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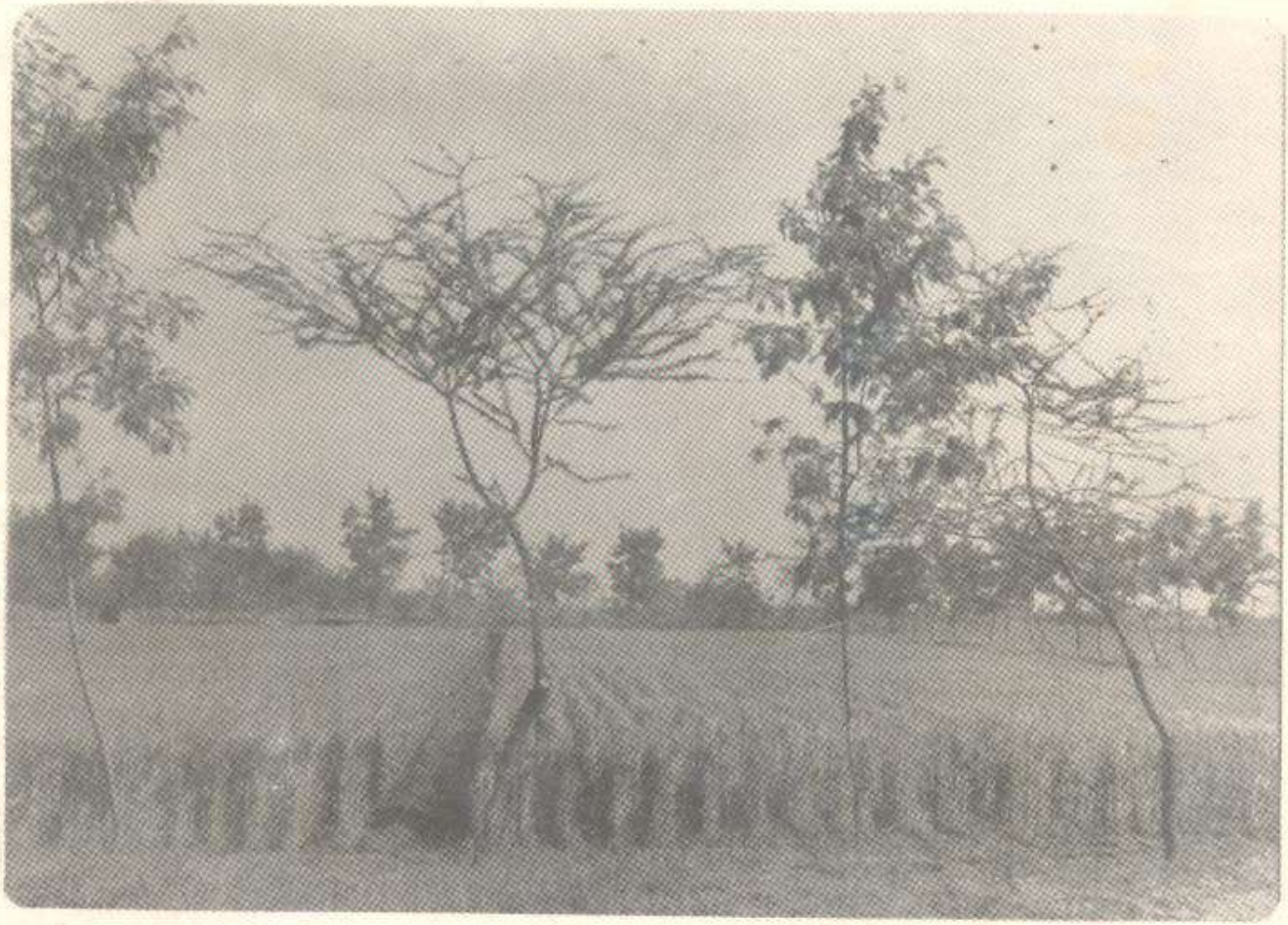

Edited by
Dr. R. DEB ROY Dr. A. S. GILL

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Agroforestry Newsletter 5 (2) : 1993

AGROFORESTRY ECOSYSTEM FOR SUSTAINABILITY, ENVIRONMENT AND BIODIVERSITY

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Indian Council of Agricultural Research

NEW DELHI-110 001

Agroforestry research in India is in progress for the last 10 to 15 years. Major emphasis was to provide the much needed fuel, fodder, small timber, poles and tree products to the rural people. In farming system tree as a component has gained popularity. Today the farmers asking for fast growing and high yielding tree seeds/seedlings. For example, poplar with rice- wheat rotation has become a common practice in the Indo-gangetic plains, and Casuarina is very popular in the coastal areas of India as mini blocks and on farm boundary but the most important role of agroforestry is ignored or given low priority. These are shade, shelter, environment, sustainability and biodiversity. All these are well known to farmers as it is entrenched in our ancient Indian tradition.

In agroforestry sector sustainability is more apt and valid. The mini forest ecosystem of the agroforestry, say a single large tree, scattered trees, rows or strips of trees on borders, on boundary, small blocks of trees, shrubs in eroded marginal areas of the farm represent the most ideal environmentally sound sustainable concept with biodiversity.

My close observations for the last 40 years in forest tree, agroforestry, social forest ecosystem have encountered wonderful and close association of plant and animal kingdom of all shade and the fabric is so well interwoven that one wonders how this biodiversity exist under such a rigid biotic interference in the farmers field.

In the hills of Himalayas and western ghats if one watches closely under a conifer, oak, alder, bemal, chinar, walnut, jack, dipterocarps, shola forests etc. a good deal of epiphytes, parasites, herbs, climbers, shrubs, tree seedlings, lichens,ferns, mosses can be seen. The close biodiversity of plants and animals in tree, an agroforestry ecosystem can be well seen. Birds nests, reptiles like lizard, snakes, insects, all arthropods, mollusks, amphibia, aves, mammals can be seen crawling or jumping over its branches and are protected by these trees. One can also see men and cattle taking rest under the tree for shade and for shelter. One can watch village folk playing under these trees, singing songs. Ladies and men seen congregating around trees, going round them enchanting mantras, and worshipping with full of devotion and in deep tranquility. It gives psychological mental satisfaction. During a visit to a farm and advising about tree planting, its management and harvest, in the centre of the farm was a "Durgah" covered by a chadar and all round it were 50 to 60 years old trees well protected. It was the common feeling that whoeverthought to cut the trees the Muslim saint appeared in his dream telling him not to cut the tree because he use to meditate under it when he was alive. Thus protecting trees goes beyond the concept of a religion and is based on the basic concept of biodiversity and environmental safeguard. In arid Rajasthan and Gujrat it is commonly observed tree grooves around temples, durgahs and churches.

Protection and sustainability is a global issue. Ecological consideration of these ecoystem have far reaching effect in meeting local, regional, national and global socioeconomic and environmental objectives. The role of ameliorating climate, aesthetic, recreational value, protection of endangered species extends beyond the borders of national both trans boundary and regional as well as global levels. One can see birds travelling long distances, crossing several nations and resting on a village agroforestry trees.

An agroforestry ecosystem which is environmentally important can provide sustainability and also extend biodiversity of fauna and flora depends on the location. With varied climatic, edaphic and physiographic conditions it will be highly site specific. The agroforestry system that can be adopted to meet such requirement are the scattered trees of khejri, babul, anjan etc. Border rows of trees like siris, neem, tamarind, babul, mango, jamun, jack, coconut etc. are quite common. There are many agroforestry ecosystem which are of great local importance for environmental sustainability and biodiversity. These have to be identified, studied, recorded, disseminated and published. For the prosperity of rural and urban people the agroforestry ecosystem has to be systematically established all over the country.

Biomass production from MPTS in Agri-silvicultural studies

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Agri-silvicultural studies were initiated during 1988-89 at NRCAF, Jhansi. In all there were 12 important MPTS as tried in the investigation with 3 spacings (4x2, 6x2 and 10x2M) and in the interspaces arable crops were raised in rotations. The experiment was partially irrigated during the winter season. Control plots were also maintained of MPTS in a spacing of 2x 2 M.

During July 1992, 40 per cent plants were harvested increasing the spacing from 4x2, 6x2 and 10x2 M to 4x4, 6x4 and 10x4 M, respectively. The data in respect of fresh and dry weight of foliage, fuel and total biomass is reported in Table 1. *Eucalyptus* registered the maximum biomass both under control as well as under agroforestry system. It recorded highest yield of follage as well as fuel under all conditions. Next in order was *Acacia cupressiformis*. It was superior in terms of fuel yield. Third in order was *A. lebbek* and *Leucaena leucocephala* under control and agroforestry system, respectively. Except *Leucaena* all other MPTS recorded less biomass under agroforestry situation compared to control. Minimum biomass yield was registered with *S. cumini* and *M. latifolia* under control and agroforestry system respectively. Control yields were higher mainly due to high density as compared the yields under agroforestry sytem, which is an average of three speciengs.

Table 1: Above ground biomass yield (t/ha) of MPTS

MULTIPURPOSE TREE SPECIES		CONTROL *			AGFORORESTRY **		
		Fo	Fu	Total	Fo	Fu	Total
A. nilotica	FW	2.56	48.68	51.24	3.00	29.31	32.31
	DW	1.18	30.30	31.48	1.76	17.91	19.67
A. cupres -siformis	FW	3.87	83.50	87.37	2.14	36.20	38.34
	DW	2.17	54.19	56.36	1.23	20.14	21.37
C. equiset -ifolia	FW	1.62	23.00	24.62	2.25	12.00	14.25
	DW	0.53	11.73	12.56	1.32	7.25	8.57
M. latifolia	FW	1.00	9.06	10.06	0.74	1.73	2.47
	DW	0.47	4.28	4.75	0.27	0.79	1.06
L. leucocep -hala	FW	2.37	14.75	17.12	2.27	20.66	22.93
	DW	1.52	9.67	11.19	1.06	12.31	13.37
D. sissoo	FW	2.45	75.00	77.45	4.26	17.41	21.67
	DW	0.85	41.43	42.28	1.66	8.90	10.56
A. lebbek	FW	15.00	63.12	78.12	3.82	15.66	19.48
	DW	6.74	47.91	54.65	1.68	8.90	10.58
S. cumini	FW	0.67	5.00	5.67	2.87	7.91	10.78
	DW	0.29	1.80	2.09	1.19	3.33	4.52
E. teretic -ornis	FW	33.84	124.87	158.71	11.32	64.11	75.43
	DW	20.30	73.75	94.05	5.74	38.15	43.89
E. officinalis	FW	1.13	16.25	17.38	2.06	11.35	13.41
	DW	0.54	8.94	9.48	0.85	6.12	6.97

FW : Fresh weight ; **DW** : Dry weight ; **Fo** : Fodder ; **Fu** : Fuel.

* In control MPTS spacing was 2 m X 2 m.

** In Agroforestry situation the values are an average of three MPTS spacing (2x4, 2x6 and 2x10 m).

Effect due to boundary platation of *Eucalyputs* on the yield of wheat

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Since two and half decades ago, boundary lantation of *Eucalyptus* is very common in punjab. Now days, it has come under severe criticism due to the omplain of yield reduction in field crops as well as its dverse effect on soil and crop ecosystem in the vicinity the *Eucalyptus* tree line. Keeping this in view, series of vestigations , were conducted during 1989-90 and 990- 91 at PAU, Ludhiana.

GRAIN YIELD : results revealed that the percent ss in grain yield of wheat increased from 15-30 percent th the increase in age of *Eucalyptus* trees line from 2-9 ars. Maximum reduction (29.8-38.0%) in grain yield as recorded on the northern aspect where adverse fect was upto 30m. Minimum loss was on the southern pect (18-20%) and area affected came down upto -20 m distance from tree row. Maximum reduction of ain yield varied between 46-60% at the nearest stance from tree line (0-5 m). This variation depends on the age on trees and row direction of tree line.

SOIL AND CROP ECOSYSTEM : The interference *Eucalyptus* tree line (16 years old) with the incoming ar radiation caused marked change in the soil and p environment on different planting aspects, ticularly the northern aspect. Since the *Eucalyptus* es canopy intercepted about 55% of the total oming solar radiation on the northern aspect, as a ult PAR interception by wheat canopy on the northern aspect reduced to 23.2 to 34.6% at different distances from the tree line. On an average basis, the wheat crop planted on northern, eastern and southern aspect intercepted 28.3, 59.6 and 70.4%, respectively.

The *Eucalyptus* trees had markedly reduced the soil moisture content in 0-180cm soil profile upto 15 m distance from the trees. Northern aspects recorded relatively more soil moisture due to shade effect. *Eucalyptus* tree line added litter fall in the wheat field @ 24.2 to 30.8 kg/ha at 0-5 m distance and 1.30 to 2.65 kg/ha at 25-30 m distance from the tree line, from sowing to harvesting. The maximum litterfall was recorded on the southern aspect.

The available nutrients like nitrogen, phosphorus and potassium were not found limiting, rather these nutrient were more near the tree line in whole of the 0-180 cm soil profile than control. Regarding the allelopathic effect of *Eucalyptus* trees on the wheat growth and yield, it was observed that wheat yield was significantly reduced in soil collected from 2.5 m and 7.5 m distance from the tree line than control (37 m). It seems to be due to allelopathic effects only.

MITIGATION OF YIELDS : Considerably these losses can be reduced if row direction of tree line would be kept in north-south direction. Moreover the distance between *Eucalyptus* trees should not be 3 m. In case of root pruning (trenching), it increased the grain yield by 4-5 q/ha over the non-trenching treatments. Furthermore, these losses can be minimised by the manipulation of agronomy practices for 10-15 metre wide strip alongwith the *Eucalyptus* tree line, particularly dates of sowing and irrigation schedule etc. may play vital role.

Evaluation of MPTS and grasses on salt affected soils of U.P.

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Field experiments on different MPTS in combination with natural and cultivated grass species on the slat affected soils were carried out at the Regional Research Centre, Daleepnagar (Kanpur Dehat), C.S.Azad University of Agriculture & Technology, Kanpur during 1991-92 and 1992-93. The soils of the experimental site were aquack and aric netrustalf which consist of ustalf, ochrepts and orthants. Infiltration rate on such soils are poor and presence of a hard pan of calcium carbonate at 60-90 cm depth, high pH (9.5 - 10.5) and ESP (35-81) with good quality underground water.

MPTS establishment and growth : *Dalbergia sisoo, Albizia amara, Terminalia arjuna* and Prosopis juliflora gave cent per cent survival followed by 82% in *Leucaena leucocephala*, 75% in *Azadirachta indica* and least (56%) in *Syzygium cumini* during March. *Prosopis juliflora* maintained 100% survival followed by *Dalbergia sissoo* (90%) *Albizia amara* (88%), *Leucaena leucocephala* (78%) and least in *Syzygium cumini* (52%) during October.

In March, highest plant height of 155 cm was recorded with *Eucalyptus hybrid* followed by *Leucaena leucocephala* (140 cm), *Dalbergia sissoo* (125 cm), *Prosopis juliflora* (110 cm) and minimum (60 cm) with *Albizia lebbek* . Highest plant height (190 cm) was in *Leucaena leucocephala* followed by *Prosopis juliflora* (180 cm), *Eucalyptus hybrid* (170 cm), *Dalbergia sissoo* (140 cm) and least in *Terminalia arjuna* (80 cm) in October.

Leucaena recorded maximum collar girth (4.2 cm) followed by *Terminalia arjuna* (3.2 cm), *Azadirachta indica* (3.1 cm) and minimum (2.3 cm) in *Syzygium cumini* and *Albizia lebbek* in March. During October maximum collar girth (6.0 cm) was observed in *Prosopis juliflora* followed by *Leucaena leucocephala* (5.6 cm), *Dalbergia sissoo* (4.8 cm) and least (3.3 cm) observed in *Syzygium cumini.*

Forage Production :

Brachiaria mutica commonly known as para grass established well on sodic soils and produced highest green forage yield (780 q/ha) with 16 q/ha of Pyrite application under irrigated condition. Other grasses in order of productivity were *Chloris gayana* (660 q/ha), *Leptochloa fusca* (625 q/ha) and *Setaria sphacelata* (540 q/ha). The yield levels of these grasses with the application of 50 q/ha FYM and without any amendment (control) were in the same order. Yield levels of the grasses were low under rainfed silvipastoral system. *Brachiaria mutica* produced 300 q/ha green fodder with 50 q/ha of Pyrite application. Productivity of *Setaria sphacelata, Chloris gayana* and *Leptochloa fusca* were 175 q/ha, 160 q/ha and 120 q/ha, respectively.

Effect of FYM on growth and yield of *Albizia falcataria*

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ICAR Research Complex for N.E.H. Region

Barapani - 793 103, Meghalaya

Albizia falcataria a fast growing leguminous nitrogen fixing, multipurpose trees is one of the species as evaluated for its suitability in agroforestry systems on hill slopes (29-36%) of an acid Alfisol (pH 4.9, organic C

1.77%, exch. Al. 148.6 mg kg-1, exch. Ca. 240.5, exch. K. 66.7, Bray's P_2-P 1.2, Ri-Bhoi district, Meghalaya. It exhibited 90% survival with maximum height and diameter increments over 5 years of planting and excelled amongst other MPTS, indicating thereby its better adoption on inherently poor soils, though the species has a well spread crown but the branching pattern and leaf arrangement are such that it allows sufficient light for the under storey crops. In addition it also adds a large quantity of organic matter through litterfall which serve as an effective soil mulch as well as manure. Notably a much spectacular increase in tree diameter (60%) and timber volume (200%) was recorded in the plants treated with FYM @ of 10 kg plant per annum over no FYM (Table 1).

Table 1: Effect of FYM on *Albizia Falcataria* growth, timber volume and biomass production (age 5 years)

Treatment		Height (m)	DBH (cm)	Spread (m)	Timber volume cum ha-1	Biomass (kgplant -1)*
FYM	(F_1)	12.8	24.8	10.1	251.3	147.1
No FYM	(F0)	10.6	15.5	7.9	85.3	65.7

* Air dry weight basis

Alley Cropping with Sesbania Sesban

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Sesbania sesban is a fast growing nitrogen fixing tree species having multiple uses. It can withstand coppicing. In the present study the effect of 4 alley width of *Sesbania sesban* (without alley, alleys at 4m, 6m and 8m) was investigated on the productivity of forage sorghum (PC-6) - chickpea (Radhe) sequence at IGFRI, Jhansi during 1992-93.

In the year of establishment the varying alley width of Sesbania sesban (Table 1) had no significant effect on the dry matter yield of sorghum, however, there was reduction in production by 8.1, 6.1 and 3.6 per cent over control (60.4 q/ha) under 4,6 and 8m alley width, respectively.

The succeeding crop of chickpea exhibited significant reduction in grain and straw yield due to differential alley width of *sebania* (Table 1). The highest grain (20.3 q/ha) and straw (31.3 q/ha) yields were obtained in plots without alley. A reduction of 19.7, 13.7 and 6.4 per cent in grain yield was recorded with 4m, 6m, and 8m width, respectively.

Table 1: Effect of alley width of Sesbania sesban on the forage sorghum - chickpea sequence productivity.

TREATMENTS	SORGHUM		CHICKPEA			
	Dry matter yield (q/ha)	Reduction in yield due to alley width (%)	Grain yield (q/ha)	Reduction due to alley width (%)	Straw yield (q/ha)	Reduction due to alley width (%)
With out alley	60.4	-	20.3	-	31.3	-
Alley at 4m	55.5	8.1	16.3	19.7	23.2	26.0
Alley at 6m	56.7	6.1	17.5	13.7	23.7	24.3
Alley at 8m	58.2	3.6	19.0	6.4	26.1	16.6
C.D. (5%)	NS	-	2.8	-	4.3	-

NS : Not Significant

Perennial Pigeonpea Based Alley Cropping Systems under rainfed conditions

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Alley cropping systems can provide yield advantage by utilising the available resources more efficiently than single stands of crops, because in a mixture of crops component crop will compete for growth resources differentially.

Results of perennial pigeonpea based alley cropping systems indicated that maximum height of perennial pigeonpea was recorded with sorghum intercrops as compared to groundnut during both the years. The number of primary branches were more in association with groundnut as compared to sorghum intercrops during both the years. The growth performance of sorghum during 1991-92 was better as compared to 1992-93 but in groundnut it was vice versa.

The grain yield of perennial pigopea in the alley systems showed that pigeonpea + groundnut produced higher grain yield as compared to pigeonpea + sorghum during both the years. The grain yield of perennial pigeonpea increased after first ratooning under sole as well as in the alley systems. The grain yield in perennial pigeonpea equivalents registered under perennial pigeonpea + groundnut system was significantly higher as compared to the yield recorded under sole crops and perennial pigeonpea + sorghum alley system. The grain yield of sorghum was less during 1992-93 as compared to 1991-92 but groundnut yield was higher in the second year. The straw and stick yield of perennial pigeonpea under sole and alley system were higher in the second year.

Agri-horticultural studies

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The on-station trial continued for the fourth year at NRCAF, Jhansi. During 1991-92 season maximum wheat yield was recorded in the interspaces of Guava (27.35 q/ha) through groundnut - Wheat rotation, followed by Kinnow (27.13 q/ha) and Anar (24.75 q/ha) through groundnut-wheat and sorghum-wheat rotation, respectively. Least production was registered from the interspaces of Ber (20.61 q/ha) through sorghum wheat crop rotations. Chickpea gave a grain yield of 7.18, 5.28, 5.89 and 7.41 q/ha through sorghum chickpea crop rotation from the interspaces of Guava, Ber, Anar and Kinnow, respectively. Chickpea on an average gave 7.8 per cent higher grain yield in sorghum-chickpea rotation as compared to groundnut-chickpea rotation from the inerspaces of the fruit trees.

On an average, higher rabi yields were registered from the interspaces of Guava (16.55 q/ha) followed by Kinnow (16.40 q/ha) and Anar (15.59 q/ha). Least production was in Ber (13.05 q/ha). One of the main reason for lower yield of rabi crop was due to damage while harvesting ber fruits.

During 1991-92, Leucaena leucocephala, a fast growing multipurpose tree species was copiced during June and Nov. for fodder and fuel yield. On an average fresh fodder yield was higher under control (38.25 q/ha) as compared to agroforestry system (34.71 q/ha) with fruit tree spacing of 5 M x 5 M. For fuel yield (fresh) the trend (63.54 q/ha) was slightly in favour of control (sole crops in the interspaces of fruit trees) as compared to agroforestry system (62.28 q/ha). Under agroforestry system interestingly fodder and fuel production was b

in association with Kinnow followed by Anar, Guava and Ber.

Besides *Leucaena*, fuel yield was also obtained through Guava, Ber and Anar during pruning alongwith fodder yields. Guava and Ber also registered fruit production. Comparing fruit yields under control and agroforestry situation for 5 x 5 M spacing, Guava (7.10 q/ha) and Ber (10.74 q/ha) recorded much higher yield under control as compared a yield of 1.59 q/ha and 2.80 q/ha under agroforestry system, respectively

Agri-horticultural studies on farmers field

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National Research Centre for Agroforestry,

Jhansi

On-farm trial was initiated during 1989-90 in village Karari (Dist. Jhansi). The experimental soil was sandy loam in texture and poor in fertility status.3 fruit trees were spaced in 6 m x 6 m and 5 different crop rotations were tried in the interspaces. In all there were 15 treatments with 2 replications laid out in a randomised block design. Fruit saplings were planted by following the recommended procedure. Normal package and practice were followed in growing of crops as per the treatments in the interspaces of the fruit trees.

The wheat grain yield data is reported in Table 1 for 4 years (1989-90 to 1992-93). Wheat production was maximum (41.21 q/ha) during the second year and with aging of the trees production came down to 34.99 q/ha and 29.65 q/ha during 1991-92 and 1992- 93, respectively. Among the fruit trees, wheat production was higher from the interspaces of citrus (Kagji Nibbu) during all the 4 years of the investigation. On an average, wheat gave 36.13 q/ha of grain yield from the interspaces of citrus which was 6% and 12% more than Guava and Ber, respectively.

It was noticed that during harvesting jof ber fruits the wheat crop was damaged. Guava canopy to some extent affected wheat proiduction.

Table 1: Grain yield of wheat from the interspaces of fruit trees.

Fruit Trees	1989-90	1990-91	1991-92	1992-93	Mean
Guava	32.50	40.15	34.12	27.93	33.67
Ber	21.87	41.03	34.71	29.46	31.76
Citrus	34.37	42.46	36.14	31.56	36.13
Mean	29.58	41.21	34.99	29.65	33.85

Comparative performance of lambs and kids under silvipastoral system and natural grassland.

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Comparative performance of six males each of lambs (*Muzzafarnagari*) and Kids (Barbari) were studied at the NRCAF, Jhansi on two years old established silvipastoral system (*Albizia amara* + *Dichrostachys cinerea* + *Leucaena leucocephala* as a tree/bush + *Chrysopogon fulvus* as grass + *Stylosanthes hamata* + *S. scabra* as legumes) as well as on natural *Sehima-Heteropogon* grassland in a area of one and 2 ha, respectively. The animals were introduced for grazing on 10 August, 1992 and continued upto 31st March, 1993. Results showed that on an average, kids grazed on silvipasture gained body weight at the rate of 40.8 g/ha/day, while kids grazed on natural grassland gained at the rate of 17.2 g/ha/day in a total grazing period of

233 days (Table 1). Similarly, lambs grazed on silvipasture gained body weight at the rate of 58.4 g/ha/day, and on natural grassland at the rate of 33.9 g/ha/day.

The study revealed that gain in body weight of lambs and kids grazing on established silvipasture was much higher than grazing on natural Sehima heteropogon grassland.Performance of lambs were better than kids on both the pastures in respect of their body weight.

*Indian Grassland and Fodder Research Institute, Jhansi

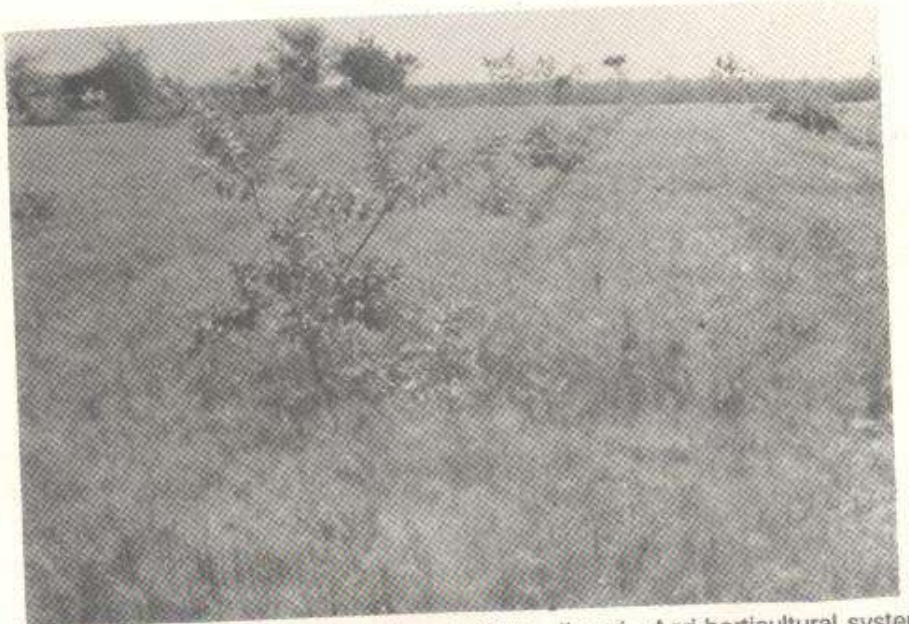
Table 1: Comparative performance of lambs and kids under silvipasture and natural grassland.

Animal Species	Silvipasture System			Natural Grassland		
	Initial weight (kg/ head)	Final weight (kg/ head)	weight gained (g/ha/ day)	Initial weight (kg/ head)	Final weight (kg/ head)	weight gained (g/ha/ day)
Kids (4-6 months old)	11.8	21.3	40.8	11.8	15.8	17.2
Lamb (4-5 months old)	13.4	27.0	58.4	13.4	21.3	33.9

AGROFORESTRY CALENDER
NATIONAL / INTERNATIONAL

1. XVI International Congress of Biochemistry and Molecular Biology, 19-22 Sept. 1994 at New Delhi. Contact Dr. N. Appaji Rao, Secretary General, IUBMB Congress' 94 Dept. of Biochemistry Indian Institute of Science, Bangalore, 560 012.
2. Agroforestry Training Material Workshop, November 2-5, 1993 ICRAF, Nairobi, Kenya. Contact person: Training Material Coordinator, ICRAF Training Programme, P.O. Box 30677,Nairobi, Kenya. Fax No. (254-2) 521001 Teles: 22048.
3. International Symposium on Pulses Research a Directorate of Pulses Research, New Delhi, Indi from April 2-6, 1994. Contact Dr. A.N. Asthana Directorate of Pulses Research, Kanpur - 208 02 India.
4. 81st Science Congress at Jaipur (Jan. 3-8, 1994 Contact Prof. D.L. Deb, President Science Sectio NRL, IARI, New Delhi- 110 012.
5. Conference on Sustainable Development Degraded Lands through Agroforestry in Asia an the Pacific, New Delhi, India from Nov. 25-30 199 Contact Dr. Panjab Singh, President, RMSI Director, Indian Grassland and Fodder Researc Institute, Jhansi 284 003, India.
6. Second National Symposium Allelopathy Sustainable Agriculture, Forestry and Environme from Sept. 6-8, 1994 at Jodhpur (Raj). Contact D S. Narwal, Prof. Of Agronomy, Dept of Agronom HAU, Hisar. (Haryana)
7. International Symposium on Environment Degradation in Arid and Semiarid and D Subhumid Ecosystems (Dates not decided) Jodhpur (Raj.), India. Contact Dr. Venkateswarlu, Director, CAZRI, Jodhpur (Ra 342 003, India.
8. Congress on traditional Sciences a technologies of India: Conference on Agricultu Animal Husbandry, Fisheries and Forestry, Powai (Bombay). Contact Conferen Coordinator Dr. V.K. Dubey, Prof. & Head, Deptt Extension Education, Institute of Agricultu Sciences, BHU, Varanasi (UP) 221 005. Fax. 9 542-312059. Nov. 28-Dec. 3, 1993.
9. National Conference on soil and wa conservation for sustainable production panchayat Raj at Chandigarh. (Jan. 28- 30, 19 Contact Shri J.S. Gill, Chief Conservator of for SCO 92-94, Sector 17-D Chandigarh - 160 Phone : 544857, 542839, 542067.

Dr. P.M. Ganapathy (IDRC Coordinator) alongwith Dr. A.S. Gill Principal Scienti st & Principal Investigator (IDRC) discussing with a farmer in village Simardha, Distt. Jhansi SITE- IDRC Project Demonstration Trial (Photo by Rajesh Srivastava).



On farm trial (IDRC) in village Karari, Distt. Jhansi - Agri-horticultural system. (Photo by Rajesh Srivastava).

Dr. S. Chinnamani Assistant Director General, Agroforestry (Middle) alongwith Dr. R. Deb Roy Director (Left) and Dr. A.S. Gill Principal Scientist and PI (IDRC) (Right) inspecting the Aonla tree bearing in Agri-horti trial (Rainfed) at NRCAF Jhansi (Photo by Rajesh Srivastava).

Inaugural function of IDRC sponsored Seminar at NRCAF Jhansi (L + R) Dr. P.M. Ganapathy (IDRC Coordinator), Dr. R. Deb Roy (Director NRCAF), Dr. Mahatim Singh (Director, PRII), Dr. S. Chinnamani (ADG), Dr. N.K. Bhattacharya (Director, Goat Res. Instt), Dr. A.S. Gill (Principal Scientist and organising Secretary) and Dr. Panjab Singh (Director, IGFRI) (Photo by Rajesh Srivastava).