CHAPTER 6
WELFARE OUTCOMES AND SUSTAINABILITY IMPLICATIONS OF RURAL LIVELIHOOD STRATEGIES

6.1 INTRODUCTION

Chapter 5 has addressed the first three objectives of the research related to households' livelihood strategies in the HHs. However, two most important questions of the investigation regarding welfare and sustainability outcomes of the previously identified rural livelihood strategies are not yet answered. These questions are:

- To what extent do the strategies being pursued help the households to ensure their food security?
- Do the households and the communities in pursuit of their livelihood strategies compromise sustainable use of the renewable local natural resource-base?

The need to answer these questions will take us to the last component of the SRLF, livelihood outcomes, in terms of food security and the sustainability of NRM. Chapter 6 deals with these partially capitalising on the analyses and discussions have been made so far.

The next section of the chapter, after addressing methodological issues in measuring food security, presents an assessment of the food security status of households and empirically examines household level determinants of food security status. In so doing, it attempts to relate livelihood outcome as reflected in terms of food security status at household level with the other livelihood components: livelihood assets and livelihood activities.

The section that follows the food security analysis (Section 6.2) is concerned with the sustainability implications of the rural livelihood strategies. First, it discusses how the difficult concept of 'sustainability' can be operatinalised considering the objective and the scope of the enquiry. It then highlights the major sustainability implications of the livelihood strategies, identified and discussed in the preceding chapter, of the rural households and communities in the HHs. The overall aim of this section is to identify

which strategies are sustainable and which ones compromise sustainable use of the local natural resource base. This will, hopefully, give us a clue on ways and means of strengthening sustainable local livelihoods and/or to recommend alternative strategies to deal with both the welfare aspect and the sustainability aspect of unsuccessful local strategies in the final chapter of the thesis.

The third section presents the major typology of rural livelihoods by way of summarising livelihood strategies and livelihood outcomes in the HHs. The chapter concludes by summarising the major observations of the livelihood outcomes analysis in section 6.4. The latter section also forms the last part of the analytical component of the thesis.

6.2 FOOD SECURITY OUTCOMES

6.2.1 MEASURING FOOD SECURITY STATUS OF HOUSEHOLDS

'Food security' is one of the concepts in the rural development literature with various definitions and hundreds of indicators. For instance, Hoddinott (2001) notes 200 definitions and 450 indicators of food security. Some of the indicators are qualitative and others quantitative. The indicators measure different aspects of food security such as supply, access and outcome. Some food security indicators are appropriate for monitoring purposes, while others are outcome indicators. There is no one best or universally accepted food security measure. It is up to the researcher to select an indicator or a combination of indicators that suits the objective of the investigation, the level of aggregation and specific circumstance of the study and the study area.

Outcome indicators are appropriate for this study given the objective and the analytical framework guiding the investigation. The SRLF makes a distinction between livelihood assets, livelihood activities, and livelihood outcomes. The first two aspects have already been dealt with in the previous chapters. This section looks at food security status as an outcome of livelihood strategies of the rural households.

There are still a number of outcome indicators to choose from. The four recommended and most commonly used outcome indicators of food security are: individual intakes, household caloric acquisition, dietary diversity and indices of coping strategies in descending order of the cost of acquiring the relevant data as

well as the quality of the indicator. Preschoolers' nutritional status, although it captures health and sanitation aspects, is also commonly used as a proxy indicator of food security at household level. Some researchers argue (e.g. von Braun and Pandya-Lorch, 1992) that the correlation between preschoolers' nutritional status and food security status of households to which they belong is strong in SSA at low GNP per capita income levels (less than U.S $ 600).

Households' income level is often used in Ethiopia as a measure of food security outcome. Either an estimated level of income required per adult equivalent to command food that would satisfy the minimum recommended daily calorie intake of 2200 kcals per annum, given typical national or regional food consumption basket, or absolute poverty line estimated by adding income required to meet basic nonfood needs on the former, or a combination of them, is used.

The problem with using absolute poverty levels lies in the conceptual distinction between poverty and food security. In addition, although the conversion of caloric requirement to income may introduce certain standardization, it is sensitive to price changes. One should also keep in mind that the reliability of income data in subsistence farming where record keeping is limited is always questionable. Of course, it cannot be denied that measuring food security in terms of income is consistent with objectives of many rural development interventions aimed at raising the level of income of rural households. However, the correlation between income, and food security and nutritional status of households is not always strong (Hoddinott, 2001).

Moreover, the level of income estimated as adequate to acquire the recommended minimum calories by different studies does not converge. To mention some examples, the Welfare Monitoring Unit of the Ministry of Economic Development and Co-operation (Government of Ethiopia, 1999) estimates the food poverty line for the Hararghe Region at about 650 birr per adult equivalent per annum. The other study (Emana, 2000) estimates the food poverty line for Babile (a district in the East Hararghe Zone) at about 348 birr per adult equivalent per annum.

Having looked at the alternative indicators of food security status at household level and considering the specific local context, calorie availability as measured by the net quantity of cereals available for consumption at household level is used as a proxy indicator in this study. Table 6.1 displays a typical consumption basket for the lowest income quartile group in Ethiopia.

Table 6.1: Typical minimum consumption basket for low-income households in Ethiopia

Food item	Calorie share	Level of calorie	Level of quantity	Share of expenditure
Cereals unmilled	22%	483.96	140.68	12%
Cereals milled	48%	1049.37	305.89	37%
Pulses unmilled	6%	133.24	38.23	4%
Pulses milled or split	5%	106.42	32.71	5%
Oil seed	1%	13.45	2.74	0%
Cereal preparations	0%	0.22	0.15	0%
Bread & other prepared food	2%	39.79	12.94	2%
Meat	0%	6.88	3.82	2%
Fish	0%	0.02	0.02	0%
Milk, cheese and egg	1%	18.27	27.07	3%
Oils and fats	1%	19.29	2.41	2%
Vegetables	2%	40.81	103.76	4%
Fruits	0%	1.48	2.23	0%
Spices	2%	34.08	11.9	6%
Potatoes and other tubers	8%	177.47	119.72	9%
Coffee, tea and buck thorn leaves	2%	47.92	26.53	11%
Salt, sugar and others	1%	27.4	20.68	3%
All items	100%	2200.06		100%

Source: Government of Ethiopia, 1999

Cereals constitute about 70% of the total calorie consumption according to Table 6.1. Besides, Emana (2000), citing FAO (1999) and the Ethiopian Institute of Nutrition Studies (Agren and Gibson, 1968), indicated that cereals account for 74% of the calories of the Ethiopian rural households and estimated that 236 kg of cereals is needed per adult equivalent per year, based on the assumption that 1kg of cereals provides 3400 kcal, to meet the recommended minimum calorie of 2200 kcals per day. The same quantity was used as a cut-off point to distinguish the food secure households from the food insecure households.

The quantity of cereals available for consumption at household level was estimated from cereals produced, cereals bought and cereals sold, i.e., the net quantity of cereals *available for consumption = (cereals produced + cereals bought + cereals received as gift/transfer) – (cereals sold + gift and transfer given),* ignoring the

amount stored since households rarely store cereals beyond the beginning of the next cropping season in the study area. The data on cereals harvest and transaction was collected periodically from the end of one cropping season (March, 2001) to the beginning of the next harvest season (January, 2002).

6.2.2 FOOD SECURITY STATUS

Table 6.2a and 6.2b show food security status of households in the study area by site and household type. About 53% of the households did not have cereals sufficient in quantity to meet the recommended minimum daily calorie requirement. The fact that the cereal available for consumption at household level seems sufficient on average indicates high variation in access to food across sites and among different households. It also confirms the common knowledge that the availability of sufficient food in aggregate does not guarantee food security at household level.

The food security status varies across sites and among different households. Alemaya scored high in average cereal availability for consumption despite the fact that chat covers larger area of cropland. The income from cash crop production, chat and vegetables, enabled households in Alemaya to adopt capital-based intensification of staple crop production and finance grain deficit. These, together, more than offset the effect of shifting land to the cash crops. As expected, the resource-poor households are the most vulnerable to food insecurity. So do households living in the less commercialised area where the level of capital and technology-based intensification of food crop production is generally very low.

Table 6.2a: Food security status, by site

	Food insecure	Food secure	Average cereals available for consumption per adult equivalent (kg) per annum
Kuni	71.5%	28.5%	206
Sabale	61.5%	38.5	213
Alemaya	32.9%	67.1%	283
Overall	52.8%	47.2%	239

Source: own data and analysis

Table 6.2b: Food security status, by types of household

	Food insecure	Food secure	Average cereals available for consumption per adult equivalent (kg)
Poor	67.9%	32.1%	215
Less poor	43.5%	56.5%	245
Better-off	38.6	61.4%	276
Overall	52.8%	47.2%	239

Source: own data and analysis

6.2.3 HOUSEHOLD LEVEL DETERMINANTS OF FOOD SECURITY STATUS

A logit model was developed and estimated to rigorously assess household level determinants of food security status. In addition to 'chat production' other explanatory variables included in the analysis were: gender, family size converted into adult equivalents, cropland area per adult equivalent, livestock ownership, access to extension, vegetables (the most important cash crop next to chat) production and participation in off-farm/non-farm activities.

Table 6.3: Definition of variables for assessing the determinants of households' food security in the HHs

Variable	Expected sign	Variable description
Food security status	Dependent variable	1 if a household is food secure, 0 otherwise.
Gender of household head	+	Dummy, male-headed household = 1
Consumption unit	-	Family size converted to adult equivalent
Cropland size per adult equivalent	+	Cropland in ha/adult equivalent
Have access to extension	+	Dummy, favourable response = 1
Livestock ownership	+	In tropical livestock unit
Grow chat for market	+	Dummy, at least 10 % of total cropland area planted with chat = 1
Grow vegetables for market	+	Dummy, favourable response = 1
Participate in off/non farm activities	?	Dummy, favourable response = 1

The results of the binary logistic regression analysis are provided in Table 6.4. All the variables, which are included in the regression model, have the theoretically expected signs. The goodness of fit of the model is high with 75.4% of the cases correctly grouped and in addition the Hosmer and Lemeshow's test shows that the model fits the actual observations fairly well.

Table 6.4: Logistic model estimates of the determinants of food security status of households in the HHs

Variables	B	Wald	Sig.
Cropland area per adult equivalent	4.623	3.630	.057
Livestock owned	.530	11.098	.001
Grow chat for market	1.040	5.262	.022
Grow vegetables for market	1.910	11.538	.001
Participation in off-farm/non-farm	-.303	.622	.430
Have access to extension	.046	.009	.923
Consumption unit	-.581	17.230	.000
Male-headed household	.837	3.501	.061
Constant	-.982	1.034	.309
Sample size	195		
-2 Log likelihood	192.657		
Percent of correct prediction	75.4		
Hosmer and Lemeshow test	$X^2 = 6.938$		0.593

Source: Own data and analysis

Participation in off-farm/non-farm activities and access to extension are insignificant in predicting food security status of households. The former corresponds with the limited scope of the non-farm economy in the survey region. Indeed, as the earlier analysis showed, it is the food insecure household who usually pursue diversification into off-farm/non-farm activities as a coping mechanism. The positive sign of the coefficient for 'access to extension' shows a potentially positive contribution of extension to households' food security through its effect on productivity.

Livestock ownership is positively and significantly correlated with food security status of households, i.e, it increases the probability of a household being food secure. A pair of oxen provides draught power that enables timely land preparation and increases yield. Cows provide milk that is directly consumed or sold on the market the revenue of which is used to purchase grain during deficit. All the other variables, except family size, are significant and positively related to food security status of households.

Based on selected observations, it was expected that chat production would contribute significantly to an improved food security status of households. The results reported in Table 6.4 confirm this expectation with the finding 'grow chat for the market' increases the probability that a household will be food secure. However, it is clear from the results that land per adult equivalent and the production of vegetables

make a far greater contribution to household food security status. This is expected given the fact that land is the most scarce production factor in the area.

The study further looked at the nutritional dimension of food security. The nutritional status of preschool children (6–60 months) is commonly used as a proxy for nutritional status of the respective households. Once-off anthropometric measurements (age, sex and height) of preschoolers were taken from the same households who had preschool children at the time of the survey. The procedure recommended by the United Nations' Sub-Committee on Nutrition (Beaten *et al.*, 1990) and Nutrition Guidelines by Médecins Sans Frontières (Arbelot *et al.*, 1995) was followed and a public health officer provided technical assistance in the execution of this component of the study. Height and age data of preschoolers was converted to a Z-score and the internationally accepted cut-off point (- 2Z or 2 standard deviations) was used to distinguish the malnourished from the non-malnourished preschoolers.

Finally, multivariate linear regression analysis and binary logistic regression analysis were conducted to empirically establish the determinants of preschoolers' long-term nutritional status. Similar methods were employed elsewhere (von Braun *et al.*, 1991; Kennedy *et al.*, 1992; von Braun and Kennedy, 1994). Kirsten et al. (1998) used both OLS and logistic regression model, and Garrett and Ruel (1999) used two stage least square in addition to OLS to address simultaneity bias in analysing the factors influencing nutritional status. Variables included in the models were endowment of productive resources (land and livestock), commercialisation (growing chat/vegetable for market, participation in off-farm and non-farm), household demography (household size, religion, gender of household head, mother education), child age, birth order and health, and access to publicly provided services (extension and potable water). Table 6.5 displays the results of estimation of the parameters of the model.

Table 6.5: OLS and Logistic models estimates of the determinants of long-term nutritional status of preschoolers in HHs

	OLS estimation (y= height for age Z)		Logistic estimation (y =1 when the child is not malnourished)	
Variables	B	Sig	B	Sig.
(Constant)	-1.974	.007	-1.018	.485
Child less than/equal to 24 months	-2.11E-02	.868	-.261	.297
Birth order of the child	1.099E-02	.851	.130	.261
The child is sick two weeks prior the survey	-.548	.087	-.551	.350
Have access to potable water	.104	.362	.517	.353
Mother has formal education	.148	.412	.168	.619
Male-headed household	-.428	.269	-.122	.868
Adult equivalent	-.116	.276	-.316	.143
Cropland area per adult equivalent	-1.974	.318	-1.018	.485
Tropical livestock unit owned	.234	.008	.344	.080
Grow chat for market	.729	.011	1.010	.068
Grow vegetable for market	.276	.316	.183	.723
Participation in off/non-farm activity	-8.67E-02	.754	.409	.437
Religion	.332	.314	.946	.108
F	2.133		-2 Log likelihood	117.429
R^2	.238		Percent of correct prediction	71.8%
Hosmer and Lemeshow's test	X^2 =11.537		.173	

Source: Own data and analysis

Unfortunately, from the 197 sample households included in the livelihood study only 103 had preschoolers during the time of the survey. The sample size may be small for such study (the previous study by the Ethiopian Institute of Nutrition Studies used a sample size of 389). Although the limitations of the small sample size should be considered while interpreting the results, the analysis indicates that chat production has a positive effect on preschoolers' nutritional status that is significant at less than 1% (OLS) and at less than 10% (logit model). The TLU owned is also positively and significantly related to preschoolers' nutritional status at less than 2% (OLS) and at less than 10% (logit model). Dairy production is particularly important in this case. Children are given priority in milk consumption. Women commonly control income from the sales of milk and other milk products such as butter increasing the probability that the proceeds from selling milk would be spent on goods and services that improve children nutrition and health.

All the other non-significant variables have theoretically expected signs except the birth-order of the child. The coefficient for participation in off-farm/non-farm activities changed from a negative in OLS to a positive in logistic models, but insignificant in both. The R^2, the measure of overall fit of the OLS model, is comparable to other studies (*cf.* Garrett and Ruel, 1999). The logit model predicted about 71% of the originally grouped cases correctly. Furthermore, the prevalence of malnutrition among preschoolers, school age children and adolescents (less than 18 years old) taken together was 37.5% in Alemaya (highly chat dominated area), 45% in Sabale (moderate chat growing area) and 50% in Kuni (where chat is not important). This finding lends support to the results of the preceding food security analysis.

6.3 SUSTAINABILITY IMPLICATIONS OF RURAL LIVELIHOOD STRATEGIES

6.3.1 THE CONCEPT OF SUSTAINABILITY

'Sustainability' is the other most common concept in the rural development and environment related literature, but the most difficult one to define. It is more so than the concept of 'food security'. The concept originated from a number of disciplines, applied at different levels of aggregation, and is multidimensional (includes environmental, economic, social and institutional) and may have context-specific meaning. Thus, it is not important to dwell on the issue of definition here. Rather, the concept is used in its narrower sense to serve the purpose of the study.

Forest, soil, pasture and water are the most important part of the renewable rural natural resource base. In the SRLF, they form part of the rural livelihood assets, so-called 'natural capital'. Rural livelihoods that can generate output or income sufficient for households to lead an active, healthy and socially acceptable level of living standard, and able to adapt to and recover from gradual changes called 'stress' and sudden changes known as 'shock' are said to be sustainable. Nevertheless, rural livelihoods cannot be sustainable in a sense just described if households in the process of pursuing their livelihood strategies compromise sustainable use of the local natural resource base. In the SRLF, sustainable use of the local natural resource is considered as one of the important outcomes of successful rural livelihoods. Sustainable rural livelihood strategies may, therefore, be defined as those strategies that enable rural households to generate sufficient living while at the

same time enhance or at least maintain the quantity as well as the quality of forest, soil, pasture and water resource in the long-run.

If there are various meanings of the concept of 'sustainability', so do indicators to measure it either quantitatively or qualitatively. Not unlike the case of food security, there is a need on the part of the investigator to make judgement concerning what indicator or combination of indicators suits the objectives and scope of the investigation. It is not the intention of this section to provide a detailed and exhaustive analysis of sustainability issues. Rather, it limits itself to highlighting the major implications of livelihood strategies adopted and pursued by households and communities for a sustainable management of the local natural resource base in the study area based on stylised facts pooled from the analyses in the previous chapters. For this purpose, suffice it to consider as unsustainable any livelihood strategy or an aspect of a livelihood strategy that has led to or would likely lead to a decline in forest, pasture, soil and water resource in quantity and/or quality terms in the long-run.

6.3.2 HIGHLIGHTS OF SUSTAINABILITY IMPLICATIONS

The Ethiopian Highlands are generally preferred for human settlement and farming due to their relatively favourable climate and low incidences of human and livestock diseases. Population pressure on the land in the HHs is among the highest in Ethiopia. The reasons are: the natural population growth in the HHs has been very high; some people had immigrated to the HHs from the Central Ethiopian Highlands in the late 19th century; and out-migration has remained negligible. The increased labour force, increased subsistence requirements and diminished cropland size cultivated by households are the direct outcomes of the population growth. The sustainability outcomes of households' land use strategies, livelihood diversification and demographic behaviour in the HHs are highlighted below.

Land use strategies and sustainability

Smallholder farmers had limited access to the market, improved technologies and investment capital. Hence, conversion of forestland and pasture into cropland and intensive cropland use through the total elimination of the practice of fallowing and increased multiple cropping have been the rational strategies used by the

households to maintain per capita food production. With the risk of over generalising, the strategies have led to the degradation of the renewable natural resources. The degradation processes are most visibly manifested in the form of the conventional problems of deforestation, soil fertility depletion, dwindling grazing land and siltation of water resources. The available limited empirical evidences support these observations. Tefera *et al.* (2000) estimated that over 81% of soil erosion in one of the districts included in this study, Chiro, is primarily caused by the practice of cultivation on steeper slopes and runoff from surrounding fields. Another study reported a 72% decline in barley yield alone over 15 years period in the study area due to soil erosion (ICRA, 1996: 35, cited in Devereux, 2000). The case study presented earlier (Box 5.3) showed yield decline on the smallholder farms due to soil mining. Furthermore, farmers in Alemaya catchments had reported a reduced availability of water for irrigation on the farm due to siltation of the Alemaya Lake.

Crop cultivation has expanded to the former forest area on steeper slopes particularly in the West Hararghe zone. Besides the possible loss of biodiversity, the reduction of vegetation covers on the hills has exposed the soil to erosion. The reduced vegetation covers, steeper slopes, intense and erosive rainfall and easily erodible light and shallow soil have accelerated the erosion problem and resulted in soil fertility depletion. In addition, women have to now travel a long distance to collect fuelwood for cooking or for sale on the nearby market due to the deforestation. For the same reason, crop stocks are removed from the farm and used for animal feed, fuelwood, construction and are sold on the market.

The expansion of crop cultivation into communal pasture has created serious livestock feeds shortage and has resulted in the substantial reduction of the large ruminant population. As a consequence, the availability of livestock manure for fertilisation has been substantially reduced and draught power shortage has become the major constraint for timely land preparation. The limited availability of manure in the situation of intensive spatial and temporal land use has led to soil exhaustion and soil fertility depletion.

In the East Hararghe zone, specifically in Alemaya catchments, water from the Alemaya Lake is used for chat and perishable production on the smallholder farms.

Although land degradation through soil erosion is less problematic in the area, thanks to the moderate slope and heavy clay soil, the farmers over utilise water from the lake without any restriction. To make the problem worse, outside agencies such as the Harar Brewery, the Hamaressa Edible Oil Factory and the Harar City Municipality piped as much water as they could from the same lake without any concern for the increasing problem of sustainability. No one has taken any initiative to protect the watershed. As a result, the volume of irrigation water on the farm has reduced substantially due to siltation and salinization; a larger proportion of the land formerly covered by the lake has been converted to cropland; and the City of Harar has faced serious water crisis. The latter has already prompted search for alternative source of potable water for the city.

Nonetheless, smallholder farmers have never been passive victims of the resource degradation problem that is partially created by their own livelihood behaviour. The farmers have tried to respond to the population pressure in a number of ways. Soil and water conservation activities are widely carried out despite the prevailing land tenure that does not provide tenure security that is long enough to encourage investment in land improvements. Investment in soil and water conservation is a long-term undertaking. For the study area, it is estimated that the farmers have to wait from 6 years (on 20% slope) to 20 years (on 40% slope) to reap the return from investment in soil conservation (Adnew, 2000). The conservation activities are widely practiced as a survival strategy particularly in Kuni and Sabale where the problem of soil erosion is very serious. The conservation methods include flood diversion cannel, soil bund, stone bund, soil /or stone bund with grass strip, planting trees, and planting of chat hedgerows. The intensity of using the conservation measures is high on cropland with steeper slopes. The physical structures are usually reinforced by biological conservation methods, and annual crops are intercropped with perennials at higher slopes. Besides, cash crop growers and the relatively better-off households widely use inorganic fertilisers to replenish soil fertility. Moreover, the practice of stall-feeding, planting crops with high biomass such as sorghum to use the stalk for animal feed, fodder production and purchasing of grasses and by-products of factories represent the farmers' conscious response to the increasing livestock feed shortage with the shrinking grazing land.

Factors such as risk, resource, agro-climate, property right and collective actions influence sustainability outcomes of rural livelihood strategies, particularly in farming. The relative resource scarcity among the farm households is not the same. The ability to bear risks involved in adoption of crop and conservation technologies is as well significantly different among the farm households. Nor is the nature of NRM problem uniform across villages. Thus, households and villages have pursued heterogeneous investment strategies.

The topography of Sabale and Kuni is such that soil erosion from the cropland with steeper slopes represents the major threat to the households' livelihoods. Labour is abundant in these sites, but the site is less commercialised. Thus, soil and water conservation activities represent the largest investment, in terms of labour, due to the nature of the problem and the relative abundance of labour. The intensive land use is commensurate with investment in inorganic fertilisers in Alemaya where crop production is highly commercialised and the opportunities cost of labour is high. Although soil erosion and soil fertility depletion problem is not serious, lack of collective action represents the major bottleneck for sustainable watershed management in Alemaya.

What is equally interesting here is the effect of the attributes of technology such as spatial, temporal and resource intensity in adoption decisions. Technologies with long gestation period need tenure security for sufficiently long time, where as activities like watershed management need collective action at PA or higher level in addition to clearly defined property right (see also McCulloch *et al.*, 1998). The resource-poor subsistence farmers more easily take up technologies the adoption of which need no or little cash outlay and involve low risks.

Livelihood diversification and sustainability

The rural households have attempted to diversify their livelihoods away from crop production however limited it might be. Diversification away from farming is not normally expected to shift labour from conservation activities in such labour surplus area as the HHs. Besides, the environmentally unsustainable type of livelihood diversification such as fuelwood sale and charcoal making are on decline with the

dwindling nearby communal woodlots. The households living in nearby towns are being introduced to the alternative sources of energy such as kerosene.

The other off-farm and non-farm activities have no direct negative repercussions on the local natural resource base. A larger proportion of off-farm and non-farm income is not invested in farming. However, the income is used either to purchase grain and/or invested in children's schooling (clothing, school fees and stationeries). The latter is expected to have favorable impact in the long-run on the natural resource as a livelihood diversification strategy. Nonetheless, their strong correlation with faming means that off-farm and non-farm employment and income are neither adequate to reduce risk of food insecurity during unfavorable agricultural seasons nor do they play a very significant role in terms of reducing the mounting pressure on the dwindling local natural resource base.

Demographic behaviour and sustainability

There is a growing awareness about the disadvantages of having many children or large family size in the prevailing circumstances of reduced access to natural resource and accelerated natural resource degradation. This has motivated the rural households, particularly the resource-poor, to take deliberate action to limit their fertility within marriage. It was observed in the HHs that the poorer a household is, the smaller its size. There is a positive and significant relationship between natural resource endowment and the size of households although one cannot argue for sure that this is the result of deliberate demographic behaviour in the past on the part of the households. The better-off households do also appreciate the problem and have been motivated to invest in their children's schooling to address the same problem in the long-run.

In brief, the perceptions of the rural households are changing for the better in area of reproductive choice. Furthermore, the demand for child labour service is expected to decrease and the cost of raising children to increase in the HHs due to the tiny cropland, the improving provision of safe potable water in nearby villages, the change of grazing system from free grazing to stall-feeding, the deepening poverty in environmentally fragile villages and the increasing children school enrolments. Nonetheless, the prevailing socio-cultural and socio-economic settings in the HHs

are such that reliance on fertility decline as a means of realising sustainable rural livelihoods is a bit far-fetched. The reasons are: children have remained important sources of old age security particularly for the poor; the prevailing household formation system encourages early marriage; mothers are less educated and disenfranchised in fertility decisions; and family planning knowledge is insufficient among couples in reproductive age despite the high level of awareness about its existence.

To sum up, the population growth and accompanying demand for more food and related products have made change in the land use systems a necessity. However, whether the changes in the land use systems would follow sustainable path, in the final analysis, equally rests on factors external to the households. Surely, the local people have been continuously developing highly innovative and sustainable indigenous strategies appropriate to their dynamic physical and socio-economic circumstances. Eventually, a stage is reached where the rate of change is such that the indigenous strategies would fail to cope with the changes in the absence of external interventions and support in the form of market incentives, alternative technology and an enabling institutional and policy framework.

The observed changes in the land use strategies are the commutative result of the complex interaction of the demographic change with the other factors referred to as the 'conditioning' or 'mediating' factors. For instance, the rapid expansion of chat has been driven by the strong market incentives and the increased cash income has encouraged investment in fertilisation. On the other hand, the unsustainable exploitation of water resources and degradation of communal forest and pasture are both the clear manifestation of lack of effective institutional arrangements at the grassroots level for collective action and for controlling access to common property regimes. The major bottlenecks for sustainable intensification of the smallholder production in the country are:

- the rigid and inflexible land tenure of the last half a century;
- negligence, or in some instances, conscious marginalisation of the agricultural sector in general and the smallholder sub-sector in particular by the policymakers;

- insufficient incentives due to the 'missing' or 'thin' market and unavailability of profitable productivity-enhancing and resource-conserving technologies until a decade a go;
- the fragile physical environment (light and shallow soil, steep slopes, intense rainfall), characterised by increasing risks and uncertainties, and the recurrent drought with all its consequences.

In conclusion, the population growth alone does not make land degradation inevitable. In the context of the HHs, the rural households have acted and do act responsibly regarding sustainable NRM within the limitation imposed upon them by the physical, institutional and policy environments. Where degradation problem is serious conservation activities are intense. Furthermore, the households are trying to diversify their livelihood into off-farm/non-farm activities and desirable behavioural changes are unfolding in areas of fertility in response to the increasing natural resources scarcity. However, the households have to make a living by exploiting the natural resource even if this means cultivating marginal areas in the absence of a viable alternative source of livelihood. Hence, if there is any meaningful association between the simple population density and the extent of natural resource degradation in the context of the HHs, it is indeed, at least partially, a reflection of the failure to innovate responsive institutions, create the necessary incentives and institute effective policies.

6.4 REVISITING RURAL LIVELIHOOD STRATEGIES: TOWARDS A LIVELIHOOD TYPOLOGY

Having seen rural livelihood strategies and their welfare and sustainability outcomes, we are now in a position to trace the major rural livelihoods types in the HHs and the sustainability of NRM. This enables the investigator to show a bigger picture by bringing together evidences provided by the analyses that have been done so far. Three broader rural livelihoods types are discernible in the HHs:

Rural livelihood type one: *High commercial production of chat and perishables combined with high external input staple crops production, intensive dairying and trade.*

This livelihood type is predominant in Alemaya. Alemaya has exceptional comparative advantage in cash crop production and intensive dairy production. This is due to its superior natural resource endowment (moderate slope, fertile soil with better water retention capacity, access to irrigation), high access to the domestic and export markets and the farmers' better know-how in vegetables production by virtue of Alemaya's proximity to the Alemaya University of Agriculture (AUA) and its (some villages) experience as a model centre for promotion of villagisation and cooperative-based agricultural development during the previous regime gave

Chat and vegetables are largely produced for the markets- both domestic and export. The commercial crop production has led to higher households' income. Yet, the households retained the production of staple crops to minimise the risk of food insecurity associated with total reliance on the market for the staple grain. The high income coupled with better access to information and improved agricultural inputs has encouraged wider adoption of yield-increasing staple crop technologies especially inorganic fertilisers. The higher yield of staple crops, maize and sorghum, has, in turn, reduced the land required for subsistence crop production, releasing more land for cash crop production and improving households' self-sufficiency level in the staple grain.

Those households who could not produce enough staple grain, due to severe land constraint, for own consumption pursued market strategy capitalising on the advantage of increased cash earnings from the commercialisation process. The sorghum harvest season coincides with the period of high prices for irrigated chat. Those who are not self-sufficient in grain production buy grain from the market immediately after harvest at low prices for immediate consumption and reserve what they produce to consume when grain prices are at their seasonal high (usually in the pre-harvest season commonly known as 'season of poverty'). Grain availability on

the markets has never been a problem since the HHs are located close to one of the major surplus grain producing regions of the country, the Central Highlands.

The labor-intensive nature of both chat production and vegetables production together with the possibility of multiple cropping due to availability of water for irrigation means that this area has high labour absorbing capacity. This has created more employment, attracted migrant workers from poor areas in neighboring districts and resulted in higher wage, at least twice as high as wage rate in Sabale or Kuni. This also means that the resource-poor households in Alemaya are better-off than their counterparts in Sabale or Kuni. The accelerated processes of commercialisation and the high profit have also increased the households' demand for purchased inputs, non-food consumption goods, and marketing and transport services, creating a multiplier effect on the local economy.

This livelihood type has resulted in higher income, higher yield, more employment opportunities and higher wage, and as a consequence, highly associated with improved human welfare and less serious resource degradation although the free-rider problem in watershed management cannot be overlooked.

Rural livelihood type two: *Low external input staple crop production and extensive livestock production combined with less remunerative off-farm and non-farm activities.*

This livelihood type is most dominant in Kuni (Chiro District). The moderate population density in Kuni means less serious land constraint. It also means some communal pasture and woodland are available. These give Kuni some comparative advantage for extensive crop and livestock production. The bimodal rainfall in this upper highland also enables the farmers to grow small cereals (barley, wheat, etc.) in *belg* and large cereals in *maher in combination*.

However, the agro-climate of the area (soil, slope, rainfall, frost, etc.), moderate access to the markets and limited irrigation potential give the area less comparative advantage for the production of chat and perishables. Onion is the most important cash crop though not supported by extension. Although the area has a potential for

fruit production, it is less exploited. These have resulted in low cash income that, in turn, associated with low investment in yield-increasing crop technologies. The MoA loan service for the purchase of inorganic fertilisers and improved seeds requires down payment at the beginning of planting season where neither cash nor grain to be sold to raise the required amount is available. The principal and interest have to be settled immediately after harvest when grain prices are very low. In addition, the risk of crop failure due to unfavourable rainfall is frequent, but in the loan policy there is no provision for grace period or write-off the loan during this time of hardship. This means households have to dispose of their most valuable asset, cattle, if they have any, to settle the cost of inputs from which they might have not benefited. Affordability and risks have made the crop technologies unattractive in Kuni. Thus, this livelihood type is associated with declining crop yield with declining soil fertility through labour-based and 'capital deficient' intensification and expansion of crop cultivation at the expense of grazing land and the practice of cultivating easily erodible steep slopes.

Many households in this area are involved in off-farm and non-farm activities to supplement the insufficient farming income. Livestock trade and grain trade are lucrative activities, but they require license and start up capital. Many households expressed lack of credit service to start trade activities as a constraint in Kuni and Sabale. The majority of the households are then drawn into intermittent low wage off-farm and non-farm activities. As a result, this livelihood type is associated with low income, low food security status of households, low preschoolers' nutritional status and serious depletion of the renewable local natural resource base.

Rural livelihood type three: *Moderate cash crop production, moderate external input staple crop production, combined with off-farm and non-farm income and limited intensive dairying.*

This livelihood type is most prevalent in Sabale. Its agro-climate is pretty similar with that of Kuni. What makes Sabale's situation different from Kuni's is the most serious land constraint and availability of some irrigation water and unexploited irrigation potential. Subsistence crops, cash crops, and off-farm and non-farm income make approximately equal contribution to the total average households' income. Chat is the

major cash crop and coffee is produced in a limited degree. The proceeds from cash crop sales are used to finance the adoption of yield-increasing crop technologies. Off-farm and non-farm income, income from milk sales and part of income from chat sales are used to finance grain deficit.

This livelihood type is more diversified and more successful than the second one. Although households in Sabale are poorer than households in Kuni in resource endowment, the former is better-off in terms of income, food security status, preschoolers' nutritional status and the extent of natural resource degradation.

6.5 SUMMARY AND CONCLUSION

Chapter 6 established human welfare outcome, in terms of food security status of households, and underscored sustainability implications of rural livelihood strategies in the HHs.

The first section of the chapter discussed how households' food security status was determined. The section also presented the results of the assessments of household level determinants of food security status. The net quantity of cereals available for consumption at household level for the study period was used as a proxy indicator of households' food security status. Cereals account for 74% of the total caloric consumption of an average rural household in Ethiopia. It was estimated that 236 kg of cereals per year is required for an adult person to meet her/his minimum daily calorie requirement of 2200 kcal.

The results of the analysis indicated that Alemaya is the most food secure since only 33% of the households were not able to meet the minimum calorie requirement. On the contrary, Kuni is the least food secure since more than 71% of the households did not have sufficient quantities of cereals to be able to meet their minimum calorie requirement, while the figure for Sabale is about 61%. By household type, 68%, 44% and 39% of the resource-poor, the less resource-poor and the better-off households, respectively, are food insecure. Overall, 53% of the households are food insecure, almost equal to the national figure of 52% for rural households.

The results of the binary logistic regression analysis of household level determinants of food security status indicated that cropland size per adult equivalent, commercial production of chat and vegetables and TLU owned correlated positively and significantly with households' food security status. However, land per adult equivalent makes a far greater contribution to households' food security status. This is expected given the fact that land is the most important and scarce production factor in the study area. Participation in off-farm/non-farm activities has a negative sign and is insignificant in predicting food security status of households.

To supplement the food security analysis, the nutritional status of preschoolers was determined and quantitative analysis of determinants of long-term nutritional status of the preschoolers was conducted. Both the OLS method and the binary logistic regression were used for analysing the data. Growing chat for the market and TLU owned positively and significantly explain the nutritional status of preschoolers. Furthermore, the prevalence of malnutrition among preschoolers, school age children and adolescents (less than 18 years old) taken together is 37.5% in Alemaya (highly chat dominated area), 45% in Sabale (moderate chat growing area) and 50% in Kuni (where chat is not important). This lends support to the results of the preceding food security analysis.

The second section of the chapter presented the highlights of sustainability implications of rural livelihood strategies in the HHs. A narrower definition of the concept of 'sustainability' is used for the purpose of this study. A sustainable rural livelihood strategy is taken to mean a livelihood strategy that enables households to generate sufficient living without compromising the sustainability of NRM.

On the one hand, rural livelihood strategies in the HHs in the context of increasing man-land ratio and constraining physical environment, institutional and policy factors have resulted in natural resource degradation. On the other hand, the increasing scarcity of natural resources and the increasing threat of the resource degradation to rural survival have created incentives for investing in resource conservation and soil fertility management. Some households and villages tend to invest more in soil and water conservation, while others tend to invest more in inorganic fertilisers. Heterogeneous investment strategies are pursued due to differences in the nature of

the degradation problem, relative resource scarcity and ability to bear risks involved in the adoption of resource-conserving and productivity-enhancing technologies.

In addition, the households have attempted to diversify their livelihoods away from farming. Yet, the strong correlation of the off-farm/non-farm activities with the performance of farming means that the former is neither adequate to reducing risk of food insecurity during unfavourable agricultural season nor plays a significant role in terms of reducing the unprecedented pressure on the land. Interesting desirable changes in rural households' perception in areas of fertility and family planning were observed too, notwithstanding the prevailing socio-economic and socio-cultural realities that would make the rapid decline in total fertility rates difficult.

In brief, the deliberations on sustainability concern underscored that in the context of the HHs neither the nature and the extent of the degradation problem is uniform across the study sites and among farms, nor the degradation problem can sufficiently be explained by population growth alone nor are the households passive victims. The local people have been continuously developing highly innovative and sustainable indigenous strategies appropriate to their dynamic physical and socio-economic circumstances. Eventually, they reached the stage where the rate of change is so fast that indigenous strategies are failing to cope with the rapid changes in the absence of external intervention. External intervention and support were needed in the form of market incentives, alternative technology and an enabling institutional and policy framework. Thus, it is asserted that if there is any meaningful association between the simple population density and the extent of natural resource degradation in the HHs, it is indeed, at least partially, a reflection of the failure to innovate responsive institutions, create the necessary incentives, and institute effective policies.

Finally, the rural livelihood strategies and livelihood outcomes were revisited and an attempt was made to develop typology of rural livelihoods. Three such types were identified. The one that combines large-scale cash crop production with high external inputs staple crop production, intensive dairy production, and lucrative trade was found most successful in terms of human welfare and the sustainable use of the

renewable local natural resource base. However, the livelihood types are not static; new practices may develop and strategies may change.