

FORESTRY RESEARCH PAPER SERIES

Number 13

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THE CASE FOR PLACING MORE EMPHASIS ON PRIVATE TREE PLANTING PROGRAMMES

A Case Study of Pakhribas Agriculture Centre's
Private Tree Planting Programme

By

Yam B Malla

HMG-USAID-GTZ-FORD-WINROCK PROJECT
STRENGTHENING INSTITUTIONAL CAPACITY IN THE
FOOD AND AGRICULTURAL SECTOR IN NEPAL

FOREWORD

This Forestry Research Paper Series is funded through the project, "Strengthening Institutional Capacity in the Food and Agricultural Sector in Nepal," a cooperative effort by the Ministry of Agriculture (MOA) of His Majesty's Government of Nepal and the Winrock International Institute for Agricultural Development. This project has been made possible by substantial financial support from the U.S. Agency for International Development (USAID), the German Agency for Technical Cooperation (GTZ), the Canadian International Development Research Centre (IDRC), and the Ford Foundation.

One of the most important activities of this project is funding for problem oriented research by young professional staff of agricultural agencies of the MOA and related institutions, as well as for concerned individuals in the private sector. In particular, funding is provided by the Ford Foundation to support research activities related to the human aspects of natural resource management. This research is carried out with the active professional assistance of the Winrock staff.

The purpose of this Forestry Research Paper Series is to make the results of the research activities related to forestry available to a larger audience, and to acquaint younger staff and students with advanced methods of research and statistical analysis. It is also hoped that publication of the Series will stimulate discussion among policymakers and thereby assist in the formulation of policies which are suitable to the management of the natural resource systems upon which the development of Nepal's agriculture depends.

The views expressed in this Forestry Research Paper Series are those of the authors, and do not necessarily reflect the views of their parent institutions.

Gerard J. Gill
Series Editors

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THE CASE FOR PLACING MORE EMPHASIS ON PRIVATE TREE
PLANTING PROGRAMMES

A Case Study of Pakhribas Agriculture Centre's Private
Tree Planting Programme

By
Yam. B. Malla*

A. INTRODUCTION:

For the last ten years or so, His Majesty's Government of Nepal (HMG/N) has placed considerable emphasis on addressing the deforestation problem which contributes so much to the country's environmental degradation. In the absence of the active participation of local people, government forestry personnel have been unable to manage the country's forests. Realizing this fact, the Government made amendments to the forest legislation in 1978, the first time this had happened since 1957. These amendments represent a significant change in national forest policy in that the communities will have formal responsibility for managing forests.

Under this community orientated forestry policy, there are four different programmes: Panchayat Forest (PF), Panchayat Protected Forest (PPF), Lease Forest and Private Forest programmes (see Appendix 1 for details). The success of these different programmes depends almost totally on the active participation of local residents. The Government will provide, through the Ministry of Forest and Soil Conservation, technical and financial support to the communities which, in turn, will be responsible for managing these forests in accordance with the management plans approved by the Department of Forests.

Based on the above programmes and policy, there are over twenty different forestry related projects currently in operation in Nepal, attempting to involve local people in forestry activities. However, almost all the projects seem to have put the major share of resources and effort into the Panchayat Forest programmes. Relatively little emphasis has been placed on Panchayat Protected Forests and Private Forest programmes. These last are limited to demarcation work for the former and distribution of seedlings to farmers in the case of latter. Virtually no

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action has so far been taken to implement the Lease Forest Programme.

Considering these various programmes from the viewpoint of local residents, PPFs and the private planting programme should receive the most attention. In the case of lease forests, many villagers fear that unless the programme is carefully planned and implemented, the local elite will be the ones who will gain control over such forests. For PPFs, though there are some early benefits in the shape of grass obtained from the plantation area as a result of protection, in the longer term people are not sure as to how the benefits will be distributed. Moreover they will have to wait a long time to acquire any such benefits. Experience has shown that because of the degraded nature of the sites available for PF plantations, trees may take at least five years before they reached the stage of first pruning. So the possibility of reaping early benefits from PPFs is also remote.

The PPF programme, on the other hand, is attractive because it is located in already existing forest and farmers can have immediate benefits from it. Private planting is attractive because the trees belong to the individuals. Also the programme is attractive to the Government because the cost to them of managing private forest will be minimal, as individual farmers will be responsible for maintaining and protecting the trees and forest. In fact private land is more efficiently managed than land under public or common ownership which has no one responsible for managing it, and which therefore always remains in a degraded state. The private planting programme offers tremendous promise for the future and there is a need, therefore, to look into the possibility of promoting private tree planting by farmers, a potential which, so far, has barely been tapped.

In this context, Pakhribas Agriculture Centre (PAC) is one of the very few - possibly the only - project which has emphasized a private tree planting programme in a relatively structured manner. The methods and approaches the Centre has chosen to promote this program are more than just distribution of seedlings, which has been the normal practice in other project areas. PAC's innovation has been to involve farmers in forestry activities. This is considered to be amongst the Centre's most successful programmes, and could well be introduced to other parts of Nepal. It was considered useful to study PAC's methods and to determine what farmers found attractive about the programme.

B. OBJECTIVES:

A research project for a case study of Pakhribas Agriculture Centre's private tree planting programme was undertaken with the aim of exploring and documenting the methods and approaches the Centre has used for involving farmers in forestry activities. For this purpose the study concentrated mainly on the following four objectives:

1. To find out what exactly PAC has done to involve farmers in forestry activities, and why this approach has been successful;
2. To establish to what extent individual farmers have participated in the programme, and, more importantly, why they are interested in the forestry programme;
3. To examine the number, type and range of tree species taken by farmers and the type of land on which trees are planted; to check whether some trees planted in the early stage of the programme have begun to yield, and if so, to what extent farmers have benefited;
4. Finally, to identify and categorize the participant population and compare their family size, livestock number, farm holdings and ethnic origins with those of non-participants.

C. METHODOLOGY

In order to collect the required information, the following research methods were used:

1. Review of Reports and Documents:

The Annual Reports and other forestry related documents and papers of PAC were reviewed with a view to eliciting information on the forestry programme's objectives, organizational set-up, methods of working towards fulfilment of objectives, area of working, number of farmers participating in the programme, and number and types of tree species distributed to the farmers.

2. Site Selection:

Four Panchayats from within the Centre's target area in Dhankuta District were selected randomly and a sample of farmers, both participants and non-participants, of these Panchayats was visited and interviewed. The selected Panchayats are:

Pakhribas
Hattikharka
Phalante, and
Murtidhunga

3. Sample Selection

The household or family was the sampling unit. From the record of PAC's Livestock Development Section, a list of all the households of the selected panchayat was prepared. And from the record of the Forestry and Pasture Development Section, another list of the names of farmers who have planted trees was prepared for each selected panchayat. Eighty farmers, twenty representing each panchayat, were selected by random sampling. Similarly, another sample of seventy eight farmers was randomly selected from the non-participant group. Once again twenty farmers were selected from each panchayat, except for Pakhribas Panchayat which was represented by eighteen farmers. In all, 158 farmers were visited and interviewed.

4. Questionnaire Development and Data Collection:

Two sets of questionnaires were developed for participant and non-participant farmers. These were prepared on the basis of the pretested questionnaires developed in 1980 for a pilot survey of the forestry programmes. This report is based in large part on the data gleaned from these questionnaires.

5. Field Work:

Survey work was conducted between December 7 and 22, 1985 by the author and seven PAC's field staff. The latter were trained in administering the questionnaires and in the techniques of measuring tree heights and diameters in the field.

6. Compilation, Coding and Tabulation of Data:

This was done in Kathmandu by the author with the help of Prem B. Malla and Prakash Gurung.

7. Method of Data Analysis:

The Method of analysis of this study was primarily qualitative and explanatory, as the nature of the data and the procedure used in data collection, particularly for objectives 1, 2 and part of 4, were more amenable to this approach.

Quantitative methods were also used, for such variables as number, type, and range of tree species planted by

farmers, survival and growth rates, and to make a comparative study between the two sets of sample farmers (participants and non-participants).

D. FINDINGS

1. Pakhribas Agriculture Centre's Approach To Involve Farmers In Forestry Activities:

The Pakhribas Agriculture Centre (PAC) which is located in the Pakhribas Village Panchayat of Dhankuta District, East Nepal, was established in 1973 with the aim of assisting farmers of its target area to raise their standard of living through better farming practices. The Centre has incorporated the four most important elements of the hill farming system, namely, agriculture, livestock, horticulture, and forestry & pasture. Each has developed a strong research, extension and training component to effectively implement the programmes. This ODA/UK funded project executes its programme activities in fourteen panchayats in three districts:- Dhankuta (6), Tehrathum (1), and Taplejung (7). In addition, the Centre provides technical support to some of the areas under the Koshi Hill Area Rural Development Project (KHARDEP).

PAC's private tree planting programme is considered to be one of its most successful activities. But before going into detail about this particular programme, it will be helpful to review the type of rural people with whom PAC staff work the role of forestry in the farming system, the size of land holding, the extent to which land is available for more planting, and the overall programme of the Centre's Forestry and Pasture Development Section.

a. Population By Different Ethnic Groups:

Table 1 shows the ethnic and caste breakdown of the population of the four panchayats with whom the Centre staff work.

b. Trees and Forests in the Farming System:

Agriculture predominates in the economy of Nepal and the PAC's Working area is no exception. The Hill farming system, which is mostly subsistence in nature, incorporates activities such as food crop production, livestock raising and utilization of various products of forest and trees. Firewood is the only type of fuel available in the area for cooking and heating, and over fifty per cent of the livestock feed requirement is met from forest, grazing land and fodder trees on private land.

Table 1: Population (Households) by Ethnic Groups & Caste in Percent

	<u>Pakhribas</u>	<u>Hattikharka</u>	<u>Phalate</u>	<u>Murtidunga</u>	<u>Total</u>
Brahmin/					
Chhettri	39	31	48	69	46
Rai	19	*	19	*	8
Limbu	1	30	-	7	12
Gurung	13	2	-	1	4
Magar	10	26	11	7	15
Tamang	7	4	9	7	6
Newar and					
Others	11	6	14	9	9

* less than 0.5%

Source: Livestock Development Section, PAC

From the analysis of the existing situation of the Pakhribas area, two things are evident from the forestry viewpoint. First, as a result of deforestation, there is very little public forest left in the Pakhribas area, so that farmers are increasingly dependent on private land for fodder and firewood. Second, there is more non-arable land available in the forms of marginal land, Kharbari (an area kept aside for growing thatching grass), gullies, streambanks and odd corners which at present are being underutilized, but could be made more productive through planting of trees and grasses.

Table 2 shows the extent to which farmers have been collecting tree fodder and firewood from their private land. Farmers rely more for tree fodder on private land than public forest on which they rely relatively more for fuelwood trees.

The time taken to collect forest products from the public forest ranges from one to six hours. Some twenty-six per cent of the farmers interviewed said that they also have to buy firewood and fodder. The local price is around from Rs5.00 per load for firewood and Rs3.00 to Rs10.00 per load for tree fodder. (One load of firewood or fodder is estimated to be approx. 25 to 30 kgs.)

Table 3a shows the number of trees maintained by the farmers on their private land. Some ninety-four per cent of the farmers interviewed have trees on their farmland with an average of ninety seven trees per household. Ninety-three per cent of the farmers maintain fodder trees.

1

Table 2: Source of Tree Fodder and Firewood

<u>Source</u>	<u>No. of Farmers</u>	<u>% of Farmers</u>
Tree Fodder: Public Forest	8	5
Private Land	129	81
Both	21	13
Fuel/Timber Wood: Public Forest	35	22
Private Land	71	44
Both	52	32

1. Estimated from 158 Sample farmers, both participants and non-participants.

1

Table 3a: Number of Trees Maintained in Private Land

	<u>Total Trees</u>	<u>Fodder Trees</u>	<u>Firewood/including Timber Trees</u>	<u>Others Bamboos</u>
Total No.	14643	6445	6850	1348
No. of Farmers Having Trees	151	149	78	108
% of Farmers Having Trees	94	93	49	68
Maximum Trees Owned	694	208	514	100
Minimum Trees Owned	NIL	NIL	NIL	NIL
Mean	97	43	87.8	12.5
% of Farmers Without Trees	6	7	51	32

1 Estimated from 158 sample farmers and include both participants and non-participants.

However, though the difference between the total number of fodder and firewood trees is not large, those farmers with fuelwood trees have an average of eighty eight trees as against an average of only forty three fodder trees owned by those farmers having this type. Over sixty per cent of the farmers interviewed have bamboos. The number for those having them varies from one to one hundred.

In response to the question of who planted the above trees, a number of mixed answers were given. These are summarized in the Table 3b.

Table 3b: Number of Trees Maintained on Private Land

<u>Answers</u>	<u>No. of Farmers</u>	<u>% of Farmers</u>
1) Came-up naturally and were protected	46	29
2) Planted by forefathers	42	26
3) Planted by Present Members of the Family	20	12
4) Some by present members of the family and some came-up naturally and were protected.	18	11
5) Some were planted by forefathers and some came-up naturally and were protected	10	6
6) Some were planted by forefathers, some by the present members of the family and still others came-up naturally and were protected	20	12
7) Don't know	4	2

Usually the trees that were said to have been planted by forefathers or present members of the family had been uprooted from somewhere else.

The types of tree species, particularly the ones with fodder value growing on private farmland, do not seem to occur in the natural forest (See Appendix 2 for details of tree species observed in private land). From the viewpoint of altitudinal range, farmers living above 1300 metres above sea level (m.a.s.l.) who tend to have more bari land and also more non-arable land, maintain more trees on their private land than those at lower altitude. The latter tend to have more khet land around which they do not plant trees, as shading may adversely affect the rice yield.

c. Land Holding and Availability of Land for More Planting

An attempt was made to estimate as how much land is actually available for further planting. The findings are presented in Tables 4a and 4b.

Table 4a: Size of Land Holding and Availability of Land for More Planting

	Total of Khet, Bari Marginal Land & Kharbari (Ropani)	Khet (Ropani)	Bari (Ropani)	Non-arable Marginal land (Ropani)	Kharbari (Ropani)	Stream banks (Nos)	Gullies & Odd Corners (Nos)
Total	3714	3000	4020	1369	325	330	505
No. of Farmers Owning	158	136	156	108	52	125	149
Mean	55.1	22.0	25.8	12.7	6.2	3	4
% of Farmers Owning	100	86	99	68	33	79	94
Maximum Owned	630	300	185	400	50	12	28
Minimum Owned	1	NIL	1	NIL	NIL	NIL	NIL
% of Farmers Without	0	14	1	32	67	21	6

N.B. 1 Ropani = 1/20 Ha.

1. Estimated from 158 farmers and include both participants and non-participants.

Means for each column are not comparable cumulative because they are calculated by dividing the total land in the particular category by the numbers of farmers owning such land. In each case the number of farmers varies.

Overall, there tends to be more bari (rainfed) land than khet (irrigated) land in the study area. Almost all of the farmers have bari land, with an average of 1.3 ha., the minimum being 0.05 ha and the maximum 9.4 ha.. Eighty-six per cent of the sample farmers had khet land averaging a little over 1.0 ha, ranging from nil to 15 ha. per household. As to the availability of type of land for more planting, almost all the sample farmers have marginal non-arable land in such forms as steep non-cultivable land, Kharbari, stream banks, gullies and odd corners. Over sixty-eight per cent of the farmers have non-arable marginal land with an average of 0.7 ha. - the minimum being nil and the maximum 20 ha. Thirty-three per cent of the farmers have Kharbari averaging 0.3 ha. - the maximum being 2.5 ha. and the minimum nil. Over ninety-five per cent of the sample farmers have stream banks, gullies and odd corners of their private farmland.

Leaving the above land out of account has led to a substantial underestimation of the overall productive capacity of farms in the hill region.

When estimation of land holding is not restricted to only khet and bari land (and this has been the normal way of estimating average land so far) it appears that the size of the average land holding in the hills is much bigger than previously estimated. The present national figure of 0.4 ha. average land holding in the Hill region seems to have failed to take into account of the non-arable farmland owned by the farmers. As can be deduced from Table 4b, adding Kharbari to arable land increases the size of holding by twenty-four per cent.

Table 4b: Size of Land Holding and Availability of Land For More Planting

	<u>Khet + Bari</u>	<u>Non-arable + Kharbari</u>	<u>Total</u>
Area (Ropani)	7020	1694	8714
Sample Size* (no)	158	158	158
Mean (Ropani)	44.43	10.72	55.15
%	80.6	19.4	100

* Including those who do not own land in a particular category.

Almost all the farmers interviewed have non-arable marginal land in addition to their khet and/or bari land. (Note that fourteen farmers do not have khet land and two farmers have no bari land). The range in total land holding is from 0.05 ha to as much as 31.5 ha. Overall just under twenty per cent of all private land is in categories other than arable land. Such land, if utilized properly, particularly through tree planting, has tremendous potential for raising the overall level of production. Moreover these figures remain underestimates, because it has been impossible to take account of stream banks, gullies and odd corners in calculating land area. Such land can nonetheless be useful for planting trees.

d. PAC's Forestry and Pasture Development Section

Although Pakhribas Agriculture Centre was initiated in 1973 with only agriculture and livestock components in its programme, the Centre realized later that in the complex hill farming system there are three main components, namely crop production, livestock husbandary and forestry, which are inseparably integrated. The farmer who cultivates land also raises livestock and depends on the forests and trees for the support of both. Realizing this very important, but often neglected, aspect of the farming system, a Forestry and Pasture Development Section was established in 1975 with the main aim of increasing agricultural production through forestry and making farmers in the area self-sufficient in fuel, fodder and timber supplies.

The PAC's forestry programme was initiated at a time when all the forest and public land belonged to government, following to the nationalization of forest in 1957 and the Forest Act of 1961. Village people feared that they would loose land if trees were planted on it. The Programme was therefore started before the present community forestry programme was initiated. And in 1975 HMG/N, was not committed to giving land and forest back to the people for management. Hence the Centre could not make much progress in establishing community plantations in the early days.

One option was to encourage farmers to plant trees on their private farmland, a development which the PAC staff thought might eventually contribute to reducing the pressure on public or government forest. Later, after having won the confidence of individual farmers, and particularly after the promulgation of the rules and regulations of Panchayat Forests (PFs) and Panchayat

Protected Forests (PPFs) scheme, the next step for PAC staff would, obviously, have been to encourage the development of group approach and motivate the farmers to organize PFs and PPFs in a structured and organized manner. Some panchayats, particularly Murtidhunga amongst the sample panchayats, made a good start but were seriously affected by the uncertainty surrounding the future of PAC itself. During the last five years, at any one given time, PAC's future was never certain for more than two years, which is, by any standard, far less than adequate for a programme like community forestry. This resulted in relatively less emphasis on the establishment of PFs and PPFs.

In the beginning, the concept of a private tree planting programme was not very easy to translate into practice. It required first an understanding of the local situation, the type of land available for planting, and the type of trees farmers would be willing to plant. Appropriate information on growing techniques for local trees was hardly known at that time. The second, and more difficult, task was to remove the fear and suspicion that existed in people's minds and to convince them that trees on private land would not become government property.

The Centre's Forestry and Pasture Development Section concentrated in the early stages of the programme primarily on the following objectives.

- Identifying the local tree species that were most common in the areas, and making information available on phenology of such tree species and on proper growing techniques in the nursery and in the field.
- Designing an extension and training programme in order to involve farmers in forestry activities.
- Initiating some small scale research on exotic trees, grasses and fodder legumes at the PAC Farm, and
- Establishing examples of sound land use systems on the PAC Farm and in the villages for demonstration to the farmers.

e. Emphasis on the Local Broad-Leaved tree Species

PAC's nurseries are normally established on a one-nursery-per-panchayat basis and all raise both grass and tree seedlings. The production capacities of village nurseries vary from 6,000 to over 15,000 seedlings per panchayat per year. The nursery at PAC farm, which

serves three neighbouring panchayats, has, together with on-farm nurseries, produced up to 80,000 seedlings per year.

The tree seedlings raised in the nursery are normally local broad-leaf species with fodder and firewood value. These are the ones mostly preferred by the farmers. These seedlings are first distributed on payment to the individual farmers for private planting and then the remaining ones are given free for plantations on communal land and to schools or other institutions for ceremonial plantations.

f. Extension and Training Programme

With a number of constraints in forestry extension such as the isolation of villages, fear and suspicion of people, the long time span for a tree to grow, protection problems of planted trees, lack of appropriate institutions, technical information and government commitment, it was important to keep the programme slow moving and small scale. There was no proven method for forestry extension as such, and the option was to draw upon approaches that have proved successful in other areas of extension.

The methods for forestry extension in Pakhribas are adapted from the agriculture extension approach, which includes activities such as Seminars/Workshops for the village leaders, meeting with the farmers, demonstrations, exhibitions, farmer's field days, farm visits, regular follow-up and supervision and tree planting competitions amongst the farmers. The majority of these activities are planned and conducted together with the Agriculture and Livestock Sections of the Centre. The ratio of forestry field staff to farm families is 1:500 (approximately).

The Centre has a very strong feed-back mechanism from villagers to the field staff and subsequently to the staff at the Centre, normally through personal contacts and monthly meetings.

Similarly, different training programmes on forestry and pasture activities are conducted. These include Afforestation Training, Leader Farmers Training, Panchayat Level Training, and Agriculture Assistant training. These are conducted for farmers both at the Centre and in the villages. Some training programmes - particularly Panchayat Level Training in the village - are for a short period (one to two days) and are designed basically to expose the field staff to as many farmers as

possible. This is not possible with other training courses, which are normally conducted at the PAC farm, so that the number of farmers who can be trained at any one time is rather limited.

PAC's initiative in modifying the course curriculum of HMG/N's Agriculture Assistants (AAs) training, though no longer conducted at the Centre, deserves special mention. The original course included only agricultural subjects and took a the single disciplinary line of thinking that was not compatible with the PAC's approach. In order to make the month-long training more appropriate to a mixed farming system, the Centre, with the permission of the Department of Agriculture, made modifications in the course curriculum and allocated one week each for agriculture, horticulture, livestock, and forestry & pasture. The Centre has sufficient resource personnel to organize and conduct such multi-disciplinary training courses.

Finally, although the group approach was adopted overall, occasionally for some programmes/activities (such as demonstrations, field days, training/courses etc.) individual contact and farm visits are necessary. These approaches seem to have worked fairly well and as a result there has been no attempt so far at forming any committees. But then private planting decisions are made in most cases at the household level.

g. Organization and staffing

The staff of the Section includes two graduates, one Senior Supervisor, two Supervisors (both promoted after they have worked as Field Assistants) based in the Centre and thirteen Field Assistants based in the villages (one per panchayat). Except for the two graduates, all the staff have been locally hired.

Amongst the local staff, only four are SLC holders, three are ex-soldiers, (they can read and write well) while the others have attended formal schooling at Standards 6 to 10. The local staff have not attended any formal forestry institute for training. They have, however, received in the Centre one month's intensive training prior to assignment to their work and working area. In the training, they learn simple applied forestry practices and the course curriculum has been designed in line with the overall aims and objectives of PAC in general and the Forestry and Pasture Section in particular. Besides receiving regular on-the-job training in their subject matter, all the field staff have received a month-long multi-disciplinary training

course in which all the essential elements of a farming system are covered.

The field staff, who are selected in most cases with the help of villagers, are well trained (not necessarily "qualified") and well motivated. They are based in their own villages to encourage and help farmers to plant trees on the communal (or panchayat), as well as private, land. Not only do the field staff know the people they have to work with, but the local residents also know the staff and therefore do not hesitate to approach them.

h. Private Tree Planting Programme

Under the Private Tree Planting Programme, the Centre has two different approaches. One is to provide farmers with trees and technical suggestions for scattered planting and the other is to establish block plantations of fodder and fuel wood trees on private land. In the case of the latter, one should have sufficient land for at least fifty trees. The field staff actually visit the sites and decide jointly with the farmers which tree species to plant. At the time of planting, they go to help farmers plant trees and in the following winter they make follow-up visits and insist that farmers protect, weed, mulch, and, if possible, manure the trees.

In the last ten years, the Centre has distributed over 200,000 tree seedlings and established some 500 fodder and fuelwood blocks on private farmland. The number of trees distributed and block plantations established is increasing, as Table 5 shows.

Table 5: Total Tree Distributed and Fodder/Fuelwood Block Plantation Established

<u>Year</u>	<u>Total Tree Distributed</u>	<u>No. of Blocks Established</u>
1976	1362	NIL
1977	4280	10
1978	6862	28
1979	9647	N.A.
1980	15597	34
1981	21059	44
1982	36678	64
1983	N.A.	N.A.
1984	58637	138
1985	N.A.	N.A.

N.A. Figures not available in the reports.
Source: PAC's Annual and Half Yearly Reports.

i. Nominal Price for Seedlings

All of the trees, except the ones distributed in the year 1976, were taken by farmers on payment of Rs. 0.10 per seedling. The price is nominal and does not impose too much cost on farmers but, on the other hand, the system has proved to be very effective.

In the early stage of the programme, no charge was made for the trees distributed, but a record was kept which enabled the forestry staff to make follow-up visits in the following winter. Although some farmers had looked after their trees well, the majority of the trees had disappeared. In the subsequent year, the decision was made to charge a nominal price. This made farmers not only care for the trees taken but also looked for the preferred species and buy only the number of plants they actually wanted to have at one time. In the years 1977 and 1978, the demand for Nebharo (*Ficus roxburghii*) was so high that the price for this particular species was raised to Rs. 0.25. Even so farmers were ready to pay for what they wanted. This attitude of farmers towards trees was encouraging for the PAC and is the reason that emphasis was placed on supplying the type of trees in which farmers are interested.

2. Extent of farmers Involvement in the Programme and their Interest in Forestry

Altogether eighty farmers were selected randomly from the participant population, regardless of whether they had scattered planting or block plantations, for interview. The points discussed in the previous section explain, to some extent, the reasons for farmers' interest in forestry, but to elicit more informations on this a detailed analysis is necessary.

a. Number of Farmers Participating in the Programme

Approximately sixty percent of the farmers have planted trees on their private farmland in the last eight years. This is estimated on the basis of the records at PAC for the selected panchayats for the case study. The actual number of participants, however, is more than that shown in Table 6, as the field survey discovered many farmers who had taken trees, but whose names were not on the PAC records.

Among those who have participated in the programme, Brahmins and Chhettris seem to have had the most positive attitude towards planting trees on private land (78% of them do so). These are followed by Tamangs (15 %).

Table 6: Number of Farmers Involved in Private Tree Planting Programme in the Study Area

<u>Panchayats</u>	<u>Total Households</u>	<u>Total No. of Participating Households</u>	<u>Total Percent of Participating Households</u>
Pakhribas	407	302	74
Hattikharka	725	310	43
Phalate	396	205	52
Murtidhunga	479	360	75
Total	2007	1177	59

Source: PAC's Forestry and Pasture Development Section.

Brahmins and Chhettris usually depend more on farming and livestock (milk, ghee etc) than the any other group.

b. Trees Planted By Farmers (Number and Type)

Amongst the participating farmers in the Private Tree Planting Programme, the number of trees planted by an individual varies from two to as many as 915, with an average of 108 trees per household. Judging from the type of trees planted, they seem to value fodder trees most highly, as approximately thirty per cent of the farmers have planted only fodder tree species, while only five per cent of them have planted fuelwood trees only.

Table 7: Number of Trees Planted (Sample Population)

	<u>Total</u>	<u>Fodder</u>	<u>Fuel/Timber</u>	<u>Others</u>
Total	8642	5053	3575	14
No. of Farmers	80	75	57	1
% of Farmers	100	94	71	1.2
Maximum Planted	915	385	530	14
Minimum Planted	2	2	NIL	NIL
Mean	108	67.4	63	NA

In total ninety-four per cent of the farmers have planted fodder trees while only seventy-one per cent of them have planted fuelwood trees. Of the total trees planted by the farmers interviewed, the number of fodder trees was approximately two per cent more than the number of fuelwood/timber trees. The figures in Table 7 also clearly reflect the farmers' interest in, and preference for, fodder trees.

Table 8: Number of Trees taken per Farmer

<u>Trees</u>	<u>Taken</u>	<u>No. of Farmers</u>	<u>Percent of Farmers</u>
1	- 25	18	22
26	- 50	13	16
51	- 75	16	20
76	- 100	6	8
101	- 125	5	6
126	- 150	3	4
151	- 175	3	4
176	- 200	3	4
201	- 225	2	2
226	- 250	3	4
251	- 275	1	1
276	- 300	3	4
Over	300	4	5

Over two-thirds of the farmers interviewed have taken 100 or fewer seedlings for private planting (Table 8).

A total of thirty-nine different trees species were taken (Appendix 3). Amongst the ten most popular, seven are fodder trees. Fig trees, particularly Nebharo (Ficus roxburghii) were found to be the most popular in the area. This species was planted by seventy-two per cent of the farmers. Another fig tree species called khanyu (Ficus semicordata) was second most popular tree species being taken by thirty-eight per cent of the farmers. These two species were followed by Eucalyptus spp. (35%). The other tree species that seem popular are (in order of popularity) Kabhro (Ficus lacor), Khari (Celtis australis), Gogun (Saurauria nepalensis), Dhupi Salla (Cryptomeria japonica), Tanki (Bauhinia longifolia), Kutmero (Litsea polyantha) and Utis (Alnus nepalensis).

However, the farmers' choice is largely restricted to the type of tree species available in the Nursery at planting time. One reason for eucalyptus and dhupi Salla being popular may be their novalty value.

c. Type of Land Available For Planting

Altogether eight different types of land have been used for private planting (Table 9). Some eighty-five percent of the farmers have planted trees along terrace edges and banks, and forty-five per cent have planted on marginal land which is generally not suitable for cultivation. In fact this is an area where the farmers have established block plantations of fodder and fuelwood trees. The

other land type available for private planting is along the farm boundaries, and around the houses and cattlesheds which have been used by twenty six and sixteen per cent of the farmers respectively.

Table 9: Type of Land Used for Planting

<u>Land Type</u>	<u>No. of Farmers</u>	<u>% of Farmers</u>
Along the Terrace edge and banks	68	85
Non-arable (marginal) land	36	45
Along the farm boundaries	21	26
Streambanks	19	24
Odd corners	15	19
Around the house and cattleshed	13	16
Gullies	11	14
Kharbari	8	10

Farmers also seem aware of the need for planting trees for soil conservation. Over fifty-six per cent have planted them on areas such as stream banks, odd corners and gullies which need protection from further degradation.

One area that seems to be under-utilised is Kharbari, land kept for production of thatch grass and for feeding animals. This is the sort of area where an effective silvi-pasture system can be applied. Tables 4 and 9 show that some thirty-three per cent of farmers own such land but only ten percent have planted trees on it.

Some forty-two per cent of the farmers have planted trees more often than once. The reasons given for this are either to replace the dead ones or to plant more trees after trying small numbers. (Table 10)

Table 10: Number of Occasions (or frequency) of Planting Trees

<u>Frequency</u>	<u>No. of Farmers</u>	<u>Percentage of Farmers</u>
One Time	46	58
Two Times	22	27
Three Times	8	10
Four Times	4	5

d. Factors Motivating Farmers to Participate in Forestry Activities

In response to the question as to what actually motivated farmers to plant trees on their private land, a number of mixed answers were given. These are summarized in Table 11. It is interesting that no-one mentioned the tree planting competition programme, nor did anyone mention things like documentary films, radio etc. Nevertheless, in response to the question concerning awareness of the new Community Forestry Development Programme (CFDP), seventy two per cent of the farmers said they were aware of the changes made in forest legislation. As to their preference among the different options under CFDP, forty per cent preferred private forest and nineteen per cent liked both private forest and panchayat protected forest (PPF). Similarly, eight per cent of farmers felt positively about both private forest and Panchayat Forest (PF) whereas four per cent favoured all three. None of the farmers felt that lease forests, PF or PPF were sufficient by themselves.

Farmer attendance at forestry-related training activities was as follows:

Afforestation Training Course: 16%
 Panchayat Level Training: 46%
 Ward Level Training: 24%
 Agriculture Assistants Training: 5%
 Farmers' Field Day/Agriculture Day at PAC farm: 15%
 Total Involvement: 64%

(N.B. 21 farmers (26%) were involved in more than one of the above activities.)

Table 11: Factors Motivating Farmers to Become Involved in Forestry*

<u>Motivation</u>	<u>No. of Farmers</u>	<u>% of Farmers</u>
1. Scarcity of fodder and firewood and readily availability of trees in the nursery.	18	23
2. PAC, Staff.	13	16
3. Forestry related training.	9	11
4. Plantations on PAC Farm.	5	6
5. Plantations on neighbour's land.	4	5
6. Scarcity of fodder and firewood, and readily availability of trees in the nursery and PAC Staff.	11	14
7. PAC Staff and forestry related training	6	8
8. Plantation at PAC Farm and Plantations at neighbour's land.	2	3
9. Scarcity of fodder and firewood, and readily availability of trees in the nursery and PAC Staff and Plantations at PAC.	8	10
10. Scarcity of fodder and firewood, and readily availability of trees in the nursery and PAC Staff and Forestry training.	4	5

* Includes multiple responses

Sixty-nine per cent of farmers said that the Field Assistants have actually visited their farms for supervision of the trees. Field Assistants' contacts with the individual farmers vary from once in four months to twice a month. However this has mostly been limited to those who have established block plantations or those who have planted a minimum of fifty trees.

Finally, among the messages transmitted to the farmers by the extension workers (field staff), the most useful information and knowledge considered by the farmers are

(i) HMG/N Policy on Community forestry, (ii) PAC's own forestry programmes and objectives, (iii) availability of different type of tree seedlings in the nursery (iv) choice of sites for different tree species, and (v) tree planting and tree care techniques. They also appreciate the regular follow-up and supervision by PAC Staff of the planted trees. Charging only a nominal price for the seedlings was another aspect of the programme appreciated by the farmers.

3. Condition of Planted Trees in the Field

This section will discuss some technical aspects of forestry. An attempt will be made to address questions such as how the trees planted by farmers have fared in terms of their survival and growth rates, what protection measures have been adopted to care for the trees, and whether the trees have actually started to yield some benefit to the farmers. These are obviously the factors on which success of any forestry programme depends.

a. Survival Rates

Survival rate is considered to be one of the most important indicators of success for any tree planting programme, regardless of institutional form (communal or private planting). Table 12 gives survival rates. In fact a hundred per cent survival was achieved by sixteen farmers (22%) and total failure by only two farmers (3%).

Table 12: Survival Rates of Trees Planted in the Private Land

<u>Survival Rate %</u>	<u>No. of Farmers</u>	<u>% of Farmers</u>
0 - 19	6	8
20 - 39	5	6
40 - 59	12	15
60 - 79	19	24
80 - 100	38	48

The mortality rate tends to be higher with the increasing number of seedlings planted. The rate of survival however tends to decrease with the older plantations, as Table 13 indicates.

Table 13: Average Survival Rate by Plantation Age

<u>Trees Planted</u>	<u>Average Survival % (1985)</u>
1976/77	36
1977/78	37
1978/79	57
1979/80	62
1980/81	58
1981/82	71
1982/83	65
1983/84	68
1984/85	66
1985/86	80

The above figures should be interpreted cautiously. One would expect a fairly high mortality up to the point when trees are established, after which the rate should be low. It was not possible to obtain information on when mortality occurred in the older plantations, but it does appear that knowledge of cultural techniques may have improved since 1977/78 and that one can now expect about seventy per cent survival.

Also, 1977/78 represents the point when farmers started to pay for seedlings and this could have made them take better care of them.

As to the reasons for the failures of planted trees, altogether eight different reasons were given by the farmers. These are summarized in the Table 14.

Table 14: Reasons for the Failures of Planted Trees

<u>Reasons</u>	<u>No. of Farmers</u>	<u>% of Farmers</u>
Due to own animals	23	29
Due to Neighbour's animals	19	24
Due to diseases & insect attacks	19	24
Due to unsuitability of sites	12	15
Theft	10	12
Due to heavy snowfall	7	9
Due to landslips	3	4
Due to fire	1	1

Animal damage was mentioned most frequently (42 times) as the reason for failure. In the case of diseases and insect attacks, stem borer, particularly with the fig trees (Ficus roxburghii), was frequently noticed. Sixty-eight per cent of losses were due to causes that could be controlled fairly easily through improved extension (animal damage and unsuitable sites). Table 15 summarises the protection measures adopted by the farmers.

Table 15: Protection Measures Adopted By Farmers

<u>Protection Measures</u>	<u>No. of Farmers</u>	<u>% of Farmers</u>
Without fencing	39	49
Fencing individual trees	36	45
Fencing whole block plantations	14	18
Fencing by planting live fences	2	2

Although some farmers have protected the trees well, even without using any sort of fencing, fencing individual trees was observed to be the most effective measure, but it is also the most time-consuming and therefore cannot be applied to large numbers of trees. Bamboo materials and thorny plants were most often used as fencing materials.

b. Growth Rate of Some Popular Fodder Trees

In order to have a general idea as to the rate at which the trees have grown, some trees of the following four fodder species, planted in 1977 through 1984, were marked randomly and their heights and diameters-at-breast height (d.b.h.) taken. The figures obtained are summarized in Table 16.

As is clear from the Table, some trees, particularly Gogun, Khanyu and Nebharo, which were planted in the beginning of the programmes, have reached the stage of producing fodder. In fact some trees have an annual height increment of over one meter, which is good for these species. However, some farmers seem to have cared for their trees well. They have not only protected, but have also weeded, mulched and manured them, activities which will have enhanced growth.

Table 16: Average Height and D.B.H. of some Popular Fodder Trees in the Pakhribas Area

Age (Yrs)	Year of Planting	<u>Ficus</u> <u>roxburghii</u> (Nebharo)		<u>Ficus</u> <u>semicordata</u> (Khanyu)		<u>Saurauia</u> <u>nepalensis</u> (Gagun)		<u>Litsea</u> <u>polyantha</u> (Kutmero)	
		Height in M	D.B.H. in Cm	Height in M	D.B.H. in Cm	Height in M	D.B.H. in Cm	Height in M	D.B.H. in Cm
1.	1984	1.5 (8)	N.R.	1.5 (2)	N.R.	0.9 (5)	N.R.	0.6 (3)	N.R.
2.	1983	2.4 (8)	4.1	1.9 (2)	N.R.	1.4 (4)	N.R.	1.4 (2)	N.R.
3.	1982	3.3 (4)	5.1	2.8 (3)	3.4	2.2 (4)	3.2	2.7 (3)	4.1
4.	1981	3.1 (5)	4.8	3.4 (3)	5.7	1.9 (3)	2.2	2.5 (2)	4.0
5.	1980	4.1 (8)	6.9	3.1 (6)	5.9	2.8 (3)	4.4	3.7 (4)	4.7
6.	1979	4.4 (9)	7.7	N.R.	N.R.	4.3 (5)	6.8	4.1 (4)	5.1
7.	1978	4.5 (9)	8.7	4.3 (6)	7.4	5.6 (4)	10.0	4.4 (3)	6.9
8.	1976	5.4 (11)	8.7	6.0 (3)	7.3	7.2 (4)	11.4	4.7 (2)	7.3

N.R: Figures within the brackets indicate total number of trees measured and NR for not recorded.

The mean annual increment for height was calculated, assuming that trees were planted at an average height of 0.30 m. This gives only a rough approximation of mean annual increment and does not, for instance, take into account the possibility that in recent years improved cultural techniques may have enhanced growth. Some farmers have even put organic manure on the trees and mulched them during the dry season for moisture retention.

From Table 17 it appears that mean annual increment (height) may culminate around year 3 for Nebharo, Khanyu and Kutmero, but may not have culminated in Gogun by year 8.

Table 17: Mean Annual Increment (Height) in Nebharo, Khanyu, Gogun and Kutmero Trees (M)

<u>Age (Yrs)</u>	<u>F.roxburghii Nebharo</u>	<u>F.semicordata Khanyu</u>	<u>S.nepalensis Gogun</u>	<u>L.polyantha Kutmero</u>
1.	0.83	0.81	0.43	0.23
2.	1.05	0.78	0.54	0.57
3.	1.01	0.85	0.62	0.81
4.	0.69	0.78	0.39	0.54
5.	0.76	0.56	0.51	0.67
6.	0.68	N.R.	0.67	0.64
7.	0.61	0.56	0.76	0.59
8.	0.63	0.71	0.86	0.55

c. Benefits from Planted trees

Because of the long time required by trees to grow to a useable size, it is still a little too early to calculate how much benefit the participants have been able to derive from the trees planted on their farmland. None of the farmers interviewed had harvested trees for firewood but nineteen per cent of them said that they had begun to receive a yield from some of the fodder trees. However, this additional amount of tree fodder the farmers have harvested, which varies from 0.5 to 3.0 bhari, (12 - 75 Kgs), is as yet insignificant compared to their total requirement. The trees which have begun to yield some benefits were planted in the years 1977 through 1981.

d. Management of Planted Trees

Most of the trees planted during early phase of the programme have attained considerable heights. Because of the uncertainty regarding the survival rates of the

trees, farmers were originally advised to plant them at a rather close spacing of 2m x 2m. However this spacing now seems to be too close for most trees, particularly fodder trees. Normally a desirable height for a fodder tree is considered to be about 5 metres. Some fodder trees have grown much taller than this (see Table 16). Therefore it is time to consider management aspects, especially fodder production (e.g. thinning and shaping the crown size through pruning and increasing the number of growing points). For this, research will have to be carried out and findings made available to the farmers. The extension messages, which have so far been limited only to planting and protection techniques, should include management techniques as well.

4. Comparisons of Participant Population with the Non-participants

This section will discuss the non-participant population and identify factors inhibiting their participation in the forestry programme.

For the study seventy-eight non-participating farmers were selected by random sampling. Eighteen farmers were selected from Pakhribas Panchayat and twenty each from Phalate, Hattikharka and Murtidhunga Panchayats.

Amongst the non-participants, fifty eight per cent of the farmers lived below 1300 metre above sea level compared with twenty-two per cent of the participant population. Only thirty five per cent of the non-participants (compared with 49% of the participants) lived between 1300 and 1800 metre above sea level, where non-arable land is generally available for planting trees.

a. Source of Tree Fodder and Firewood

The proportion of non-participant farmers relying on public and private forests for fodder and firewood seems to be much the same as was found among the participating sample (see Table 18). Some twenty-two of non-participant farmers buy fodder and firewood (30% of the participants).

Table 18: Source of Tree Fodder and Firewood

<u>Source</u>	<u>Participants</u>	<u>Non-participants</u>
	<u>No (%)</u>	<u>No (%)</u>
<u>Tree Fodder:</u>		
Public Forest	6 (8)	2 (3)
Private Forest	62 (77)	67 (86)
Both	12 (15)	9 (12)
<u>Firewood/Timber:</u>		
Public Forest	20 (25)	15 (19)
Private Forest	35 (44)	36 (46)
Both	25 (31)	27 (35)

b. Family Size and Land Holding:

Appendix 4 shows considerable differences between participant and non-participant farmers in these respects. The latter have the smaller families and less non-arable/marginal land.

c. Livestock Number:

All the farmers interviewed maintained some kind of animals. The livestock holding pattern of both participants and non-participant population is very much the same (see Appendix 5). However when the numbers of different animals owned by these two categories of the population are compared it is evident that fewer non-participants own buffalos (55% vs. 71%) and the average buffalo herd is smaller (2.4 vs. 3). As a result the non-participants had a little over half the number of buffalo owned by the participants. The non-participants, however, seem to have more oxen than the participants; averages being 2.2 and 1.8, respectively.

d. Number of Existing Trees in the Farmland

Appendix 6 shows that all of the non-participant farmers maintain trees of one kind or another on their private farmland (in comparison to 92% of the participating sample population). The average number of trees owned by the non-participants (88) is less than that of the participating sample (105). While the proportion of farmers owning fodder trees and fuelwood trees is very similar in both categories of the sample population, the number of fodder trees owned per farmer possessing them is markedly less for the non-participating sample (35);

this may be a reflection of their smaller area of bariland. In fact the number of fodder trees/ropani of bari land amongst the non-participating sample (1.69) is greater than that for the participating sample (1.54). Surprisingly, of those farmers with fuelwood trees, the non-participants have more than the participants.

e. Access to Information and Other Facilities Related to Forestry Programmes

Table 19 shows to what extent the non-participants are exposed to information and other facilities relevant to forestry development programmes.

Table 19: Non-participants's Access to Forestry Programme Related Information and Facilities:

<u>Informations/Facilities</u>	<u>No. of Farmers</u>	<u>% of Farmers</u>
Awareness of Govt's New Policy on Community Forestry Development:	30	38
Awareness of PAC's Forestry Programme:	68	87
Received PAC's Forestry Related Training	25	32
Meet with PAC's Forestry Staff:	57	73

f. Reasons for not Participating in the Tree Planting Programmes:

When asked what deterred them from planting trees on their private farmland, sample farmers gave six different answers which are summarised Table 20.

Two pronounced factors emerge from Table 20: the lack of land for such a planting programme and the fear and suspicion of the people. Fourteen per cent of the farmers could not plant trees, simply because the type of tree species they wanted (Sissaun and sal) were not available in the nurseries. This is an important reason, as the nurseries generally have a better selection of tree species for farmers living above 1300

Table 20: Reasons for not participating

<u>Reasons</u>	<u>No. of Farmers</u>	<u>% of Farmers</u>
Did not have land to plant trees	28	36
It might become govt. property	16	21
Seedlings of choice not available in nurseries	11	14
Did not know trees should be planted	7	9
Did not know where to get the seedlings	7	9
Did not know the techniques required	6	8
Protection of planted trees was a problem	3	4

metre above sea level then for those living at lower altitudes. About thirty one per cent of the farmers fall in the last four categories of Table 20; this possibly reflects an ineffectiveness in extension work. Nineteen per cent of the non-participating sample however said that they were considering planting trees.

E. SUMMARY AND CONCLUSIONS

Pakhribas Agriculture Centre (PAC) has certainly placed great emphasis on the private tree planting programme. During the late 1970s, it was the deliberate policy of the Centre to focus on private tree planting, but in later years, particularly during the last five years or so, it would probably be fair to say that it was uncertainty about the future of PAC that led the forestry staff to continue to put their major effort and resources into private planting and less emphasis on Panchayat Forests (PFs) and Panchayat Protected Forests (PPFs), both programmes with a longer time frame.

From the analysis of the existing forestry situation in the Pakhribas area, two things are evident. First, as a result of deforestation there is very little public

forest left, and farmers are increasingly dependent on private land for fodder and firewood. Second, there is still non-arable land available in such forms as marginal land, kharbari, farm boundaries, gullies, streambanks, and odd corners which, at present, are underutilized.

In this case study, overall just under twenty per cent of all private land is in categories other than "arable" land (i.e. khet and bari only). Such land, if utilised properly, particularly through planting trees and grasses, has tremendous potential for raising overall production. Moreover the above figure is an underestimate of the area that can be planted to trees, because it has been impossible to take into account streams banks, gullies and odd corners in calculating land area. Nevertheless such land can be useful for planting trees.

When estimation of land holding is not restricted to arable land only (i.e. khet and bari only), which has been the normal way of estimating average land holding, the average land holding seems to be much bigger than was previously thought. The present national figure of 0.4 ha. average holding in the Hills appears to have failed to take account of non-arable land owned by farmers. This has led to a substantial underestimation of the overall productive capacity of farms in the Hill regions.

Considering the Centre's private tree planting programme, which is the main objective of this case study, the methods and approaches chosen are more than just distribution of seedlings. In the last ten year period, PAC has distributed over 200,000 seedlings and established some 500 blocks of fodder and fuelwood trees on private land.

Some sixty per cent of the farmers in the Study Area have participated in PAC's private planting programme. Inadequate supply of fodder and firewood is the major problem facing them, and one of the main reasons for them to participate in the Programme.

In order to implement the programme, PAC has designed a very intensive extension and training programme with a strong feedback mechanism from villagers to the field staff and subsequently to the staff at the Centre, normally through personal contacts and meetings. Besides its intensive extension programme, the Centre's approach to hiring highly-motivated local persons to

work as field staff in their own areas is probably the factor contributing most to its success. Not only do the field staff feel competent to work in an area which is already known to them, but the target population also know these persons well and do not, therefore, hesitate to go to meet them. From this it can be deduced that the extension worker who is an outsider, even if qualified and trained in a formal institute, should not always be considered essential to the effective implementation of village development programmes.

Apart from the above, the other strategies adopted by the Centre for implementing the programme are: placing emphasis on the tree species demanded by the farmers, charging a nominal price for the trees taken, and providing both demonstrations and regular follow-up on planted trees.

Even so, the PAC's approaches have not been without problems. Although it has had success in winning the confidence of some individuals; others have not been affected. Looking at the range of tree species raised in the nurseries, one gets the impression that only those species that can grow above 1300 m.a.s.l. have been considered so far. Some fourteen per cent of the farmers interviewed among the non-participant population who live below this altitudinal range could not plant trees simply because the type of species they wanted were never available in the nursery. In some farmers fields, mortality rates are rather high. Sixty eight per cent of the losses were due to causes (animal damage and unsuitable sites) that could be controlled fairly easily through an improved extension programme.

Non-availability of adequate extension messages (or technologies) is yet another problem. Those farmers who participated in the early stage of the programme now need more information than just planting techniques. The management aspect of trees, such as thinning, pruning and shaping the crown for better yield (in the case of fodder trees), have so far been neglected and the forestry field staff seem to be unaware of what should be the next step.

There still exists the fear among some people that they will loose land if trees are planted on it. Quite a number of farmers are still unaware of PAC's forestry programme, and about rules and regulations governing community forestry in Nepal.

Some thirty six per cent of the sample of non-participants did not participate in the programme

because of lack of land on which to plant trees. These farmers are not necessarily landless, but rather they do not own non-arable land on which trees could be planted. Such farmers rely more on public land for fodder and fuelwood, could well support and participate in PFs programme. On the other hand, farmers who have seen that the Programme has a practical approach to their problem, appear convinced that it will benefit them in the long run without imposing too much cost and risk.

The number of trees taken by individual families varies from two to as many as 915, with an average of 108 trees in the study area. Ninety-four per cent of the participating farmers have planted fodder trees, while only seventy one per cent have planted firewood trees. Thirty per cent of the farmers planted only fodder trees. The total number of fodder trees planted was approximately forty two more than the number of fuelwood and timber trees.

An average seventy per cent survival rate was recorded. There has been an improvement in survival rate since 1977/78, the year in which farmers first started to pay for trees. It also appears that knowledge of cultural techniques has improved since then. Fencing individual trees was found to be the most effective method of protection, although some farmers have protected their trees well without any sort of fencing. Bamboo materials and thorny plants were most often used as fencing materials. Some farmers have not only protected but also weeded, mulched and manured (even applied chemical fertilizer to) the trees.

Some trees, particularly Gogun (Sauraria nepalensis), khanyu (Ficus semicordate) and Nebharo (Ficus roxburghii) which were planted at the beginning of the programme have reached the stage of producing fodder. In fact, some of them have an annual height increment of over one metre. This, moreover, gives only a rough approximation of mean annual increment and does not, for instance, take into account the possibility that in recent years improved cultural techniques may have enhanced growth.

None of the farmers interviewed had harvested trees for firewood but nineteen per cent said that they had begun to take a crop from some fodder trees. The amount harvested varies from 0.5 to 3 bhari (12-75 kgs), and is as yet insignificant compared to their total requirement of fodder.

Among farmers who are aware of community forestry rules and regulations, the majority have seen clear benefits in private planting and have therefore given top priority to this programme. Next in their preference are the PPFs. This order of priorities, in fact, is the reverse of the government's present approach which is to establish as many PFs and PPFs as possible. The farmers' order of preference is reflected in the PAC's forestry programme, which takes into account the 'felt needs' of the farmers and not the needs as perceived by government.

The findings provide sufficient reason to argue that, although the area covered by PFs and PPFs will be much bigger and therefore overall impact will be greater, the private tree planting programme, with due emphasis, will not only provide farmers with immediate access to fodder and firewood trees, but may also eventually contribute considerably to reducing the pressure on public or communal forest land. Furthermore, as individual farmers are solely responsible for managing trees planted on private land, the only cost that government may bear will be the staff salaries and allowances which they have to bear in any case.

There is a fear that the private planting programme may be open to attack on the grounds of equity (i.e. because it supports only those farmers who have most land and therefore can accept risk). Although people with sufficient land for planting trees would certainly benefit, the landless and people with not enough land to be self-sufficient would not necessarily be disadvantaged. A strategy of providing a limited number of seedlings free-of-charge and then charging a nominal price for others may partly solve the issue of equity. In addition it would be wise to take into account the huge area available in the form of non-arable land which constitutes about twenty per cent of total private land. The overall productivity of these lands would otherwise remain undesirably low. Both the farmers and PAC have well demonstrated that such land can be utilized for growing trees.

Viewing the question of forestry in Nepal in general, and farmers' interest in the private tree planting programme in particular, it appears that the present approach of community forestry development need some modification. PAC, which has been fairly successful in a programme which relies for its motivation on private gain, rather than public concern, has better prospects

in the early stages of the Programme. Government's effort on the other hand, has been largely to motivate public opinion, and so far the establishment of PFs and Panchayat nurseries have been the main approaches it has adopted to motivate the public. While it appears that the strategy needs to be flexible in order to meet the requirements of each panchayat, the government's overall effort in private and public forestry should be about equal rather than present approach of emphasizing public forestry only.

For the private planting programme to be effective, a shift in emphasis from the present philosophy of 'raise whatever seed is available' to raising the ones preferred by the farmers will be required. Also the Government's present practice of just distributing seedlings must be changed; the sort of strategies used by PAC could usefully be adopted. This would, in turn, require a major change in role for the Government's field based forestry personnel, and a changeover to assisting people with managing their own trees and forest resources. This would mean that these field staff would be required to deal, not only with the demarcated forest areas and trees, but also with individual trees, farmland and above all, farm families.

Nevertheless, it is very important that private planting is not seen as the solution to all the forestry problems in Nepal. It addresses only a part of the problem and other issues and problems will still have to be resolved through community forestry programmes.

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Appendix 1RULES AND REGULATIONS GOVERNING COMMUNITY FORESTRY IN NEPAL

Under the Community Forestry Programme, four different types of programme are being implemented in the country. These are Panchayat Forest (PF), Panchayat Protected Forest (PPF), Lease Forest and Private Forest.

Panchayat Forest (PF):

Government land, either barren or with only a few trees which can be developed as a forest only by reforesting at least two-thirds of the area, can be handed over to the panchayat as Panchayat Forest. In the hills a maximum of 2,500 ropanis (125 ha.) and in the Terai, a maximum of 200 bighas (approx. 150 ha.) can be handed over to a panchayat to be developed and maintained as Panchayat Forest. Such areas do not necessarily have to be located in one place in one block.

The people of the concerned panchayat will be responsible for planting seeds or seedlings, taking care of the forest, and protecting and managing them in accordance with the management plan approved by Forest Department. The Forest Department, on the other hand, will provide support by issuing planting materials free of cost, technical know-how and some funds.

The village panchayat concerned may distribute forest products from the PFs for use by people of the area under its jurisdiction. In case the forest products of the PFs are in excess of the requirements of the people of the local village panchayat area, the village panchayat concerned may sell or supply such surplus forest products to the people of other village panchayat areas. The prices for such forest products can be fixed by the concerned village panchayat and any income from the sale of such products will be credited to the same village panchayat fund.

Panchayat Protected Forest (PPF)

Any government forest or part of it can be handed over to a panchayat for protection management and proper utilization. A maximum of 400 bighas (270 ha.) in the Terai, and 10,000 ropanis (500 ha.) in the hills, shall be given as Panchayat Protected Forest (PPF) for each village panchayat. PPF may be handed over to a panchayat in one lot or in different lots within the prescribed limits.

Seeds and saplings required for maintaining PPF, and for their reforestation and management, shall be supplied free of cost to the local panchayat by the local Forest Office. In addition, technical and some financial, assistance will be provided by the Government. The concerned panchayat will bear responsibility to manage and use the PPF in accordance with the management plan approved by the Forest Department.

Forest products from PPFs such as grass, foliage, fuelwood and medicinal plants will be supplied free of cost for use by the people of the panchayat area concerned. Forest products which are in excess may be sold or exported to the people of other village panchayats area. Seventy five per cent of the income accruing from the PPF shall be made available as subsidy to the concerned village panchayat and the rest will be deposited in the Government treasury.

Lease Forest

Government forest area without trees or with only scattered trees may be allocated to individuals, groups or institutions as lease forest for the production of forest produce such as firewood, timber, forest raw materials for industry, grass for animals, bamboo, reed, cane, agave, Christmas trees and other decorative trees, plants, cardamom, lac, medicinal herbs, resin etc.

The duration of the lease period will be of 30 years at most. However, after the expiration of the lease period, the contract may be renewed without changing the area, person or agency in contract. No charge will be made for such renewal.

The lease forest area for the individual contractor shall be a maximum of 35 bighas in Terai, 50 ropanis in the Kathmandu Valley and 80 ropanis in other hilly areas. For an agency, the area shall be a maximum of 100 bighas in the Terai, and 400 ropanis in other areas.

Within one year's period of the signing of contract, the individual or agency must start works stated in approved project. But if such work could not commence due to unforeseen reasons, HMG may extend this period.

An annual rent of Rs. 20 per bigha in Terai and Rs. 1 per ropani in Valley and Hills will be charged for all types of forest products.

The annual production of lease forest may be utilized for consumption and sale as specified in the approved forest programme. If forest products are extracted from clear

felling, replanting must be done, and arrangements should be made for protection, preservation and management within one year's period.

Private Forest

Any individual wishing to establish forest in his/her registered private land shall be allowed to have own forest with the permission of the concerned District Forest Office. The owner of the forest may utilize the forest products as he/she wishes and the owner him/herself will be responsible for the management and protection of this private forest.

The Government can provide the owner with free planting materials, technical advice and some financial assistance as prescribed in the rules. There is no set period for private forest and it depends on the individual owners as to how long he/she wishes to maintain it as private forest.

Appendix 2TREE SPECIES OBSERVED IN THE PAKHRIBAS AREA

<u>Species</u>	<u>Altitudes (m)</u>	<u>Uses</u>
Acacia catechue (khayar)	Up to 1000	Fodder/Firewood/Timber/ dye
Albizzia mollis (rato siris)	600 - 1500	Fodder
Albizzia lebbak (seto siris)	450 - 1400	Fodder
Alnus nepalensis (utis)	900 - 2200	Firewood
Artocarpus lakoocha (badahar)	600 - 1200	Fodder/Fruit
Bassia Butyraceae (chieri)	600 - 1200	Fodder/Fruit
Bauhinia longifolia (Tanki)	600 - 1400	Fodder
Bauhinia variegata (koiralo)	600 - 1400	Fodder/Pickle
Brassiopsis glomerulata (kalo chuletro)	1500 - 2100	Fodder
Brassiopsis hainla (seto chuletro)	1300 - 1800	Fodder
Bredelia retusa (gayo)	600 - 1500	Fodder
Buddelia asiatica (bhimsenpati)	1000 - 1700	Fodder
Castanopsis hystrix (patle katus)	1550 - 2250	Fodder/Fruit/Timber/ Firewood
Castanopsis indica (dhalne katus)	Up to 1400	Fodder/Firewood/Timber/ Fruit
Castanopsis tribuloides (masure katus)	1550 - 1900	Fodder/Firewood/Timber/ Fruit
Cedraia toona (toonj)	Up to 1220	Firewood/Timber
Celtis australis (kharj)	600 - 1300	Fodder/firewood
Choreospondias axillaris (Lapsi)	900 - 1800	Firewood/Fruit
Delbergia sissoo (Sisaun)	Up to 1200	Fodder/Firewood/Timber
Evythrina arboresions (Phaledo)	600 - 1400	Fodder

<u>Species</u>	<u>Altitudes (m)</u>	<u>Uses</u>
Ficus lacor (kabhro)	900 - 1600	Fodder
Ficus nemoralis (dudhilo)	1200 - 1900	Fodder
Ficus roxburghii (nebhara)	1300 - 1900	Fodder
Ficus semicordata (khaniyu)	1200 - 1600	Fodder
Grewia oppositifolia (Shyal fusro)	Up to 1650	Fodder
Juglans regia (okhar)	1400 - 2200	Firewood/Timber/Fruit
Litsea polyantha (kutmero)	900 - 1600	Fodder
Macaranga spp. (Maletu)	600 - 1600	Firewood
Michelia champaca (champ)	1000 - 2700	Timber
Melia azadarach (bakaino)	Up to 1900	Firewood
Morus spp. (kimbu)	900 - 1950	Fodder
Mucuna momosperma (baldhyangro)	Up to 1200	Fodder
Myria spp. (kafal)	900 - 1500	Firewood/Fruit
Pinus roxburghii (khote salla)	900 - 1400	Firewood/Timber
Pinus wallichiana (gobre salla)	1800 - 2500	Firewood/Timber
Prunus cerasoides (palyu)	1200 - 2200	Fodder/Firewood/Timber
Quercus incana (banjh)	1200 - 1500	Fodder/Firewood/Timber
Quercus lamellosa (pharant)	1500 - 2700	Fodder/Firewood/Timber
Salix spp. (bains)	1500 - 2700	Fodder
Sapindus mukorossi (ritha)	Up to 1500	Firewood/Soap
Sauraria nepalensis (gogun)	1300 - 2000	Fodder
Schima wallichii (chilaune)	900 - 1700	Fodder/Firewood/Timber
Shorea robusta (Sal or Sakhuwa)	Up to 1000	Fodder/Timber

Appendix 3THE SPECIES PREFERRED BY FARMERS IN THE PAKHRIBAS AREA

<u>Species Taken</u>	<u>Tree Types</u>	<u>No. of Farmers Taking</u>	<u>% of Farmers Taking Trees</u>
Ficus roxburghii (Nebharo)	Fodder	58	72.5
Ficus semicordata (Khanyu)	Fodder	31	38.75
Eucalyptus Spp. (Mashala)	Firewood/Timber	28	35.0
Ficus lacor (Kabhro)	Fodder	20	25.0
Celtis australis (Khari)	Fodder/Firewood/Timber	20	25.0
Sauraria nepalensis (Gogun)	Fodder	17	21.25
Juniperous Spp. (Dhupi)	Firewood/Timber	17	21.25
Bauhinia longifolia (Tanki)	Fodder	16	20.0
Litsea polyantha (Kutmero)	Fodder	14	17.5
Alnus nepalensis (Utis)	Firewood	14	17.5
Boehemeria regulosa (Dar)	Fodder/Timber	14	17.5
Moras Spp. (Kimbu)	Fodder	12	15.0
Pinus roxburghii (Aulo Salla)	Fuelwood/Timber	12	15.0
Ficus nemoralis (Dudhilo)	Fodder	8	10.0
Delbergia sissoo (Sissaun)	Timber/Firewood	8	10.0
Albizzia spp. (Siris)	Fodder/Firewood/Mulch	5	6.25
Prunus nepalensis (Arupate)	Fodder	5	6.25
Pinus wallichiana (Gobre Salla)	Timber/Firewood	4	5.0
Shorea robusta (Sakhuwa)	Timber	4	5.0
Choreospondias axillaris (Lapsi)	Fuelwood/Fruits	4	5.0

<u>Species Taken</u>	<u>Tree Types</u>	<u>No. of Farmers Taking</u>	<u>% of Farmers Taking Trees</u>
Artocarpus lakoocha (Badahar)	Fodder/Fruits	3	3.75
Juglans regia (Okhar)	Timber/Fruits	3	3.75
Michelia champaca (Champ)	Timber	3	3.75
Prunus cerasoides (Painyu)	Fodder/Firewood	3	3.75
Pinus patula (Patula Salla)	Timber/Firewood	3	3.75
Grewia oppositifolia (Shyal fusro)	Fodder/Firewood	3	3.75
Bauhinia Variegata (Koiralo)	Fodder	2	2.5
Castanopsis hystrix (Patle Katus)	Firewood/Fodder/Timber	2	2.5
Cryptomeria japonica (Chupi Salla)	Firewood/Timber	2	2.5
Quercus lamellosa (Phalant)	Fodder/Firewood/Timber	2	2.5
?			
(Bhakri Ghans)	Fodder	2	2.5
Salix Spp. (Bains)	Fodder	1	1.25
Schema wallichii (Chilaune)	Firewood/Timber	1	1.25
Leucaena leucocephala (Ipil-ipil)	Fodder/Firewood	1	1.25
Bredelia retusa (Cayo)	Fodder/Firewood	1	1.25
Bamboo Spp. (Bans)	Fodder/rough poles	1	1.25
Arundinaria Spp. (Nigalo)	Fodder/rough materials	1	1.25
?			
Ghotlikath)	Firewood/Timber	1	1.25
?			
(Bangi Kath)	Firewood	1	1.25

Appendix 4

FAMILY SIZE AND LAND HOLDING PATTERN IN THE PAKHRIBAS AREA

	Family size (Nos)		Khet (Ropani)		Bari (Ropani)		Non-arable Marginal Land (Ropani)		Kharbari (Ropani)		Stream-banks (Nos)		Gullys and Odd Corners (Nos)		Total of Khet, Bari Kharbari and Marginal land (Ropani)	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Total	80	78	1769	1231	2240	1580	1125.5	243.5	181	144	178	152	344	261	5515.5	3198.5
No. of Farmers having	-	-	69	67	79	77	66	42	25	27	64	61	73	76	80	78
% of Farmers having	-	-	86	86	99	99	82	54	31	35	80	78	93	97	100	100
Maximum Owned	21	14	300	56	185	80	400	30	50	30	12	7	28	15	630	115
Minimum Owned	3	3	NIL	NIL	1	1	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	1	1
Mean	8.0	6.8	25.6	18.4	30.9	20.5	17.0	5.8	7.2	5.3	2.9	2.5	4.7	3.4	68.9	41.0
% of Farmers without	-	-	14	14	1	1	18	46	69	65	20	22	7	3	NIL	NIL

1 = Participants
1 Ropani = 1/20 ha

2 = Non-participants

LIVESTOCK OWNERSHIP PATTERN IN THE PAKHRIBAS AREA

	Buffalo		Cow		Oxens		Goat		Sheep		Total	
	1	2	1	2	1	2	1	2	1	2	1	2
Total Nos.	170	98	226	200	127	137	469	416	59	13	1051	864
Total Livestock Unit (LSU)*	225	147	226	200	127	137	94	83	12	3	714	570
No. of Farmers having Livestock	57	41	69	68	69	63	71	67	7	2	78	78
% of Farmers having Livestock	71	53	36	86	86	81	89	86	9	3	98	100
Maximum Owned	11	6	7	9	7	9	26	26	15	12	44	49
Minimum Owned	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	1
Mean	3.0	2.4	3.3	2.9	1.8	2.2	6.6	6.2	8.4	6.5	13.5	11.1
% of Farmers without	29	47	14	14	14	19	11	14	91	97	2	NIL

1 = Participants, 2 = Non-participants

*LSU: 1 Buffalo = 1.5 LSU ; 1 Cow or ox = 1 LSU; 1 Sheep/Goat = 0.2 LSU

NUMBER OF EXISTING TREES IN THE FARMLAND

	Fodder Trees		Fuel/Timber Trees		Others including bamboos		Total	
	1	2	1	2	1	2	1	2
Total No.	3764	2681	3578	3272	444	904	7796	6857
No. of Farmers having Trees	73	78	42	36	60	48	74	78
% of Farmers having Trees	91	100	52	46	75	62	92	100
Maximum Owned	208	180	250	514	35	100	376	694
Minimum Owned	NIL	2	NIL	NIL	NIL	NIL	NIL	2
Mean	51.6	34.4	85.2	91	7.4	18.8	105.4	88
% of Farmers without	9	NIL	48	54	40	52	8	NIL

1 = Participants, 2 = Non-participants

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