Agroforestry NEWSLETTER

National Research Centre for Agroforestry, Jhansi

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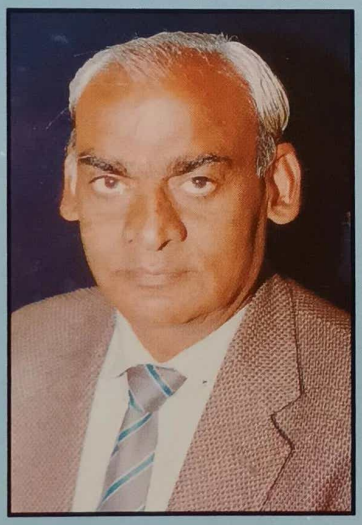
From the Director's Desk



Dear Reader,

In the previous Number of Agroforestry Newsletter, role of agroforestry in environment was elaborated. Now in this current issue, role of agroforestry in sustenance of agriculture is elucidated.

Sustainability refers to sustainable land use, which has received global attention in international development circles. Yet, it should not be written off as a passing fashion, for the concept which it represents is real and valuable sustainability, means continued production at levels or above those of today, integrated with conservation of the natural resources viz. soil, water and air on which the production depends. India has made great strides and achieved self sufficiency in agricultural production and now exporting food grains to other countries. However, with more emphasis on agricultural production due to swift mounting pressure of the burgeoning populations of human and livestock on the static natural resources viz. soil, water and air have posed multiple problems of land degradation unstable agriculture, environmental contamination and socioeconomic stresses. In the quest of optimising productivity the multitier systems occupied prominent position in agriculture. These systems are commonly known as agroforestry. The problems viz. degradation of soil, soil erosion, unstable agriculture, contamination of environment and poor socioeconomic status of rural population can be solved to a considerable extent through adopting and popularising

agroforestry among farmers as this land use system is an integration of tree and arable crops which improves soil fertility, reduces soil degradation, inhibits soil erosion, causes redressal of highly contaminated environment, improves socioeconomic status of farmers and generates employment for rural population, besides the production of food, fodder, fuel wood, timber, medicines etc. Therefore, it is the first and foremost duty of scientists, extension workers and planners to promote agroforestry in the country. The financial institutions should also come forward to finance agroforestry projects.

(DR. K.R. SOLANKI)

POPLAR : AN ECONOMY BOOSTER AND ECOFRIENDL AGROFORESTRY TREE

O.P. Toky

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Tree Introduction :

Poplar is one of the fastest growing trees which can be cultivated with agricultural crops. It is an exotic tree introduced in India from the Western countries. During the last five years the demand for its wood has increased several fold. The wood is commercially used for plywood, fibre board, match sticks, packaging cases,etc.

Selection of Clone :

Among Poplars, *Populus deltoides* is known to perform the best in north-western plains of India. There are several clones of *P. deltoides* such as G3, G48, S7C15, S7C20, PLL1, PLL2, PLL3, PLL4, PLL5, PLL6, D121, L-group, H-group,etc. which are considered fast growing. The selection of the clone nevertheless is important depending upon the texture, fertility of the soil, and availability of irrigation water.

Economics :

A well drained, fertile soil with texture ranging from sandy loam to sandy is most suitable for poplar growing. The poplar prefers neutral soils but can be grown well on soils having pH between 5.5 to 8.0. In one acre of land 133-200 saplings (ETPs) are planted at a spacing of 5x5m or 5x4 m or 8x3 m or 10x3 m.

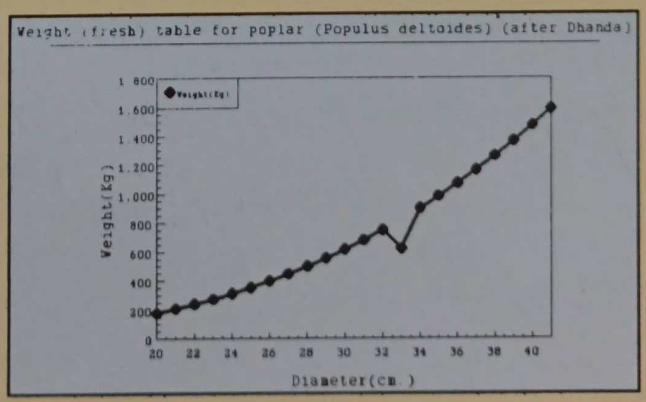
Poplar tree matures for harvest after 7-8 years having a girth of 90-100 cm. One tree of 90 cm of girth provides 5-6 quintals of fresh bole wood and each quintal of wood fetches about Rs. 400/- in the open market. One tree after 8 years can provide a handsome price of about Rs. 2000/-. In one acre 160 trees fetch about Rs.3,20,000/-. On an average a farmer can earn about Rs. 40,000/- per acre per year. The income from crops grown in association with poplars is additional. Infact, in intercropping the growth and production of poplars is significantly increased as compared to when they are grown as monoculture.

The demand of poplar wood is increasing due to the ban of tree felling in most parts of the country. A high percentage of poplar wood is being utilised for preparation of good quality plywood.

To get the best economic return from poplars, it is essential to choose the right type of clone, healthy disease free saplings (ETPs), proper pruning of side branches and management of soil and water. It is also essential to protect the trees from termites and other diseases.

Planting Season :

The best time for planting poplar is December-January-February. One year old saplings also called as ETPs (Entire Tall Plants) are transplanted naked roots The ETPs are essentially treated with a mixture of fungicide and insecticide to avoid any carrying of nematodes or termite or fungal infection from nursery to the farmers field. In the field each pit should have 2-4 kg farm yard manure, 2-4 kg neem cake and 50 g superphosphate. The neem cake protects the plants from termites and helps to get optimum tree growth.



Ecological gains :

Apart from a very handsome income from poplars, the soils are enriched with organic matter when planted with poplars. It is estimated that 5-10 tons of organic matter is added every year over an area of one acre from the leafall of 5-6 years old poplar tree. The leaves are easily decomposed and mineralized to increase soil fertility.

Agricultural crops :

The agricultural crops such as wheat and sorghum during winter can be taken up even with trees of 7-8 years old without much reduction in the yield because the poplar trees shed off all the leaves during winter. Sugarcane, fodder, turmeric and ginger crops grow excellently in association with poplar trees.

TRAINING OF FARMERS ON PRUNING IN BER

R.P. Dwivedi and S.K. Shukla
National Research Centre for Agroforestry, Jhansi.

A training of farmers was organised in the last week of May, 1997 at Village Karari in Jhansi with following objectives : (i) to attract the farmers who were either self motivated or externally stimulated to take part in the course (ii) to impart new knowledge, (iii) to encourage mutual exchange of experience among participating farmers. The lectures, group discussion and problem solving methods of training were followed. The training was attended by 22 farmers. The principles of ber pruning were explained in detail and the method of scientific pruning was demonstrated.

Training in the initial stage of ber plants, aims at developing ideal framework i.e. high statured trees with well distributed branches, so that the tree is strong enough to bear fruits. Plants are trained in such a way that they do not meddle with the cultural operations to be performed for understorey crop in ber based agroforestry system. Pruning in ber consists of removal of 30 to 50 per cent apical portions of old shoots of ber. Lack of proper pruning in ber trees leads to various problems like occurrence of insect pests and diseases, problem of crossing branches, breaking of branches due to heavy fruit load. This also accentuates the problem of tip bearing because fruit bearing in ber takes place on new shoots burgeoning during rainy season. Partial cutting of old ber shoots in the month of May, encourages the growth of new shoots which give optimum flowering and fruiting in the following season. The training aroused the farmers and they expressed willingness to have similar type of training programme on budding of deshi ber with improved cultivars in order to improve the yield and quality of fruits.

POTENTIAL INTEGRATION OF TEAK, PAPAYA, PASTURE AND FIELD CROPS UNDER RAINFED CONDITIONS

B. S. Nadagoudar, S. L. Madiwalar, S. M. Mutanal and S. J. Patil
Forestry Department, University of Agricultural Sciences, Dharwad 580005, Karnataka

An experiment to find out suitable agroforestry systems for red gravelly soils in transitional tract of Dharwad was initiated during Kharif 1984. The experiment involved integration of arable crops (sorghum, groundnut, chilli and fingermillet), silvicultural crops (teak), horticultural crops (Papaya) and pastoral crops (guinea grass and subabul). Teak was planted either 10 or 20 m apart with 2 m between trees. Along the teak row, one papaya plant was planted in between rows and 60 cm between 2 plants for grass and 20 cm for subabul. Narrow spacing was given to subabul since the objective was to harvest it for fodder leaving stubble to a height of 15 cm. Width repeated cutting of pasture component, vegetative barrier was created to prevent runoff losses. Of the 4 arable crops, only 2 crops were grown each year in a fixed rotation which is a common practice followed by farmers in the area. Papaya, completed its life cycle in about 3 years after planting.

At the end of 12 years, the reduction in the yield of sorghum with teak ranged from 16 to 37 per cent . Presence of pasture components in addition to teak reduced the yield of agricultural component to an extent of 37 to 61 percent. Sorghum yield was higher with 20 m spaced teak as compared to 10 m spaced teak.

This was due to more number of affected rows of sorghum by the side of teak trees in 10 m rows than 20 m rows on unit area basis.

The higher pasture yields were obtained with 10 m inter row spacing of teak compared to that with 20m. This was mainly due to more number of pasture rows per ha in closer inter row spacing. The height and DBH of teak ranged from 10.15 to 10.63 m and 15.05 to 15.13 cm respectively in treatments without any pasture crops. The growth of teak trees was reduced with inclusion of pasture crops.

Income over twelve years period indicated that field crops contributed 47.8 to 58.8 per cent to the total income. The contribution of papaya, teak and pasture crops to the total income ranged from 0.2 to 2.9 , 36.9 to 49.3 and 3.9 to 5.7 per cent,respectively. Economic analysis over 12 years period revealed that growing of teak, papaya and pasture crops alongwith field crops in 10 or 20 m alley resulted in higher net return by Rs. 6,319 to Rs. 9,299 per ha per year as compared to growing only field crops. Inclusion of only teak and papaya with agricultural crops resulted in highest net returns (Rs. 14,527/ha/yr) followed by field crops + teak + papaya + grass (Rs. 11,736/ ha/yr) and field crops + teak + Papaya + subabul (Rs.11,547/ha/yr). Net present value & internal rate of return were also higher in the treatment with field crops + teak + papaya compared to other combinations.

PROMOTION

Sh.Veer Singh Pal was promoted to the post of Junior Clerk.

NEW STAFF MEMBER

Sh.R.S.Yadav, Scientist (Soil Science) joined the Centre on transfer from Project Directorate on Cropping Systems, Modipuram, Meerut.

GROWTH AND BIOMASS PRODUCTION OF MPTs AT VIIITH YEAR OF ESTABLISHMENT UNDER RANGELANDS IN RED GRAVELLY SOILS

P. Rai and Rajendra Singh
National Research Centre for Agroforestry, Jhansi

Seven multipurpose tree species namely *Albizia amara, A. procera,Dichrostachys cinerea, Dalbergia sissoo, Emblica officinalis, Eucalyptus tereticornis* and *Hardwickia binata* were introduced under rangelands in red gravelly soils to select the suitable MPTs for increasing the productivity of rangelands. The tree saplings were planted at 8 m spacing between rows and 4m within rows and 16 plants were planted for each species. The experimental area was dominated by natural *Sehima nervosum* and *Heteropogon contortus* grass. During May 1996, three plants of each species were harvested and growth (height, collar diameter and diameter at breast height) and biomass production (bole, branches and leaf) were recorded. On the basis of average data of 3 plants, suitable MPTs were selected.

Growth parameters

The plant height of MPTs significantly differed and maximum height of 7.8 m was recorded with *Albizia procera* followed by *Dalbergia sissoo* (6.7 m) and *E. officinalis* and minimum height was with *D. cinerea.* The growth in CD (22.6 cm) and DBH (10.4 cm) were also higher with *A. procera* followed by *D. sissoo* (13.4 cm), *E. officinalis* (12.3 cm) and *A. amara* (11.6 cm) for CD and *E. officinalis* (11.4 cm), *A. amara* (10.7 cm) and *D. sissoo* (10.3 cm) for DBH. The minimum CD(6.8 cm) and DBH (3.8 cm) were noted with *D. cinerea.*

Mean Annual Increment (MAI) showed that the range of growth in height was from 0.44 to 0.97 m. In case of CD and DBH it ranged from 0.85 to 2.82 cm and 0.47 to 1.92 cm respectively.

Biomass production

The dry biomass recorded with bole, branch and leaf were significantly differed in these MPTs. The maximum bole yield of (36.8 kg/tree) was obtained with *A. procera* followed by *D. sissoo* (28.7 kg/tree) and *A. amara* (14.9 kg/tree) and minimum was noted with *D. cinerea* (6.0 kg/tree).

The production of branches was found again maximum with *A. procera* (11.8 kg/tree) followed by *A. amara* (8.2 kg/tree). *E.officinalis* (6.8 kg/tree) and *D. sissoo* (6.7 kg/tree). The minimum branch production was noted with *D. cinerea* (3.1 kg/tree).

The dry leaf fodder production of 6.3 kg/tree was obtained with *D. sissoo* followed by *E. officinalis* (4.9 kg/tree), *A. procera* (2.0 kg/tree) and *H. binata* (1.5 kg/tree).

The total above ground dry biomass production of 50.6 kg/tree was obtained with *A. procera* followed by *D. sissoo* (41.7 kg/tree), *E. officinalis* (24.6 kg/tree), *A. amara* (22.6 kg/tree), *E.tereticornis* (18.7 kg/tree) and *H.binata* (15.1 kg/tree). The minimum yield of 9.7 kg/tree was recorded with *D. cinerea*.

The productivity of aforesaid species was calculated assuming 300 plants/ha as plantation was done at 8x4 m spacing. It was observed that maximum productivity of 1.89 t/ha/yr was obtained with *A.procera* followed by *D. sissoo* (1.56 t/ha/yr) and minimum of 0.36 t/h/year was noted with *D. cinerea*.

It can be concluded that out of seven tree species evaluated *A. procera* and *D. sissoo* were found most suitable tree species for introduction in rangelands condition in red gravelly soils for increasing the productivity of rangelands.

ALL INDIA COORDINATED RESEARCH PROJECT ON AGROFORESTRY

All Indian Coordinated Research Project on Agroforestry was shifted from Indian Council of Agricultural Research, New Delhi to National Research Centre for Agroforestry, Jhansi. Dr. K.R.Solanki, the Director of the Centre assumed the charge of the Office of Project Coordinator of AICRPAF w.e.f. 1.4.97, accordingly.

FOUNDATION DAY

National Research Centre for Agroforestry was established on the 8th day of May, 1988 at Jhansi. The Centre celebrated its foundation day on 8th May 1997.

A seminar was organised and scientists presented work on "Anjan" Hardwickia binata Roxb. Dr.K.R. Solanki, Director presided over the function.

SHORT COURSE : A REPORT

K.R. Solanki & A.K. Bisaria

Emphatic efforts were made to offer wide publicity about the Short Course on "Recent Advances in Agroforestry and its Role in Conservation of Soil, Water and Biodiversity" (4th June to 13th June, 1997) and 120 copies of the circular alongwith application proforma were sent to the Agricultural Universities, Basic Universities, ICAR Research Institutes, Forest Departments and NGO's. We received 40 applications in response to aforesaid circular. A list of 30 candidates was finalised and were invited to participate in the Short Course. Thereafter 4 more candidates were invited because some candidates expressed their inability to attend. However, 22 candidates representing eight States viz. Bihar, Gujrat, Jammu & Kashmir, Karnataka, Madhya Pradesh, Maharashtra, Punjab and Uttar Pradesh belonging to various ICAR Institutes, State Agricultural Universities, Forest Department and NGO's attended the Short Course.

Hon'ble Dr. R.K. Rajput, Ex. Director, Directorate of Water Management Research, Patna (Bihar) inaugurated the short course on 4.6.97 in a colourful function.

The entire topic was classified into 30 titles out of which 26 lectures were delivered to the participants besides four laboratory exercise and field demonstration of equipments, four field visits and one excursion tour.

The valedictory function was held on 13th June, 1997 and Dr. A. S. Faroda, Director, Central Arid Zone Research Institute, Jodhpur (Rajasthan) awarded certificate and the set of lectures in the form of compendium to the participants.

There is a huge demand for the compendium from different Universities and Research Institutes.

All the participants appreciated for successful organisation of the Short Course.

SHORT COURSE - A GROUP PHOTOGRAPH

Standing from left to right :

Dr. A.P. Jaiswal, Sh. Ajit, Dr. A.K. Handa, Dr. Ram Newaj, Sh. Baljit Singh, Sh. A.H. Mughal, Dr. Md. Shamshad Ali, Sh. H.C. Soni, Mr. B.C. Channakeshava, Dr. S.K. Shukla, Dr. Banwari Lal, Sh. M.P. Rai, Sh. D.S. Eknath

Sitting from left to right :

Dr. V.K. Singh, Dr. R.A. Singh, Sh. Munish Kumar, Sh. S.P. Karbhari, Sh. M. Venkatesh, Dr. P. Rai, Principal Scientist, Dr. K.R. Solanki, Director Short Course & NRCAF, Dr. A.K. Bisaria, Convenor, Dr. V.K. Gupta, Sr. Scientist, Sh. K.V. Keshav, Sh. R.K. Prajapati, Sh. Sunil Kumar

List of Visitors during Short Course w.e.f. 4.6.97 to 13.6.97

Dr. R.K. Rajput, Ex. Director, Directorate of Water Management Research, Patna (Bihar)
Sh. T.A. Khan, Sr. Scientist, IGFRI, Jhansi
Dr. L.P. Mishra, IGFRI, Jhansi
Dr. M.M. Roy, Sr. Scientist, IGFRI, Jhansi
Dr. R.K. Pathak, Coordinator UP Diversified Agricultural Support Project, Lucknow
Dr. M.G. Gupta, Sr. Scientist, IGFRI, Jhansi
Dr.S.A.Faruqui, Sr. Scientist, IGFRI, Jhansi
Dr. Manjit Singh, Pr. Scientist, CAZRI, Jodhpur
Dr. H.P. Singh, Pr. Scientist, CAZRI, Jodhpur
Dr. P.S.Tomar, Pr. Scientist, IGFRI, Jhansi
AVM Sahani, NGOs, Jhansi
Dr. A.S. Faroda, Director, CAZRI, Jodhpur
Dr. A.K. Sharma, Pr. Scientist, CSWCRTI Regional Res. Station, Datia, (M.P.)
Dr. R.K. Tyagi, Sr. Scientist, IGFRI, Jhansi
Dr. P.S. Pathak, ADG (AF.), ICAR, New Delhi

BER (ZIZYPHUS MAURITIANA) IDEAL FOR AGROFORESTRY

A. S. Gill, R. Deb Roy and C. K. Bajpai
National Research Centre for Agroforestry, Jhansi : 284 003 (U.P.)

Ber is an important fruit tree for the arid and semi-arid condition occupying about 12,000 acres in the country. The tree provides beside fruit, a good amount of fodder and fuel at the time of pruning during the month of May-June, soon after the harvest of the fruits. Studies were initiated under "Agri-Silvihorticultural" system at NRCAF, Jhansi. Ber improved material (variety banarasi karaka) was planted during 1988-89 on sandylom soils, poor in fertility status and neutral in reaction. In between ber plants, subabul (*Leucaena leucocephala*) saplings were planted (Under 5x5 m ber spacing there were 40 subabul plants/ha) during interspaces crop were sown during the Kharif (rainfed) with recommended package of practices.

Agri-Silvi-Horticultural Studies - Wheat and Subabul raised in the interspaces of Ber (1993-94)

Results revealed that initially the interspaces of ber plant were successfully exploited. Food grain productivity from the crops and fuel and forage production from pruning of ber was ensured. This was in addition to the coppicing of subabul prior to sowing of Rabi crops which yielded fairly rich nutritious forage material and fuel production.

After 3-4 years, ber plants started yielding fruit production. Thus, the system ensured the production of food, fodder, fruit and fuel from the same piece of land. With the introduction of subabul, it was also presumed that the tree improved the fertility status of the soil as being a "nitrogen fixing tree species".

In wheat, on an average, during 1989-90, 1990-91, 1991-92, 1992-93 and 1993-94 the grain yield were in the order 29.2, 30.3, 21.2, 11.9 and 12.2 g/ha and relative grain yield 96, 120, 69, 40 and 49 percent, respectively from the interspaces of ber tree i.e. the grain yield decreased year after year, but fruit production increased year after year.

Comparison between agroforestry and control in Ber over an average of 5 years, clearly expressed that the fruit tree growth was much better with crops in the interspaces including higher subabul production as compared to control (on crops in the interspaces of Ber). However, there was some reduction in fruit yield under the agroforestry system, but this was compensated by food grain production higher subabul fodder and fuel yield as compared to Ber fruit trees under control.

On the basis of 5 year results (1989-94) the study revealed that Ber based agroforestry system can be ideally suited for the semi-arid conditions, where the soils are poor, moisture a limiting factor and climate conditions very hostile. The Ber due to its zerophytic character can be raised profitably. The farmers will also accept the system without much efforts.

HUMAN RESOURCE DEVELOPMENT

1. Dr. R.P. Dwivedi, Scientist
   (Extension) attended third summer school on Management of Common Property Resource at Indian Institute of Management, Ahmedabad.
2. Dr. S.K. Shukla, Scientist (Horticulture),
   Shri Ajit, Scientist (Statistics) and
   Dr. A.K. Handa, Scientist (Forestry)
   attended Short Course on "Recent Advances in Agroforestry and its Role in Conservation of Soil Water and Biodiversity at NRCAF, Jhansi (June 4-13, 1997).
3. Dr. P. Rai, Principal Scientist attended training course on "Rapid, Relaxed and participatory Rural Appraisal for Identification of Field Problems for Formulation of Research and Extension Programmes in Agriculture" at National Academy of Agricultural Research Management, Hyderabad.

Supervision and Guidance : Dr. K. R. Solanki, Director, NRCAF, Jhansi

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