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TREES ON FARM LANDS IN NORTH-WEST INDIA:
FIELD DATA FROM SIX VILLAGES

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I. INTRODUCTION

Trees have long been planted and protected on farmlands in India as part of age-tested agroforestry practices from the semi-arid regions to the hill farming systems and humid sub-tropical areas. In such situations trees generally complement or supplement agricultural production (Filius, 1982). However, during the last decade a form of tree growing has become popular with some farmers whereby trees may partially or completely replace annual crops. This is known as farm forestry and the trees are grown primarily on field bunds and boundaries or in place of annual crops as woodlots. As regards species planted, Eucalypts (particularly hybrids of *E. tereticornis)* have been favoured. The intention of farmers has been to raise trees chiefly for market sale, as poles or pulpwood rather than as fuelwood.

Farm forestry is generally linked with commercial enterprise. In regions of the country characterised by poorer soils, insecure agriculture and greater dependence on rainfall farmers have often planted Eucalyptus in place of inferior food grains such as ragi (sorghum) in Karnataka, or risky cash crops like groundnut in Gujarat. In the northern states of Punjab, Haryana and Western Uttar Pradesh (U.P.) where cultivation is under more secure conditions of assured irrigation and better soils, farmers have been less inclined to attempt wholesale transfer of landuse. Trees were planted on boundaries, retaining cultivation of annual crops, but woodlot planting was attempted either by absentee landowners or by resident farmers on inferior soils.

Field work was undertaken in six villages from three districts of U.P. using data from the period 1978-89. Two districts, Muzaffarnagar and Nainital, lie within the `green revolution' belt. Farmers in these districts had longer experience of farm forestry and were thus more likely to yield information on returns and marketing. The third district was Allahabad which represents a low productivity region of the state.

In each village a record was first made of the land holdings and the trees planted by every household. These were divided into two categories - planters and non-planters. Planters were defined as those farmers who owned or had planted more than 10 trees. The planters were further divided into two groups -`large' farmers owning more than 2.5 ha and `small' farmers with less than 2.5 ha. More detailed information was collected from between 25 and 30 planters by way of a formal questionnaire. In addition, from each village 6-12 non-planters were selected for questioning, ensuring that this group also contained large and small farmers in almost the same proportion as in the sample of planters.

II. REASONS FOR PLANTING TREES

Formerly, trees did not play a critical role in farming systems of the alluvial plains of North-West India. Agriculture was almost exclusively geared to crop and livestock production. Soil fertility was replenished by alluvium from the hills and, unlike in other regions of India, cow-dung and crop residues rather than wood provided much of the fuel for cooking. Thus trees were required neither for ecological functions nor to satisfy subsistence needs.

In the surveyed villages agricultural residues and dung were still important sources of domestic fuel. Only 35% of the fuel requirement was met by wood, of which only half came from the planted trees. Furthermore, as shown in Table 1, farmers did not produce wood on farms solely to meet their household consumption needs. Among large farmers 70% stated that income generation was the main reason for growing trees, whereas only 54% of small farmers mentioned this as the most important reason.

This trend is further shown in the species planted by farmers. In a majority of villages Eucalyptus were most common, totalling 83.9% of all trees planted. Mangos were also found in all villages. Apart from these, there were species of local importance such as mahua *(Modhuca indica),* sheesham *(Dalbergia sissoo),* babul *(Acacia nilotica)* and poplar. Other reasons indicated for tree planting included the need to protect fields from the risk of encroachment by neighbours.

TABLE 1: REASONS FOR PLANTING TREES

REASON FOR PLANTING TREES	MOST IMPORTANT	SECOND MOST IMPORTANT
Additional income through sale	87	1
Small construction timber	29	26
Fuelwood	17	13
Others	7	5
	140	45

III. THE LOCATION OF FARM TREES

The most common pattern of tree growing was in boundary plantations, which accounted for 51.6% of trees located. For most resident landowners, both large and small, annual crops continued to be the main source of sustenance and income and they did not wish to see a reduction in their crop yields through planting trees. Trees were planted to supplement crop production, with farmers looking forward to receiving the income in `lumps' for key expenses such as marriages and house building.

Woodlots accounted for 30.3% of the total trees, whilst the remainder (18.1%) were grown in home gardens or intercropped with seasonal crops.

It should be noted that in each village of Muzaffarnagar and Nainital district there were two or three farmers, often absentee landowners, who had between themselves planted 25000 to 40000 trees on crop lands woodlots. The selection of land on which to establish woodlots was made according to a number of reasons. Resident farmers tended to select land which was giving low crop yields or where supervision of labour was difficult. Some absentee landowners also diverted their crop lands so as to reduce labour and supervision headaches. In a few cases the urban rich (presumably those with unaccounted money) bought marginal land with a view to establishing eucalyptus plantations on a commercial basis.

IV. REGIONAL VARIATION

The initial village census indicated that of a total of 1011 farmers in all six villages 35% could be classified as tree planters. As shown in Table 2, the proportion was low (20%) for villages in Allahabad district and high for those in Muzaffarnagar (43%) and Nainital (52%). The total number of trees planted and the number of trees planted per household in the Allahabad villages were also much lower than in the other districts. All categories of farmers, but especially larger farmers, had planted many times more trees in the commercialised villages of Western U.P.

These differences appear to be linked with land productivity and the overall degree of commercialisation in agriculture. Data on these indicators (Table 2) suggests that villagers in Allahabad were poorer, with low intensity cultivation and few surpluses for market sale, preventing them from investing their land and capital in long gestation crops.

Eucalyptus requires 6 to 9 years to mature. Increasing its planting density on farms entails either sacrificing crop production in the first few years or substantial capital investment if undertaken on barren land. In either case the option of tree planting would be exercised only if the farm had been generating cash or grain surplus, or if there was an alternative means of income support for the farmer. Further, growing wood economically on a large scale requires efficient marketing. Farmers acquire this by experience when they produce agricultural surplus for sale.

The western districts of U.P. are characterized by larger holdings, secure means of irrigation, a long history of owner cultivation and cash crops, higher surpluses and their re-investment in agriculture, a higher risk-bearing capacity and better enterprise. There is greater diversification of rural incomes in this region, enabling even marginal farm households sometimes to have an alternative source of income. These conditions facilitate investment in long rotation tree crops.

On the other hand, the agrarian structure of the eastern districts of U.P., of which Allahabad is an example, is characterised by heavy dependence on grain production, smaller holdings, low overall incomes, a less marketed surplus, imperfect credit markets, more dependence on the village merchant for marketing small surpluses, inter-locked credit and output markets, less monetisation, less diversity of rural incomes and greater debt bondage. A less

TABLE 2: BASIC DATA ON VILLAGES AND TREES

INDICES	ALLAHABAD		MUZAFFARNAGAR		NAINITAL	
	DEOGHAT	ALIPUR JEETA	CHAUKRA	JHATMU JHERA	HAJEERA	BAGHWALA
% irrigated land	0	88	95	93	85	93
Agr. Assets/ha	1961	9226	11395	12397	8303	11996
Fertilizer/ha	4	708	1154	2169	1344	1570
Production/ha	3161	7228	11404	18932	17381	19922
% produce marketed	49	27	78	81	67	81
Payment made to casual labourers per ha of cultivated land						
by large farmers	320	643	1205	2445	1591	2192
by small farmers	0	104	275	1551	1472	1909
No. of farmers	219	193	240	197	99	63
No. large farmers	50	17	87	72	39	39
No. small farmers	169	176	153	125	59	24
Planters (large)	33	10	50	53	26	31
Planters (small)	10	30	27	57	16	12
Trees owned (large)	3255	1337	42631	69843	38661	45732
Trees owned (small)	591	2674	18110	4412	4893	3873
Trees per household						
large farmers	65	78	490	970	991	1173
small farmers	4	15	*118	35	83	161

* In this village, one non-resident who was classified as small farmer planted about 15,000 trees. If this number is excluded, the average for trees by small farmers per household would be only 32.

developed infrastructure for the supply of agriculture inputs, greater insecurity of land tenure, and on the whole poor human capital as far as enterprise is concerned are also features of these areas. Surplus from land is not ploughed back into farming to the same extent as in Western U.P. These conditions are not conducive to market oriented high intensity tree planting.

V. SMALL AND LARGE FARMERS

The percentage of planters among large farmers was significantly higher compared with small farmers. Out of 304 large farmers in the six villages 67% had planted more than 10 trees. But of the remaining 708 small farmers only 27% had planted trees. From the category of small farmers, if one takes out those who had holdings of less than 0.5 ha it transpires that very few of them planted trees although their percentage among land owners was 28%. This confirms the findings of other evaluation reports that small farmers tended to lag behind in the uptake of farm forestry.

Experience has shown that small farmers attempting to adopt the technology associated with high yielding crop varieties do so gradually over a number of years, each year financing a higher application of inputs from the enhanced profits of the previous season. For this process to take place with commercially oriented tree crops takes several rotations. The lag between the adoption rate of a small and large farmer, and between a farmer entirely dependent on land and the one with other sources of income cannot be bridged in ten or fifteen years. Therefore, even after a decade of tree planting activity, differences in the intensity of planting by the big and small farmer may persist.

Various other socio-economic characteristics which distinguish planters from non-planters, and woodlot planters from others, became apparent through the survey.

VI. CASTE

The survey revealed that caste status appeared to be a greater barrier to tree growing than a lack of land on which to plant trees. As shown in Table 3, when the size of land holdings is kept roughly constant middle and upper cast

TABLE 3: CASTE-WISE ECONOMIC INDICATORS AND TREE PLANTING

	CASTE				AVE-RAGE
	HIGH	MIDDLE	BACK-WARD	LOW	
Land owned in ha	5.57	5.01	4.33	3.08	4.773
Assets/ha	12736	9392	9346	7005	99653
Cash-fertilizer used/ha	1263	1335	1100	930	12143
Non-crop income	22359	10880	8371	5953	12501
Casual labour/ha	1577	1638	1020	469	1340
Production/ha	14347	13051	11998	12157	12988
% of output sold	77	72	70	66	72
Trees planted/ha	498	330	289	87	337

1. Fertilizer means cash paid for chemical fertilizer, and the value of manure used is not added. Fertilizer is being used here as a proxy for monetisation of inputs, and not for calculating the total value of inputs.

2. To calculate production the value of annual produce taken home after payment to labourers is multiplied by the unit price obtained by the farmer.

3. Except for land and trees, the unit for all other indicators is Rupees.

farmers have more assets and employ more casual labour per unit of land, sell a larger proportion of their output, have better access to non-crop incomes and in addition plant more trees. The two lower caste groups, constituting 37% of the interviewees and owning 32% of land, planted only 15% of the trees.

In addition, if we look at the number of trees planted per ha by woodlot planters from the lower caste groups, we find that they planted less than other planters, though they may have been large farmers. Thus low caste status seems to have inhibited the woodlot planters from putting too much area under trees.

The importance of caste in this situation can be attributed to several factors. First, higher caste farmers have greater access to education and to channels within bureaucracy which enabled them to tap sources of credit, markets and extension. These farmers were previously landlords and as such traditionally planted fruit trees on grove lands. Caste restrictions meant that they tended to shun manual work; tree growing was a good option which suited their cultural attitudes towards work on the land. And lastly, they had better access to non-farm businesses which enabled them to wait till the trees matured.

VII. AGRICULTURAL ASSETS

At this stage it is instructive to distinguish further between woodlot planters and others and to identify the reasons why some farmers were able and concerned to undertake this more ambitious reallocation of land. In each village, amongst both large and small farmers and in each caste group, woodlot planters had significantly more land than other planters and even more when compared to non-planters. As regards trees planted per unit of land, the woodlot planters planted more than other planters.

So how did woodlot farmers compare with other farmers in ownership of assets? As planters generally possessed more land than the non-planters, in order to make comparison meaningful the value of these indicators per hectare of land owned has been calculated, details of which are given in Table 4. The table shows that except in Jhatmujhera in all villages the planters in general and woodlot planters in particular possessed far more assets per unit of land owned than the non-planters.

TABLE 4: AVERAGE ASSETS/ha OF WOODLOT PLANTERS, PLANTERS AND NON-PLANTERS IN RUPEES

NAME OF VILLAGE	ALL HOUSE-HOLDS	WOODLOT PLANTER	PLANTER		NON-PLAN-TER
ALIPURJEETA		9226	35132	5653	1953
DEOGHAT		1961	2840	1969	1613
CHAUKRA		11395	22319	9654	6192
JHATMUJHERA		12397	11530	12644	11734
HAJEERA		8303	25237	7669	4556
BAGHWALA		11996	22067	10607	8088
Average for all villages		9313	19659	8619	4664

Woodlot planters were almost a class in themselves in terms of the number of trees planted, land owned and the value of agricultural assets. This was specially true of large farmers. Woodlot planters from the small farmers category also possessed substantial assets as compared to other small farmers, and even higher than the assets of non-planting large farmers. One can conclude that more land and secure asset position was positively correlated with higher levels of tree planting, especially for woodlot planting, as it enabled farmers to meet their needs during the period trees gave no returns.

VIII. NON-CROP INCOMES

In the study area non-crop incomes were recorded as originating from three major sources:

i) `Wage' - the aggregated income from wage labour and artisan based activity;

ii) `Land based' - income accruing from subsidiary land based activities, for example from orchards, the sale of milk and hiring of tractors;

iii) `Urban' - remittances, salaries, pensions, income from shops and businesses etc.

When these three components are studied for different size-class and categories of planters, as shown in Table 5, it is apparent that farmers with higher non-crop incomes planted more trees. The security from non-crop incomes clearly improved the risk bearing capacity of farmers and allowed them to afford to wait until the trees mature. Moreover, once a family's time is committed to non-crop occupations it becomes difficult to support intensive agriculture; tree crops demand less continuous labour and supervision. Thus non-crop income has both an enabling and a compelling role in the change-over from annual to perennial crops.

The information in Table 5 has been analyzed separately for large and small farmers.

Large farmers - The income of woodlot planters from `land based' and `urban' components was several times higher than the income of other planters or non-planters. Non-crop income for woodlot farmers formed a sizeable component of their total incomes, and in many cases was comparable with crop incomes. Woodlot planters from these groups were not involved in wage work at all, but some other large farmers (these belonged to lower castes) had a small component of income from `wages'. In between other planters and non-planters too there was a perceptible difference between their non-crop incomes from non-wage sources.

TABLE 5: NON-CROP INCOME BY COMPONENTS IN RUPEES

CLASS GROUPS	NUMBER OF FARMERS	WAGE	LAND BASED	URBAN	TOTAL NON-CROP INCOME
LARGE					
WOODLOT PLANTER	22	NIL	14761	31118	45879
PLANTER	82	347	3221	3364	6931
NON-PLANTER	26	489	1791	3362	4719
SMALL					
WOODLOT PLANTER	9	583	1014	7144	9853
PLANTER	56	2730	1178	3954	7969
NON-PLANTER	20	2699	1051	1216	5466

Small farmers - For woodlot planters the `urban' component of their incomes was far in excess to such incomes of other small planters or non-planters. Between other planters and non-planters too, the pattern for small farms was similar to that of large farms. There was no such strong trend for the `land based' component, understandably as the land held by such farmers is not much. On the other hand, for the small farmers the wage income was an important source of their non-crop incomes (except for woodlot planters), often more than the total of `land based' and `urban' components of non-planters.

Looking at the two sets of figures together, as the farm size decreases, share of wage income in the basket of non-crop income increases. In fact, the other planters who had marginal land holdings had a higher wage income than the planters. But as the size of land increased, the difference between the `land based' and `urban' income of planters and non-planters also increased, suggesting that it is this component which influences tree planting most.

To conclude, planters had better access to non-crop incomes than the non-planters. The difference becomes very significant - by a factor of 7 - when one compares woodlot planters with non-planters.

IX. LABOUR

With regard to labour three facts need to be mentioned at the outset. First, large farmers tend to have larger families with a higher adult representation. Second, in the `green revolution' areas even small/marginal farmers tend to hire labour, as multiple cropping requires more labour than can be provided by families. Third, casual daily labour is being slowly replaced by contract labour, which reduces supervision problems.

The labour required in growing trees is not uniformly distributed across the rotation. Substantial labour and supervision are required at nodal points but the per ha absorbtion of labour is generally much less in tree-based farming than in annual crops. For example, Malmer (1987) calculated that over an average rotation of 10 years Eucalyptus plantations require only 45 person-days of labour annually as compared to 100 person-days of employment needed for groundnut cultivation in unirrigated conditions of Tamil Nadu. Formerly, the objective of minimising involvement of family labour was possible only by renting out land, now trees have emerged as a new alternative to leasing (Bhalla, 1987).

X. OVER PRODUCTION OR MARKET FAILURE?

The data presented in Table 6 reveals that in villages of West U.P. there was a significant decline in the level of tree planting after 1986. After initial good sales of Eucalyptus the market was rapidly saturated and prices started to fall. In contrast, since planting in Allahabad began at a later date and remained at a low level there has been no such glut; in the winter of 1989/90 farmers in this district seemed keen to continue planting eucalypts.

TABLE 6: EUCALYPTUS PLANTING IN MUZAFFARNAGAR AND NAINITAL (1981-89)

YEAR OF PLANTING		EUCALYPTUS PLANTED IN CHAUKRA	JHATMUJHERA	HAJEERA	BAGHWALA	TOTAL	% SHARE IN THE TOTAL
1989	NIL	NIL	27	1000	1027		0.6
1988	260	1500	710	2825	5295		3.1
1987	40650	1070	13050	5925	60695		35.3
1986	3650	3596	2430	6350	16026		9.3
1985	16000	6655	250	1400	24305		14.1
1984	2500	3970	18950	5750	31170		18.1
1983	10500	7230	600	NIL	18330		10.6
1982	600	1410	60	7870	9940		3.8
1981	1800	90	NIL	1000	2890		1.7
BEFORE 1981		135	NIL	150	2100	2385	1.4
TOTAL		76095	25521	36227	34220	172063	100.0

Many farmers had planted eucalypts on farm bunds, hoping to get a good income after 6 years. They did not anticipate that trees would cause any loss of agricultural production. However, they did experience a loss in crop production after the third year, varying between 10 and 25%. This loss, which farmers put at Rs 3-6 per tree per year, was not adequately compensated by the revenue, which was between Rs 25 and 35 for a 5 year old tree. They had been led to anticipate Rs 100 per tree. By February 1990 many farmers said that they had stopped planting eucalypts and intended to go back to annual crops after the expensive removal of the tree stumps.

Two factors explain the collapse of Eucalyptus markets. First, the main demand for wood in India is from the rural population for fuelwood, but people are prepared to spend time gathering `free wood' and are loathe to pay money for it. Hence the market for wood is limited. Second, the producers are in a poor bargaining position with the merchants.

Eucalyptus is a versatile tree. Its wood can be used as timber, pulpwood, poles, for packing cases, and as fuelwood, depending upon the size and quality of wood. The total area brought under eucalypts in the farm forestry programme is estimated to be 2.5 million ha (Chambers *et al.*, 1989) which could give an annual wood production of about 10 million tonnes. How would this be utilised? The approximate figures for demand and supply in the country are shown in Table 7.

TABLE 7: DEMAND AND SUPPLY OF WOOD IN INDIA
[in million tonnes]

TYPE	DEMAND	SUPPLY
Timber	13	6
Pulpwood	10	5
Fuelwood	157	95
Poles	na	na
(Saxena, 1990)		

Farmers face several problems in catering for the small demand from sectors other than fuelwood. Wood with a diameter of more than 20 cm is utilised as second class timber, that between 10 to 20 cm as pulpwood and poles, and below 10 cm as firewood (Ahmed, 1989). However, farmers have found that it is uneconomical to extend the rotation beyond six or seven years. They have generally resorted to dense woodlots of over 2500 trees per ha, or planted at a distance of 1 to 1.5 m on bunds, which has led to poor quality produce. In their anxiety to reduce loss of crop production in case of bund plantation they often sold the trees in the 4th or 5th year. In none of the 48 cases of sale from West U.P. villages was the diameter of trees sold more than 22 cm, and in as many as 20 cases it was less than 15 cm. In spite of the excess production of Eucalyptus this has not helped to reduce shortages of timber.

As regards pulpwood, there are three paper mills within 100 km of the four Western U.P. villages. Their annual requirement is 100,000 MT each, 70% of which is met from government supplies. Despite problems of irregular supply and corruption mills still prefer to buy from government as supplies are cheaper and available in bulk. The mills are also permitted to bid in open auctions which Forest Corporations organise for traders, but purchasing small lots from a large number of dispersed farmers requires a new marketing infrastructure (Chambers *et al.*, 1989). It is also not easy to obtain permission to move wood bought from private sources as restrictions exist on transport of wood obtained from private lands.

Eucalyptus is also used for scaffolding and shuttering purposes in the construction industry and poles are now being used in making shacks, road-side stalls and packing cases. It has not been possible to estimate the total demand from this sector, but it would be much less than what is required by the paper mills from the open market. Small scale industry prefers to buy wood through the commission agents as it ensures a stable supply and the commission agents often sell on credit. Farmers sell in the months of May, June or September when they are free from agricultural operations, whereas industry requires wood throughout the year.

Brick-kilns were another major market for Eucalyptus. Some kiln owners come to the village themselves, while in a few cases farmers had delivered the wood. In such cases, in addition to the expenses on felling, transport and roadside bribes, the farmers have to get an ownership certificate from the revenue department, for which they pay Rs 50 to 100 per case. Permission causes delay and uncertainty (Chambers *et al.*, 1989).

According to traders in Muzaffarnagar, of the total farm wood which is marketed in the district, the share ultimately reaching papermills is 10%, small scale industry (5%), brick-kilns (35%) and households (50%). These figures may not be exact but they do indicate that a substantial portion of Eucalyptus raised by farmers is ending up as domestic fuel which runs contrary to their intentions. Unlike timber, which has to be bought from the markets, fuelwood is generally gathered by rural people and even by urban poor, and only the lower middle class (the middle class use kerosene and the rich use gas) in urban areas and the very rich in rural areas buy fuelwood. Moreover, the north Indian villager has for centuries used cow-dung and husk as fuel in preference to wood.

The fact that fuelwood markets supply scarcely 10-15% of the total fuelwood which is consumed has two implications for the production of fuelwood as a farm crop (Leach, 1987). First, the gatherers always have the advantage over producers over the pricing of fuelwood. Second, the market price of fuelwood would generally

be lower than the social cost for replacement of growing stock through investments in plantations. These considerations make production of wood by farmers for fuelwood markets a non-viable proposition. This has been exacerbated by the fact that although the real price of fuelwood in Muzaffarnagar increased steadily from Rs 30 in 1980 to 43 per quintal in 1984 at the 1980 value of the rupee, it has since declined to Rs 30 again in 1989.

These problems on the demand side have to be viewed in the context of excessive production of Eucalyptus on farms in the entire West U.P. region. Though no firm estimates are available, the following calculation would show that supplies from Western U.P. are quite substantial.

The average number of Eucalyptus trees in the four West U.P. villages was about 50,000 per village. Even if a lower figure of 20,000 is assumed and taking the average number of villages per district as 1000, the number of districts covering the three mills as 12, average quantity per tree being sold as 0.5 quintal, and rotation of Eucalyptus as 6 years, the production reaching the market is in the order of 2,000,000 tonnes annually. Comparing this with the over-all demand from the mills and industry one can understand why most Eucalyptus is being sold as fuelwood.

XI. THE MARKETING STRUCTURE

In addition to issues of macro supply and demand it appears that rigidities caused by laws, the marketing structure and under-development of wood markets also result in a low price for producers.

Farmers in U.P. are allowed to fell Eucalyptus trees on their holdings but transportation necessitates a transit permit from the Forest Department, who in turn ask the farmers to obtain a land ownership certificate from the Revenue Department. Few farmers are able to get these certificates, hence they sell the standing crop to a trader who `deals' with the bureaucracy. These laws prohibit direct contact between the producer and the market.

Between the producer and the consumer there are several types of intermediaries; the village trader, traders from other villages, town based contractors, commission agents, saw mill owners, wholesalers and retailers. Many have multiple functions. Only in a few cases, such as to a brick-kiln, was the producer able to reach the consumer directly.

Some farmers felt that only the contractor is aware of the market specifications (length of the log) and that it was therefore necessary to sell the standing crop to them for appropriate cutting. Most growers were not aware of the support price being offered by the paper mills. The factory would like debarked and graded wood to be delivered at their doorstep, but farmers lacked the necessary expertise or knowledge about this.

Traders were able to exploit this situation. When bought on the basis of weight, farmers complained that the traders tended to delay weighing so that weight might be lost whilst drying. The other trade practice was to delay making the full payment. In about one-fourth of the cases farmers did not get the entire amount soon after felling, the delay ranged from 5 days to 5 months. Moreover, it was observed in Muzaffarnagar that the prevailing market price for fuelwood for the consumer was Rs 65 to 70 per quintal, whereas farmers got Rs 25-35 a quintal for fuelwood. The difference was more pronounced for larger trees, the farmers receiving only Rs 45-50 per quintal against a market price of Rs 110-120.

XII. CONCLUDING COMMENTS

In the alluvial plains of U.P. farm production systems were formally geared to crop and livestock production. Trees were neither necessary for fuel nor for fertility. Why then did farmers take to tree planting in West U.P. villages and not in Allahabad?

Wood production entails the investment of land, labour and capital in a long gestation enterprise, and hence was undertaken by those with surplus to invest. This was more evident in the agriculturally commercialised villages in Western U.P. where a greater proportion of cultivated land lies in large holdings. Farmers planted trees on their own with minimal outside assistance in anticipation of handsome profits. The planting of eucalyptus appeared to them a very attractive proposition as it promised to reduce their costs, improve profitability, minimise the danger of encroachment and at the same time cut down on their supervision time.

Farmers in Allahabad, with less monetisation, less use of cash inputs and cheaper labour had less compulsion to change their cropping pattern. Trees with a long gestation period were hardly a viable option for those farmers who had no means of alternate income. Thus, rather than associating tree growing with peasants' subsistence strategies, the north Indian experience shows that tree planting needs to be seen as an outcome of agrarian capitalism; production for the market with reduced labour.

But producing wood for the markets brought new problems. Markets in general perform two functions, allocative and exploitative (Harriss, 1989). To the extent markets facilitate commodity production and integrate producing regions with consuming regions, they help the farmers in choosing the most profitable production strategy. Farmers allocate their resources on the basis of signals received from markets. But markets may also play a retrogressive role by coercing producers to sell at a low price through monopsony, credit and withholding of information. In such a case commercialisation may take place either without increase in production or without increase in benefit to producers.

It appears that wood markets in the study area are more exploitative than allocative. The very fact that high pole prices prompted many farmers to change their existing landuse shows that at least initially the markets did perform an allocative function. High prices signalled a demand which was transmitted to the farmers through the markets. But other issues relating to market imperfections became more relevant as the supply grew. Farmers' enterprise then seems to have been thwarted by market constraints and rigid laws.

In the mid-eighties the Indian press and environmentalists were alarmed at the rapid spread of Eucalyptus on private lands. This was seen to symbolise private gains at social costs. However, the scenario has changed since 1986. Many farmers are uprooting Eucalyptus stumps and returning to annual crops. Does this mean that Eucalyptus remained `a five-year wonder', an innovation that failed? Should this experiment be seen as an aberration in the long chain of cropping patterns that the north Indian farmers have tried? Looking at the trends in 1990 it appears that some absentee landowners may still continue planting Eucalyptus, as their interest is to avoid encroachment and to seek ease of management. But for a majority of resident farmers their involvement with farm forestry seems to be over. For them money no longer grows on trees.

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