Agroforestry
NEWSLETTER

Vol. 7 - 1 & 2 JAN-APRIL 1995 Quarterly

Benefits of agroforestry

AGROFORESTRY has been recognised by the International Centre for Research in Agroforestry, Nairobi, as an appropriate strategy to solve problems of rural development, particularly in the marginal regions in the tropics, and to harmonise optimal productivity with enviromental sustainability.

The centre has successfully demonstrated that it is possible to have rural development with environmental sustainability, instead of increasing competition among forestry products, crops and livestock goods.

Dry lands cover vast areas in the tropics, and may be considered to suffer from frequent,periodic or even permanent stress. Desertification, says Dr H.J.Von Maydell of West Germany's Institute for World Forestry, is an ever-present threat to farmers.

Urbanisation on or near fertile agricultural lands and the processes of boosting agricultural production and rural development have been increasingly burdening the human ecological carrying capacity The speed of desertification, the loss of fertile lands, biodiversity and genetic variety and water supplies, and a global, or at least regional climate change, is alarming. No time must be lost to balance the effects, actions and policies with environmental compatibility , according to Dr Maydell.

Researchers have expressed the necessity of bringing home to those concerned that agroforestry may be better than, or at least competitive with, other forms of traditional or modern land use, foremost with agriculture or with social forestry

Dr. R. Deb Roy of the National Research Centre for Agroforestry, Jhansi has expressed the view that if we have to achieve the sustainability in agriculture and to save our environment we hardly have any other alternative but to follow integrated agroforestry systems using multipurpose and nitogen fixing trees and shurbs, not only in cultivated and marginal lands, but also in some of the wastelands in various agroclimatic regions to solve some of the pressing problems and amelioration of polluted environments, and also to achieve the national target of 33 percent of the total land area under tree and grass cover

Dr. Panjab Singh, of the Indian Grassland and Fodder Research Institute, Jhansi, feels somewhat relieved that work done over the past five years on improved technique viz. multi- tier agroforestry and improved grassland management systems, backed with appropriate soil-water conservation practices on degraded lands, have not only stopped degradation of resources but have also improved plant and animal producitivity and resources status for sustainable development

Dr. A.S.Gill also of the National Research Centre for Agroforestry, has observed that environment and agroforestry systems are well related to each other Through agroforestry systems there has been a reafforestation process Agroforestry systems proved to be an advantageous mechanism during droughts and floods Wind breaks, shelter belts, planting trees on fields and farm reduce the dependence on fertiliser, provide greater nutrient out-turn, and improve soil fertility.Agroforestry systems have earned a place for sustainable agriculture and environment These systems have also provided fodder, fuelwood, timber, fibre, fruits, medicines and other products for the daily need to the farming community

C.M.Kumbhkarni **Environment** [THE TRIBUNE WEDNESDAY, APRIL 26 1995 (5)]

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INTENSIVE FEED GARDEN

Intensive Feed Garden (IFG) is the planting of forage and leguminous trees together on a piece of land as potential nutritional source of animal feeds throughout the year. It requires 200 sq. m. of land to feed 5-6 heads of native goats and about 400 sq.m. to feed a cattle.

The concept of an IFG aims at maximizing the production of fodder in a limited land area (10m x 20m) through extensive cultivation of leguminous trees/shrubs and grasses (Fig. 1). This technology is recommended where compound farming is practiced and livestock have to be confined. It is appropriate where feed is scarce and not readily available or for "cut-and-carry system.

BENEFITS FROM AN INTENSIVE FEED GARDEN

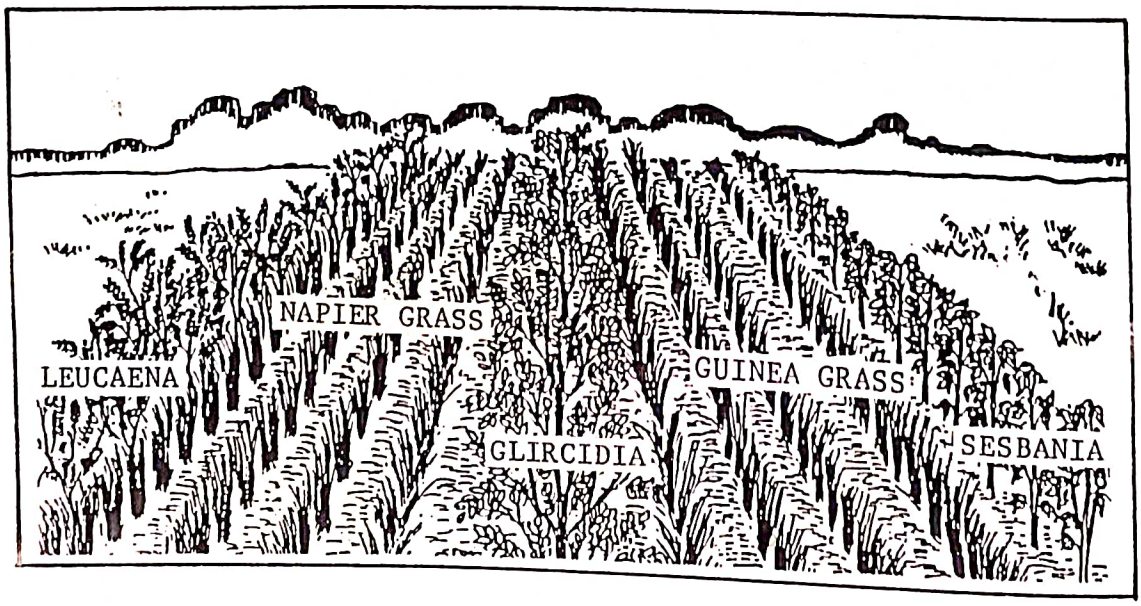
1. Provides renewable and inexhaustible source of nutritious, and palatable fodder,fuel and green manure.
2. Curbs soil erosion, conserves soil moisture and increases soil fertility.
3. Increases the productivity of a given piece of land by interplanting diverse species of fodder trees, shrubs, and grasses.
4. Provides a stable agricultural system for semi-arid tropics, drought-stricken areas and other adverse environments.
5. Reduces danger of toxicity problems from noxious weeds and contaminated poisonous fodder..

LAND PREPARATION AND PLANTING

The land should be cleared of all weeds before land preparation and planting. Since forage grass seeds are small, they require a fine seedbed. If vegetative planting materials are used, a rough seedbed is tolerated. *Leucaena* and *Sesbania* can be planted either on a flat or ridged land and must be planted ahead of the forage grass to minimize shading for the first 4-6 weeks. Forage trees may be planted by direct seeding or by seedlings previously raised in a nursery. Direct seeding in easier, cheaper and feasible in area where annual rainfall is 1200 mm or more with a minimum growing season of about 200 days. Planting by seedlings is recommended at the start of the rainy season. If irrigation is available, planting can be done any time of the year. In drier environments, one seedling per hill is desirable. *Leucaena* seeds have hard seed cover and should be scarified with hot water treatment. Both *Leucaena* and *Sesbania* seeds should be inoculated with soil from areas where the trees are already growing before planting so that they will have the ability to nodulate and fix atmospheric nitrogen.

The information is brought out by Agroforestry Technology Information Kit (DENP/IIRR/FF)

Dr. A.S.Gill, Director
NRCAF, JHANSI.



NFT BASED AGROFORESTRY SYSTEMS IN DRYLANDS OF ANDHRA PRADESH

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The agroforestry experiments with NFTS which are fodder yielding were takenup to study their potential use specially in drylands. Subabul (*Leucaena leucocephala*) was intercropped with castor to which four doses of nitrogen (N) application viz No N, 50 % less of recommended dose of N, recommended dose of N and 50 % more of recommended dose of N were imposed. Perusal of data showed that sole crop of castor resulted in higher yield over the intercropped castor irrespective of N application during both the years of study. Lower yields of castor with subabul may be due to competition from the tree providing shade, specially during 1994. (4th year of the tree). Higher dose of N application, though increased castor seed yields but did not compensate the yield loss due to, shading. Thus, it can be inferred that the subabul trees have to be pollarded to enhance the crop yield which provides about 10% leaf foliage of the total biomass which can be used as fodder during off season specially in drylands. In the second experiment, Sissoo (*Dalbergia sissoo*) another NFT was intercropped with castor and sunflower during 1993 and 1994 after 2 years stylo and 3 years stylo in addition to continuous cropping and cropping after 2 and 3 years follow, at three levels of N (No N, 50 % less recommended dose and recommended dose of N) The results revealed that cropping of castor and sunflower after 2 and 3 years stylo resulted in higher seed yields of castor and sunflower over continuous cropping and cropping after 2 years fallow at all levels of N in both the years. The seed yields of castor and sunflower at 50 less recommended dose of N after 2 and 3 years stylo were almost similar to the yields recorded at recommended dose of N in continuous cropping. It is evident that the yields of castor and sunflower are decreasing year after year in association with Sissoo which may be due to competition from the 4 years old trees. To get good yields of associated crops at the age of fourth year, the Sissoo trees have to be pruned/ lopped which provides 20% of green fodder that can be used as off season fodder. In another experiment African babul (*Faidherbia albida*). yet another promising NFT was under planted with castor, sunflower, and redgram for a period of five years starting from 1988 onwards in three different tree spacings (3x3, 4.2 x 3 and 5.4 x 3 m). The yields of castor, sunflower and redgram as intercrops with African babul were not decreased significantly as compared to yields of respective sole crops during all the five years, of study. This is mainly because of decidous habit of tree during Kharif season and deep rooting habit as well. The tree regenerates its new foliage during October onwards which yields about 10% pod of total biomass which can be used as green fodder during dryseason specially for goats and sheep.

VARIABILITY FOR LEAF CHARACTERS AMONG BABUL (ACACIA NILOTICA) PROVENANCES UNDER RAINFED CONDITIONS

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A provenance trial (Range-wide provenance samling phase) was initiated in 1993-94 at Forestry Research Farm, J.N.K.V.V., Jabalpur to determine the extent and pattern of variation between *Acacia nilotica* provenances (populations) under rainfed conditions.

Three months old seedlings of ten *Acacia nilotica* provenances were transplanted in a R.B.D. with three replications in the second week of July, 1993. Rows were 5 m apart and trees were 1 m apart within rows.

At the age of six months, provenances were evaluated in respect of 10 growth characters. Analysis of variance revealed significant differences among the provenances, for two leaf characters viz; number of pairs of side axes and length of leaflets (Table 1).

Table 1. Mean performance of Acacia nilotica provenances after six months in respect of 10 growth characters under rainfed conditions.

Provenances (Seed sources)	CHARACTERS									
	Plant height (cm)	db10 (cm)	db 30 (cm)	No. of primary branches/ plant	Length of spines (cm)	No. of pairs of side axes	Length of leaves (cm)	Length of Pinnae (cm)	No. of pairs of leaf lets	Length of leaflets (cm)
1. Bilaspur	128.8	1.6	1.3	32.0	1.9	2.6	3.0	1.3	12.9	0.4
2. Murena	118.7	1.5	1.3	34.4	2.3	2.6	3.0	1.3	12.2	0.4
3. Pinjore	117.4	1.4	1.1	31.2	2.1	2.4	2.9	1.3	11.9	0.4
4. Pune	128.2	1.7	1.4	35.6	1.9	2.6	3.0	1.3	12.2	0.4
5. Jhansi	124.6	1.6	1.3	32.3	2.2	2.6	3.4	1.4	12.8	0.4
6. Firojpur	134.2	1.6	1.3	32.3	2.1	2.7	3.5	1.4	12.1	0.5
7. Datia	112.3	1.3	1.1	32.0	2.3	2.4	3.0	1.3	11.8	0.5
ε Yemen	129.1	1.6	1.3	34.6	2.2	2.4	3.1	1.3	11.7	0.5
9. Hyderabed	115.7	1.4	1.1	29.3	2.0	2.4	3.0	1.3	11.2	0.4
10. Local	123.5	1.5	1.2	29.2	2.1	2.6	3.3	1.4	12.0	0.4
GX	123.2	1.5	1.2	32.3	2.1	2.5	3.1	1.3	12.1	0.4
SEM±	4.6	0.1	0.1	1.4	0.2	0.1	0.2	0.1	0.6	0.02
CD	--	--	--	--	--	0.2**	--	--	--	0.06*

**, * CD at 1%, and 5%, respectively.

For the character number of pairs of side axes. Firojpur provenace (2.7) was found significantly superior over the provenances viz. Datia (2.4), Yemen (2.4) and Hyderabad (2.4) and was at par with the remaining provenances. For the character length of leaflet, Firojpur provenance (0.5 cm) was found at par with Datia (0.5cm) and Yemen (0.5 cm) provenances but significantly excel in leaflet length over the remaining provenances of the set (Table 1).

ARRESTING ROOT INVASION OF TREES

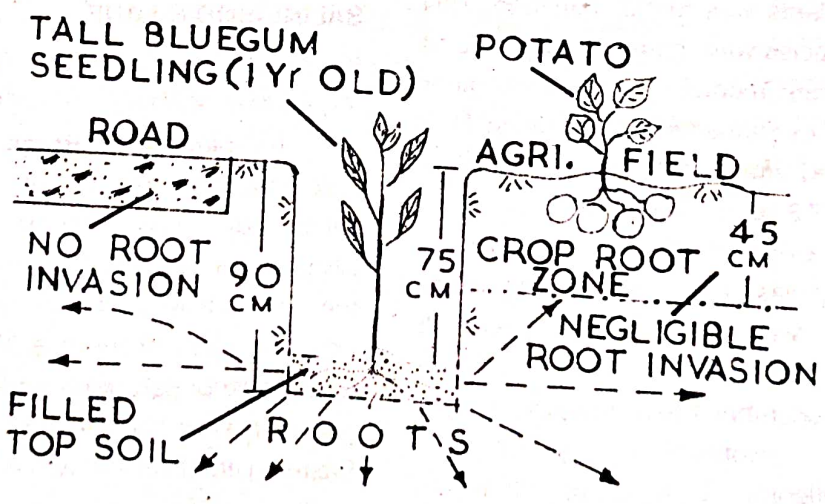
K.Jeevarathnam, P. Samraj and C. Henry

Central Soil & Water Conservation Research & Training Institute Research Centre, Udhagamandalam.

In the Nilgirls, bluegum (*Eucalyptus globulus*) trees are grown in agricultural fields and as plantation because of its advantages such as fast growing, non-browsing and more blomass production. In agroforestry, the root effect of these trees in agricultural fields is an important factor to be considered. The invasion of roots of bluegum trees into the crop root zone reduces the yield of agricultural crops due to extraction of nutrients and moisture, apart from interference with agricultural operations.

The tap root system of a mature bluegum tree of twenty years old penetrates deeply as much as six metres and superficial roots spread laterally to about eight metres. The superficial feeder roots invade into the agricultural fields and compete with crops and reduce the yield to the tune of 30 to 40 percent.

To minimise these undesirable effects, a study was started in 1983 at the (Central Soil & Water Conservation Research farm, Octy. The results reveal that about 75 to 80 percent of the lateral roots can be arrested from invading into the crop root zone by planting tall seedlings (1 to $1^1/_2$ years old) in deep pits of 60X75X90 cm. The purpose of planting tall seedlings is that there can be casualties initially due to water stagnation by excess rainfall. The data on height and dbh of bulegum trees indlcate that planting tall seedling in deep pits hastened the initial growth of trees due to better moisture conditions in pits (2.0 to 2.5 m annual increment). It is found that 20 to 25 percent of small feeder roots enter the crop zone of agricultural fields to a distance of about three metres from the trees and reduce the crop yield (Potato) by 10 percent. Most of these small feeder roots get eliminated during regular tillage operations. Similar results were obtained in case of trenching in between



bluegum plantation and agricultural field. Hence, if the bluegum trees are to be raised as plantation, trenches are to be excavated to a depth of 90 cm in between the agricultural fields and plantation area. The method of planting tall seedling in deep pit is best suited for trees to be grown on farm boundaries.

By adopting these planting methods and soil working techiques, the roots are trained in the initial years of planting and allowed to spread and penetrate below the level of root zone of agricultural crops.

SURVIVAL OF MPTS IN RANGELAND AFTER FIRE - A EXPERIENCE

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National Research Centre for Agroforestry.

Jhansi - 284003

Seventeen multipurpose tree species (MPTS) were introduced in rangelands during August 1988 to select the suitable MPTS. Evaluation of MPTS is still continued under rainfed conditions in red gravelly soils. Due to extreme high temperatures fire incidence took place on 16th May 1994 and data on damaged species were recorded during end of June 1994. Three species viz. L.leucocephala, M. azaderach, A. pendula were damaged 100% followed by A. nilotica (90.9%), A. lebbek (88.8%) and A. amara (75.0%). In case of D. strictus, D. cinerea, E. officinalis, H. binata and M. latifolia none of the plants was found damaged. This shows that these 5 species were hardy and capable to tolerate natural fire. Date recorded during December 1994 reveal that species damaged 100% during May 1994 again regenerated after cutting in June, 1994 at the tune of 92.9, 77.8 and 100% in case of L. leucocephala, M. azdarach and A. pendula, respectively. Further, it was observed that in case of A. lebbek, A. procera, D. sissoo, A. indica; T. arjuna, all the plants damaged during May 1994 were again regenerated during December 1994. However, in case of A. amara, A. nilotica, A.cuppressiforms, M.azedarach, E. tereticornis, L. leucocephala plants could regenerat at the tune of 43.8, 36.4, 28.6, 22.3, 16.7 and 7.1%, respectively as such these species seemed to more succeptible to fire hazards. Out of seventeen species, 5 species (D. strictus, D. cinerea, E. officinalis, H. binata and M. latifolia) have more tolerance capacity to fire incidence while 6 species (A.cupressiformis, A. amara, A. nilotica, M. azedarach, E. tereticornis and L. leucocephala) are more succeptible to fire hazards.

KINNOW-TURMERIC LANDUSE SYSTEM IN V-SHAPED MICRO- CATCHMENT WITH MULBERRY AS SURROUND IN HEDGE ROW FOR SUSTAINED PRODUCTIVITY

Y.K.Arora

Central Soil & Water Conservation Research & Training Institute.

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After 6 years of establishment, Kinnow- Turmeric system in V- shaped microcatchment with **Morus alba** surrounded hedge row produced 6.86 t/ha Kinnow fruits, 1.00 t/ha turmeric from interspace and 2.41 t/ha canes for basket making, 1.41 t fuel wood and 0.83 t leaves for sericulture from **Morus alba** hedge row surround (Table-1). Such systems appear as alternate landuse for marginal class II rainfed land for sustained productivity.

PARAGRASS FOR SILVIPASTORAL SYSTEM ON SALINE-SODIC LAND

B.S. Rana, A.K. Saxena, O.P. Rao and B.P. Singh

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The paragrass **(Brachiaria mutica)** has been recommended as one of the useful grasses for saline-sodic soils. Introduction of paragrass in silvipastoral system of agroforestry not only augments the productivity level but also has an ameliorating effect-on such problem soils. The study on biomass production of paragrass under a mixed tree stand and open area on rain-fed saline-sodic soil of a part of Eastern Uttar Pradesh was carried out.

Table-1: Kinnow-Turmeric- Morus landuse system in V-shaped microcatchment.

Treatment	Av. No. of fruits/tree	Fruit yield (t/ha)	Av. fruit weight (g)
	1994	1994	
Kinnow mandarin (5m apart 400/ha)	245	6.86	70

Hedge Row Surround of		Cane Yield for Basket kg/tree	t/ha	Fuel Wood Yield kg/tree	t/ha	Yield of Leaves kg/tree	t/ha
Morus alba (0.5 x 0.5m)	1994	2.20	2.41	1.30	1.41	0.77	0.83
Turmeric (2460 Sq m in 1 ha) t/ha orchard				1994 1.00			

Of the two paragrass stands selected, one stand was under the tree cover and other was an adjacent open stand. The above ground biomass was harvested from ten, 50x50cm randomly disposed quadrats in both stands at monthly intervals from October, 1992 upto September, 1993. Above ground material included standing live (green biomass) and standing dead components. The samples were oven-dried.

Periodic changes in aboveground biomass (Live + standing dead) of two stands are given in table 1. The aboveground biomass of paragrass ranged from 314.3 to 647 g m-2 in open area (Stand I) and 392 to 821.9 g m-2 in tree stand (Stand II). As evident from the data, the lowest biomass was reflected in the month of March and highest in September for both the stands. Interestingly, across all the months, the stand II had more grass biomass than in stand I. Biomass showed a general decline from October to May, although a small rise in green biomass occurred during January and February, apparently due to winter rainfall. Biomass increase (%) in stand II over stand I during study period followed the order: Summer (March- May) rainy (June-September) Winter (October-February). Greater biomass increase (24.7- 59.4%) during summer period (Table 1) reflects the moderating effect of tree cover on soil moisture regime and other microclimatic factors. The annual above ground net production in stand II (590.3 g m-2 Yr-1) was greater than the net production (526.1 g m-2 Yr-1) in stand I.

Kinnow - Turmeric Land use system in v sheped micro coskhment with mulbery

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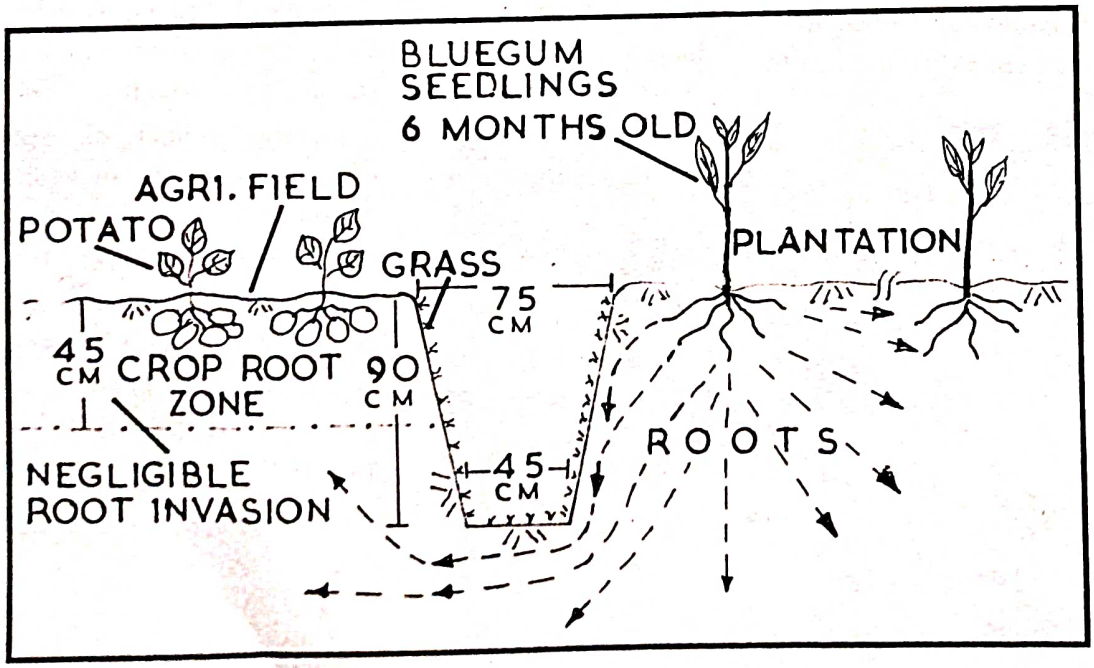
Table 1: Above ground biomass in two paragrass stands on saline sodic soil.

Month	Above ground biomass (g m -2)		Percent biomass increase in stand II over stand I
	Stand I (Grass in open area)	Stand II (Grass in tree stand)	
October	637.0	752.2	18.1
November	605.8	705.5	16.5
December	528.8	634.0	19.9
January	628.3	667.1	6.2
February	678.6	729.6	7.5
March	412.6	657.7	59.4
April	384.6	574.5	49.4
May	314.3	392.0	24.7
June	319.8	398.0	24.4
July	387.0	509.0	31.5
August	497.5	587.3	18.0
September	647.8	821.9	26.9



[Ref. Jeevarathnam *et.al.*]

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AGROFORESTRY CALENDER

S.No.	TITLE	DATES	PLACE	CONTACT POINT
1.	Seminar on Agroforestry for higher crop. biomass and soil productivity with special reference to Bundelkhand regeon.	June 26-27 1995	Jhansi	Dr. P.Rai, Org. Secretary NRCAF, Jhasni (U.P.) 284003
2.	National Symposium on Intergrated Watershed Management for Sustainable Production.	Sept. 6-8 1995	Balachaur	Dr. H.S. Sur, Reg. Res. Station Ballowal, Teh. Balachaur Dist. Hoshiarpur (Punjab)
3.	International Neem Conferene	Feb. 4-9 1996	Australia	Dr. Efol Hassan Plant Prod. Dept. The Univ. of Queensland Gatton College Lower,Queens land. 4343, Australia
4	II International Crop Science Congress	Nov. 17-23 1996	New Delhi	Dr.S.K. Sinha IARI, New Delhi : 110012 India
5.	II Congress on Traditional Science and Technologies of India.	Dec. 27,1995 Jan 1,1996	Madras	Dr. L.Kannan, Traditional S & T Congress Sectt.Student Centre Anna University Madras : 600025 India
6.	International Seminar on Sustainable Reconstruction of highland and headwater regions	Oct. 6-8 1995	Delhi	Dr. R.B. Singh, Dept. of Geography, Delhi School of Eco. University of Delhi Delhi : 110007
7.	National Workshop on Combining Sustainable Development & Biodiversity Conservation in integrated watershed management	June 14-17 1995	Bhopal	Dr. T.H. Babu IIFM, P.Box 357 Bhopal : 462003
8.	4th International Course on Fodder Tree Legumes-Multipurpose Species for Agriculture	Nov./Dec. 1996	Australia	Course sect.. Dept. of , Agriculture The Univ. of Queensland St. Lucia Queensland. 4072
9.	Annual Congress 95 (Plant Genetic Resources)	Nov 16-17 1995	Sri Lanka	Congress office PGIA P.O. Box 55 Peradeniya Sri Lanka.
10.	National Workshop on soil resource inventory for perspective use planning	Sept. 26-29 1995	Nagpur	Dr. J.L. Sehgal, Director, NBSS & LUP, Amravati Road, Nagpur-440010.

Edited & Compiled by : Dr. A.S.Gill, Dr. A.K Bisara

The agroforestry newsletter aimed at providing important highlights on research, development, education and training in India published quarterly by the National Research Centre for Agroforestry (ICAR) Jhansi. Contributions, letters, comments, queries, etc. on any aspects of agroforestry may be sent to Director, NRCAF, Jhansi (India):284003

Date of Printing:10 May 1995
Published by:
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Printed at : Veer Bundelkhand Press (Offset Printers), 178, Gusainpura, Jhansi : Phone : 0517 - 440931