Agroforestry NEWSLETTER

National Research Centre for Agroforestry, Jhansi

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VISIT

Dr. K. R. Solanki, Director, NRCAF presenting momento to Dr. G. B. Singh, Deputy Director General (SA & AF), I.C.A.R.

From the Director's Desk

The retrospective perusal of the agroforestry research exhibits its wide spectral potential in sustenance of agriculture as these systems offer food, fodder, fruits, vegetables, fuel wood, timber, medicines, fibre etc. from the same area of land at a time which not only fulfil the demand of people but also elevate their socioeconomic status and standard of life.

It is worth to mention that agroforestry systems can be sources or sinks of green house gases depending on the components of the systems and the methods through which these are established. Selection of agroforestry system and its management practices affect the spatial temporal flux of carbon and nitrogen reservoirs in soil and vegetation. Agroforestry systems may be managed to stabilize the emission of green house gases. Agroforestry systems appear to stabilize green house gases in following three ways viz. sequestering carbon dioxide in plants and storing carbon and nitrogen in perennial vegetation and soils for long period, producing food, fodder, fuel, fibre etc. to suppress deforestation and sustained production of biofuel (fuel wood and crop's stems, roots, leaves etc.) cuts down the combustion fossilfuels which are the major sources of green house gases.

The apparent high potential of agroforestry systems, its applicability to control soil erosion, soil improvement, creating congenial and conductive microclimate, for trees and understorey crops and reduction in the accumulation of green house gases in the atmosphere. In the present situation it is the first foremost duty of Ecologists, Plant Physiologist, Agroforesters and Policy makers to launch agroforestry programme in countries where suitable land for such systems is available. Such programme have already been initiated in Australia, Africa, Brazil, India, United States of America and other countries.

K. R. SOLANKI

AGROFORESTRY VISION-2020

Broad spectrum of future research are as follows :

1. Sustainable biomass production through agroforestry system.
2. Improvement of selected tree species for higher productivity for different agroecological zones.
3. Long term bench mark studies for monitoring changes in physical condition and chemical composition of soils under various agroforestry systems.
4. Environmental factors in relation to productivity in various agroforestry system.
5. Impact of agroforestry systems on soil and water conservation and improvement of degraded and wastelands.
6. Development of mathematical and statistical models for integrated tree crop production system.
7. Developing strategies for swift transfer of proven technology and feed back.
8. Training programmes for trainees as well as for trainers.
9. Promotion of national and international collaborative research programmes.

Suppression Effect of Phalsa (*Grewia asiatica*) on Yield and Nutrient Uptake by Crops

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A field experiment was carried out on a rainfed vertisol at Agricultural Research Institute, Acharya N.G. Ranga Agricultural University, Hyderabad, during the years 1990-91 to 1992-93. Sorghum, redgram, castor and sunflower were sown on either side of tree rows of tamarind (*Tamarindus indica*) and phalsa (*Grewia asiatica*). Tamarind was planted at 12m apart and in the inter rows space of two plants of tamarind, five plants of phalsa were planted at a spacing of 2m. In the space on either side of the phalsa row (5m on either side), these crops were sown.

Perusal of the data from 3 years revealed that during second and third years of cropping, there was reduction in the yield of crops in the rows immediate to phalsa plants. There was maximum yield reduction in first and second rows in all these crops, and this reduction was maximum in redgram and sunflower. The results also further showed that the reduction in total yield recorded in redgram (with phalsa 5.51 q/ha: without phalsa 6.10 q/ha) and sunflower (with phalsa 6.0 q/ha: without phalsa 7.99 q/ha) were significantly higher than in castor and sorghum, as these two crops could show some tolerance to root interference of phalsa.

The influence of phalsa was also noticed in nutrient uptake pattern in different rows, which shows that the nutrient and moisture extraction capacity of crops was hampered significantly due to interference of phalsa roots. Observations clearly indicated that in rows I and II the uptake of N, P and K was significantly lower than the uptake recorded by crops in III, IV and V rows.

The results obtained in this investigation permits to conclude that when phalsa is included in an Agri-silvi-horti system, crops like sunflower and redgram may be avoided as they seemed to be more susceptible to root interference of phalsa.

Variation on Zizyphus mauritiana Variety Banarasi Karaka for Powdery Mildew Infection

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Zizyphus mauritiana (Ber) is one of the important horticultural crops that are being evaluated at NRCAF, Jhansi for their suitability to various agroforestry systems. Among its varieties under test, Banarasi Karaka recorded the best performance. The variety is susceptible to powdery mildew which often limits its productivity.To control the disease, two to three sprays with suitable fungicides are recommended. The method is costly, requires repeated application of fungicides and its affectivity reduces after appearance of the disease. To identify Banarasi Karaka plants with more resistance/tolerance to the disease, variation in this variety for the disease infection was studied. Observation on disease build up in 38 plants, were recorded during last three years. To assess the amount of disease (disease index) on a plant eight branches were randomly selected, two from each side. Diseased fruit surface area (%) was recorded for 25 fruits per branch and the disease index was obtained by calculating average diseased fruit surface area (%) per fruit. Disease progress curve for different plants were linearized by using Gompertz transformation and compared on the basis of K, the rate parameter of Gompertz model. A few plants with appreciable amount of resistance to the disease were identified with very low value of K (0.018). Disease index for above mentioned plants did not cross 5.0 during last three years, even though many infected Ber plants were present nearby. In general, K for Banarasi Karaka ranged from 0.038 to 0.072 and disease index from 53.8 to 85.5. Thus, identified resistant Banarasi Karaka plants may be exploited for control of the disease at large scale.

Maximizing Phytomass Production of Mulberry in Degraded Bouldery Riverbed Lands of Doon Valley

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Dehradun-248 195

An investigation was carried out at CSWCRTI, research farm, Selakui, Dehradun on bouldery riverbed land of Doon Valley to maximize the phytomass production of mulberry. The bouldery riverbed lands are characterized by high gravel content (about 74% under study site), poor moisture holding capacity due to high infiltration rate and low in organic matter content; thereby such lands are either lying vacant or occupied by uneconomical vegetation. Therefore, it was planned to utilise and rehabilitate such lands through mass plantation of suitable MPTS. Mulberry is one of the important MPTS, the leaves are fed to silkworm in sericulture industries, thinner twigs for basket making while thicker twigs used as fuel wood. Moreover, the phytomass productivity of mulberry is quite low in bouldery riverbed land.

In present study, the sprouted mulberry cuttings of uniform size were planted during July, 1975 at the spacing of 2x2m (2500 plants/ha). The pits ($0.5m^3$ size) were filled with FYM and good soil (1:1). The following treatments viz. T1-

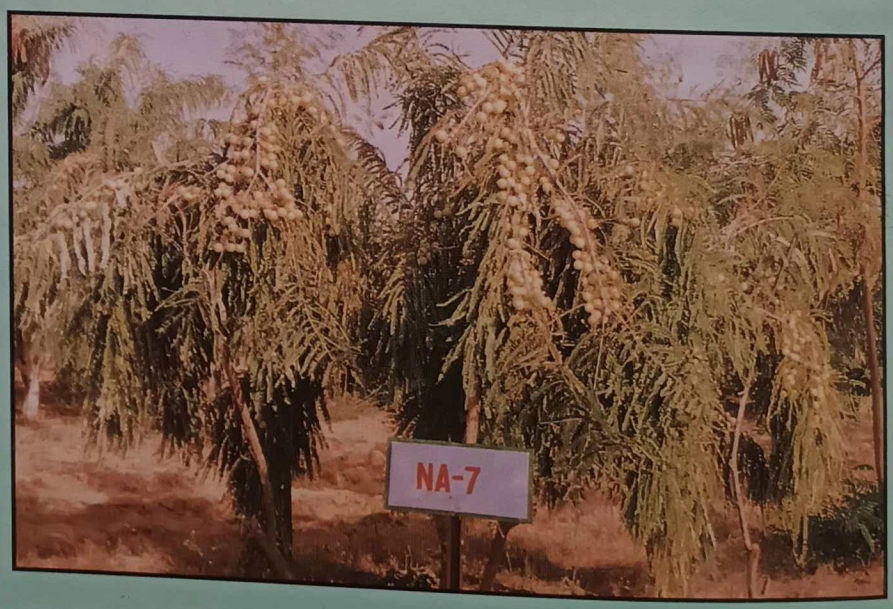
coppicing at 15 cm stump height, T2-Pollarding at 1.5 m stem height and T3-75% lopping of the crown were imposed during 1985. The phytomass in form of leaves twigs (2-5 cm diameter) and fuelwoods (2 cm and 75 cm dia.) were recorded in 1994. The experiment was laid out in RBD with three replications.

Observations indicated that the maximum total phytomass (15.5 kg/tree) was obtained from pollarding. The twigs and fuel wood production were significantly higher under pollarding than those of lopping and coppicing but the differences of twigs production between coppicing and pollarding were non-significant. However, the production of leaf fodder did not differ significantly under various management practices, though it was maximum in lopping (4.4 kg/tree) followed by coppicing (4.2 kg/tree) and minimum in pollarding (4.0 kg/tree). Among various components, the maximum contribution was made by twigs of 2-5 cm diameter followed by leaf fodder and fuelwoods. The studies revealed that under degraded bouldery riverbed lands, the phytomass production of mulberry can be improved by pollarding, which is a feasible silviculture practice than the lopping of the tree crown.

AONLA DIWAS

Aonla Diwas was organised to create the awareness amongst the farmers about 'Aonla' production under rainfed conditions at the Centre on December 5, 1996. The farmers of nearby villages have participated.

There was a question-answer session. Farmers raised their problems pertaining to the cultivation and production of Aonla for which solution were suggested by the Director/Scientists. The function was presided by Dr. K.R. Solanki, Director, NRCAF, Jhansi.



ARIS Cell

Agriculture Research Information Service Cell has been recently established at the centre. Sh. Ajit, Scientist (Statistics) has been deputed as the Officer Incharge of the ARIS.

Forage Production System From Mango Orchard

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Fodder crop Oats being harvested

Mango occupies the largest area among the fruit crops in the country and in mango fruit production its position is secured in the world. There are ample opportunities to grow crops in the interspaces of the mango orchard in the initial years of its establishment as well as during the time it is yielding fruits. There is a possibility that with the enlargement of mango canopy, crops may become un-accessible. Studies were initiated at NRCAF during 1990-91 with planting of grafted plant saplings of 4 mango varieties (Amrapalli, Mallika, Deshari and Langra) in a spacing of 4x4m (100 plants/ha). In between mango trees, *Leucaena leucocephala* was also introduced with a plant population of 200 plants/ha. Four cropping systems were tried and in the present paper only fodder production system (Oat-Cowpea) is presented.

Fodder crop Cowpea being harvested

Data on fresh and dry weight of oat-cowpea rotation were registered from the interspaces of mango fruit crop from 1992-96.

There was not much difference in the productivity, if mango varieties were taken into consideration. During the fifth year (1995-96) maximum forage yield from oat-cowpea crop rotation, fresh weight (560 q/ha) and dry weight (94 q/ha) was recorded from the interspaces of 'Amrapalli' variety of mango.

Thus, the results were quite favourable in raising fodder crops in the interspaces of mango orchard. Planting of *Leucaena* also helped to a greater extend, firstly being a NFT, which improved the soil productivity, secondly it acted as a barrier to the fruit plants during the summer season, and finally due to coppicing each year it gave 'biomass yield' of fodder and fuel. Here it will be also important to highlight the point that growing a leguminous crop of cowpea in the rotation , improved the productivity of the succeeding crop besides smothering the weeds during the rainy season.

Topworking in Jharberi (*Z. nummularia*)

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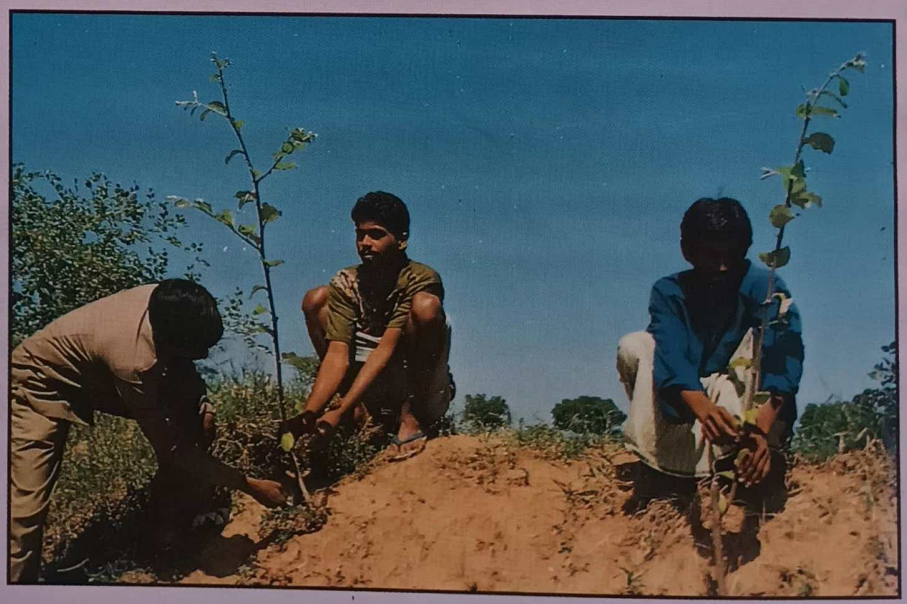
'How to do budding ?' Farmers are in the phase of learning

A vast area of Bundelkhand region is barren either due to adverse soil conditions or for want of irrigation water. A large number of thorny bushes of *Zizyphus nummularia* grow naturally on such lands. The plant is so hardy that it is found growing even in the crevices of rocks. The root system is very deep, well developed and it can tolerate extreme of moisture stress. The fruits are small having sweet and sour taste and consumed by local people. These plants can be converted into highly profitable ber trees yielding quality fruits by topworking jharberi plants with improved cultivars of ber (*Zizyphus mauritiana*) like Banarasi Karaka, Gola, Seo etc. Thus, the economic returns from marginal and degraded lands of Bundelkhand region can be increased with little efforts.

In view of the above fact efforts were made to train the farmers of the village Karari in the technique of topworking so that they can perform the task themselves on their farmlands. The technical help was provided by the centre. The jharberi bushes were headed back in the month of June 1996. The budding was performed in the month of August 1996 on newly emerged shoots with the bud material from improved ber cultivars namely Banarasi Karaka and Gola. The budding was done by the farmers with the help of gardener of the centre. A total number of 380 plants were topworked. Out of 380 plants, 272 plants sprouted successfully by the end of September 1996. Thus, a success of budding was recorded to the tune of 71.57 %.



Learning by doing : Farmers' participation

The success of budding tempted other farmers of the village.

Now, it can be stated that the above programme of topworking if implemented on large scale, will bring the awareness among the rural masses. Once the farmers are convinced, they will undertake the task of topworking themselves on and around their farmlands wherever the jharberi bushes are available. This will go a long way in enhancing economic returns from degraded and marginal lands of Bundelkhand region.

Extension, Training, Kisan Diwas & Kisan Gosthi

Kisan gosthi was organised on September 19,1996 at village Karari of District Jhansi to popularise agroforestry system among the farmers. About 110 farmers including farm women participated in Kisan Gosthi. Dr. K.R. Solanki, Director, NRCAF, Jhansi and chairman of Kisan Gosthi emphasized the importance of cooperative nursery at village Karari, and growing improved varieties of Aonla and Ber with crops in rainfed conditions.

The various speakers at Kisan gosthi were : Drs. P. Rai, R. Newaj, Anil Kumar, S.K. Shukla and Sh. C.K. Bajpai. The programme was conducted by Dr. S.K. Shukla, Scientist (Horticulture) and convened by Dr. R.P. Dwivedi, Scientist (Agril. Extension). During question -answer session the farmers have shown keen interest regarding growing of fruit trees.

Allelopathic Effect of Leaf Extract of *Hardwickia binata* Roxb. on *Glycine max* L.

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National Research Centre for Agroforestry,
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The effect of aqueous extract of leaves of *Hardwickia binata* Roxb. on seed germination and seedling growth of *Glycine max.* L. were examined in laboratory. Aqueous extract of leaves was prepared by soaking 25 gm material in 200 ml of distilled water for 24 hours, blended for 3 minutes, centrifuged at 20,000 rpm for 10 minutes then filtered through Whatman No. 1 filter paper. The extract was further diluted to 25, 50, 75 and 100% concentration. Glass distilled water was considered as control. Twenty seeds of soybean (*G. max* L.) were placed in petriplates of 20.00 cm lined with double filter papers moistened with 10 ml of aquous leaf extract on the first day and 5 ml after 3 days.

Germination was recorded second day and onwards. The root and shoot length were measured on sixth day. The length of root was increased progressively upto 75% concentration of extract and reduced at 100% concentration. However, the root elongation was signficantly higher over control. Almost similar trend was exhibited by the shoot elongation in *G. max.* Dry matter production was determined at 85 °C and it was increased at all the concentrations of leaf aquous extract both in root and shoot. It appears from the results that leaf aquous extract has a positive allelopathic effect on *G. max* which may be due to accelerated reserve food translocation and activity of catalase and IAA - oxidase.It seems that some active substance is present in leaves of *H. binata* which causes positive allelopathic effect in *G. max.* The causing factors (active substance) and its nature etc. remains to be elucidated.

COMPUTER TRAINING PROGRAMME

In view of rising emphasis on the Human Resource Development, Automation in offices & use of modern electronic communication system i.e. computers, to increase the working efficiency at all levels. A four weeks training programme on "COMPUTER FUNDAMENTALS" for the staff of the centre was organised from November 27 to December 26, 1996. Sh. Ajit, Scientist (Statistics) was the Course Coordinator and Smt. Uma, Sr. Technical Assistant facilitated in teaching. The course consisted of basics of computers, MS-DOS ver 6.22 and working knowledge of packages like Word Perfect 5.1, Lotus 1-2-3 release 3, dBase-III and Harvard Graphics ver 3 . The course was attended by 23 participants from diversed categories of scientific, technical and administrative staff including AAO/AF&AO.

PERSONALIA

AWARD

Sh. R.P. Dwivedi, Scientist (Extension) received Doctor of Philosophy Degree (Ph.D.) from I.V.R.I., Izzatnagar, Bareilly (U.P.)

PROMOTIONS

Sh. D.K. Awasthi, Office Assistant was promoted to the post of Office Superintendent.

NEW STAFF MEMBERS

Sh. A. Shankar, Scientist (Pl. Physiology), Mrs. Chitra Shankar, Scientist (Entomology) and Sh. Munna Ram, Sr. Scientist (Soil Science) and Dr. Ram Vinod Kumar, Scientist (Plant Breeding) joined the Centre.

VISIT ABROAD

Dr. A.K.Bisaria, Sr. Scientist (Pl. Physiology) and Dr. Ram Newaj, Scientist (Sr. Scale) visited Australia to attend training on agroforestry management under AUS-Aid programme (January 20-February 14,1997).

MANAGEMENT COMMITTEE :

Second management committee meeting was held on February 28, 1997.

INSTITUTE JOINT STAFF COUNCIL

A meeting of IJSC was held on March 21,1997 under the chairmanship of Dr.K.R.Solanki, Director of the centre.

Distinguished Visitors During April, 96 to March, 97

1. Dr. G.B. Singh, DDG (SA & AF), ICAR, Krishi Bhavan, New Delhi
2. Sh. G.S. Sahni, IAS & Secretary, ICAR, New Delhi.
3. Dr. K.G. Tejwani, Ex. Director, CSWCR&TI, Dehradun, Chairman, RAC
4. Dr. F.B. Patil, Prof. (Agroforestry), MPKV, Rahuri, Member, RAC
5. Dr. O. P. Toky, Prof. (Forestry), CCS HAU, Hissar, Member, RAC
6. Dr. P. S. Pathak, ADG(AF), ICAR, New Delhi, Member, RAC
7. Sh. D.D. Verma, Sr. FAO, IGFRI, Jhansi
8. Dr. J. Venkateswarlu, Ex. Director, CAZRI, Jodhpur (Raj.) Chairman, QRT
9. Dr. R.N. Kaul, Ex. Principal Chief Conservator of Forest, Arunachal Pradesh, Member, QRT
10. Dr. R.K. Pathak, Prof. (Horticulture), NDUAT, Faizabad, Member, QRT

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