Agroforestry
Newsletter
National Research Centre for Agroforestry, Jhansi-284 003

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Forthcoming Events
- Farmer's training on PPVFRA
- Kisan Mela
- Women Cell / Institute Joint Staff Council / PME meetings

Issue Highlights
- Agroforestry Role in Carbon dioxide Sequestration
- Parameterzing CO2FIX model for assessing carbon sequestration
- IMC / Women Cell / Institute Joint Staff Council / PME meetings
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Salient Finding of NRCAF

PARAMETERZING CO2FIX MODEL FOR ASSESSING CARBON SEQUESTRATION UNDER AGROFORESTRY SYSTEMS IN SEMI-ARID REGIONS OF INDIA

Agroforestry is a viable alternative to prevent and mitigate climate change. In India, sequestration potential in agroforestry has been estimated but most of the estimates are based on biomass productivity and do not take into account contributions such as soil and others. This is mainly due to absence of a standard methodology for carbon sequestration potential in Indian context. An attempt has been made to use CO2FIX model to estimate the C-sequestration potential of agroforestry systems in the Bundelkhand region.

The CO2FIX model v3.1 was developed at Centro Agronómico Tropical de Investigación y Enseñenza **(**CATIE**),** Wageningen, Netherland under the CASFOR II **(**Carbon Sequestration in Forested Landscapes**)** project. The software can be downloaded free of cost from the site: http://www.efi.fi/projects/casfor. CO2FIX v3.1 is carbon accounting model that consists of six modules viz. biomass module, soil module, products module, bioenergy module, financial module and carbon accounting module

For the purpose of simulating carbon stocks under agroforestry systems in various districts of Bundelhkand region, the modules taken into considerations are biomass, soil and carbon accounting modules. CO2FIX model requires primary as well as secondary data on tree and crop components (cohorts) for preparing the account of carbon sequestered under agroforestry systems on per hectare basis. Accordingly, district wise survey was conducted to record the primary data. The tree species being grown on farmland were classified into three categories/cohort's viz. slow, medium and fast growing trees as per the nature of the tree species. DBH of the surveyed trees was used to approximately find out the age of the standing trees. To derive the incremental data of tree stem growth, the volume equations published in FSI's India State of Forest Report-2009 (www.fsi.nic.in) were used as the secondary data.

The harvested data available for different tree species (classified under the slow, medium and fast growing categories/cohorts) and crop components at NRC for Agroforestry, Jhansi was used to find out the relative growth of foliage, branch and root with respect to stem. These relative proportions were parameterized in CO2FIX model for branch, foliage and root growth.

For demonstration purpose the carbon sequestration potential of *Emblica offinalis* based agrihorticulture system (*Emblica officinalis* as tree and green-gram as crop component) under rainfed condition in semi-arid regions has been worked out using CO2FIX model for 25 year rotation period. Changes in biomass, SOC, C sequestered and CO2 equivalent carbon sequestered were estimated using CO2FIX model version 3.1. Simulation was carried on twenty five year period for biomass, C-stock and C- sequestered. Carbon sequestered by the system varied from 8.7 to 18.41 t C ha^{-1}. Similarly CO_2 equivalent carbon sequestered in the system varied from 31.89 to 67.51 t CO_2 equivalent C ha^{-1} during different years. These values obtained for carbon sequestered through CO2FIX model are almost at par with those reported by other researchers in Indian context using traditional biomass inventory methods.

Ajit, Ram Newaj, S.K. Dhyani, , A. K. Handa, R. H. Rizvi, R. Prasad,
B. Alam and R. Singh
National Research Centre for Agroforestry, Jhansi

AGROFORESTRY ROLE IN CARBON DIOXIDE SEQUESTRATION-RESEARCH INITIATIVES OF NRC FOR AGROFORESTRY

Carbon sequestration is emerging as a major thrust area in context of increasing concerns about climate change at global level. In context of carbon cycle, agroforestry plays an important role in carbon dioxide sequestration due to many reasons. The foremost among them is that the tree component fixes and stores carbon from the atmosphere via photosynthesis and trees being a perennial component in the system; they can function as active carbon sink pool for many years and continue to store carbon until they are harvested or decay. The second reason is that the agroforestry provides a good surface cover which minimizes the loss of nutrients from the surface soil, improves edaphic conditions, increase biomass production, provide a protective ground cover through tree and crop cover and decrease risk of soil degradation by erosion, leaching and nutrient depletion. Such favourable trends enhance soil resilience and lead to overall improvement in soil organic carbon pool. Finally, agroforestry is one of the alternatives to increase the forest cover, which will widen the area for carbon sink.

Major role for agroforestry is now in the domain of environmental services. It is a viable alternative to prevent and mitigate Climate Change. The National Research Centre for Agroforestry, Jhansi has been working on Carbon sequestration since 2000 and have successfully conducted sponsored projects from DST and ICAR on the subject. These include- (i) Carbon and Nitrogen dynamics in *Albizia procera* based agroforestry system (AP Cess fund, ICAR), (ii) Net Work Project on Impact, Adaptation and Vulnerability of Indian Agriculture to Climate Change (ICAR), (iii) Spatial and Temporal Analysis of Agroforestry Interventions in North-western India using GIS and RS (DST), (iv) Carbon dioxide sequestration potential of agroforestry systems under irrigated and rainfed conditions (DST).

The research results have given valuable information and strengthened our capabilities. The Centre has also added a number of state of the art equipments to its laboratories for in depth studies on the frontier areas. The scientists have estimated Carbon sequestered and CO_2 equivalent carbon sequestered in *Albizia procera, Dalbergia sissoo, Hardwickia binnata* and *Emblica officinalis* based agroforestry systems for their rotation period (30, 50, 45 and 25-years, respectively) using CO2Fix Model. In North-western India using GIS and RS, the spectral signatures for Poplar and Eucalyptus were generated and area under these two agroforestry systems estimated. The work on mitigating potential of agroforestry system on climate change was carried out to estimate the carbon sequestration potential of agroforestry practices in Bundelkhand region.

The Centre has recently submitted a project on "**Carbon sequestration**

potential of agroforestry practices/systems under different climatic zone of Uttar Pradesh to mitigate the problems of climate change" to the UP Council of Agricultural Research, Lucknow, UP. On the basis of the strength and capabilities of the Centre in this area, it has been included as one of the partners in a new ICAR scheme "**National Initiative on Climate Resilient Agriculture"** to assess the Carbon sequestration Potential of selected Agroforestry systems in the country.

A. K. Handa, S. K. Dhyani, Ajit, Ram Newaj, B. Alam, R.H.Rizvi,
R. Prasad and R. Singh
National Research Centre for Agroforestry, Jhansi

Salient Findings of AICRPAF Centre's

(I) AGROFORESTRY HELPS IN BIODIVERSITY CONSERVATION

AICRP on Agroforestry at Acharya N.G. Ranga Agricultural University, Hyderabad has been entrusted to establish Agri Biodiversity Park (ABDP) in 150 acres area with natural ecosystem, undulating terrain rocks, boulders and hillocks in the University campus, Rajendranagar. The Agri Biodiversity Park is aimed mainly to preserve and conserve the native flora and fauna of Deccan plateau region through *ex-situ* conservation of the species and to establish 15-20 biotic communities including wild relative field crops as a repository that flourished in the region in the past. Tree blocks depicting vast genetic diversity with species such as Teak, Mahuwa, Palm, Ficus and Medicinal plants were planted in mixed tree block, in an area of 25 acres. The Park has thirty Ficus species in Ficus block. In addition to plantation blocks, water ponds and water bodies were also created as a source of water for all resident and migratory bio creatures for promotion of faunal genetic resources. At present in agri-biodiversity park insects (24 spp.), Fish (5 spp.), Reptiles (8 spp.) were recorded. Regarding Butterflies out of 120 species present in the Andhra Pradesh state 56 were recorded in the Agri Biodiversity Park. Pertaining to birds the species increased from 35 to 162 species within two years. The agroforestry not only helps in livelihood support but plays vital role in conservation of biological diversity as well. This is the best tribute on the occasion of "International Year of Biodiversity".

(II) AGROFORESTRY CENTRE DEVELOPS ECOFRIENDLY BAMBOO TREEGUARDS (VALUE ADDITION OF BAMBOO)

Bamboo based agroforestry systems are being promoted for livelihood support, natural resource conservation and environmental protection through carbon sequestration. The AICRP on Agroforestry centre at Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola at College of Agriculture, Nagpur designed and fabricated the treeguards made from locally available bamboo. This has replaced the non degradable, traditional iron /steel treeguards used long way to protect the trees in plantation prgogramme. Nagpur Munciple Corporation has planned to use more than five thousands bamboo treeguards in the current financial year for protecting plants in the city. Many other government organizations (National highway divisions, Power stations etc.) and NGO are prompted to use these tree guards in their plantation programmes.

Bamboo tree guards are cheaper, easy to fabricate and are being made of farm produce,

provide ample opportunities to poor marginal farmer for growing bamboo on farm. The centre has designed series of bamboo treeguard costing from Rs. 250/- to Rs. 600/-. Technical input from the scientist of this centre combined with skill of local artisans has created the new utility of bamboo. The enterprise has generated employment opportunities to local people for growing bamboo, its harvesting, processing and fabrication of tree guards. Green bamboos after harvesting are allowed to undergo the standard drying and seasoning treatments. These treatments are suitably modified by this centre for ease of working. Bamboos were treated with antitermite and antifungal material for enhancing its longevity under structural use.

For fabrication of one unit of one thousand bamboo treeguard requires 4000 to 6000 green bamboos and 1000 to 1500 mandays. Rural unemployed youth were trained to fabricate treguards. They are paid @ Rs. 120/-.Thus for fabricating one unit (1000) treeguards of bamboo a cultivator can get Rs. 1,00,000 to Rs. 1,50,000 for producing raw material and employment of Rs. 1,20,000 to Rs. 1,80,000 is generated .

Different treeguard models of Bamboo

HUMAN RESOURCE DEVELOPMENT

- Dr. S. K. Dhyani, Director attended a NAIP Leadership Development Programme at IIM, Lucknow from 18th to 22nd October,2010.

- Dr. Ajit, Sr. Scientist of the Centre participated in the Training on "SAS: A Comprehensive Overview (Part-II) from 13th September to 01st October, 2010 and training on SAS: Genetics/LMP Genomics from 04th to 08th October, 2010 of the NAIP Consortium "Strengthening Statistical Computing for NARS" Funded by NAIP at IASRI, New Delhi.

- Dr. V K Gupta; Dr. Sunil Kumar, Pr. Scientists; Dr. S P Ahlawat; Dr. R P Dwivedi; Dr. A Venketesh; Dr. Badre Alam,; Dr. (Er.) Ramesh Singh, Sr. Scientists; Dr. D R Palsaniya; Dr. P Rathkrishnan, Scientists and Sh. Rajendra Singh, Technical Officer of the Centre participated in the National Symposium on "Optimizing Forage Production from Arable and Non- arable Lands for Increasing Livestock Production" from 12th to 14th November, 2010 at IGFRI, Jhansi organized by RMSI, Jhansi. Dr. Badre Alam, Sr. Scientist also delivered a 'Key Note Address.

- Dr. Badre Alam, Sr. Scientist of the Centre attended Annual Review Meeting of Carbon Sequestration Project of the Dept. of Science & Technology at J. N. University, New Delhi during 11th to 12th November, 2010.

- Dr. Badre Alam, Sr. Scientist of the Centre participated in the National Symposium of the Indian Society of Plant Physiology at BHU, Varanasi during 25th to 27th November, 2010 and presented a paper.

- Dr. Badre Alam, Sr. Scientist of the Centre participated in the International Conference on "Climate Change and Sustainable Management of Natural Resources" during 5th to 7th December, 2010 at ITM Universe, Gwalior and delivered invited Plenary Lecture on the topic "On the Environmental Physiology to crop with Climate Change :Adaptation and Mitigation Perspectives".

INSTITUTE JOINT STAFF COUNCIL

Institute Joint Staff Council (IJSC) meeting was held on 21st December 2010 under the Chairmanship of Director Dr. S. K. Dhyani.

WOMEN CELL

A meeting of Women Cell was held on 21st December 2010 under the Chairmanship of Director Dr. S. K. Dhyani.

PME MEETING

The PME meeting was started with the visit of experimental fields of ongoing research projects and research farm on 23rd December, 2010. All the Scientists participated in the PME meeting.

INSTITUTE MANAGEMENT COMMITTEE

Fourteenth Institute Management Committee (IMC) meeting was held on 27th November, 2010 at NRCAF Jhansi under the chairmanship of Dr. S. K. Dhyani, Director, NRCAF, Jhansi. Dr. Ramesh Singh, Sr. Scientist personated brief research achievements of Garhkundar – Dabar and Domagor – Pahuj watersheds being developed by NRCAF. Thereafter, the agenda items were placed and discussed in the meeting. The meeting was attended by the members (Mr. Pyare Lal, CEO, Pragati Biotechnologies, Jalandhar; Dr. D.R. Malviya, Head, Seed Tech & Sh. Suresh Chandra, Sr. FAO, IGFRI, Jhansi; Dr. V K Gupta, Dr. R. K. Tewari, Dr. Rajendra Prasad, Pr. Scientists, NRCAF, Jhansi; Sh. J. N. Mathur, Jt. Director Agriculture, Jhansi (U.P.); Dr. S. N. Pandey, Project Coordinator, Taragram, Jhansi ;Sh. Sharma Puran, Sr. Journalist, Atmadpur, Agra (U.P.) and invitees (Dr. S.P. Ahlawat, Sr. Scientist &I/CAF&AO; Dr. Rajeev Tiwari, Sr. TO; Sh. Dalbir singh, AAO). Dr. D. R. Palsaniya, Scientist, NRCAF acted as a Member Secretary of the meeting.

NEW ASSISTANT DIRECTOR GENERALE

Dr. J.C. Dagar from CSSRI, Karnal has joined as ADG (Agro/AF) in NRM Division at ICAR, New Delhi on the 3rd November 2010.

PROMOTION

- Sh. Mahendra Kumar Gautam, Sr. Clerk of the Centre has been promoted to Assistant w.e.f., 15th November, 2010.
- Sh. Birendra Singh Tomar, Sr. Clerk of the Centre has been promoted to Assistant w.e.f., 27th December, 2010.
- Sh.Vir Singh Pal, Jr. Clerk of the Centre has been promoted to Sr. Clerk w.e.f., 27th December, 2010.

DIRECTOR& PROJECT COORDINATORS VISITS

- Dr. S. K. Dhyani, Director & Project Coordinator of AICRP on Agroforestry visited the BAU, Ranchi Centre from 7th to 9th October,2010 to monitor the progress of the project.
- Dr. S. K. Dhyani, Director attended the meet on "Research Needs Arising due to Abiotic Stresses in Agriculture Management in India Under Global Climate Change Scenario" at NIAM, Baramati, Maharashtra on29th &30th October,2010.
- Dr. S. K. Dhyani, Director delivered a talk as Lead Speaker on Environment Science and Forestry at Uttrakhand State Science & Technology Congress at Doon University, Dehradun on 11th November,2010.
- Dr. S. K. Dhyani, Director attended NRM Division Director's Meeting at ICAR H. Q. New Delhi on 24th November,2010.

SELECTION

- Dr. Sunli Kumar, Pr. Scientist (Agronomy) has been selected as Head (Crop Production Division), IGFRI, Jhansi.

- Dr. P. Rathakrishnan, Scientist (Forestry) has been selected as Sr. Scientist (Forestry) at Regional Research Station of CAZRI at Bikaner (Raj.).

ICAR INTER ZONAL SPORTS

Sh. Attar Singh (SSS) of the Centre participated in the ICAR Inter Zonal Sport at CAZRI, Jodhpur from 9th to 13th November, 2010 and got First prize in cycle race.

VISITOR

- Dr. K.M. Bujarbaruah, Vice Chansllor, AAU, Jorhat(Assam)
- Dr. C. Rajkhowa, Director, NRC for Mithun, Nagaland
- Dr. J. C. Dagar, ADG (AF), NRM Division, ICAR, New Delhi.
- Dr. J. P. Mishra, Pr. Scientist, NRM Division, ICAR, New Delhi.
- Mr. Pyare Lal , Chief Executive, Pragati Biotechnologies, Jalandhar (Punjab)
- Sh. H.L. Meena, H.Q. Director, NRM Division, ICAR, New Delhi.
- Sh. Ashok Gupta, DRM, Jhansi.
- Sh. A.P. Singh, Chief Engineer (Central Circle), CPWD, Bhopal.
- Sh. Sharma Puran, (Member, IMC), Atmadpur, Agra (U.P.).

HAPPY NEW YEAR

2011

From Director & Staff