulture) joined as Senior Scientist (Horticulture) at ICAR Research Complex for NEH Region, Umiam, Meghalaya.
- ▲ Dr. H. Biswas, Scientist (Soils) joined as Senior Scientist (Soils) at VPKAS, Almora, Uttarakhand.
- ▲ Dr. Raman Jeet Singh, Scientist (Agronomy); Mr. Kuldeep Kumar, Scientist (Agronomy); Mr. Dileep Kumar, Scientist (Agronomy) and Mr. Suresh Kumar, Scientist (Agriculture

Economics) joined CSWCRTI, Dehradun upon selection in December, 2011.

- ▲ Dr. D. Dinesh, Scientist (Soil Science) joined Research Centre, Kota upon selection on September 5, 2011.
- ▲ Sh. Jitendra Singh, A.A.O joined Research Centre, Agra upon transfer from IVRI, Izatnagar, Bareilly on June 6, 2011.
- ▲ Sh. Janak Singh, Sh. Ramesh Pal, Sh. Raghuvir, Sh. Virendra Pal and Sh. Ajab Singh joined Research Centre, Agra as SSS upon selection on February 8, 2012.

Promotion

- ▲ Sh. Narayan Singh, T-4 promoted to Technical Officer (T-5) on January 15, 2011.

Retirements

- ▲ Sh. Dev Raj, SSS, relieved from his duties upon superannuation from Research Centre, Chandigarh on December 31, 2011.
- ▲ Sh. Madholal, Technical Officer (T-5) relieved from his duties upon superannuation from Research Centre, Kota on October 31, 2011.
- ▲ Sh. A. Chandran, SSG relieved from his duties upon Voluntary Retirement from Research Centre, Udhagamandalam on January 2, 2012.

In News



Technology

The water harvesting technology “*Jhola Kundi*” was devised for utilizing perennial water available in *Jhola* streams as a source of irrigation to produce water intensive but remunerative vegetable crops such as tomato, cabbage, cauliflower, brinjal, pepper etc. in *Jhola* lands, as well as adjoining sloping medium and uplands of Eastern Ghats Highland Zone during summer and post monsoon seasons. *Jhola Kundi* is a water harvesting device of circular shape dug manually with depth varying from 2 m to 4 m and diameter of about 3 m at a suitable location along the periphery of *Jhola* system. Soil obtained after excavation of *Jhola Kundi* is deposited around the *kundi* 0.5-1.0 m away, as a bund to prevent its silting. The stored water is lifted through traditional water lifting devices i.e Tenda with optimum operation lift of 1.2 to 4.0 m or paddle operated pump with optimum operation lift of 5-7 m for irrigating the fields. By using a *Jhola Kundi*, a farmer can irrigate 0.5 ha to 1 ha area in *rabi* and 0.2 ha to 0.4 ha area in summer.

The cost of excavation for a *Jhola Kundi* of 30 cum capacity is about Rs. 3000/- only, which a farmer can easily afford. Traditional water lifting device can be fabricated by the farmer himself or he can opt for pedal operated Krishaka Bandhu Pump costing Rs. 3000/- only. For cultivation of vegetables in one hectare area, a total fund of Rs. 15000/- will be required including excavation of *Jhola Kundi*, K. B. pump and inputs (seeds, fertilizer and pesticides). By introduction of *Jhola Kundi* technology, the farmers can cultivate vegetable crops instead of non-remunerative millet or upland paddy in lean periods to increase their income substantially. The technology can



give net returns to the tune of Rs. 52,178 per ha/year. Introduction of the technology on farmers' fields provided annual net income from cash crops ranging from Rs. 23,027/- to Rs. 64,700/- per hectare. Cropping intensity increased from 127% to 270% and benefit cost ratio was observed to be 2.8:1. The technology was widely accepted by farmers as it was affordable and very cost effective. Due to accrued benefits received from vegetable production, the economic background of the tribal farmers improved significantly.

Small and marginal farmers of the Eastern Ghats High Land region having *Jhola* lands and medium lands in their possession can suitably adopt *Jhola Kundi* water-harvesting technology for harvesting water from water rich *Jhola* ecosystems for growing off-season remunerative vegetable crops.



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