CHAPTER VI

CONCLUSION AND DISCUSSION

6.1 Conclusion

Salle is one of the long settled hilly villages situated in Dhankuta district of eastern Nepal. The area is endowed with the diversified social strata of Brahmin, Chhetri, Magar, Gurung and Damai, among which Magar is the dominant ethnic group. Crop and livestock production are the mainstay of the villagers. There is complex farming system with most farmers depending on crop, livestock and tree/ forest for their livelihood. Most commonly encountered agroforestry system is the combination of annual crops and multipurpose trees or crop/ tree/ livestock mix typically found around homestead. However, few households (24 per cent) have off farm job like army service, teaching etc., and also portering and daily wage labor in order to maintain subsistence level of household economy. There is an increasing population pressure on the land. Literacy rate of the village is about 26 per cent. The average family size per household is 6, with average landholding of 1.71 ha. The *khet*land represents a small portion (average size of 0.52 ha). Only 21 and 13 per cent of households owned *nagi*land and private forest land respectively.

Farmers who cultivate land also raise livestock and depend on tree/ forest for the support of both components. Changes in one of the components of the agroforestry systems thus has effects on the other. The present land use situations with the scarcity of arable and productive land reflected the low capacity of agricultural system to provide subsistence for farmers. Almost all of the farmers have rainfed land for growing maize, potato, soybean and millet. Findings show that the ethnicity and economic status of the farmer has no correlation with the selection of these crops.

Cows and buffaloes are the economically important animals which have a close relationship with the prevailing resource and agricultural features in the village. Livestock subsystems are regarded as secondary in priority to crop production. Animals are always underfed and their feeding type is confined to stall feeding system. Decreasing of fodder trees in forest and marginal areas increase the pressure towards the private land. At the same time, the quality and quantity of private fodder trees is decreasing due to heavy lopping. Therefore, planting of multipurpose tree species in and around the farmland is realized to be crucial for sustaining the hill farming system.

The fodder and firewood production are highly prioritized and are the main objectives of agroforestry system. However, this may be possible for only rich farmers for long term as the medium and poor farmers have comparatively low access to farm and forestland in addition to food insufficiency problem. Almost all of the farmers with different socioeconomic status have grown trees on the farmland. An

average number of trees available to the household on *nagi* and private forestland are 1232 and 244 respectively. *Utis, Painyu, Gogan, Nevaro* and *Dudhilo* are common trees. The farm, trees and livestock linkage is stronger in the village. The farmers are very much interested in tree plantation in their *nagi*land which although is available to the minor fraction of population but hopefully could serve a potential source of fuelwood, fodder and timber to the whole community in the future. It was found that in spite of some negative effect on crops by tree crop interaction, trees have been considered beneficial to the farmers in many ways. The percentage of tree fodder to the total fodder consumed exhibits a seasonal and geographic variations. However, fodder tree and tree fodder are primary constituents of animal feed use. Analysis of the results from several PRA procedures showed a differential preference category of the fodder species to male and female. However, it was not visible in the formal survey. To both of them, *Nevaro, Gogan, Dudhilo* and *Utis* are the most preferred tree species. High milk production, nutritious to livestock, household use of leaves, good source of fuelwood and timber are some of criteria behind this preferential category.

Both men and women have been involved in production and management aspects of the agroforestry system. In general, cultivation practices (especially ploughing and land preparation) are found to be performed by men. However, dominant role of women is clear in sowing, weeding, harvesting and postharvest management of millet and soybean. Besides this, participation in overall agricultural activities is also found to be affected by ethnicity. Involvement of Magar, Gurung

women is comparatively high in all crop production activities. Finding also shows more involvement of medium and poor economic status women irrespective to ethnic groups in crop production than that of rich women. Feeding and management of livestock and poultry are exclusively performed by women in all groups. However, disease management, buying and selling of livestock and livestock products are the job in which role of men is found to be dominant. The tree management activities for example logging, buying and selling of timbers are specially performed by men and the collection of fodder, bedding material and fuelwood as routinely works are carried out by women in all of socioeconomic group.

Labor use pattern for different cropping activities by gender was found varied according to the nature of work, type of crop etc. There was no significant difference between male and female in potato sowing and storage since they equally participate and allocate the same amount of time. However, time spent by the female farmer of rich Magar/ Gurung group is found significantly different to that of male in case of harvesting and storage of potato. Likewise, medium group women work more days which is significantly greater than that of poor women for maize cultivation. In the same way, significant differences in time spent for cultivation practices of millet was found owing to more time spent by female. Soybean may also be regarded as female's crop since all production activities are performed by female. It is found that in feeding, shed cleaning and compost making processes, women of medium and poor Magar/ Gurung and poor Brahmin/ Chhetri socioeconomic group allocate significantly greater time than men ($p < 0.05$). However, milking, disease management, selling and buying of livestock and livestock products, time spent by men is greater than that of

women regardless of socioeconomic strata. Time spent by women in farmland tree activities is significantly greater than by men in Magar/ Gurung ethnic group. It was found that medium group women significantly spent more time than men in farmland tree activities. Women perform 84 per cent of the fodder collection for which on an average they spent 26 days per year for gathering fodder and bedding materials as compared to 21 days by male counterparts. Except nursery management, it was found that female farmers have greater role in tree management.

It was found that women contribute substantially more time to domestic tasks than men. On an average, 5.75 hrs/ day is spent on cooking, cleaning and washing by women whereas, men are found rarely involved in these household activities. Women have to collect water five or six times a day for cooking, drinking, cleaning kitchenware and preparing animal feed depending upon the size of family, number of livestock and use of water.

Although men are culturally accepted as the decision maker in the household, the decisions that they make are usually suggested by other members of the household, in particular by the wives. In the activities like amount of compost to be applied, time of weeding and amount of grain for the whole year consumption, women have comparatively better role. The extent of overall decision regarding crop production activities is found to be affected by ethnicity. Magar/ Gurung women have better role as compared to Brahmin/ Chhetri. In certain decisions relating to livestock e.g., on choice of area and person for fodder collection and feeding management in fodder unavailability season, women involvement is significant. Magar, Gurung and resource

poor women have stronger roles as compared to Brahmin, Chhetri and rich and medium respectively. Women of Magar/ Gurung caste have stronger decision making role as compared to Brahmin/ Chhetri in livestock activities too. A significant number of respondents (65 per cent) reported that decision on tree management is generally made by men. Magar/ Gurung women are comparatively participating more in decision making concerning to the tree management than those of Brahmin/ Chhetri. Likewise, decision making for the household activities are mostly found to be done by women. However, it was found that women's involvement is meager in decision making on participation of village meetings and training activities.

In Salle village, the private tree plantation program from the PAC was started in 1987. This program is not only responsible for planting trees on *nagi*land but also encourages farmers in planting trees on their farmland, wasteland, streambanks etc. Most of the farmers reported that the tree species planted on *nagi*land were fuelwood/ timber trees. Their choice were largely restricted to the type of tree species available in the nursery at planting time. Moreover, most of the *nagi*-owners hoped that there would be an increase in availability of fuelwood from *nagi*land in the future. The Salle experience has shown that the primary motives of the farmers whether big or small, is to attain self sufficiency in meeting their basic needs for fuel, fodder and timber. The plantation scheme has demonstrated that the private plantation program is more than just the distribution of saplings and that of private tree planting program can be successfully designed and implemented in cooperation with farming community. However, there has been a visible change occurred at the household or

the village level. The prominent impact of the planting scheme at the village level, is the change in practice of grazing to stall feeding which has brought a more advantages in terms of manure, disease control, protection over crops coupled with some disadvantages of higher fodder, bedding material as well as labor requirement. There has been an overall decrease in number of livestock i.e., higher in Brahmin/ Chhetri which is related with the unavailability of *nagi*land. The effect is more spectacular in small ruminants like sheep and goat, to them, grazing land is very important. The decreased stock holding have had a crystal clear impact on livelihood of poor farmers, as the livestock is kept for cash generation. However, farmers have adjusted to the new situation and altered their resource use pattern.

Out of some prominent advantage of the distributed fodder saplings, some particularly, *Katus, Okhar* and *Champ* found slow growing and long time taking for establishment. Farmers are more concerned to the fodder side by side fuelwood. It was found that they preferred *Nevaro, Dudhilo* and *Gogan* for fodder and *Utis, Phusre* and *Patle* for timber and fuelwood. Timely unavailability of preferred tree saplings is the most highlighted constraint in the planting program. It is obvious that new tree species have been growing after the scheme. This might directly be due to the impact of plantation program.

It was found that *nagi*land plantation program was much affected to the *nagi*-owners as compared with the others. Those include increasing availability of grasses, fuelwood and bedding material. Increase in the number of trees on farmland could

be counted as a very positive side effect of plantation program. Although a minor fraction responded for some negative impact of the program as they realized which is associated with the decreasing livestock number. It is worthy to mention that since most of the tree species on *nagi*land are still in growing stage, the fuel/ fodder requirement of the area has not been fulfilled so far. However, majority of farmers are hopeful that they will have plenty of supply in near future. It was observed that change in stall feeding of livestock caused an increase in number of children for school attendance which in turn caused adults to bear the major burden of agricultural workload. Increased responsibility in livestock causes either reallocation of household labor or work burden to the household members. About 1/3 and half of the *nagi*-owners and non-*nagi*-owners respectively reported that women at the present stocking system, have to spend more time for fodder and bedding material collection. Besides, it was also distinct that the time spent was different for monsoon and winter season showing more in monsoon than in winter. During monsoon, as there is more availability of tree fodder and grasses, women spent more time on collection, cutting of grasses which is a time consuming activity.

Problem of workload found more severe in Brahmin/ Chhetri group compared to the other groups due to transfer of labor from children to women. Rich and poor women also expressed same responses as their male counterparts mostly work outside the village. Likewise, increase in time requirement for livestock activities was prominent in rich farmers which might be due to large livestock size in contrast to non-*nagi*-owners who at the other hand had to spend more time for fodder and

bedding material collection. Time spent for fuelwood collection was more spectacular in non *nagi*-owners especially Brahmin/ Chhetri which could be due to less number of trees on their farmland. These all conclude a significant change in workload in women as a result of changing activities of household as well as change in surrounding.

6.2 Discussion

The agroforestry system in eastern hills of Nepal to the large extent is subsistence oriented. Salle village is an example of eastern hill agroforestry system where 88 per cent of households which are mostly medium and poor have food insufficiency problem. The principal means to solve food problem are either by increasing productivity of agroforestry system or adopting some income generating programs where the most common agroforestry practice is the use and/ or incorporation of trees and shrubs on private farmland. To increase the productivity of agroforestry system, emphasis should be given on each component e.g crops, trees and livestock. In fact, the relationship of these components are stronger irrespective of ethnic group, social status or the access to the resources. This fact was observed while doing PRA. It is commonly believed that, there is a common overlap between RRA and PRA. However, PRA tends to emphasize group discussions and diagramming by rural people and to pay special attention to outsiders' behaviour, attitudes and interactions with villagers. This involves rural people in the generation, analysis and ownership of information and more likely to be part of a continuing participatory processes.

Gender differentiation at the Salle village with respect to the crop cultivation, livestock management and forestry practices, particularly in relation to the fuelwood and fodder purpose tree species, were found to be very interactive and substantial in the farming system. Women's role are more visible in some crop cultivation practices and fuel/ fodder collection activities. Furthermore, women's workload has been found to be increasing due to increment in number of children going to school. These all indicated that women's role could be utilized to strengthen the private tree plantation program not only in *nagi*land but also around the farmland.

While the problem of food shortage has not been solved, the livestock population is decreasing in the context of degrading private forestland and prohibition of animal grazing on the *nagi*land. In addition to this, only few farmers have the access to *nagi*land. In these circumstances, a clear solution should be searched out in order to maintain the status of livestock as well as the productivity of crop production system.

The limitation of this study is that farmers were not asked directly what would happen if the *nagi*land was not for their access even after the area had been converted into forestland; in such a situation, how the farmers would solve these types of problems ? Would they consider the changes that occurred in agroforestry components (especially livestock and fodder status) as the problem in a subsistence type of farming system ? Similarly, it remained further unclear whether gender related-activities which are found to be stronger in Magar/ Gurung in comparison with

other ethnic groups are sufficient to point out the solution just on the basis of access and control. However, the study of agroforestry system components and their interactions are useful means to find out suitable alternatives to tackle the problems.

The tree plantation program introduced by PAC, yield positive changes in many ways. However, species preferred by the farmers are not directly coincided with the species distributed except Alnus. Considering the available barren *nagi*land, growing demand of fodder and fuelwood, as well as degrading trend of natural forests, the tree plantation program has brought beneficial changes, which is visible in terms of mutual understanding of the villagers with respect to the utilization of natural resources.

There is a criticism about private tree planting in many literature. It is argued that it is cash oriented rather than aiming to supply subsistence fuel, fodder and timber, and that only the big farmers are benefitting from the programs. Contrary to these assumptions, the Salle experience has shown that the primary motives of the farmers, whether big or small, is to attain self sufficiency in meeting their basic needs for fuel, fodder and timber. The interest in markets or cash develops only later. Furthermore, once a program demonstrates that tree planting is beneficial, the chances are high that even those with small holdings will participate with nominal or no external assistance. The Salle tree planting scheme has demonstrated that a private planting program is more than just the distribution of saplings and that a private tree planting program can be successfully designed and implemented in cooperation with the farming community.

From the case study of Salle village, several features are highlighted as the supportive aspect of self sustaining tree planting activities of villagers. The fundamental prerequisite is that they themselves must recognize that tree planting is for their own benefit. Outside intervention by government institutions or projects can affect the farmers' decision to plant trees either by demonstrating tree planting where farmers have not recognized its importance or by removing constraints to planting such as the provision of seedlings, information on government forest legislation and technical information, etc. The hill agroforestry production with crop, livestock and tree subsystems are strongly interrelated and interdependent. Interventions in the tree production system will only be successful if they can be integrated in their farming systems by the farmers. The species choice and timely availability of seedlings are essential to any acceptance of tree planting by the farmers. The issue is of importance because it demands a major shift in emphasis from the present practice of raising whatever species is available to the ones most preferred by the majority of the farmers. The encouragement and promotion of private nurseries through the local community is unique in the case of Salle village. But, the PAC scheme would be strengthened if it would incorporate farmers' preferences based on different socioeconomic status and also gender.

In the future, more emphasis could be put on parallel work with non-*nagi*-owners who lose the grazing resource. In Salle, these farmers have had the opportunity to buy tree seedlings at the planting scheme nursery and collect grass cuttings from the PAC nursery to plant on their *bari* and waste land. In the future,

more grass need to be distributed since it becomes productive more quickly than trees and allowing diversification of the fodder resource.

Methods need to be developed for improved grass production that would decrease collection time and also it should be acceptable to farmers' situation. A few farmers have been experimenting napier grass and setaria obtained from the PAC forestry nursery on *bari*land and wasteland. However, in order to be followed by other farmers, they should be encouraged and should be given appropriate technical help in planting, caring and management.

On the other hand, fodder tree which takes less time to collect than grass is also equally important for alleviating the fodder deficit during dry period. Distribution of fodder tree saplings preferred by the farmers are, therefore, need to be equally emphasized. However, as mentioned in Chapter III, there is a limit to which farmers are willing to plant trees on *bari*land due to shading effect of tree over crop, which could reduce the crop yield.

After knowing constraints, opportunities and impact of existing agroforestry practice using gender-based approach, suggestions could be provided to policymakers for the improvement of the design and implementation of the program as well as the integration of womens' concerns into agricultural development activities. Those include, need of training and career development opportunities for the women in nursery management and proper utilization of tree resource, knowledge on improved cultivation practices of some crops specially millet, soybean, maize and potato, and

improving skills on feeding practices to the animals like cows, buffaloes and pigs, as women were found to be heavily involved in these activities.

6.3 Policy implications and further research

Food insufficiency in the village to sustain throughout the year is one of the problem highlighted in this study. Development of upland maize/ potato based cropping system in order to make the village sustainable development could be the policy level approach needed at present in the area. This may bring further interactive changes in the relationship between crop, livestock and tree components which should be addressed simultaneously to lessen the complexity of the system. Research is needed to identify the best fodder tree species for combination with maize, potato, millet, soybean and wheat. Shading effect was described as main disadvantage of agroforestry, hence, the trees giving less shade effect to above mentioned crops should be experimented.

The results of gender analysis imply that findings may be helpful to formulate policies in order to strengthen the women's participation regarding with improved crop production activities. It is also clear that the management of fodder and fuelwood trees may be efficient if women are provided with necessary technical support (training, involving in the meetings etc.) in the village. To make the training efficient and for more participation, time and location for any training is essential to be decided. Through the analysis of time allocation of women, it can be suggested that the training should held in winter rather than monsoon. The unavailability of seasonal

fodder in the owned land often forces the women of poor farmers' families to go to the distant forest for fodder collection. This tendency eventually forced them to reduce their livestock population which causes finally loss of income from livestock. Such findings may by useful to be considered while conducting any livestock improvement program in the village. Women's crucial roles, therefore, in tree, crop and animal production can no longer be underestimated and ignored. Hence, women's concerns should also be integrated and analyzed before launching any agroforestry and livestock specialized researches and programs in the Salle village.

Farmers' felt need regarding the tree component should be fully recognized. They are the adopters, managers as well as users. Therefore, any tree plantation program if should be launched in the future, have an ample participation of farmers at every step of development. Species selection, site management, further training related to the forestry activities should reflect the need and aspiration of people to make any program success. It is obviously observed that in Salle village, farmers' aspiration towards the more fodder species was not fulfilled since almost all species distributed by the program were other than fodder species. This, however, equally revealed the opportunity of further expansion in tree plantation program that seems necessarily to be coincided with the interests of farmers.

Since the long term success of any development program depends to a large extent on the participation of local people, this aspect needs to be adequately addressed while initiating rural development programs in general and forestry development programs in particular.