CHAPTER V

PRIVATE TREE PLANTING PROGRAM OF PAC AND ITS EVALUATION

The role of tree subsystem as an important component of household inter-relationships has been described earlier (Chapter IV). Due to the prominent interactive effect, each component may be spectacular more or less depending on the bio-physical as well as socioeconomic structure of the area. Status of tree component is directly related with the livestock, which varied among different ethnic groups. The tree plantation program launched by the PAC on some of the private barren as well as cultivated land has developed a new consequences of system interaction, which is obvious with respect to gender differentiation and the agroforestry system.

5.1 Private tree planting program of PAC

PAC is the multidisciplinary semi-governmental project, whose objectives and approaches emerge from the strongly felt need for arresting declining trends in productivity and maintaining sustainability of hills resources. The workable solutions to the problems of hill agriculture that PAC's hope, can be found through an

integrated and multidisciplinary based development approach. PAC's one of the pioneer project which has emphasized a private tree planting program in a relatively structured manner.

The methods and approaches the centre has chosen to promote this program are more than just distribution of seedlings. PAC's innovation has also been to involve farmers in forestry activities.

5.1.1 Introduction of PAC's tree planting program

The PAC's forestry program was initiated at a time when all the forest public land belonged to government, following to the nationalization of forest in 1957 and the forest act of 1961. The program was therefore started before the present community forestry program, during the late 1970s by the deliberate policy of the centre to focus on private tree planting. Two things are reported by Malla (1988), from the analysis of the existing forestry situation in the Pakhribas area. First, as a result of deforestation there is very little public forest left and farmers' dependency on private land for fodder and firewood are increasing. Second, there is still uncultivated land available in such forms as marginal land, farm boundaries, gullies, streambanks and odd corners which, at present are underutilized. The proper utilization of such lands, particularly through planting trees and grasses, has tremendous potential for raising overall production.

The Private Tree Planting Program has following objectives;

1. To provide farmers with trees and technical suggestions for scattered planting.
2. To establish block plantations of fodder and fuelwood trees on those private land sufficient for at least fifty trees.

The field staff visit the sites and decide jointly with the farmers which tree species are to be planted. At the time of planting, they go and provide technical support to farmers for planting trees and in the following winter they make follow up visits and suggest farmers to protect, weed, mulch and if possible manure the trees.

In the last ten years, the centre has distributed over 200,000 saplings and established some 500 fodder and fuelwood blocks on private farmland. In the early stage of the program, 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. In the subsequent year, the decision was made to charge a nominal price for the saplings. The tree planting was extended within Forestry Section's command area in four Koshi hill districts. In Hattikharka Village Development Committee of Dhankuta district, altogether 725 households were provided with saplings and necessary technical supports. In case of Salle village, 21 per cent of total households responded of participating in private tree planting program.

5.1.2 Initiation of tree planting program in Salle village

In the late 1987, a group of farmers from Salle village contacted the Forestry section at PAC seeking advice and help for planting trees on 30 ha of *nagi*land (grassland) previously used for open grazing but privately owned by 68 households. Following a request from the villagers, a program of home farm visits to meet individual farmers and to identify their needs and opportunities was launched by the staff of the Forestry Section. There was equal participation by both *nagi*-owners and non-*nagi*-owners in a series of village on site meetings. The community self help group with 54 members was formed which resulted in the formation of Salle community tree plantation scheme. An executive committee was formed with 6 members, including two women farmers, by the villagers. The members included farmers both with and without access to *nagi*land. Several meetings were organized by the committee to discuss and to agree upon the future program. The main points agreed between the committee and the villagers were;

1. Development of village level program such as the construction of nursery particularly labor from each household.
2. Fixing a nominal charge for seedlings.
3. Preparation of a simple plan for the plantation.
4. Development of local rules and regulations for protection and management of the plantation area.
5. Holding meetings on the first saturday of every month.

PAC provided nursery training to one person selected by the committee to work as a nurseryman. Back in the village, the man with the help of other villagers constructed the village nursery on his private land. Labor required in construction, soil collection etc. and construction materials such as bamboos, shade etc. were contributed by the villagers. PAC provided the nursery polypots and polythene pipes for irrigation. A total of 18,000 saplings (8,000 in 1988 and 10,000 in 1989) have been produced in the nursery. PAC provided an additional 42,000 saplings during the first 2 years to meet the local demands. All collection, transportation, distribution and planting activities were organized by the committee and carried out by the participants themselves. As agreed previously, farmers were charged 15 paisa[1] per fodder tree seedling and 10 paisa for other species. The amount collected was set aside in a community fund which was deposited at the bank in a joint account with the committee chairman and two other committee members as signatories.

5.1.3 Management aspect of tree planting program

For the protection of unfenced plantation area against grazing and vandalization, the committee in consultation with other villagers, developed its own rules and regulations. A summary of these rules and regulations extracted from the

[1]100 paisa= Rupees 1.0 and Rupees 50= US $ 1

meeting minutes, maintained by the committee over the period of two years, is as follows,

1. Each household is to practise a stall feeding system.
2. A *Kanzihouse* (animal pound) is to be constructed with labor contribution from each household.
3. Animals found grazing on the plantation area are to be brought and kept in *Kanzihouse*. The owners are then charged depending on types of animals and the severity of damage done by animals.
4. Non *nagi*-owners may cut grasses from *nagi*land with permission of owners. However, anyone found guilty of stealing grasses from the plantation area is to be fined 10 ruppees per load.
5. All *nagi*-owners must provide a watchman in turn.
6. All owners of *nagi*land have to contribute labor for the construction of firelines at the start of the dry season.
7. Anyone found guilty of setting fire to the plantation area is to be fined Rs. 500.

Most of these rules found effective, however, some of the farmers reported that, rules like the provision of watchman and contribution of labor for the construction of firelines are difficult to approach at practical level.

5.1.4 Involvement of gender

The successful management of the *nagi*land/ forest depends upon the active participation of women, as they are responsible for collecting most of the fuelwood, fodder, leaf composting and bedding as well as controlling grazing. They also provide much of the labor for nurseries and tree planting. The men, on the other hand, generally take care of cutting and selling timber and with administrative decisions about the forests.

It is generally known that women farmers are highly involved in tree planting and management activities. However, buying and carrying of saplings from nurseries or the project are largely done by men, the planting, caring and management of saplings are reported to be mostly performed by women. From the beginning, two women farmers voluntarily agreed to work as committee members in assisting the execution of private tree planting program in the Salle village. Their participation in meetings and discussions were negligible as compared to men. Through informal interview, it was found that, even though they are interested in the issues discussed in the meetings many times they cannot be bold enough to express in the group as they are illiterate and lack the confidence and also lack awareness in various other programs executed by the project and government. Another reason is of course the lower societal status of rural women. Some indicated that it was rooted in the male dominated structure of Nepalese society whereby women were supposed to be secluded within the household with a minimal role in decision making. Siddiqi (1989) reported that when women members didn't show up for a

Forest Management Committee, it was assumed that they were not interested in forestry. In fact, women did not show up because the timing of the said meetings were inappropriate for them. Some farmers also responded that it was meaningless to join a group with five times as many men as women, where men would dominate all discussions and decision making. Some women also felt that it was a waste of time because important matters such as identification of actual user group and subsistence needs were never brought up at such meetings. The women sometimes opt for such limited exposure also because they do not wish to be bothered as it would mean addition to their regular workload. They are generally quite heavily occupied in the field and do not have much leisure time to participate in activities other than households and field. Participation of women is supposed to be possible only through a slow extension process which emphasizes the importance of user groups (Siddiqi, 1989). Over time this is expected to lead to the inclusion of women, as primary users, in forestry development activities (Fisher and Malla, 1987). In the Salle case, even though, during discussions with the project staff about problems and potentials in tree resources in the village, female farmers particularly are being encouraged to participate, their participation still seem to be below target. Hence, any of the situations for making women interest in participation on discussions/ meetings and realizing them the necessity of their role in successful execution of any forestry programs, should be followed.

5.2 Evaluation of PAC'S private tree planting program

The tree planting program was implemented through a community self help group which agreed through member discussion, on a no- grazing policy in the planted area. The *nagi*land which has been planted, was formerly used for livestock grazing by both the private owners and also non-owners living in the vicinity. Fourty four sampled households (Table 41) who own the *nagi*land and participated in program were mostly Magar and Gurung. The rules of the planting scheme committee mean that no one is now allowed to graze the area, although grass is cut mainly by the *nagi*-owners. As there is no alternative area for grazing, households who used to graze their livestocks on *nagi*land are now practicing stall feeding. Even though the non-*nagi*-owners are not directly participating in tree program, are affected in one way or another.

The Salle scheme is a planting program on private land but its implementation is organized through a community group. Both *nagi*land and cultivated *bari*land is planted with trees and some of the less well off members of the community are involved in this scheme. Non-*nagi*-owners planted tree saplings especially on *bari*land (Thapa *et al.*, 1990).

There has been observed changes in labor requirement and division for agroforestry systems particularly livestock production after the planting scheme was introduced. It is known that contribution of women is major in livestock production.

Therefore, it is important to make evaluation of the effect of program on household and women's situation in addition to its effects on non-*nagi*-owners who used to use *nagi*land, what was in effect a common grazing source. The effect can be observed in terms of livestock rearing practice, livestock holding, awareness and interest in planting new tree species, availability of fodder/ bedding material and labor especially with reference to working women.

Table 41 Farmers owning *nagi*land in Salle village

Ownership on *nagi*land	No. of HH*	Per cent of HH	No.of respondent
Nagi-owners	44	43	55
Non-*nagi*-owners	59	57	90
Total	103 (n = 103)	100	145 (n = 145)

* HH indicates household
Source: Survey, 1992

5.2.1 Overall impact of the program at village level

1) Changes in livestock rearing practice from grazing to stall feeding

The greatest impact of the planting scheme at village level has been the change in practices of grazing to stall feeding. There are trade offs in this situation, as stall feeding system has both advantages and disadvantages. The advantages and disadvantages mentioned by farmers are discussed below:

i) Advantages of stall feeding

a) Increased manure collection for application to cultivated land, rather than it being dispersed on pasture land.

b) Improved livestock disease control, especially of internal parasite burdens by breaking the life cycle.

c) Greater control over protection of crops and tree seedlings allowing regeneration of desirable species and establishment of new plantings and prevention of palatable species being grazed out.

d) Erosion control on pasture land by decreasing overgrazing.

e) Increased energy efficiency with protection against climatic stress and decreased energy expenditure in searching for fodder.

The PRA results indicated that most of the farmers responded first two advantages. In addition to this, they also affirmed in increasing number of children attending school since the adoption of stall feeding (Figure 41). These children were previously engaged in herding animals. The adoption of stall feeding has eliminated this need which in turn has encouraged parents to send their children to school.

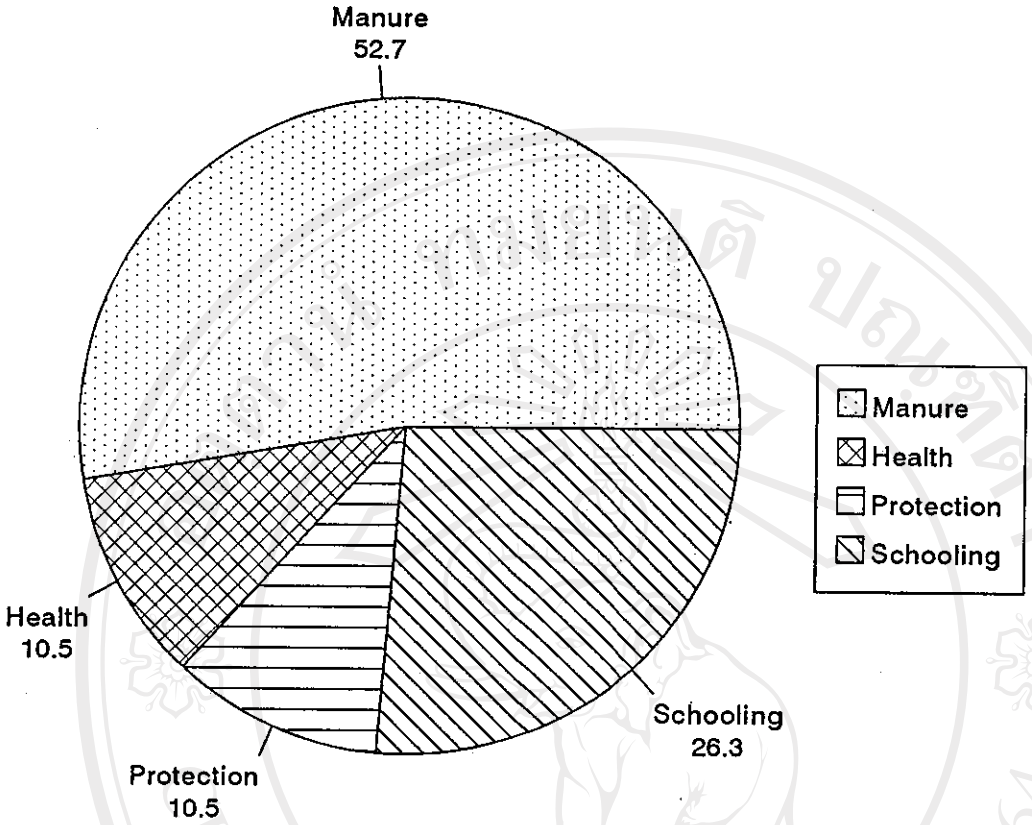

Figure 41 Farmers' response on advantages of stall feeding
Source: Survey, 1992

Some farmers also reported that there is efficient use of labor now. In previous free grazing system, at least one member of the family had to be engaged in herding animals full time, which was regarded as an inefficient use of labor. Currently, children collect fodder during the morning before they go to school and women do so either during morning or afternoon. This type of observed results contradicts the commonly held belief that more labor is required for stall feeding. However, the statement could be justified due to the reduction in livestock population which enabled them to manage their animals in the stall feeding system.

ii) Disadvantages of stall feeding

Some of the disadvantages of stall feeding system are mentioned as higher requirement of fodder, bedding material and labor needed for management which forced them to reduce their herd size (Figure 42).

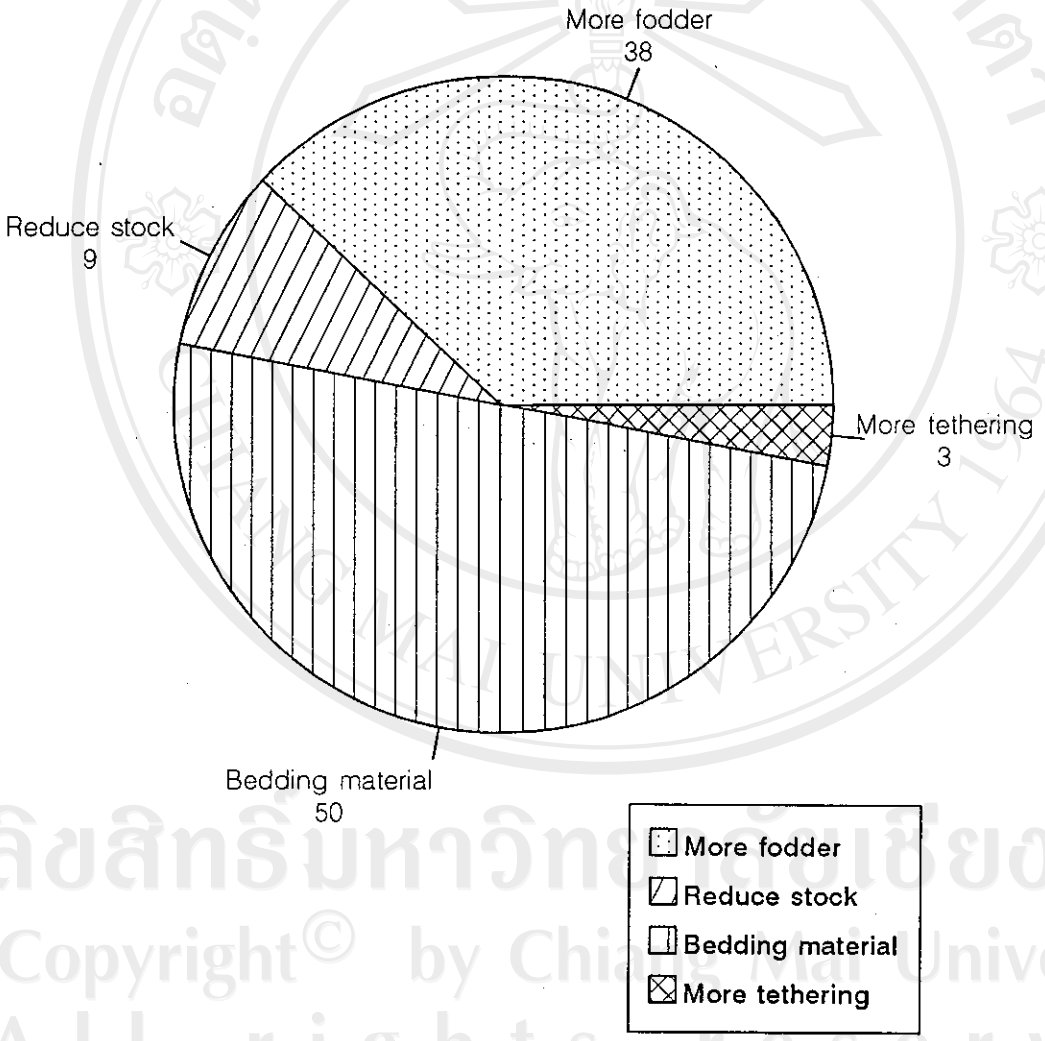

Figure 42 Farmers' response on disadvantages of stall feeding
Source: Survey, 1992

2) Changes in livestock holding

There has been an overall decrease in number of livestocks owned by households. The percentage decrease is almost the same within each ethnic group regardless of economic status but it is comparatively higher in Brahmin, Chhetri than in Magar, Gurung. The reason for this can be unavailability of *nagi*land and also less number of trees on private forestland and farmland of Brahmin, Chhetri farmers. From these observations it is also clear that most of non-*nagi*-owners reduced more number of livestock than *nagi*-owners. The small animals like goat, sheep and pig showed greatest decrease in all socioeconomic groups. Sheep and goat raising requires grazing land. As there is no more grazing allowed, it is believable in decrease of sheep herd size. Only medium Brahmin, Chhetri socio-economic group showed greatest decrease in large animals like cattle and buffaloes (Table 42).

It has been reported by different researchers that farmers in the eastern hills with large farms (> 1 ha) have more fodder trees per LSU (Livestock Unit) than those with small farms (< 0.5 ha) (Dutt, 1979; Hopkins, 1985), implying that smaller farms are more reliant on common property resources for fodder and bedding material supply. Conlin and Falk (1979) concluded that livestock population are more dense on small farms (< 0.5 ha) and that although they own smaller numbers of stock, these farmers as a group are more dependent on livestock for their livelihood. But due to insufficient feed and fodder, they are forced to decrease livestock, that is why the percentage decrease is more in such cases. The decreased

stock holdings have had a greater impact on livelihood for poor farmers. These relationships are pictured out during informal survey to some extent. As the livestock is kept for cash whenever needed regarding as major source of income, the decrease of livestock number affected adversely in their income.

Table 42 Change in livestock holding by socioeconomic group

SES	Average livestock holding per household											
	Before project			After project			Av. change			RDLH (Per cent)		
	LA	SA	T	LA	SA	T	LA	SA	T	LA	SA	T
E1R	7.0	16.0	23.0	5.6	10.0	15.6	**-1.4**	**-6.0**	**-7.4**	20	38	32
E1M	4.6	8.7	13.3	4.3	4.6	8.9	**-0.3**	**-4.1**	**-4.4**	6.5	47	33
E1P	3.1	3.9	7	2.8	2.1	4.9	**-0.3**	**-1.8**	**-2.1**	9.7	46	30
E2M	6.4	8.3	14.7	3.6	3.9	7.5	**-2.8**	**-4.4**	**-7.2**	43.8	53	49
E2P	3.3	9.3	12.6	2.8	3.4	6.5	**-0.5**	**-5.9**	**-6.1**	15	63	49
Mean	4.9	9.2	14.1	3.8	4.8	8.7	**-1.06**	**-4.4**	**-5.44**	21.6	47.8	39

Source: Survey, 1992

Note: RDLH = Relative decrease in livestock holding
LA = Large animals for e.g., cow, buffalo, ox etc.
SA = Small animals for e.g., goat and sheep
T = Total number of livestock
SES = Socioeconomic group

Besides land and tree holding, the causes for reduction in livestock holding are sought for in order to explain and make understand about this relationship. Farmers have adjusted to a new situation and altered their resource use pattern. There is likely to be a similar trend for other communities where there is a move towards stall feeding due to pressure on land resources (Campbell *et al.*, 1990).

As the existing fodder resources in the village were not enough and also with the purpose of maintaining quality of livestock, the farmers in the Salle village decreased the number of livestock (Campbell *et al.*, 1990). Thus, fodder shortage followed by labor shortage and lack of grazing land were main limitations to the number of livestock kept per household. Leaf litter shortage and no capital to buy more stock were also the causes for this situation. The non-*nagi*-owners expressed the grazing limitation as the main reason for decreasing livestock number. These reasons are justified by the farmers' responses in a survey in Lamjung District (Gajurel *et al.*, 1987). The most serious problem in livestock raising was feed supply.

These decreases in livestock holdings could be seen in a positive light as they mean a decrease in pressure on fodder resources. Despite the lower number of stock, the farmers are still not in a position to supply enough quantity of feed.

3) Introduction of new tree species

The tree planting program not only introduced tree species plantation on *nagi*land but also encouraged farmers to plant on the farmland. Hence, the evaluation of this program should also be done with regard to effect on farmland trees in addition to *nagi*land.

The tree species distributed by PAC to Salle private plantation scheme are given in table 43. Mostly fuelwood/ timber trees were distributed. However, some fodder tree local nurseries were established which helped to improve the status of fodder trees in the village.

Table 43 The tree species distributed from PAC to Salle private plantation scheme

Tree species (Local names)	Purpose
Utis	Timber, fuelwood, bedding material
Gobre salla	Timber, fuelwood
Patulo salla	Timber
Falant	Timber, fuelwood and fodder
Katus	Timber, fuelwood, fruit
Okhar	Timber, fruit, fodder
Champ	Timber

Source: Forestry Section (PAC), 1992

The existing trees on *nagi*land as reported by *nagi*-owners are *Utis, Salla, Masala, Nevaro, Falant* (Table 44). Most of them owned *Utis* and only few of them had *Nevaro*. But some farmers reported that they had also planted *Katus, Okhar* and *Champ* which are slow growing and taking long time for establishment. Matrix scoring and formal survey results indicated farmers' tree preferences. They seem to be more concerned about fodder trees as they have to face the problem of fodder scarcity. Fodder problem is prioritized as the major one although they equally have the problem of fuelwood insufficiency. It was found that farmers preferred *Nevaro, Dudhilo* and *Gogan* for fodder and *Utis, Phusre* and *Patle* for timber and fuelwood.

It was known that fodder species they preferred were considered highly nutritious, more milk giving, and some are evergreen in nature (Chapter IV). Timely unavailability of preferred tree saplings is the major constraint of the programs realized by most of the farmers.

Table 44 Trees planted on *nagi*land

Tree species (local names)	Av. no. of trees per farm	Range	Per cent of *nagi*-owners with species
Utis	882.0	0-2625	80
Salla	97.0	0-156	57
Masala	44.0	0-45	35
Nevaro	13.8	0-20	25
Falant	53.0	0-60	30

Source: Survey, 1992

Analysis regarding availability of farmland trees and shrubs before and after the scheme showed that there had been plantation of new tree species on farmland. Comparison between the changes in number of tree species before and after plantation program are presented in tables 45 and 46.

Table 45 Common farmland trees and shrubs before the scheme

Tree species (local names)	Av. no. of trees per farm	Range	Per cent of farmers with species
Utis	258.2	10- 500	100
Dudhilo	31.6	4- 70	100
Ghurmiso	15.4	7- 40	100
Painyu	15.1	2- 30	100
Gogan	6.2	0- 25	92
Nevaro	4.3	0- 15	85
Bans	2.0	0- 5	74

Source: Thapa *et al.*, 1990

Utis, Ghurmiso, Dudhilo, Painyu etc were observed on the farmland before the scheme too. Some tree species like *Bains, Khanyu* and *Dhupi* were planted after the scheme, however, all these were not available from the nursery. The average number of some tree species like *Utis, Nevaro, Gogan* etc were found increasing. This might directly be due to the impact of the plantation program.

Table 46 Common farmland trees and shrubs after the scheme

Tree species (local names)	Av. no. of trees per farm	Range	Per cent of farmers with species
Utis	300.0	20- 500	100
Dudhilo	24.5	6- 40	100
Ghurmiso	18.4	8- 45	100
Painyu	11.0	10- 20	100
Gogan	27.4	8- 43	100
Nevaro	28.5	6- 72	100
Bans	6.0	0- 6	76
Bains	4.8	0- 7	79
Khanyu	25.0	0- 44	80
Dhupi	12.0	0- 24	70

Source: Survey, 1992

5.2.2 Impact of the program at household level

To discuss the effect of program at household level, both *nagi*-owners and non-*nagi*-owners are considered along with comparing between them. The farmers indicated positive and negative effects of program. The beneficiaries of the *nagi*land plantation program were the *nagi*-owners, since most of them responded positive effect however, most of the non-*nagi*-owners indicated no effect (Table 47).

Table 47 Impacts of the program on household situation

Impacts	*Nagi*-owners		Non-*nagi*-owners		Total	
	No. of HH	Per cent	No. of HH	Per cent	No. of HH	Per cent
Positive	22	50	16	27	38	37
Negative	4	9	8	14	12	12
Positive and negative	15	34	10	17	25	24
No Effect	3	7	25	42	28	27
Total	44	100	59	100	103	100
	n = 44		n = 59		n = 103	

Source: Survey, 1992

1) Positive impact

The positive impacts as mentioned by farmers are listed in table 48. The responses of *nagi*-owners and non-*nagi*-owners are observed similar. Increase in availability of grasses, fuelwood and bedding material from *nagi*land as well as other private land and decrease in time for fodder/ bedding material collection were the main positive effects. Some other positive effects, e.g., increase in interest of planting trees, more number of children can go to school and increase in manure were also mentioned.

Table 48 Positive impacts of the program (farmers' response, n= 38)

Positive impacts	*Nagi*-owners		Non-*nagi*-owners		Total	
	No. of HH	Per cent	No. of HH	Per cent	No. of HH	Per cent
Grass[1]	5	22.7	6	37.5	11	28.9
Time[2]	8	36.4	4	25.0	12	31.6
Int[3] & Com[4]	3	13.6	2	12.5	5	13.2
Children[5]	1	4.5	3	18.8	4	10.5
Environment[6]	3	13.6	-	-	3	7.9
Time & children	2	9.2	1	6.2	3	7.9
Total	22	100	16	100	38	100
	n = 22		n = 16		n = 38	

Note:

1. Increase in grass, bedding material and fuelwood availability from *nagi*land and / or forestland.
2. Decrease in time of fodder/ bedding material collection.
3. Increase interest in planting trees
4. Make strong feeling of community and preservation of community resources.
5. More number of children can go to school as they donot have to spend time for animal grazing.
6. Increase in manure, forest and good environment.

Source: Survey, 1992

2) Negative impact

Only 12 respondents argued for negative impact of the program. The major negative impact reported by both *nagi*-owners and non- *nagi*-owners is a decrease in livestock number. More time is needed for care and feeding management of livestock in stocking system as compared to grazing system practiced before scheme. And as there is a shortage of labor, they have to decrease livestock number (Table 49).

Table 49 Negative impacts of the program on household situation (farmers' response, n= 12)

Negative impacts	*Nagi*-owners		Non-*nagi*-owners		Total	
	No. of HH	Per cent	No.of HH	Per cent	No.of HH	Per cent
More time spent in livestock care in stocking system	-	-	3	37.5	3	25
Have to decrease livestock number	2	50	2	25.0	4	33
Scarcity of labor for caring livestock so decrease in livestock number	2	50	3	37.55	5	42
Total	4	100	8	100	12	100
	n = 4		n = 8		n = 12	

Source: Survey, 1992

3) Impact on fodder, bedding material and fuelwood supply

It is true that as no grazing is allowed on *nagi*land, the grasses and also tree seedlings can grow well (Hopkins, 1985). Thus availability of grasses used as livestock feed would be increased. When the farmers were asked whether the scheme has solved their fodder scarcity problem, only 26 per cent of *nagi*-owners and 16 per cent of non-*nagi*-owners gave positive response (Table 50).

Table 50 Farmers' response on solving fodder scarcity problems by tree planting program

Type of response	*Nagi*-owners		Non-*nagi*-owners	
	No. of respondent	Per cent	No. of respondent	Per cent
Yes	15	26	14	16
No	42	74	74	84
Total	57	100	88	100
	n = 57		n = 88	

Source: Survey, 1992

Rest of the respondents argued for negative by giving several reasons. Twenty seven per cent of respondents said that trees planted on *nagi*land are mostly fuelwood/ timber and 20 per cent reported three reasons simultaneously, i.e, 1) trees planted on *nagi*land are still small; 2) decrease in pastureland and so need to buy more straw for feeding the livestock ; and 3) trees planted on *nagi*land are mostly fuelwood/ timber (Table 51).

Table 51 Reasons for the negative impact of tree planting program

Reasons	Farmers' response	
	No. of Respondent	Per cent
Tree[1]	12	16
Land[2]	8	11
Timber[3]	20	27
House[4]	4	5
Tree & Land	10	14
Tree & Timber	2	3
Tree & House	1	1
Land & Timber	2	3
Tree, Land & Timber	15	20
Total	74	100

n = 74

Note:
1 : Trees are still small.
2 : Decrease in pastureland by plantation program so need to buy more straw for feeding the livestock.
3 : Trees planted on *nagi*land are mostly fuelwood/ timber.
4 : *Nagi*land is far away from the house.

Source: Survey, 1992

Bedding material is mostly collected from forest and farmland. Most of the *nagi*owners and some non-*nagi*-owners with approval from the owners, collect from *nagi*land. About 40 per cent of *nagi*-owners and 30 per cent non-*nagi*-owners reported that grasses and tree leaves from *nagi*land has solved the problem of insufficiency of bedding material required in large amount for stocking system. However, because of far distance to *nagi*land from house and trees are still small, 34 per cent *nagi*-owners did not support this statement. A strong community feeling and unity among the villagers can be noticed from the PRA results. That is why even the villagers who do not own *nagi*land, are also sharing the tree products and

grasses from the *nagi*land. Another important aspect is about time needed for tree product collection on *nagi*land. Even though there is accessibility, the villagers do not prefer to go far distance as it is time consuming.

Reliance on farmland as the source of fuelwood is greatest. Other sources include private forest, public forest and multiple sources including *nagi*, farmland, forest, streambank and bought. Most of the trees on *nagi*land are for fuelwood/ timber, but they are still in growing stage and fuelwood requirement is not fulfilled by the trees planted on *nagi*land. Campbell *et al.,* (1990) pointed fuelwood shortage as main problem in the vicinity. Most of the farmers hoped that there will be increased availability and the possibility to buy fuelwood in the future. Thapa *et al.,* (1990) identified this as a major motivation for planting on the *nagi*land.

Hence, the majority of farmers are hopeful that they will have plenty of fodder, grass, fuelwood and timber in near future.

5.2.3 Change in labor use and labor division specially referring to women

In the grazing system, the physically weak members of the family, children and old people, shared a greater proportion of the total livestock work load. The stall feeding system has often moved the workload to the mature members of the household, i.e., the women and men. Although this indicated the advantages of releasing children for school attendance, adults already bear the major burden of the

agricultural workload. Increased responsibilities in livestock care causes either reallocation of their labor from other areas of the farming system or they have to work harder. This has the future implication for other technology development that labor constraints must be scrutinized otherwise non adoption of recommended practices may result.

Involvement in agroforestry activities, time allocation study, activity profile and participant observation indicated greater role of women in livestock tasks, e.g., fodder and bedding material collection and also care and management of livestock. As women are mainly responsibile for livestock care, it is expected that they have to bear additional workload.

The time requirement for the care and management of livestock varies with the season. The average time spent on livestock tasks per household by women is 3.92 hrs/ day in monsoon and 3.42 hrs/ day in winter for stall feeding system (Chapter IV). However, the time spent ranges from 25- 30 per cent of total working hours in a day but it varies with the economic status and size of livestock holding of the household. The observations from PRA revealed increase in time spent as economic status decreased. In terms of livestock holding, only households having medium numbers of livestock spent more time since most of the households owning large number of livestock are rich and they can use hired labor for care and management of the animals. Campbell *et al.*, (1990) in their study, indicated a decrease in labor requirement for stall feeding as compared to grazing as a large number of stock can be managed by a few labor provided that there is availability

of pasture. The average time spent on livestock task per household at the time of grazing practice was 7.4 hrs/ day compared to 7 hrs/ day in monsoon and 4.6 hrs/ day in winter for stocking system. Daily livestock tasks were also monitored in Sindhu Palchok District and an average of 7.57 hrs/ day was calculated for tasks including fodder collection, grazing and looking after stock at home (Shrestha and Evans, 1984). This is greater than the average time spent during monsoon in Salle. The study in Sindhu Palchok was conducted during winter when fodder is relatively scarce. It was questioned whether a lower labor input would be expected in the monsoon, when there is abundant fodder and less trips to the forests, or whether labor inputs would be greater as livestock exist in a mal-nourished condition in the winter and possibly more fodder is collected and fed in the monsoon. The latter case happened in Salle. Greater volume of fodder is collected in the monsoon compared to winter. Fodder collection in the monsoon and specially of grass, is a major time consuming activity. As a proportion of the total time spent on livestock tasks, fodder collection takes 47 per cent of the time in winter and 66 per cent of the time in monsoon. Total fodder collection time in winter is thus less than in the monsoon. In winter when labor is more readily available , fodder is scarce (Sharma and Pradhan, 1985).

The problem is that with the move from grazing to stall feeding the highest labor demand for livestock care has shifted to coincide with the peak labor period for other agricultural activities.

However, the above studies included time allocated by all members of the household. Hence, this study has emphasized on revealing effect of scheme on women's time allocation on various agroforestry activities after differentiating between gender in this aspect in time allocation. About 37 per cent and 51 per cent of *nagi*-owners and non-*nagi*-owners reported that women, at the present stocking system, had to spend more time for fodder and bedding material collection as children labor is diverted towards education. Another supporting cause for this situation as mentioned by female farmers are involvement of men in off farm activities (wage and some other income generating activities rather than farming).

As their male counterparts go outside the village for job, women are left to do all farming, livestock and household management. Similar incidence is also indicated by women in Ghana (Owusu- Bempah, 1988). However, some *nagi*-owners indicated fodder collection work becoming easy and comparatively less time consuming because of its increased availability on *nagi*land as well as farmland.

Increase interest in planting trees and awareness in new fodder trees and management are also regarded as the main effects of project on them (14 per cent households). Only few non-*nagi*-owners did not respond about effect of the project (Table 52).

Table 52 Impact of project on women's activities

Impacts realized farmers	*Nagi*-owners		Non-*nagi*-owners		Total	
	No. of HH	Per cent	No. of HH	Per cent	No. of HH	Per cent
Stock[1]	16	36.4	30	50.8	46	44.7
Fodder[2]	13	29.5	5	8.6	18	17.5
Trees[3]	4	9.1	10	16.9	14	13.6
Stock & Fodder	6	13.7	2	3.4	8	7.8
Stock, Fodder & trees	5	11.3	2	3.4	7	6.7
No impact	-	-	10	16.9	10	9.7
Total	44	100	59	100	103	100
	n = 44		n = 59		n = 103	

Note:
1 : Need to collect more fodder/ bedding material because of stocking system.
2 : Easier for women farmers in fodder collection due to availability of grasses/ fodder.
3 : Increase interest to plant trees/ Increase awareness in new fodder trees and management.

Source: Survey, 1992

5.2.4 Changes in women's overall activities

General change in overall and some criteria, in which effects are observed, were studied and sorted during PRA and informal survey. However, these were verified and were explained in detail with formal survey in order to indicate changes difference among economic status, ethnic, and *nagi*owning and non-*nagi*owning groups.

The criteria like women's workload, their awareness about tree species, interest in tree plantation, time devoted for livestock care etc., were chosen based on PRA findings. As Magar/ Gurung women have more access and control of resources, and more participation in forest meetings and discussions as compared to Brahmin/ Chhetri, they indicated increase in awareness about tree species and increase in interest of tree planting on farmland, *nagi*land and forestland.

Table 53 Changes in women's overall activities after program with respect to ethnic groups

Activities	Per cent of respondents					
	Magar/Gurung			Brahmin/Chhetri		
	I[1]	D[2]	C[3]	I[1]	D[2]	C[3]
Livestock related activities:						
Workload as children go to school	38	4	58	41	-	59
Time spent for livestock care	31	7	62	30	-	70
Time spent for fodder grass cutting	23	10	67	41	-	59
Time spent for bedding material collection	29	19	52	33	-	67
Time spent for cleaning shed	34	8	58	30	-	70
Time spent for giving water, *Khole* to livestock	38	11	51	-	-	27
Tree planting:						
Awareness about tree species	72	-	28	48	-	52
Interest of tree planting on farmland	59	2	39	37	-	63
Interest of tree planting on *nagi*land/ forestland	56	2	42	33	-	67
Others:						
Time spent for fuelwood collection	28	8	64	44	-	56
Time spent for water carrying	40	8	52	-	-	100
Leisure time	9	33	58	-	37	63
	n = 118			n = 27		

Note:
1 : Increase
2 : Decrease
3 : Constant
Source: Survey, 1992

Similar situation is also clearly revealed by rich status households irrespective of ethnic groups. Non-*nagi*-owners want to plant trees on farmland (67 per cent) more than on forestland (33 per cent) as they have no other areas for plantation. Brahmin/ Chhetri faced more workload problem due to transfer of labor division from child to women as mentioned earlier (Table 53). Owusu- Bempah (1988) indicated in the survey of Ghana that children receiving education neglect to help their parents in farming and household activities. Rich and poor women also gave same response as their male counterparts mostly work outside the village either in military, government service or daily paid labor in road construction and portering. This can also be verified by long daily working hours of women in monsoon as well as winter season.

Increase in time requirement for livestock care and management was reported by some 33 per cent of households. This situation is prominent in rich farmers which might be due to large livestock holding (Table 52). But in case of fodder and bedding material collection, non-*nagi*-owners had to spend more time than *nagi*-owners. Similarly, 40 per cent of Magar, Gurung respondents also reported increase in time spent for water carrying (Table 53).

From the observations through resource mapping and farmers' response, it was known that only few households had easy access of water resources while most of them had to go farther (at least for 15 minutes). This problem was severe in winter season as the point source of water become low. This situation could be correlated with per household livestock number owned. It is obvious that, Magar/

Gurung comparatively had large stock than Brahmin/ Chhetri. However, this response was not different between *nagi*-owners and non-*nagi*-owners and also among rich and medium economic status women.

Table 54 Change in women's overall activities after program with respect to economic groups

Activities	Per cent of respondents								
	Rich			Medium			Poor		
	I[1]	D[2]	C[3]	I[1]	D[2]	C[3]	I[1]	D[2]	C[3]
Livestock related activities:									
Workload as children go to school	64	-	36	28	6	66	40	-	60
Time spent for livestock care	76	-	24	21	9	70	28	10	62
Time spent for fodder	29	-	71	14	16	70	18	8	74
Time spent for bedding material collection	57	-	43	20	14	66	22	4	74
Time spent for cleaning shed	43	-	57	20	12	68	24	10	66
Time spent for giving water, *Khole* to livestock	36	-	64	16	5	79	30	6	64
Tree planting:									
Awareness about tree species	100	-	-	46	6	48	52	-	48
Interest of tree planting on farmland	100	-	-	44	2	54	46	-	54
Interest of tree planting on *nagi*land/ forestland	93	-	7	47	2	51	44	-	56
Others:									
Time spent for fuelwood collection	29	-	71	17	10	73	30	6	64
Time spent for water carrying	14	-	86	16	2	82	34	6	60
Leisure time	-	44	56	9	19	72	9	32	59
	n = 14			n = 81			n = 50		

Note:
1 : Increase
2 : Decrease
3 : Constant
Source: Survey, 1992

Time spent for fuelwood collection was found more in non-*nagi*-owners specially in the Brahmin/ Chhetri. It could be related to the less number of trees on their farmland as well as private forest. This forced them to walk far distance to collect fuelwood in public forest or they need to buy with other villagers. Virtually, lower income level of the farmers caused them to adopt the first option.

Table 55 Change in women's overall activities due to program

Activities	Per cent of respondents								
	Nagi-owners			Non-*nagi*-owners			Total		
	I[1]	D[2]	C[3]	I[1]	D[2]	C[3]	I[1]	D[2]	C[3]
Livestock related activities:									
Workload as children go	30	15	55	35	9	56	33	11	56
Time spent for livestock care	31	5	64	32	9	59	32	6	62
Time spent for fodder	16	11	73	22	22	56	20	18	62
Time spent for bedding material collection	18	36	46	25	25	50	24	29	47
Time spent for cleaning shed	27	15	58	34	11	55	30	12	58
Time spent for giving water, *Khole* to livestock	25	13	62	30	3	67	28	76	5
Tree planting:									
Awareness about tree species	65	-	35	56	-	44	59	-	41
Interest of tree planting on farmland	60	4	36	67	-	33	64	1	34
Interest of tree planting on *nagi*land/ forestland	58	4	38	33	-	67	43	1	56
Others:									
Time spent for fuelwood	19	5	76	33	16	51	28	12	60
Time spent for water carrying	33	15	52	33	6	61	33	9	58
Leisure time	14	26	60	13	27	60	14	27	59
	n = 55			n = 90			n = 145		

Note:
1 : Increase
2 : Decrease
3 : Constant
Source: Survey, 1992

Women, in particular, might have change in workload while changing activities of household as well as surrounding. Kumar *et al.,* (1989) reported that additional workload entailed in the collection of fuelwood, fodder and grasses to women due to the result of deforestation. In this study, it was clear that stall feeding brought increase in workload to women for water collection and other aspect of livestock management which could burden in agricultural activities.

The tree planting scheme has clearly had an effect on households other than those *nagi*-owners directly involved in the planting scheme (Table 55). The study has shown a transfer of responsibility for these tasks from the children to the parents particularly female of the household. During monsoon, when peak crop labor demand falls, the livestock labor requirement has increased with a move to stall feeding. The analysis of labor use and time allocation of gender concluded that women had an important role on fodder and animal feed related work with change in workload which is spectacular in non-*nagi*-owners.