

## CHAPTER VIII

### CONCLUSIONS AND RECOMMENDATIONS

#### 8.1. Conclusions

##### 8.1.1 The study settings

Dismal performance of agriculture combined with high rate of population growth has intensified food deficit situation in Nepal. Moreover, unfavorable climatic condition and weak infrastructure development have practically accelerated the food insecurity in hills. Additionally, smaller land holding size and lack of alternative non-farm employment opportunities add to the precarious conditions among the poor farmers.

Realizing the prevailing food insecurity situation the long-term Agricultural Perspective Plan (APP) of Nepal has given its major thrust on improving food security in the country. In order to bring about desirable changes in food security, it is important to identify the food insecure section of population, their resource base, problems, and associated determining factors. This research was designed to identify factors determining household level food security under the subsistence agricultural production systems in the eastern mid hills of Nepal.

A survey study combined with interviews with key informants and farmers' group discussions was carried out at Fakchamara outreach site of Pakhribas Agricultural Center (PAC). With the coverage of 12 wards from four village development committees of Terhathum district, this site represents low production potential area without access to road and market. Inhabited by multi-ethnic societies, the study area encompasses subtropical to mild temperate climatic zone.

### 8.1.2 The resource pressure

With the total area of 2,164 ha, only 54 per cent is under cultivation. The average size of cultivated land per farm household is about 1.50 ha. However, the land size distribution pattern is moderately skewed favoring towards the larger farm size holders. Considering present household members, the average size of household was found to be six with maximum of 12 and the minimum of a single-family household without children. The population pressure, taking into account the person (adult equivalent) per unit of cultivated land, found to be increasing with decreasing farm size illustrating a high population pressure on per unit cultivating land amongst the smaller land size holders.

Livestock is another important productive resource in the study area. As a major component of farming system, almost exclusively farm households were found keeping at least one or two livestock species, with the multiple objectives of getting food, cash, power and manure for farming. The average livestock holding size was 3.84 LSU with the maximum of 10.43 LSU. Moreover, the livestock density per hectare of cultivating land was found 3.82 on an average. Considering the livestock carrying capacity of a hectare of land, the present level of livestock density seemed to be quite high. The livestock density per unit of cultivating land was found higher among the smaller land size holder implying that even under the limiting resource pressure, the small farm size holder are giving high priority on livestock keeping.

In spite of indispensable interaction between forestry and farm production systems, forest resources in the study area are found scanty with a negligible economic return. Centrally controlled management of forest in the past seriously undermined the traditional responsibility of community, thereby resulting in pervasive forest degradation. Additionally, increasing demand of forest products due to increased population had further intensified the heavy deforestation in the study area. As a result, area under forest had been severely scrutinized. 'Household forest', which is essentially started by the farm

households to meet the growing demand for fodder and firewood, sounds impressive approach to reduce further encroachment in the forest.

### 8.1.3 The production systems

Farming systems of the study area comprise all components of typical hill farms with close integration of crop, livestock and forestry. Inaccessibility to market and employment opportunity other than agriculture has obliged the farm households to adopt subsistence farming to meet their daily food requirement.

Although a range of crops and cropping patterns are being adopted by the farm households; cereal crops like rice, maize and millet are the major crops of the study area. Rice being the most preferred cereal covers the largest area of cultivation followed by maize and millet. Even under the unfavorable condition farmers practice rice cultivation primarily to meet the households' consumption requirement. Rice-fallow is the most dominant cropping pattern in *Khet* land and maize-millet on the *Bari* land. Wheat cultivation is almost negligible confining at the lower altitude covering less than one per cent of the total cultivating land. It is very common to plant pulses into the maize based cropping patterns on the *Bari* land. Most common pulse crops are soya bean, broad bean, black gram etc. Since crop production system is traditional in nature with low level of technological intervention, per unit average productivity was found to be lower than that of national as well as regional (eastern hill) averages.

Livestock production system is entirely based on crop by-products, farm forest and grazing. Therefore, integrating livestock in the farming systems has enabled farm households to support their crop production systems and the livestock itself. As livestock management is entirely based on crop by-products, fodder and forage, there seemed a seasonal variation in livestock productivity particularly determined by the availability of fodder and feed stuff. Because of high livestock density per unit area of cultivating land,

and dominance of local breed, the average productivity of livestock was found to be extremely low.

Growing diverse species of fruits and vegetables adjacent to the homestead as 'home-garden' was found a traditional practice among the farm households. Traditional vegetables and citrus fruits species are the most predominant species grown in the home garden. Despite the realized significance of home gardening for household food and nutritional security, very few number of households were found able to maintain year-round homestead gardening. Lack of irrigation and strayed-animals problem during the winter were reported to be the serious constraints to maintain year-round homestead gardening in the study area.

Forests play a crucial role in providing food security. As an integral component of farming systems, forest not only provides forest fruits and vegetables for the village dweller but also support livestock and crop production systems. Leafy wild vegetables enhance variety in the human diet and are found particularly important during the dry season when there are no more green vegetables produced in the farm yard. Despite the significant role of forests in household food security and maintaining ecological balance, the fast depletion of forest resources in the past has degraded economic importance of forest. Therefore, forest plantation with selected plant species including forest fruits, nuts, fodder, perennial woody tree not only enhances economic importance of forest but also provides positive impact on environment and forest ecology.

#### 8.1.4 The food situation

Based on production, requirement and distribution data, the Aggregate Household Food Security Index (AHFSI) for study area showed a critical level of food insecurity situation. Although, the average calorie available for consumption was 2,414 Kcal per AE per day, which is about four per cent less than subsistence requirement, about 42 per

cent of households were found getting less than 80 per cent of their subsistence calorie requirement.

Rice is the principal staple followed by maize and millet. Millet consumption as staple was found only among poor households, otherwise it is used for brewing local alcoholic beverages. Cereal grain alone contribute more than 90 per cent of the total calorific supply, while remainder portion is derived from vegetables, fruits, meat, milk and other minor crops. Own on-farm production was found by far the most important source of food supply contributing more than 80 per cent of total calorific value. Instead, contribution of wage payment received in kind has also a significant importance amongst the poor households who are unable to produce sufficient grain from their own farm.

Seasonality in agricultural production system has direct implication on food availability and households' consumption behavior. June-July are the most precarious period of food deficiency, and food availability situation improves after maize harvest in the August. In general post harvest season are mentioned as food prosper season and pre-harvest as the food deficit one. Consumption behavior, therefore, changes according to the seasonal availability of food.

Because of limited cash earning opportunities and the consumption oriented production systems, cash transaction to acquire food was found at the minimum. The scanty amount of cash earnings among the food insecure households have further declined their long-term investment and saving for future consumption trapping them into the vicious cycle of low income - low investment- low production.

Having the inherent characteristic features of low input - low output system, and lack of market integration, farming in the study area has evolved as means of sheer survival. Lack of irrigation and low level of technological intervention has hindered agricultural production and productivity thereby heightening the problem of food

insecurity in the study area. As a result, a large section of households in the study area are unable to meet their daily calorie requirement

#### 8.1.5 Factors influencing food security

Access to productive resources like land and livestock holding were found important to improve food security status of households. From the regression results, land holding was found to be the key factor determining food security status in the study area. Other parameters with significant coefficients in the model were: proportion of economically active female household member to the total household size; livestock holding (LSU) per AE, technology adoption index defined in terms adoption of modern varieties of cereals crops; and the ethnicity dummy differentiating *Brahmin/Chheti* and other ethnic groups. Contrary to the expectation, the coefficient of number of economically active household member irrespective of sex was significantly negative suggesting excess labor availability and lack of productive employment opportunities in the study area. Cash income on the other hand, has positive but non-significant effect indicating a minimal transaction of cash economy to acquire the food

Livestock, not only provide food for households' consumption but also an important source of cash. Small livestock, like goat and chicken, which can be raised with small investment by feeding with household scraps, were found important source of cash among the small farm holders.

Women play a decisive role in household food security. In the rural area, where production system is entirely consumption oriented, women are more responsible for food production, processing, preparation, storage etc. The significant contribution of women in overall household food security has been empirically justified in this study implying that with the increased women's access to productive resources, information and technology, the household food security could be improved substantially.

Cash income is one of the influential economic factors affecting production and consumption, however, increased income is not sufficient to enhance food security unless it is combined with increasing productivity and further income generation. The non-significant effect of cash revenue on overall food availability might be due to the poor market integration and lack of alternative employment and investment opportunities.

Adoption and adaptation of agricultural technologies are important to improve agricultural production, which ultimately improve households' food entitlement. Even with limited choice of modern varieties in the study area, the effect of adoption of modern varieties was found positive and significant on food availability. Adoption of modern varieties was found basically related with land holding sizes implying that the small marginal farm households are either devoid of technological information or the varieties developed are not suitable to poor farm households' condition. Since, majority of farm households in the study area are small farmers it is necessary to incorporate their need and priorities in the agricultural research and development agendas in order to ensure that the developed technology would be adaptable to poor farm households' conditions.

Ethnicity directly or indirectly influences the households' production and consumption behavior. Therefore, the agricultural systems and choice of technologies in the study area are influenced by the ethnic value and culture. The positive and significant effect of ethnicity on food availability indicates that *Brahmin/Chhetri* are in relatively better food security condition than other ethnic groups. With the declining demand for their traditional services, occupational caste groups of people, particularly leatherworkers and tailors, whose critical amount of food grain used to come from the obligatory payment (locally called *Bali*) are now in the verge of serious threat of poverty and food insecurity.

#### 8.1.6 Constraints to and strategies for food security

Several constraints to households' food security in the study area were identified during the course of study. Lack of irrigation and technologies were found the most important constraints responsible for declining agricultural productivity. Land fragmentation has further heightened the problem, as the fragmented small parcels of land are insufficient to produce required food for farm households. Additionally, lack of alternative off-farm employment opportunities due to poor infrastructure has further aggravated the purchasing capacity of the poor households.

Households' strategies to cope with food deficit problem were found varied based on the available opportunities and their resource base. The poor food-insecure households sometimes obliged to meet immediate food requirement at the expense of productive resources like land and livestock eventually eroding their long-term livelihood security. A range of short-term food strategies adapted by the farm household were identified, which includes changes in consumption behavior (eating less preferred food, altering intra-household food distribution, reducing food intake and frequency); food and cash borrowing; livestock sale; sale of household assets; mortgaging or pledging of land; seasonal laboring etc. The choice of individual strategy, however, found to be decided by severity of the problem and household's resource endowment.

To minimize the risks and uncertainties farm households have diversified their production systems exploiting different agroecological niche. Crop intensification by intercropping different leguminous and non-leguminous crops on the *Bari* land was found an important long-term strategy adopted by the farm households in order to increase aggregate food production level. Renting-in land, among the land scarce households, was found another important strategy for increasing food production. Small farm animals such as goats, pigs and chickens are also managed as a safeguard against cash insecurity.



Share rearing of livestock among the poor households was also found common as one of the important way out to increase access to cash deficit.

## **8.2 Recommendations and further research needs**

### **8.2.1 Policy recommendations:**

Based on the information generated from the present research, the following areas of research and development interventions have been recommended:

- 1) As more than 40 per cent of households in the study area are under the serious food security threat, immediate government intervention deemed imperative. For the short run 'Food-For Work (FFW) would be an alternative to increase access to food among the poor households.
- 2) Land fragmentation due to increasing number of family and property inheritance systems has converted the lands into small parcels, which are economically unsustainable. Therefore, the government should take initiative to implement well-envisioned agrarian reform enhancing better use of land resources. Furthermore, government should enhance tenants' land right and incentive to encourage landowners to rent-out their land to the needy tenants.
- 3) As the majority of farm households in the study area are small farmers with less than 0.5 hectare of cultivating land, subsistence food requirement of those small farm households will not be possible without increasing their access to cash. Therefore, alternative measures to improve cash earning opportunity among the small holder should be sought. Agro-based rural cottage industries would be an alternative.
- 4) Due to lack of transportation and marketing network in the study area, the government and non-government organizations aiming to ameliorate food security situation should develop on-farm food security strategies through productivity

improvement. At least for the short-run, the increased productivity through increasing the adoption of modern varieties and crop intensification would help improve food situation.

- 5) As a larger section of small farm size holders in the study area are substantially dependent on *Bari* land, improvement of *Bari* land farming should be the prime concern of research and development agencies to improve food security situation among the small farm size holders.
- 6) Due to lack of transportation, extension and promotion of high value low volume agricultural production like cash crops, dairy and fruit processed products is essential for market orientation.
- 7) Livestock improvement program aiming to replace unproductive animals with more productive breeds is an important area of livestock improvement. This program not only improve the livestock productivity itself but also reduce the size of livestock unit. The government and non-government organizations working for the livestock research and development should take initiative on improvement of local breeds.
- 8) Open livestock grazing system during the winter has exerted serious threat on crop intensification and forest regeneration in the study area, therefore, program encouraging stall-feeding practice is of immediate important. The village Development Committee (VDC) and the farmers' groups should take initiatives on convincing and/or enforcing the practice of stall-feeding in the community.
- 9) As minor crops like root crops, tuber, pulses, oil seed (e.g. ground nut, sesame) etc., which are grown in less fertile marginal land, play significant contribution on households' food supplies amongst the poor farm households. Therefore, research activities on those minor crops need to be encouraged. The National Agricultural Research Center, which is responsible agricultural research in the country in its research program.

- 10) Transportation network to link villages into the main transportation system is of immediate need to be addressed in order to transform low productive subsistence farming into demand -driven intensive market oriented agriculture.
- 11) Women empowerment through enhancing their participation in education, employment, research and extension is an important area to be addressed. The concerned research, extension and development organizations should incorporate gender empowerment program.
- 12) As the underlying problem of poverty and food insecurity is ever increasing population, which simultaneously demand more food, any coordinated approach to develop sustainable food security must concern on better control of the growing population.

#### 8.2.2 Further research needs

While answering number of questions related to farming and food security issues, the present research has raised few important research topics, which require further research:

1. Study on farm household resources use efficiency, resource conservation decision and their impact on environment and food security.
2. Sustainability of existing livestock production systems and its interaction with other system components in the context of subsistence hill farming