Agroforestry *New*

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Book Release: Promising Agroforestry Tree Species of India

From Left to Right: Dr Peter Carberry, Deputy Director General – Research, ICRISAT; Dr. Javed Rizvi, Director, South Asia Regional Program, ICRAF; Dr David Bergvinson, Director General, ICRISAT; Dr Trilochan Mohapatra, Secretary (DARE) & Director General, ICAR; Mr Chhabilendra Roul, Additional Secy. (DARE) & Secy. (ICAR); Dr A.K. Singh, Deputy Director General (Horticultural and Crop Science) and Dr Joykrushna Jena, Deputy Director General (Fisheries and Animal Science)

Important Event

A Book entitled "Promising Agroforestry Tree Species in India" (jointly published by ICAR- CAFRI, Jhansi and ICRAF, New Delhi) was released by Secretary, DARE, GoI and DG, ICAR on 30th January, 2018.

Research Advisory Committee

20th RAC meeting of ICAR-CAFRI was held on 12th March, 2018 under the chairmanship of Dr. Tej Partap, Former Vice-Chancellor, Sher-E-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar; Dr. S. Bhaskar, ADG(A, [Grab your reader's attention with a great quote from the document or use this space to emphasize a key point. To place this text box anywhere on the page, just drag it.]

RAC Meeting Photo

AF/CC), NRM Division, ICAR, New Delhi; Dr. M. A. Shankar, Ex. Director of Research, University of Agricultural Science, Bangalore; Dr. Parvinder Kaushal, Vice-Chancellor, BAU, Ranchi; Dr. V. K. Mishra, Ex-Dean, College of Horticulture & Forestry, Solan and Dr. Anil Kumar, Director (A), CAFRI, Jhansi (Members of RAC) participated in the RAC meeting. The Committee interacted with the Scientists and reviewed the ATR of previous RAC.

Importance of Tree Signatures in Mapping Agroforestry

Various forms of agroforestry systems are found in different parts of India. Among them, Poplar based systems in northern plains of Punjab, Haryana, Western U.P. and Uttarakhand; Eucalyptus based system in Telangana and Andhra Pradesh; Casuarina based systems in coastal Tamil Nadu and Odisha are some prominent systems. For mapping of a particular agroforesty systems/ species using remote sensing, we must know spectral reflectance pattern of that species. These spectral reflectance pattern or *spectral signatures* can be generated either from satellite remote sensing data or from hand held spectro-radiometer. But in case of trees, collection of spectral signatures with the help of spectro-radiometer is tedious and cumbersome. Further signatures need to be generated for different seasons or phenological stages. Spectral signatures created at hyperspectral scale (350-2500 nm) are more useful than multispectral scale, for narrow and contiguous spectral bands help in differentiating spectrally similar objects.

For Poplar species, spectral signatures have been generated using EO-1 Hyperion hyperspectral data for three periods (May, Sept., and Dec.). That data was downloaded from USGS website, processed and analyzed in ENVI 5.3 software. Methodology has been developed for generation of spectral signatures from hyperspectral data (Figure 1). It involves various steps like pre-processing, atmospheric correction, MNF transformation, pixel purity index, n-D visualization, endmember selection, etc.

Spectral reflectance pattern for Poplar in three periods appear different in different spectral ranges: visible (400-700 nm), near-infra red (700-1100 nm) and short-wave infra-red (100-1800 nm). In the month of May, when tree is full of new flush, the spectral reflectance in NIR range is high (Figure 2), which is not in the month of Sept. (Figure 3). Again in the month of Dec., when tree has no leaves, spectral reflectance in visible, NIR and SWIR is showing low values. This clearly indicated that seasonal or phenological behavior has effect on spectral signatures of a tree. Therefore by having library of spectral signatures for different seasons would help in accurate mapping of a particular tree species. This would further be needed for estimation of carbon stock under trees. Hence it is important to develop digital library of spectral signatures of major agroforestry species existing in different agro-climatic regions.

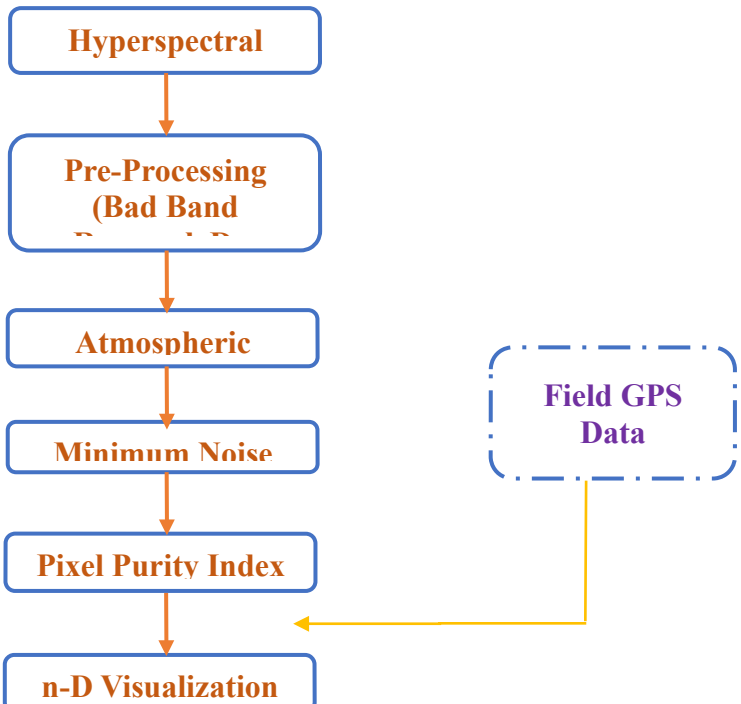

Fig. 1: Methodology for generation of spectral signatures

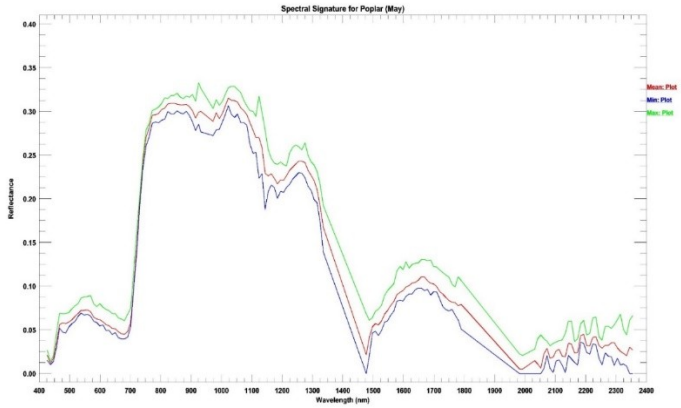

Fig. 2: Spectral signature of Poplar in the month of May

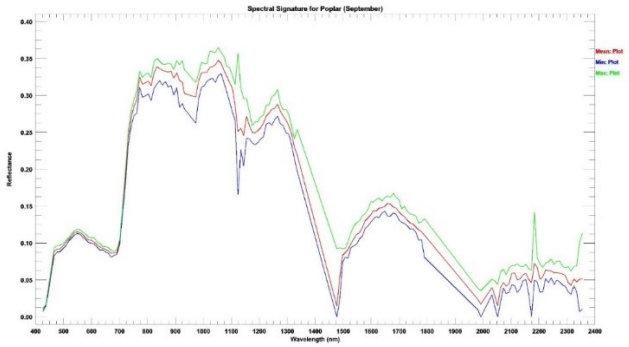

Fig. 3: Spectral signature of Poplar in the month of September

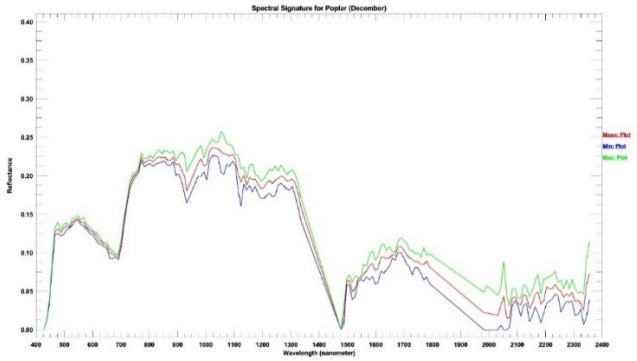

Fig. 4: Spectral signature of Poplar in the month of December

R H Rizvi, K B Sridhar and A K Handa
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Establishment of Fruit Tree Mother Block through collection of germplasm/varieties of important fruit crops for Bundelkhand region and their multiplication

Bundelkhand region is one of the most drought prone and poverty stricken region in India. Agroforestry have potential to alleviate hunger and poverty, and combat drought and reduce impact of climate change. To expand area under agroforestry in Bundelkhand region, fruit crops being an early paying crop can play a pivotal role. But, the non-availability of quality planting material of important fruit crops is a major hindrance in area expansion under agroforestry. Keeping in view of above need, a fruit tree mother block has been established at ICAR-CAFRI, Jhansi which is pre-requisite to establish a fruit tree nursery for supply of true to type and quality planting material. Secondly, collection of promising varieties/germplasm will help to conserve fruit germplasm in situ and their utilization to expand area under agroforestry. Following fruit crops have been collected from different sources and planted in mother block:

Table: 1: Fruit germplasm collected during 2017-18

Crops	Scientific name	Varieties	Source
Mango	*Mangifera indica* L.	Amarpalli, Mallika, Arunika, Ambika, Chuasa, Langra, Dashehari	CISH, Lucknow
		Baramasi Mango (CAFRI-M-01)	Local collection
Sweet Orange	*Citrus sinensis* (L.) Osbeck	Mosambi	Central Citrus Research Institute, Nagpur
		Jaffa, Blood Red	Center of Excellence for Citrus, Kota
Mandarin	*Citrus reticulata* Blanco	Kinnow, Nagpur, Nagpur Seedless, Clementine, Daisy	Center of Excellence for Citrus, Kota

Acid lime	*Citrus aurantifolia* (Christm. & Panz.) Swingle	NRCC-Acidlime-7, NRCC-Acidlime-8, Vikram, Pramalini, Sai Sharbati, Balaji	Central Citrus Research Institute, Nagpur
Guava	*Psidium guajava* L.	Lalit	CISH, Lucknow
		CAFRI-G-01	Local collection
Ber	*Ziziphus mauritiana* Lam.	Thai Apple Ber	Private nursery, Baruasagar (UP)
Fig	*Ficus carica* L.	Poona	IIHR, Bengaluru
Sapota	*Achras zapota* L.	Cricket Ball	IIHR, Bengaluru
Custard apple	*Annona squamosa* L.	Arka Sahan	IIHR, Bengaluru
Pomegranate	*Punica granatum* L.	Bhagwa, Super Bhagwa	MPKV, Rahuri
		Kandhari	Farmer field, Kullu (HP)
Khirni	*Manilkara hexandra* (Roxb.) Dubard	Thar Rituraj	CHES, Godhra (GJ)
Jamun	Syzygium cumini (L.) Skeels	Goma Priyanka	CHES, Godhra (GJ)
Bael	*Aegle marmelos* (L.) Correa	Goma Yashi	CHES, Godhra (GJ)
		NB-5	CISH, Lucknow
Tamarind	*Tamarindus indica* L.	Goma Prateek	CHES, Godhra (GJ)



Plantation in Fruit Tree Mother Block

Collection of rootstock

Rootstock is an integral part in fruit production which impart tolerance to scion variety from various biotic and abiotic factors and also improve fruit quality and yield of scion variety. Thus mother plant of rootstock is essentially required in fruit nursery for seedling raising. In citrus, mother plants of following rootstocks have been procured from Center of Excellence (Indo-Israel Project), Mangiana, Sirsa (Haryana):

1. Alemow (*Citrus macrophylla* Wester)
2. Cleopatra mandarin (*Citrus reshni* Hort. ex Tan.)
3. Kharna Khatta (*Citrus karna* Raf.)
4. Rangpur Lime (*Citrus x limonia*)

5. Sour orange (*Citrus x aurantium*)
6. Volkameriana (*Citrus volkameriana*)
7. Pectinifera (*Citrus × depressa*)

Lal Chand, R K Tiwari, K B Sridhar, Naresh Kumar, Asha Ram and A K Handa
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Incidence level of leaf roller (*Pyrausta coclesalis* Walker) in different Bamboo germplasms

Bamboo is the most important non-wood forest product in India. It is known as the 'poor man's timber'. About 2.5 billion people in the world depend economically on bamboo (INBAR, 1999) and international trade in bamboo contributes to about US$2.5 million (INBAR, 2005). India is rich in bamboo species diversity. There are 124 indigenous and exotic species representing 23 genera are distributed in India (Naithani, 1993). Many bamboo species are susceptible to insect pests attack. A total of 32 insect pests recorded on *Bambusa balcooa*, *Bambusa nutans*, *Bambusa pallida* and *Bambusa tulda*. The defoliators *Pyrausta coclesalis*, *Algedonia bambucivora, Psara licarsisalis, Hexacentrus unicolor* and *Discophora sondaica;* sap feeders *Antonina* sp., *Ceratovacuna silvestrii* and *Palmicultor lumpurensis* were categorized as major pests. Defoliating pests were found high during the month from May to August and the sap sucking pests were found high during the month of January to March (Rashi *et al.,* 2014).

A study has been carried out to assess the level of defoliator (*Pyrausta coclesalis*) incidence in different bamboo germplasms at ICAR-CAFRI farm during 2018-19. Observations recorded on *Bambus nutans, B. balcooa, B. tulda, B. bambos, B. multiplex, Dendrocalamus giganteus, D. asper,* and *D. hamilatonii* which were planted during 2017 (One year old plantings). The larva rolls up green leaves and feeds (Fig.1A). Early instar larvae feed on the upper leaf tissue and cause irregular skeletonization. Whereas, later instar larva (Fig.1B) web adjoining leaves and feed on the inner whorl of the leaves. Space inside the folded leaves are filled with yellowish white excreta. The highest leaf roller incidence was noticed in *B. nutans* (Ava. 7.2 leaf folds/plant) followed by *B. balcooa* (2 leaf folds)*, D. hamilatonii* (1.60 leaf folds) and *B. tulda* (1.33 leaf folds). However, no incidences was recorded on *B. bambos, B. multiplex, Dendrocalamus giganteus,* and *D. asper* (Fig.2). Senthilkumar (2008) and Rashi *et al.* (2014) reported as major status in causing severe damage on *B. nutans, B. balcooa, B. pallida* and *B. tulda.* Studies on its range of distribution, incidence, intensity of the attack, stage of attack and factors responsible for the pest build up helps to develop eco-friendly management practices to minimize pest incidence on bamboo.

Fig.1: A) Leaf rolling with excreta; B) late instar Larva

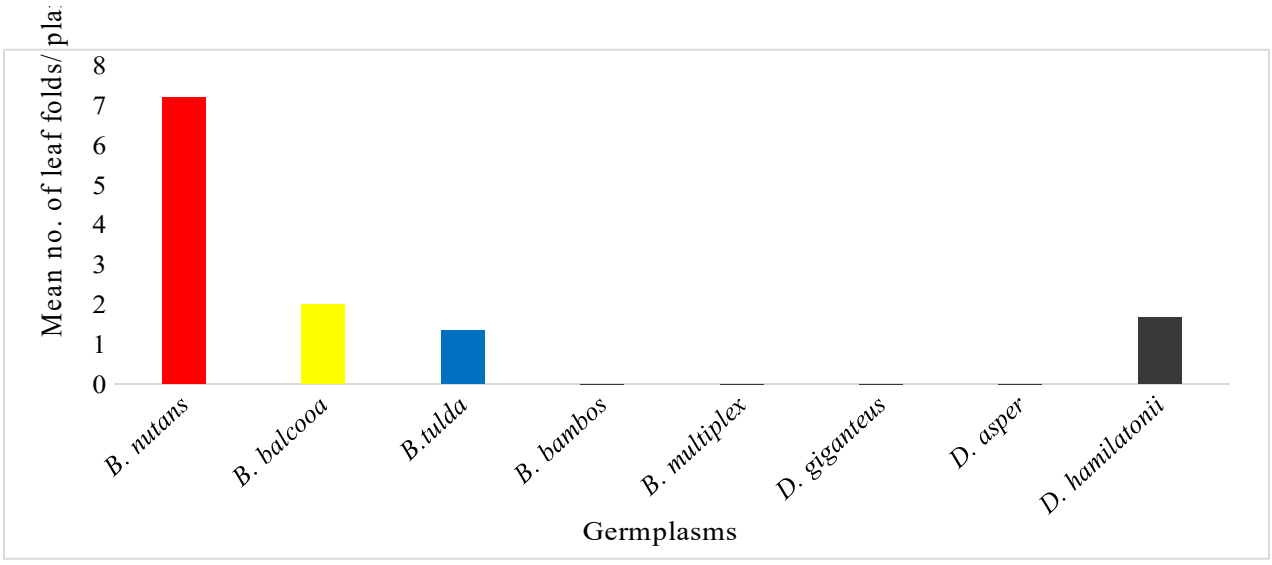

Fig.2: Incidence of leaf roller on different bamboo germplasms

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Human Resource Development

- Dr. A K Handa, Pr. Scientist attended Institute Management Committee of ICAR-IIFSR, Modipuram on 8th January 2018 at Modipuram. He also attended Launch of the National Certification Scheme for Sustainable Forest Management and official release of NCCF's country specific Internationally Benchmarked Standard for Forest Management Certification and one day National Conference on Forest Certification on 13th January 2018, at New Delhi
- Dr. A K Handa, Pr. Scientist participated in the meeting of progress of Sub Mission on Agroforestry under National Mission on sustainable Agriculture at NASC Complex on 22nd January, 2018.

- Dr. K. Rajarajan delivered lecture on Protection of Plant Varieties and Farmers Right (PPVFRA) on 20th February, 2018 at KVK, Datia (M. P.).

- Dr. R H Rizvi participated in the meeting of Sub-Group Conveners of the Centralized database system and monitoring mechanism, of TOF. This meeting was held on 6th March, 2018 at Paryavaran Bhawan, in which Dr. Rizvi presented highlights of agroforestry mapping being done at CAFRI, Jhansi.

- Dr. K. Rajarajan and Dr. C K Bajpai participated in the Training programme on "Quality Seed Production in Forage Crops" during 21st -23rd March, 2018 at ICAR-IGFRI, Jhansi.

- Dr. Naresh Kumar and Sh. Lal Chand participated in the International Conference on "Environmental, Educational and Biological Research for Human Welfare" during 25-26 March, 2018 held at BHU, Varanasi.

- Dr. Badre Alam participated and delivered invited Plenary lecture in International workshop on "Technological Innovation and Management for Sustainable Development" held at Gwalior from 27-29 March 2018 organized by the ITM University, Gwalior.

Krishi Unnati Mela-2018

Krishi Unnati Mela-2018 was organized during 14th -20th March, 2018 by the ICAR-IARI at New Delhi. Hon'ble Minister of Agriculture and Farmers Welfare along with state ministers and DG, ICAR and Director, IARI visited the ICAR-CAFRI, Jhansi stall at 5.30 PM on 14th March, 2018. Dr. Mahendra Singh and Dr. Sridhar gave presentation on "Challenges for agroforestry development in India" before the packed house and participated in discussion session during 11.00 AM to 1.00 PM on 18th March, 2018. The technical session was chaired by Dr. Bhaskar, ADG (Agronomy and Agroforestry), ICAR and was Co-chaired by Mrs. Alka Bhargav, Joint Secretary and CEO for Agroforestry and Bamboo Mission. Dr. Mahendra Singh and Dr. Sridhar had interacted and discussed with farmers and other stakeholders including Dr. Amit Kar, Head, Agricultural Economics, IARI, New Delhi and distributed the Bamboo saplings to progressive farmers from various corner of the country. Finally, about 1000 visitors had visited the stall during Mela. Dr. Mahendra Singh along with Dr. K. B. Sridhar and Shri Rajesh Srivastava participated in Mela.

Exhibition Stall

The exhibition stall of ICAR-CAFRI, Jhansi was awarded the **Excellent Stall Award** on 6th April, 2018 by NDUAT during the Kisan Mela. All the team members namely Dr. R.P. Dwivedi, Dr. K.B. Sridhar and Shri Rajesh Srivastava received the award from Dr. A.P. Rao, Director Extension, NDUAT, Kumarganj, Faizabad. The exhibition stall has increased the awareness of the farmers about agroforestry. Also participated during farmer-scientist interaction and question- answer session of the Kisan gosthi.

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