Silver Jubilee Function of NRCAF & Observation of National Agroforestry Day

National Research Centre for Agroforestry (NRCAF), Jhansi celebrated its Silver Jubilee of establishment and observed National Agroforestry Day on 8th May, 2013. Dr. D. N. Tewari, Former Member, Planning Commission, Govt. of India and Ex-DG, ICFRE was the Chief Guest on the occasion. The Chief Guest felicitated farmers and the staff of the Centre for their commendable contribution. Dr. B. Mohan Kumar, ADG (Agroforestry), ICAR, Dr. P. K. Ghosh, Director, IGFRI, Dr. P. S. Pathak, Dr. A. S. Gill, Dr. P. Rai, Dr. U.C. Sharma and Dr. S. D. Kashyap also graced the occasion. An exhibition of agroforestry technologies was also organized on the occasion. Employees of the Centre, guests, progressive farmers, research scholars, students and officers of line departments participated in the two-day function. On this occasion an Indoor Sport's Complex was also inaugurated by the Chief Guest.

To commemorate the Silver Jubilee Celebrations, plantation of Shisham was done by the dignitaries. A brain storming session on the topic "Agroforestry Research and Development: Challenges and Opportunities in India" was organized as a part of the Silver Jubilee Celebrations. During the session Partnership, marketing strategies, linkages were the important issues highlighted. Achievements of last 25 Years were also displayed on the occasion. On this occasion, a number of NRCAF publications were released.

Forthcoming Events
- RAC Meeting;   Institute Joint Staff Council/Women Cell/PME Cell meetings;
- Farmer's Trainings and demonstrations: Celebration of Hindi Saptah

Issues Highlights
Silver Jubilee Function of NRCAF& Observation of National Agroforestry Day
Annual Workshop of AICRP on Agroforestry
Institute Management Committee (IMC)
Ber Pruning Training

On 9th May, 2013 Dr. D. N. Tewari visited the Prasai-Sindh Watershed and he appreciated the work being conducted by the Centre.

Three Decades of AICRP on Agroforestry

  All India Coordinated Research Project on Agroforestry, initiated by ICAR in 1983, has completed 30 years. NRCAF celebrated the Thirty Years of Agroforestry Network as a part of Silver Jubilee celebration. The, project has contributed remarkably in the field of agroforestry research in India. It is one of the largest AICRPs in the ICAR with 37 coordinating centres located throughout the country. During last thirty years large number of technologies have been developed and identified by the coordinating centres of the project which has been demonstrated in famer's field and disseminated through trainings.

Agroforestry Land Use in Patiala and Bathinda districts of Punjab: A Remote Sensing Analysis

Agroforestry a land use system, where trees are deliberately grown with agricultural crops either within the field or on the bunds/ boundary. There are innumerable examples of this traditional land use practice in many parts of the world. In the Indian state of Punjab, farmers prefer to grow tree species like *Eucalyptus* and *Populus* on their fields with agricultural crops. Reason for adopting these species by the farmers is their fast growth and use of wood in paper and plywood industries. Some farmers also grow fruit species like mango and kinnow with agricultural crops. These agroforestry systems are not only remunerative to the farmers but also improve soil fertility of their farms. Area under agroforestry in Indo-Gangetic plains is being assessed using remote sensing under National Initiative for Climate Resilient Agriculture project.

Multispectral remote sensing data (Resourcesat-2/ LISS III) was used for land uses and land covers analysis of two districts of Punjab *viz.* Bathinda and Patiala. Remote sensing images were classified for land use/ land cover classes *viz.* cropland, agroforestry, forest, plantation/ orchard, builtups, water bodies, waste land, grassland and kandi area using supervised classification method of maximum likelihood. Classified image was subjected to post classification correction through visual interpretation. Land use and land cover statistics in these two districts are given in Table 1. Estimated area under agroforestry comes out to be 23,352.65 and 16,260.02 ha in Bathinda and Patiala districts, respectively. Area under agricultural crops was estimated to be about 82.95 and 82.84 % in these districts. Ground truth verification was also done in these districts and GPS points for agroforestry plots were collected. The accuracy in agroforestry class in these two districts came out to be 81.25 and 78.75%, respectively. Thus, on this basis, overall accuracy for agroforestry class is about 80%. Figures 1(a) to 1(d) depicts land use & land cover and agroforestry maps of these districts.

Table 1: Land use and land cover statistics for Bathinda and Patiala districts of Punjab

Land uses & land covers	Bathinda		Patiala	
	Area (ha)	**Area (%)**	**Area (ha)**	**Area (%)**
Agroforestry	23,352.65	7.02	16,260.02	4.95
Cropland	2,75,746.29	82.95	2,71,943.71	82.84
Plantation	4,040.93	1.22	4,880.16	1.49
Forest	6.05	0.00	4,012.36	1.22
Grassland	7,413.93	2.23	4,511.46	1.37
Wasteland	699.78	0.21	6,037.52	1.84
Sandy area	2.94	0.00	36.46	0.01

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Water	1,432.74	0.43	1,441.09	0.44
Builtups	19,741.25	5.94	19,172.28	5.84
	3,32,436.56	**100.00**	**3,28,295.06**	**100.00**
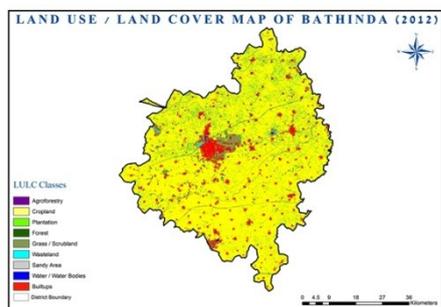
Fig. 1(a): Land use & land cover map of Bathinda district
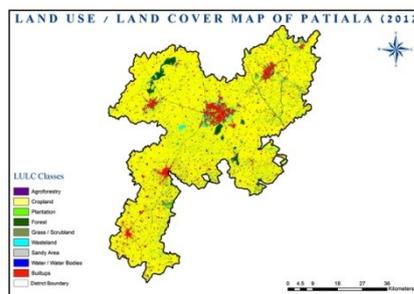
Fig. 1(b): Land use & land cover map of Patiala district
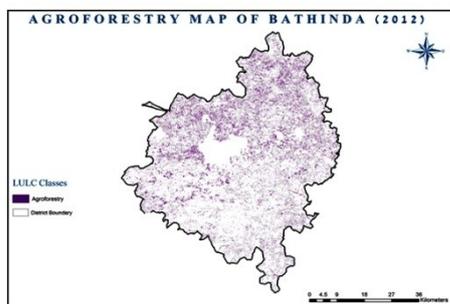
Fig. 1(c): Map showing agroforestry area in Bathinda district
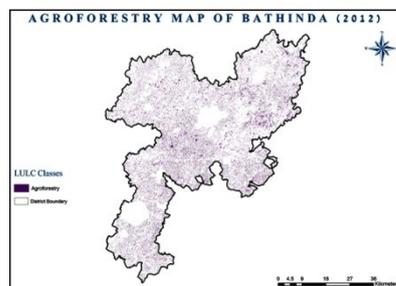
Fig. 1(d): Map showing agroforestry area in Patiala district

R. H. Rizvi, Ram Newaj, A. Saxena, P. S. Karmakar and S. K. Dhyani
National Research Centre for Agroforestry, Jhansi

Institute Management Committee (IMC)

The 17th IMC meeting was held on 7th June, 2013 at NRCAF Jhansi under the chairmanship of Dr. S. K. Dhyani, Director, NRCAF, Jhansi. Dr. Ram Newaj, Pr. Scientist presented brief research achievements of NICRA project and Dr. R. H. Rizvi, Sr. Scientist presented salient features of agroforestry mapping in India. Thereafter, the agenda items were placed and discussed in the meeting.

Annual Workshop of AICRP on Agroforestry

The Annual Workshop of All India Coordinated Research Project on Agroforestry was organized by NRCAF at CSK HPKV, Palampur during 25th to 27th May, 2013. Dr. S. K. Sharma, Vice Chancellor, CSK, HPKV, Palampur inaugurating the three days Annual Workshop of the AICRP on Agroforestry and emphasized that importance of agroforestry to meet the present challenges of climate change and provide livelihood opportunities to rural

population is increasing. He mentioned that agroforestry is providing valuable fodder for livestock and helping in resource conservation particularly in the hilly and semi-arid region. Dr. S. K. Dhyani, Project Coordinator and Director, NRC for Agroforestry highlighted the research achievements of the project and thrust areas for the XIIth Plan. He informed that the AICRP on Agroforestry was initiated in 1983 and at present it has 37 coordinating centres located in 25 SAUs, 11 ICAR Institutes and one ICFRE Institute. The recommendations of the project regarding crop diversification through agroforestry have been implemented by eight states. Five bulletins complied by PC Unit, Jhansi; SKUAS&T, Srinagar; PAU, Ludhiana; AAU, Jorhat and ANGRAU, Hyderabad were released on the occasion.

Dr. B. Mohan Kumar, ADG (Agroforestry), ICAR in his address invited the researchers to quantify agroforestry contribution for environmental services and its potential for control of non-point source pollution. Dr. B. Gangwar, Director, PDFSR, Modipuram delivered plenary lecture and he emphasized establishment of linkages between the two projects for developing farming system models for small and marginal farmers. Dr. V. P. Singh, Regional Representative for South Asia of World Agroforestry Centre in his address emphasized that the second green revolution is not possible without having trees on the farm.

The presentations of the coordinating centres were divided into five sessions namely; Himalayan, Indo-Gangetic; Humid & Sub humid; Arid & semi-arid and Tropical zones. The major recommendations emerging from the discussion include emphasis on tree improvement and production of quality planting material, value addition and post-harvest technology, economic analysis and quantification of environmental services of the agroforestry systems. During workshop, the research achievements of each centre were reviewed using performance indicators and technical programmes were finalized. AICRPAF at PAU, Ludhiana bagged the best presentation award. During the meeting there were 8 technical sessions in addition to field visits to the experimental area, Tea Husbandry and Organic Farming Unit of the University. A poster exhibition depicting agroforestry technologies developed by coordinating centres of the project for different agro-climatic zones was also organized. Scientists and Officers from NRC for Agroforestry and all the Coordinating centres attended the workshop.

PME Cell Meeting

Under the Chairmanship of Dr. S. K. Dhyani, Director a meeting of the Prioritization, Monitoring and Evaluation (PME) Cell was held on 14th May, 2013, which was attended by all the Scientist of the Centre.

Ber Pruning Training

Centre organized training on Ber Pruning from 22nd to 24th May, 2013 at villages Chhatpur, Bachhauni and Parasai of block- Babina of district Jhansi.

New Scientists

Shri Chavan Sangram Bhanudas, Scientist (Forestry) and Shri Asha Ram (Agronomy) joined the Centre on 14th April, 2013.

Human Resource Development

Dr. R. P. Dwivedi, Pr. Scientist participated in the National Seminar on "Social Dimension of Extension Education in Holistic Development of Rural Livelihood" from 26th to 27th April, 2013 organised by the Indian Society of Extension Education, IARI, New Delhi, ICAR, CBGAPG College, Bakshi ka Talab, Lucknow and FARD and presented a paper.

Dr. S. K. Dhyani, Director & Project Coordinator; Dr. A. K. Handa, Dr. Sudhir Kumar, Dr. Inder Dev, Pr. Scientists; Dr. R. H. Rizvi, Sr. Scientist and Sh. S. B. Sharma, AF & AO participated in the Annual Workshop of All India Coordinated Research Project on Agroforestry from 25th to 27th May, 2013 organized by the Centre at CSK HPKV, Palampur (H. P.).

Dr. R. K. Tewari, Pr. Scientist and Dr. Ramesh Singh, Sr. Scientist attended Workshop organized for Watershed Development Team under Integrated Watershed Management Programme (IWMP) on 23rd May, 2013 at IGFRI, Jhansi. The Workshop was organized by Department of Land Development and Water Resources, Govt. of Uttar Pradesh. Dr. Ramesh Singh presented A paper titled "Useful technologies and participatory process for natural resource conservation on watershed basis". The workshop was attended by all Project Implementing Agencies (PIAs) of Uttar Pradesh under IWMP.

Dr. Ramesh Singh, Sr. Scientist attended National Seminar on "Technological Interventions for Sustainable Hill Development" Organized by College of Technology, GBPUA&T Pantnagar from 17th to 19th June, 2013. He presented paper entitled "Improved eco-system services through integrated watershed interventions-A case study in drought prone region of Central India" authored by Ramesh Singh, R. K. Tewari, S. K. Dhyani, H.C. Sharma and R. K. Singh.

Dr. Rajendra Prasad, Dr. Ajit, Pr. Scientist and Dr. Badre Alam, Sr. Scientist participated in the Annual Review Meeting of NICRA from 17th to 19th June, 2013 held at IARI, New Delhi.

Dr. Anil Kumar, Pr. Scientist attended training programme on 'Ethics and Values' from 24th to 28th June, 2013 held at Centre for Disaster Management, NIAR, LBSNAA, Missouri.

Awards and Recognition

Dr. R. P. Dwivedi was awarded Best Paper Presentation Award for the paper entitled "Participatory Agroforestry based Ber budding Programme for Sustainable Rural Livelihood" (R. P. Dwivedi, R. K. Tewari, R. H. Rizvi and S. K. Dhyani) during the National Seminar on Social Dimension of Extension Education in Holistic Development of Rural Livelihood 26-27 April, 2013 organised by the Indian Society of Extension Education, IARI, New Delhi, ICAR, CBGAPG College, Bakshi ka Talab, Lucknow, and FARD.

NAAS Fellowship

Dr. S. K. Dhyani, Director has been elected as a Fellow of National Academy of Agricultural Sciences (NAAS), New
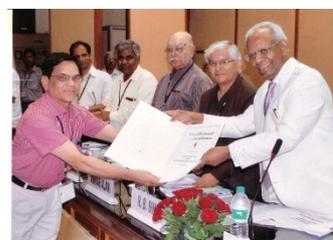
Delhi. The Fellowship was presented during the 20th Annual General Body Meeting of NAAS on 5th June, 2013 organized at the B. P. Pal Auditorium, IARI, Pusa, New Delhi.

NRCAF and ISAF Congratulate for his significant achievements in the field of Agroforestry

Evaluation of Preparatory Phase of Watershed Projects under IWMP Scheme

State Level Nodal Agency (Integrated Watershed Management Programme), Govt. of Uttar Pradesh, Lucknow has nominated National Research Centre for agroforestry (ICAR), Jhansi as independent agency for evaluation of Preparatory Phase of watershed projects under IWMP Scheme in eleven districts of U. P. other than Jhansi. The Centre has evaluated 39 IWMPs during the year 2012-13 in the districts of Lalitpur, Mahoba, Hamirpur, Banda, Agra, Mathura, Firozabad, Mainpuri, Bijnor, Rampur and Sambhal. In the post evaluation meeting held on 13th March, 2013 at Room No. -80, Main Building, Secretariat, Lucknow, Principal Secretary (LDWR), Govt. of U.P. and member Secretary, SLNA (IWMP), appreciated quantity and quality of evaluation by the Centre. Further, in light of recommendations suggested in evaluation reports, SLNA (IWMP), Govt. of U.P. organized one day Workshop of All PIAs (IWMP) of Bundelkhand region at Jhansi on dated 23rd May, 2013 and invited the Centre for discussion and presentation. Dr. R. K. Tewari, Pr. Scientist (Horticulture) and Dr. Ramesh Singh, Sr. Scientist (Land and Water Management Engg.) participated in the workshop. Dr. Ramesh Singh presented a paper titled "Useful technologies and participatory process for natural resource conservation on watershed basis". Dr. Singh delivered comprehensive lectures on various compatible technologies *viz.* (1) Rainwater harvesting and recycling on watershed basis for Bundelkhand region, (2) Cost effective design of rainwater harvesting structures (RWHS), (3) Prevention of Seepage through rainwater harvesting structures, (4) Aonla based horti-pastoral system in red soil of Bundelkhand region using contour staggered trenches, (5) Concept of drought proofing of Bundelkhand region and (6) Participatory process for watershed development. The experiences of IWMP evaluation in various districts were also shared. The suggestions were given for effective implementation and assured success of programme. The Principal Secretary appreciated the comments and views and on spot decisions were taken to smooth line the working of IWMP. He further desired that NRCAF, Jhansi should continue to contribute through capacity building and evaluation in this endeavour.

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Leaf Spectral Traits as Powerful Technique for Assessing Plant Health and Adaptation to Various Environments

This is a very common natural phenomenon that when light energy falls on any surface, it experiences following three physical events *viz.* reflection, transmittance and absorbance depending upon the nature of the surface of the material on which the light is incident and the media through which the light is passing. Based on the principle of optical laws in physics, the nature of light reflected or transmitted can be studied through spectral analysis of wavelength of the light reflected or transmitted with their relative amplitude, which is known as 'spectrum' or 'spectra' like 'Reflectance Spectra' or 'Transmittance spectra'. For the present study, a portable Spectrometer (CI-710, CID INC., U.S.A.) used after standardizing with various technical protocols using intact leaves in the leaf holder fitted with designated leaf probes guided with optical cable with light emitting diodes taking pigeon pea (*Cajanas cajan*) as a test model.

Optical properties of leaves, which mainly determine the fate of light incident on it depend on many factors. Major determinant of such factors are growing environment of the plant including soil, water, nutrients and light availability; texture of the leaves and cellular and physiological status of the leaves. In the present study, to have better understanding on introducing the spectral traits for their role in plant adaptation to low light environment, initially we compared the pigeon pea (*Cajanas cajan*) plants grown in different regimes of light *i.e.* Open (100% incident sun light); 33% shade; 50% shade and 75% shade. Transmittance spectra of young leaves of pigeon pea grown in different regimes of shade clearly indicated about their differential response (Fig.1). For better segregation and clarity, the representative transmittance spectra of mature leaves for 33% shade and 50% shade is given (Fig.2). A representative sample of typical processed Reflectance spectra with reference to PAR (photosynthetically active radiation) range of pigeon pea grown in different regimes of shade was analysed (Fig.3). From these initial basic studies, it is clearly evident that crop phenological events would play very crucial role in determining the optical properties and physiological functions of the leave and the plant as a whole. The difference in amplitude in PAR region spectra (Transmittance and reflectance spectra of mature leaves) clearly corroborated the differential adaptive traits of the plants grown in different light environment. Thus, spectral traits emerged as a powerful technique for

assessing leaf characteristics with reference to adaptability of plants growing at various light environment and differing in crop phenology. Various useful indices namely NDVI (Normalized difference vegetation index) and PRI (Photochemical Reflectance Index) etc. of Environmental Physiological importance are being developed based on the spectral reflectance and transmittance studied for broadening its scope in different climate change scenarios.

Fig.1: Transmittance spectra of the young leaves of open (100% light), 33, 50 and 75% shade grown pigeon pea crop. Lower most brown line indicating open grown crop, green line indicating 33% shade, gray line indicating 50% shade uppermost blue line indicating 75% shade grown
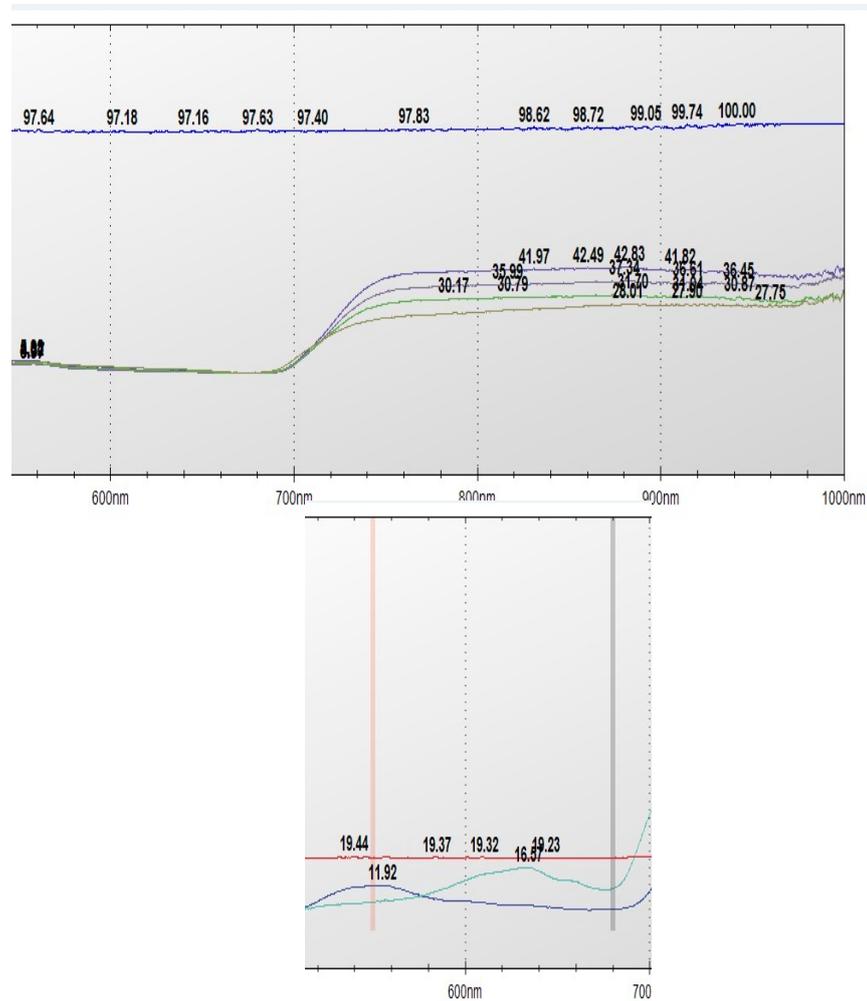

Fig.2: Segregated Ttransmittance spectra of 33 and 50% shade grown pigeon pea crop (mature leaves). Dark blue line indicating 33% shade whereas light blue line indicating transmittance spectra of 50% shade grown crop
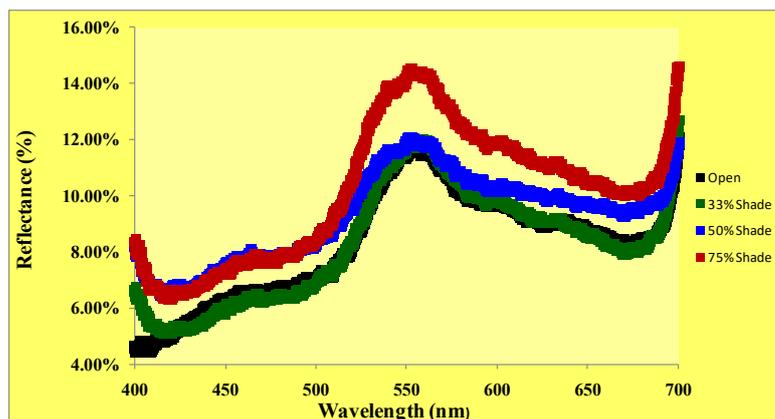
Fig.3: A representative sample of typical

processed Reflectance spectra with reference to PAR range of mature leaves of pigeon pea grown in different regimes of shade

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Director& Project Coordinator, AICRP on Agroforestry Visits to AICRPAF centers

- Visited for monitoring & Evaluating the AICRP on Agroforestry at CSK, HPKV, Palampur on 23rd -24th April, 2013.
- Visited AICRP on Agroforestry at BAU, Ranchi for IVth QRT report finalization during 29th -30th April, 2013.
- Visited AICRP on Agroforestry at CSK, HPV, Palampur for organizing the Annual Workshop of AICRP on Agroforestry during 25th -27th May, 2013.

Drought Proofing of Bundelkhand Region through Integrated Watershed Interventions

There was severe drought in Bundelkhand region from 2004-07. More than 81% wells became dry resulting into severe scarcity of drinking water. There was huge migration towards metros in search of livelihoods. The regions possess undulating topography with hillocks and semi-arid climate. The region depends upon perched water as it rests on vast granite massif. Shallow open dug wells situated in unconfined aquifer (weathered zone) are the major source of drinking and irrigation water. Therefore, saturation of weathered zone is the only option for assured supply of water for various purposes.

National Research Centre for Agroforestry has initiated a agroforestry based watershed development project at Garhkundar-Dabar watershed in participatory mode in drought prone Bundelkhand region since 2005. Gabions in 1st and 2nd order stream followed by series of scientifically and technically designed cost effective water harvesting structures (checkdams) across the drains and different kind of agroforestry interventions in watershed resulted in drought proofing with enhanced and sustained rural livelihoods. It was observed that groundwater recharge in treated watershed reached 86 per cent capacity with 600 mm annual rainfall, however, this situation could be arrived at with 1100 mm annual rainfall in control watershed (watershed without any interventions). Probability analysis based on last 69 years annual rainfall suggests getting annual rainfall of 600 (32% less than the average annual rainfall) and 1100 mm (25% higher than avg.) is 86 and 20 per cent, respectively. Probability analysis shows that there are maximum chances to get 600 mm rainfall during the year. *Therefore, even with deficit rainfall by about 32 per cent, water crisis in drought prone Bundelkhand region can be averted by adopting agroforestry based watershed interventions as it will recharge the weathered zone by 86 per cent which will serve the purpose of drinking and irrigation. The research results are being replicated in two more watersheds in the region.*

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