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National Research Centre for Agroforestry, Jhansi-284 003

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World Congress on Agroforestry 2014 - Trees for life: Accelerating the impact of Agroforestry

The 3rd World Congress on Agroforestry 2014 (WCA 2014) was organized from February 10 to 13 at Delhi. The Congress was organized by the World Agroforestry Centre (ICRAF), the Indian Council of Agricultural Research, the Indian Society of Agroforestry and Global Initiatives. It was the third Agroforestry Congress after the Second Congress held at Nairobi (Kenya) in 2009 and the first one at Orlando, Florida, USA, in 2004. The main theme of the Congress was "Trees for life: Accelerating the impact of Agroforestry".

The main aim of the Congress was to expand global agroforestry, share the current status of knowledge and practices of agroforestry, consolidate its research base, build support for agroforestry within governments, companies, academia, NGOs and the media and increase the engagement of the private sector.

The Congress was inaugurated by the Hon'ble President of India, Shri Pranab Mukherjee at Vigyan Bhavan in New Delhi on February 10, 2014. The President termed agroforestry as a promising sector which is emerging as a major domain in environmentally sustainable food production systems. Agroforestry system produces food, fuel and fibre; contributes to food and nutritional security; sustains livelihoods; helps in preventing deforestation; increases biodiversity; protects water resources, and reduces erosion. He pointed out that carbon sequestration of agroforestry farms is low-hanging fruit for climate change mitigation, justifying greater investment in them. Agroforestry is also an important alternative to meet the target of increasing the vegetation cover to 33 per cent from the present level of below 25 per cent, he added. President highlighted the research work being conducted by ICAR on agroforestry through its All India Coordinated Research Project (AICRP) on Agroforestry and National Research Centre for Agroforestry (NRCAF). The President launched the National Agroforestry Policy which was approved by the Cabinet on

Forthcoming Events

1. Annual IRC Meeting
2. Celebration of NRCAF Foundation Day
3. Institute Joint Staff Council/Women Cell / PME Cell meetings
4. Farmer's Trainings and demonstrations
5. AICRPAF Annual Wokshop

February 6th, 2014.

Shri Sharad Pawar, Union Minister of Agriculture and Food Processing Industries, in his address said that Agroforestry has been a way of life in India for centuries and it has the potential to address issues such as employment generation, livelihood, resource conservation and optimization of farm productivity. We probably need a global 'agroforestry transformation' to mobilize resources to remove the constraints that impede its wide spread application. The Indian Council of Agricultural Research and World Agroforestry Centre, Nairobi along with other partners are poised to foster such an agroforestry transformation, which will promote an "evergreen revolution" in the agriculture and natural resource management arena, especially in the developing countries. Shri Pawar released special issue of the 'Indian Farming' (ICAR) and the 'Indian Journal of Agroforestry' and presented first copies to the Hon'ble President of India.

Dr. M. Veerappa Moily, Union Minister of Environment and Forests highlighted the important role of trees in the Indian sub-continent since centuries by providing food, fuel, fibre, fruit and timber. He said that Indian farmers are growing trees on farm lands as a dynamic system of agricultural sustainability for enhancing profitability and productivity. He hoped that the National Agroforestry Policy will pave way for new era of agroforestry in the country.

Dr. Anthony J. Simons, Director General, World Agroforestry Centre elaborated upon the theme of WCA2014, Trees for Life-Accelerating the Impact of Agroforestry. He said that organization of WCA in this part of world is important as it feeds more population than other parts but has less number of trees in comparison. Dr. Simons said that agroforestry strives for green society rather than green economy.

Earlier, Dr. S. Ayyappan, Secretary, DARE and DG, ICAR welcomed the dignitaries and delegates and hoped that this conference

would deliberate on road map for the agroforestry in the next couple of decades. He said that the Congress will achieve its goal to accelerate the financial, environmental and social impacts of

agroforestry on the development.

Dr. A.K. Sikka, Deputy Director General (NRM), ICAR proposed the vote of thanks. Around 1100 participants, about 500 foreign participants from more than 80 countries, including researchers, policymakers, and major businesses with concerns for sustainable development, NGOs, farmers and youth groups from around the world participated in the Congress.

During the last day, Dr. Anthony J. Simons, DG, World Agroforestry Centre, Nairobi, Kenya, presented the draft Congress declaration entitled "the New Delhi Declaration on Agroforestry" at the plenary session. Draft is based on the observations, deliberations, recommendations, discussions and affirmations of about 1,100 global delegates and abstracts, posters and papers presented at the science and practice of agroforestry for the coming 5 years beyond, and to fully harness the vital contribution that trees make to human well-being development, climate change mitigation and adaptation, and the sustainability of life. The declaration calls for the various constituency groups to work closely together to more rapidly accelerate the impact of agroforestry.

Shri Salman Khurshid, Minister of External Affairs, Government of India delivered Valedictory Address on the concluding day of World Congress on Agroforestry. While appreciating efforts of World Agroforestry Centre and Indian Council of Agricultural Research for organizing this event of global importance, he urged to domesticate fruit and medicinal plants in the homestead for nutritional security. He said that this is the topical event with reference to Indian context as today we are looking beyond success of green revolution to sustain the food production. In the era of climate change, trees can do a lot of rescue work for us due to their innate ability to sequester carbon from atmosphere.

India could effectively showcase the diversity in the agroforestry practices adopted throughout the length and breadth of this vast country through the oral and poster presentations during the Congress. Around 1100 abstracts covering diverse regions, disciplines, species and components related to agroforestry were submitted at the Congress and the maximum number was from India. One oral, twenty five posters and six blogs were contributed by NRCAF. In addition there were more than one hundred posters displayed by the scientists from AICRP on Agroforestry network.

In order to harness the strength of electronic and social media in land-use practices like Agroforestry, Blog posts were organized for the WCA 2014. Forty seven blog posts from 19 countries were submitted to the Congress website, out of which maximum were from India. These blog posts received a total of 23,991 online voters and 2,262 comments. The blog post on "Agroforestry: Attracting youth to farming and transforming rural India" contributed by N. P. Chaudhary, a young farmer from Uttar Pradesh was adjudged the best, jury award blog. In addition, four out of five prize winning blog posts were from India.

As part of Pre-Congress activities events like National Agroforestry Day (May 8th), plantations in different parts of the country by school children, farmers and others, satellite

seminars, brain storming session, consultation meet, programs on television and radio and children painting and essay competition were organized.

National Agroforestry Day on 8th May, 2013 was celebrated at National Research Centre for Agroforestry, Jhansi. On the eve a number of events including plantation program were organized. Invited guests and experts and eminent scientists in the field, scientists of the Centre, representative from state departments, KVK, Heads from IGFRI and CSWCR &TI Centre, farmers and NGO participated. An exhibition of agroforestry technologies through exhibits, posters and materials was also organized on the occasion.

Four post Congress visits to demonstrate rich diversity in agroforestry in the country were also organized for the delegate's one each to Agra (Uttar Pradesh) for silvipasture systems and ravine agroforestry systems, Yamuna Nagar (Haryana) for commercial and industrial agroforestry, Jaipur (Rajasthan) for arid and semi-arid agroforestry systems and Kodaguru (Karnataka) for coffee based agroforestry systems. There was overwhelming response from the delegates for Congress visits.

[Contributed by National Research Centre for Agroforestry & Indian Society of Agroforestry]

Dynamics of soil organic carbon decomposition in different agroforestry systems

In various ecosystems soil organic carbon (SOC) is the largest reservoir of carbon that interacts with the atmosphere. In agricultural lands, plant cover is usually removed every year, so carbon sequestration means increased carbon content of the soil. Therefore, it is of paramount importance to adopt tree based land use system and other agricultural practices that sequester organic carbon in soil. A high level of SOC is beneficial for soil fertility and soil structure. Agroforestry land use greatly influences SOC storage. However, considering dynamic nature of soil carbon, it is important to evaluate its different components, stability, different decomposition rates and turnover time. Hence, to study dynamics of soil organic carbon decomposition in different agroforestry systems, a laboratory experiment was conducted under constant temperature (25^0C) and moisture (70% of water holding capacity) for 90 days. The 100g soil sample was incubated in glass jars. The jars were normally closed but opened periodically to maintain moisture/ aerobic conditions. The evolved CO2 was trapped in 20 ml 0.5 N NaOH solution and precipitated by addition of BaCl2 and measured by titration of residual NaOH to pH 7.0 with 0.5 N HCL. The evolved CO2 was measured daily for 3 days, every 3-4 days in the following two weeks and every 7 days (week) till end

of the incubation period ie. 90 days. The change curve of daily mineralization of organic carbon was obtained by using the total burst of CO_2 during interval of measured time divided by days (Fig 1).

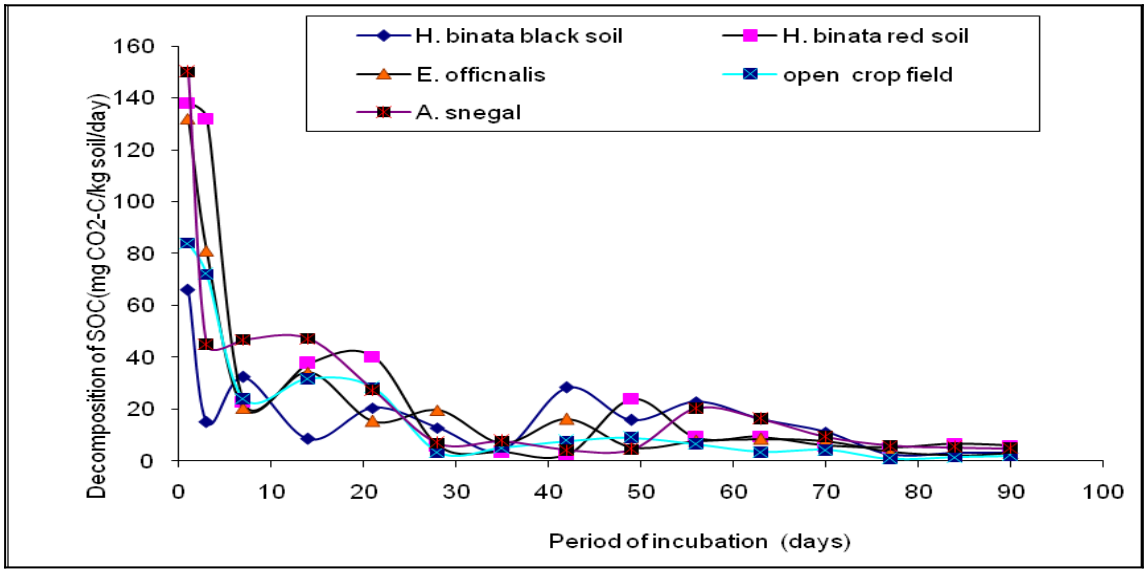

Fig 1. Decomposition rate of SOC in different agroforestry systems

The results indicated by change curve revealed that irrespective of different agroforestry systems, there were two distinct bursts of CO_2 when soil organic carbon was released. The first was rapid decomposition and the other was slow decomposition. Duration of rapid decomposition was short but owned a large quantity of decomposition. The slow decomposing owned relatively smaller quantity but took a long time.

Total release of CO2-C varied from 265.1 to 452.6 mg CO2-C/kg soil in different agroforestry systems which accounted for 4.1 to 8.0% of SOC (Table 1). Maximum fraction total SOC was mineralized in open crop field (8.0%) while minimum in *H. binata* (black soil) based AF system (4.1%). However, total accumulated mineralization was the maximum in *H. binata* (red soil) AF system while least in *H. binata* (black soil). In general more fraction of total SOC was mineralized in open crop field than different AF systems. In terms of percentage of total SOC mineralization the order of different AF systems was *H. binata* (red soil) > *A. Senegal* > *E. officinalis* >*H. binata(black soil).* Conclusively, the findings indicate that SOC in open crop field had more size of active pool which decomposed rapidly in short time whereas, AF system relatively contained more size of slow pool decomposing steadily over a long period.

Table 1. Total soil organic carbon mineralization in AF systems

Agroforestry System	SOC (g/kg soil)	Total SOC mineralization (mg CO_2-C/kg soil)	Percentage of total SOC mineralization accounted for SOC (%)
H. binata- black soil	6.45	265.09	4.11
H. binata -red soil	7.32	452.55	6.19
E. officinalis	7.45	369.99	4.97
A. senegal	7.14	405.52	5.68
Open crop field	3.55	284.81	8.02

Rajendra Prasad, Ram Newaj, S. K. Dhyani, N. K. Saroj and V. D. Tripathi
National Research Centre for Agroforestry, Jhansi-284003

Investigation on Carbondioxide Sequestration at M/S JSW Steel Ltd. through Green Belt Development

JSW Steel Ltd. is one of the premier steel producers in India with a production capacity of 10 million tons of steel per annum at it's Vijayanagar Works in the Bellery district in Northern Karnataka. It is the largest steel plant in India in a *single location*. At JSW Steel Limited, significant efforts were taken in the recent past for reduction in CO2 emission through improvements in energy efficiency. JSW Steel Ltd. has also recently completed commissioning of facilities raising the production capacity of the plant to 10 MT per annum. Even with many of the new state-of-the-art facilities, the CO2 emission from Vijayanagar Works would be about 22- 25 MT of CO2 per annum. In the past, the company had taken many proactive measures for CO2 emission reduction and sequestration.

In the above scenario, the management of JSW Steel Limited has taken a policy initiative that as the fastest growing steel company in India; it must take up a major R & D Programme on *"Carbon Dioxide Capture and Sequestration"*. The main initiatives proposed in this document primarily aims at quantifying the CO2 (carbon dioxide) sequestered through green belt development activities in the JSW Steel (Vijayanagar Works) and simulating the carbon sequestration potential of the existing green belt (i.e tree plantations) through quantitative modeling and suggesting plantation options for optimum future land usage with a view to maximize CO2 sequestration using the terrestrial sequestration approach. JSW Steel Ltd engaged National Research Centre for Agroforestry (NRCAF), Jhansi (UP) to actualize this process. In this study detailed investigations has been carried out on the impact of pro-active measures taken by JSW Steel Ltd. in CO2 sequestration through green belt development within the steel plant premises as well as it's various residential colonies at Vidyanagar, V. V. Nagar and Shankar Guda.

In the recent past researchers in Europe have tried to develop a standard methodology for carbon sequestration potential for different plant species. The most significant development is the CO2FIX model which is a comprehensive simulation modeling tool developed through joint funding from the European Commission (EC), Dutch Government and the Mexican National Council of Science & Technology under the Carbon Sequestration in Forested Landscapes (CASFOR II) Project. Scientists from the National Research Centre for Agroforestry, Jhansi (under the ageis of Indian Council of Agricultural Research (ICAR), New Delhi) has extensively used and parameterized CO2FIX for Indian conditions to simulate carbon sequestered under tree based systems. Accordingly, the carbon sequestered under various existing greenbelt configurations at JSW Steel Ltd. was assessed using CO2FIX modeling simulations.

The carbon sequestration potential of existing green belt (block plantations) in 4MT, 7MT, 10MT and township areas of JSW campus has been estimated to the tune of 2.65, 1.63, 3.01 and 3.71 tons C ha-1yr-1 (or converting into carbon dioxide equivalent of 9.71, 5.97, 11.03 and 13.60 tons CO2 ha-1yr-1 respectively). These simulated estimates of carbon sequestration seems to be logical, when we contrast them with the other recent reported studies viz Murthy et al., 2013 have reproduced that the carbon sequestration potential of tree based system in India (small agroforestry) varied from 1.5 to 3.5 tons C ha-1yr-1.`

The carbon sequestration potential of existing avenue/road-side plantations in 4MT, Main-Gate, VV Nagar, Shankarguda and Vidhya Nagar areas of JSW campus has been estimated to the tune of 1.28, 0.61, 0.24, 0.15 and 0.89 tons C ha-1yr-1 (or converting into carbon dioxide equivalent of 4.69, 2.23, 0.88, 0.55 and 3.26 tons CO2 ha-1yr-1 respectively).

If we club the results of all the nine studies areas of JSW plant and residential campuses together, overall the carbon sequestration potential of existing plantations varied from 0.15 to 3.71 tons C ha-1yr-1. The simulation results of this study also seems reasonably acceptable in the light of the reported values of carbon sequestration potential of many tree species (namely *Syzyium cumini, Gmlina arborea, Tectona grandis, Acacia auriculiformis, Dalbergia latifolia, Terminalia chibula and Hardwickia binnata* with tree densities varying from 157 to 1112 trees/ha) planted in Hosakaote Research Station of Bangalore Research Circle (Central Karnataka Zone) ranging from 0.14 to 3.50 tons C ha-1yr-1 (Kakkar and Nagaraja, 2011). Moreover, the results of this study seems reliable, when we compared them with the other published studies in India as well as in other parts of the world.

Ajit, A. K. Handa, K. B. Sridhar and S. K. Dhyani
National Research Centre for Agroforestry, Jhansi-284003

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भारतीय कृषि अनुसंधान परिषद

प्रमाण-पत्र

प्रमाणित किया जाता है कि श्री डा. ए.के. हांडा, प्रधान वैज्ञानिक, राष्ट्रीय कृषि वानिकी अनुसंधान केन्द्र, झांसी (उ.प्र.) ने परिषद द्वारा आयोजित हिन्दी चेतना मास 14 सितम्बर, 2013 से 13 अक्तूबर, 2013 के दौरान कृषि स्लोगन प्रतियोगिता में भाग लेकर प्रोत्साहन स्थान प्राप्त किया है।

स्थान: नई दिल्ली
दिनांक: 1 जनवरी 2014

निदेशक (राजभाषा)
(भा.कृ.अनु.प.)

सचिव
(भा.कृ.अनु.प.)

महानिदेशक
(भा.कृ.अनु.प.)

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ICAR Hindi Award

Dr A K Handa, Principal Scientist received consolation prize in ICAR Hindi Slogan competition of ICAR held at NASC Complex, New Delhi under the Chairmanship of Secretary DARE and DG, on 1st January, 2014.

Institute Joint Staff Council Meeting

Institute Joint Staff Council (IJSC) meeting was held on 8th January, 2014. Various issues related to welfare of the staff were discussed.

Farmers Training of Datia

Centre organized Farmers training on "Agriculture and Horticulture Development" from 29th- 31st January, 2014. In this training programme 50 farmers of Datia (M.P.) district participated. Training was sponsored by Assistant Director of Horticulture, Datia under National Horticulture Mission.

ICAR Industry Day and Agricultural Education Day

ICAR Industry Day and Agricultural Education Day was organized at NRCAF, Jhansi on 28th February, 2014. Almost 150 participants including thirty post-graduation students along with faculty member from Bipin Bihari Post Graduate College, Jhansi, SRF, RA, M.Sc. dissertation students and Ph.D. Scholars participated in the function besides scientific, technical, administrative and SSS staff of

the Centre. Lectures on Agricultural Education Scenario in India and status of agri-based industries in Jhansi were delivered. Healthy discussions on opening of consultancy services using GIS and remote sensing as business module by trained/educated young entrepreneurs was discussed. Possibilities of promoting agri-based and agroforestry-based enterprises in Bundelkhand region were also discussed. Present scenario of agri-based industries in the region is bleak and mostly confines to sale of produces and agri-inputs. Scope of fruit and vegetable preservation, value addition, creating alternate livelihood support systems through cultivation of lac, gum/resin, medicinal/aromatic plants and floriculture in Bundelkhand region was discussed at length. Bamboo/Date palm based small cottage industry need promotion in the region as they are commonly found in wastelands and under agroforestry system on field bunds. NRCAF, Jhansi can contribute in this direction by way of identifying quality germplasm and ensuring availability of mother plants, imparting training on lac cultivation, fruit and vegetable preservation, vermin composting etc. However, agri-based industry development requires greater input from various State Agencies, NGO and Societies.

Students were taken to laboratory visit followed by research farm visit. Students were encouraged to opt agriculture as career development activity. It was emphasized that Country needs trained manpower in agriculture to sustain agriculture production, enhance income from available produce/resources.

Training Programme on "Protection of Plant Varieties and Farmers Rights Act"

n awareness cum training programme on ""Protection of Plant Varieites and Farmers Rights Act" was assigned to the National Research Centre for Agroforestry, Jhansi, during the financial year (2013-2014) by the PPV & FR Authority (vide letter No. F.No.PPV&FRA/Reg-III /5-4/2012/2134 dated 27.09.2013). The purpose of training was to bring awareness about provisions of Protection of plant varieties and Farmers Rights Act, its Authority and its activites to the notice of breeders, developmental workers, reseachers, scientist, progressive farmers and other farming communities in and around the area of domain of the institute.
Accordingly, a one day training programme was conducted on 28th February 2014 at National Research Centre for Agroforestry, Jhansi by Dr.A.K. Handa, Dr. S. Vimala Devi, Dr.Inder Dev, Mr.Rajarajan and Dr. Rajeev Tiwari. The plant breeders, developmental workers, reseachers, scientist, technical staff and research scholars of NRCAF, lecturers and research students of Bundelkhand university, progressive farmers and other farming communities of Jhansi, Mauranipur and Datia and staff of KVK, Barari, Jhansi have attended the training program. Thus a total of 100 participants registered for the training. The chief guest and other invitees for the training program was Dr. R.V. Kumar, Head, GSM Division, IGFRI, Jhansi and Dr. Sippy Dassani, Lecturer, BB College, Jhansi.

During the training program detailed information through power point presentation was given on the topics viz., Plant variety protection and farmers rights- an introduction and their

objectives– by Dr.A.K.Handa , Introduction to IPR – By Dr.Inder Dev and Plant protection rights and Farmers rewards and recognitions – by Dr.S.Vimala Devi ,covering the plant variety development process and uses, local land races and extant varieties, farmers rights and their protection, objectives of PPVFR Act, protection of varieties, plant varieties and farmers rights, breeders rights, registration and duration of protection under act, depositing the samples, Indian plant variety journal, notification of varieties, gene bank, profit sharing, national gene fund, submission of application, Recognition and rewards, etc. Besides, all this information in printed form was also provided to each participant. The trainees have taken interest on the subject and raised several queries. The questions raised by the participants were satisfactorily answered by the experts. The program was a grand success.The Impact of the training was realized by the participants of scientist, development workers, research scholars and farmers, from different district of Bundelkhand namely Jhansi, Datia and Mauranipur.

Training Programmes

Five Training programmes (20th to 22nd, 24th to 26th & 27th to 29th March, 2014, 3rd to 5th & 9th to 11 April, 2014) for officers /officials of Watershed Project Implementing Agency, WDT members, members of Watershed Committee, members of SHGs, grassroot level workers and farmers from Lalitpur, Moth-Jhansi and Jhansi on Planning and Execution of Watershed project under IWMP Scheme were organized. 150 participants participated in the training.

Human Resource Development

Dr. Ram Newaj, Pr. Scientist and Shri Chavan Sangram Bhanudas, Scientist participated in Carbon Footprint Meeting on 7th January,2014 held at CR IDA, Hydrabad.

All Scientists, Technical Officers, RAs and SRFs participated in the 3rd World Congress on Agroforestry held at New Delhi from 10th – 14th February, 2014. The Congress was organized by ICRAF, ICAR, ISAF and NRCAF, Jhansi at Delhi.

Dr. Inder Dev, Pr. Scientist, Shri K Rajrajan, Scientist and Shri Chavan Sangram Bhanudas, Scientist participated in the ISTS- IUFRO Conference on "Sustainable Resource Management for Climate Change in Mitigation & Social Security" from 13th to 15th March, 2014 at Chandigarh.

Shri Chavan Sangram Bhanudas, Scientist participated in the Simulation Modelling group meeting on 19th March, 2014 at NASC Complex, New Delhi.

Dr. S Vimala Devi, Sr. Scientist participated National Conference on "Computational Techniques in Analysing" from 24th to 26th March, 2014 sponsored by DBT held at AKMU, IARI, New Delhi.

Supervision and Guidance : Dr. S K Dhyani, Director
Compiled and Edited: Dr. R K Tewari, Dr. Inder Dev, Dr. Rajeev Tiwari and Dr. Ramesh Singh
Photographs: Sh. Rajesh Srivastava

Published By Director, National Research Centre for Agroforestry, Gwalior Road, Jhansi-284003 (U.P.) India
Telephone : 0510- 2730213, 2730214
Fax. : +91-0510-2730364
Telefax : +91-0510-2730214
E.mail : krishivaniki@nrcaf.ernet .in
Web site:http://www.nrcaf.ernet.in