Livelihood strategies in the context of population pressure: A case study in the Hararghe Highlands, Eastern Ethiopia

by

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August 2003

TABLE OF CONTENTS

CHAPTER 2: A REVIEW OF CONCEPTS, THEORETICAL PERSPECTIVES AND EMPIRICAL EVIDENCES

CHAPTER 3 : ETHIOPIA'S SITUATION: PROCESSES AND STRUCTURES

CHAPTER 4: ECONOMIC SYSTEMS OF THE RESEARCH SITES AND SOCIO-ECONOMIC CHARACTERISTICS OF THE HOUSEHOLDS

ACKNOWLEDGEMENTS

A number of persons and institutions have directly or indirectly contributed to the successful completion of this research. I thank them all, though I can't name them all.

My special thanks go to the Alemaya University in particular and Ethiopian people in general for giving me a privilege of pursuing higher studies. I just hope that we, the so-called educated Ethiopians, will one day find the wisdom to put first the interests of our country and millions of fellow Ethiopians who live in abject poverty, and restore the dignity of this country.

I extend my wholeheartedly appreciation to Dr. Bezabih Emana with whom I openly shared my ignorance and confusion at the initial stage of the research, and from whom I got important ideas to begin with.

I am very grateful to my two promoters, Prof. Johann F. Kirsten and Prof. Sylvain Perret, for their unreserved support. The interest they showed in my work right from the very beginning and their confidence in me even when I was not sure I could make it had helped me to move forward. Thank you for your skilful and humane guidance and for allowing me to make mistakes and learn from them. Thank you once more again Prof. Kirsten for your understanding, kindness and doing everything possible to make my stay at the UP comfortable. Mev. Botha, the department secretary, is also well appreciated for her cooperation.

To my wife Tigist Abraham, no words can express my appreciation for your direct and indirect contribution! It was indeed you together with our lovely little girl, Sena, who paid a lion's share of the price. Thank you for your endurance and for accepting a relegation to living in a substandard condition for the last three years. I am also grateful for assisting me in interviewing women about family planning and preschoolers' nutrition, and in the process for sharing and appreciating the hardships of fieldwork. Sweat heart, you are really so special and you will always have my unconditional love!!

It is unfair not to mention my poor and uneducated mum (Elfinesh Kalbessa) and dad (Lemma Tefera) whose crucial decision to invest part of their meagre resource in my education had laid a base for me to reach where I am today. Unfortunately, my dad's dream and determination to educate me until I reach 'grade 20' has come true in his absence. I can only say may his soul rest in peace forever!

I would like to thank Mr Haji for assisting the execution of the technical aspect of the preschoolers' nutrition survey, and Mr Jelan for kindly proof-reading the earlier version of the thesis. I also extend my especial appreciation to my friends Zerihun Gudeta, Dr. Arega Demelash, Getu Beyene, Yoseph Beyene, Tekalegn Tsegaw and all other fellow Ethiopians with whom I shared the moment of frustrations and hopes. Thank you Dr. Mutimba, Mr Giregna Tuli, and all other friends back home for your moral support and encouragements through your e-mails and letters.

Above all, I praise the almighty Lord for what I have achieved and for his mercy!!

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ABSTRACT

The thesis presented the results of an investigation into livelihood strategies of rural households in the Hararghe Highlands in the context of population pressure. The human welfare and resource outcomes of rural livelihood strategies were assessed, accounting for the 'mediating' factors. The study enriches the current policy debate on how to create an enabling environment to strengthen sustainable rural livelihoods and mitigate adverse welfare and resource consequences of unsustainable rural livelihood strategies.

The sustainable livelihood framework for analysing rural livelihoods in the context of population pressure was modified in the thesis to guide the analyses. Primary data was obtained from 197 randomly selected households from three representative sites in the Hararghe Highlands. Whilst verbal description, interpretation and appreciation of facts, and case studies were used for the qualitative data analysis, multivariate techniques and logistic regression were employed to analyse the quantitative data.

The study showed that subdivision and fragmentation of agricultural land and re-emergence of landlessness have accompanied the unprecedented population growth in the Hararghe Highlands. The pace of demographic change of the area is so fast that it has caused failure of indigenous countervailing and adaptations. Sufficient effective demand for sustainable intensification of smallholder farms has, however, not been created due to uncertain right to the land and inadequate market incentives. Furthermore, the technology generation and dissemination systems have failed to build the capacity of smallholder farmers to respond to the demographic pressure in a sustainable way. This has generally resulted in negative welfare and resource outcomes.

Nonetheless, rural households pursue heterogeneous livelihood strategies due to differential access to livelihood assets, and heterogeneous constraints and incentives. The nature and the extent of welfare and resource outcomes of rural livelihood strategies are different across sites and among different households. A livelihood strategy that integrates cash crop production with high external input-based staple crops production and trade was found to be more successful. Overall, the findings challenge the current untargeted and uniform intervention that implicitly assumes that only farming and the intensification of staple crop production for food self-sufficiency is important to all households. Furthermore, the findings challenge the over simplified generalisations regarding the human welfare and resource effects of rural population growth in Ethiopia as if the interactions between them were taking place in a political, an institutional and an agro-climatic vacuum and as if rural households in a district, a sub-district or a village were a 'homogeneous' group.

What is thus needed is decentralisation of rural development planning and building of the capacity of local institutions so that they may be able to understand rural livelihoods and design innovative and locally specific integrated interventions to support sustainable rural livelihoods. The specific recommendations include ensuring land tenure security, improving farmers' access to the market and appropriate technologies, creating conducive environment for commercialisation and livelihood diversification, institutionalised safety net, resettlement and family planning.

Acronyms and Abbreviations

ADLI	Agricultural Development Led Industrialisation
AMC	Agricultural Marketing Corporation
CSA	Central Statistical Authority
DFID	Department for International Development (UK)
EARO	Ethiopian Agricultural Research Organisation
ECA	United Nations Economic Commission for Africa
EPRDF	Ethiopian People's Revolutionary Democratic Front
FAO	United Nations Food and Agricultural Organisation
FFW	Food for Work
GDP	National Gross Domestic Product
GOs	Government Organisations
ha	Hectare
HHs	Hararghe Highlands
kca	kilo calories
kg	kilo grams
MoA	Ministry of Agriculture
Mt	Metric tone
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
ITK	Indigenous Technical Knowledge
NARS	National Agricultural Research Systems
NGOs	Non-Government Organisations
NRM	Natural Resource Management
OCFELE	Opportunities Cost of Female Labour Effect
OLS	Ordinary Least Square
PADETS	Participatory Demonstration and Training Extension System
PAs	Peasant Associations
SLF	Sustainable Livelihood Framework
RPNRE	Reduced Pressure on Natural Resource Effect
SAPS	Structural Adjustment Programmes

SCF/UK	Save the Children Fund/United Kingdom
SSA	Sub-Saharan Africa
TLU	Tropical Livestock Units
USA	United States of America

LIST OF TABLES

LIST OF FIGURES

LIST OF TEXT BOXES

CHAPTER 1
INTRODUCTION

1.1 THE PROBLEM IN ITS CONTEXT: AN OVERVIEW OF THE NATIONAL AND REGIONAL SCENARIOS OF POPULATION, RESOURCE AND WELFARE

Ethiopia is one of the Sub-Saharan African (SSA) countries known for their fast population growth, accelerated environmental degradation and structural food insecurity. Singh (1998:295) succinctly describes the challenge that has faced the country in the new millennium as follows:

> *"Ethiopia today, as it enters into the twenty-first century, is in a real crises; her development fulcrum within the problematique very much hinges between two axial poles- one of fast population growth rate and the other of accelerating environmental resource degradation. Both of these problems together are accelerating mass poverty and destitution as causative factors but they themselves seem to be the twin products of poverty."*

Ethiopia's population grew from 23 million in 1960 to 37 million in 1980 and it had reached 49 million in 1990 (Ezra, 1997, cited in Degefa and Nega, 2000). Ethiopia's Central Statistical Authority (CSA) estimate shows that population of the country had reached 65.5 million by October 2001 and that it would double in 30 years with the annual growth rate of nearly 3% (CSA, 2001). The population density (persons1 per square mile) of the country grew from 50 in 1960 to 100 in 1991 and is expected to reach about 300 by the year 2020 (U.S. Bureau of the Census international database, cited in Jolly and Torrey, 1993).

The population growth is more pronounced in rural areas. The share of rural population in the total population of the country (85%), higher total fertility rates in rural areas and the past government agricultural policies are commonly held responsible for the relatively accelerated growth rate of rural population. The population pressure hits the Highlands (1500 meters above sea level) hard due to unbalanced distribution of rural settlements. Highlands are generally preferred for their relatively favourable climate and long growing period that exceeds 180 days. The Ethiopian Highlands which cover only about 50% of the total land area

accommodate 85-90% of Ethiopia's farmers and account for over 95% of cropped area, around 66% of livestock and 90% of the national economic activities (Ejigu, 2000). Human and animal diseases, mainly malaria and tsetse fly, harsh weather, lack of irrigation, market and basic social infrastructures have discouraged settlement in most part of the sparsely populated lowlands (Degefa and Nega, 2000).

Ethiopia is a large country with the estimated total land area of 111,811,000 hectares. However, only 30% of the total land area can be used for rain-fed cultivation. The figure rises to merely 38% even when vertisols, that requires special management to deal with drainage problem, and steeper slopes (over 30% slope), the sustainable use of which requires growing more perennials commensurate with investment in improved soil and water conservation technology, included (FAO, 1988, cited in Gebre Egziahber, 1995a).

The rapidly declining farm size is, therefore, logically the direct consequence of such population pressure. The limited natural resource base has to be distributed among more and more rural people in the absence of employment opportunities in the primary industries such as mining and the other secondary and tertiary industries in the country. As a consequence, the national per capita landholding had declined dramatically from 0.28 hectares (ha) in 1960 to 0.13 ha in 1980, and it had diminished further to 0.10 ha in 1990 (Degefa and Nega, 2000). Table 1.1 displays the most recent statistics regarding size distribution of cropland and average households' cropland holding at national level. According to the table, 36% of the farm households cultivate cropland that is less than half a hectare in size and 63% of them cultivate less than a hectare, the average being 1.02 ha (CSA, 1998).

The 1975 land reform and subsequent periodic land redistribution in the country were supposed to address the problem of landlessness and underemployment of labour in the country. Nevertheless, rural landlessness, estimated to 15% to 20% (Rahmato, 1996), and rural unemployment and underemployment, estimated to 25% to 45% (Demeke, 1996), are the growing problems. Land related intergenerational conflicts (Abate, 1995), sometimes resulting in violent clashes, are on increase. In the mid 1980s, it was predicted that the country would face grazing land 'crisis' by the year

2000 and cropland 'crisis' by the year 2010 unless the level of population growth and the land use systems were changed (Hurni, 1988, cited in Gebre Egziahber, 1995a).

Table 1.1: Distribution of total number of households and cropped area (ha) in 1996/97

Size of crop area (ha)	Cumulative % of households	Cumulative % of area cropped	Average cropping area per household
< 0.1	5.9	0.3	0.1
0.1 – 0.5	36.3	9.3	0.3
0.51 – 1.00	62.3	28.1	0.7
1.01 – 2.00	87.2	63.	1.4
2.01 – 5.00	99.4	96.	2.8
5.01 – 10.00	100	100	6.0
Average			1.0

Source: Computed from CSA, 1998 by Adal, 1998

The situation in the study area, the Hararghe Highlands (HHs), is worse. Hararghe is considered as one of the three zones, together with Wollo and Tigray, in the country where cropland is the most limiting factor. Population density of the HHs ranges between 230 and 410 persons per square kilometre (Scoones, 1996, cited in Adnew, 2000) and 67% of the holdings are below a hectare, the average being 0.875 ha (Tadesse, 1998). According to Diriba (1995), the landless already accounted for 15% to 20% of the rural households in the HHs in the mid 1990s.

The degradation of the renewable natural resource in Ethiopia in terms of soil fertility depletion, deforestation and dwindling communal grazing land is well documented (e.g. Gebire Egziahber, 1995a; Gebre Silassie, 1995; Tegegne, 1995). The natural forest is disappearing and soil depletion has reached an alarming rate, and shortage of grazing land is increasingly becoming a serious problem. This threatens the long-term sustainability of rural livelihoods and the natural resource use as well. According to FAO, 50% of the highlands are eroded, of which 25% are seriously eroded, and 4% have reached a point of no return (FAO, 1986, cited in Shiferaw and Holden, 2000). In economic terms, soil erosion causes an estimated average annual productivity loss of 2.2% nationally (FAO, 1986, cited in Shiferaw and Holden, 1998). Devereux (2000) sums up the appalling scenario as follows: *"Pressure on the physical environment increases inexorably, with forest cover, grazing land, livestock ownership, soil fertility and even rainfall all decreasing in many areas."*

The HHs' case is no exception in this regard. The study area is one of the regions known for depletion of their biomass resources (Gemachu, 1994, cited in Adnew, 2000). The traditional fallowing practice has almost been abandoned. The practice of crop rotation is substantially declining and the farming land has expanded to marginal land and communal grazing land and the natural forest are on the verge of total disappearance.

At the same time, poverty is pervasive and deepening in the country, particularly in rural areas. The structural food deficit of the country is enormous. Ethiopia received 10 million metric tones (Mt) of food aid between 1984 and 1998, which on average is equivalent to 10% of the country's cereals production (Jayne et al., 2002). According to an optimistic estimate, 50% of the population in the country cannot meet their daily minimum nutritional requirements. When disaggregated, those living below the estimated absolute poverty line account for 52% of the rural population and 36% of the urban population (Government of Ethiopia, 1999).

The HHs is also known for its structural food deficit and exposure to regional and localised recurrent drought, the most recent one occurring in 2003. Hararghe has been receiving food aid almost every year since the great famine of 1984/85 in the form of food-for-work (FFW) programs (Save the Children Fund (SCF)/UK, 1996).

In short, the rapidly declining availability of agricultural land, both in quantity and quality, against sustained population growth and continued reliance of almost all of the rural households on subsistence farming characterises the HHs as well as the other rural Ethiopia. Hence, in Ethiopia in general, and in the HHs in particular, ensuring food security of the rural households without compromising the long-run productive capacity of the renewable natural resource is the formidable challenge that the researchers, policymakers, development agents and farmers alike have to grapple with.

1.2 POPULATION-RESOURCE-WELFARE PARADIGMS

The brief overview of the Ethiopia's scenario in the preceding section with regard to population, environment and poverty seems to implicate a direct, simple and one to one cause – effect relationship. Most of the local scholars believe it to be so, for obvious reasons, with few exceptions. It is necessary at this junction to briefly have a look at the alternative perspectives on the issue in order to highlight controversial area needing further research and more case studies, and also to place the research in the proper theoretical perspective.

The relationship between population growth and food production, on the one hand, and population growth and environment, on the other hand, has been at the forefront of research and policy debate at least since Malthus published his extensively debated article in 1798 (Malthus, 1985). Since then, extreme views have been suggested regarding the population-environment-poverty nexus.

The classical economists and natural scientists strongly argue that the earth has limited carrying capacity and therefore can support only a limited number of people. Although this school recognises the role of exogenous technological change in increasing food production, it contends that increased food production would encourage more human fertility, re-creating the condition of poverty. Hence, uncontrolled population growth would inevitably lead to food and environmental poverty (e.g. Hardin, 1968). Population growth is accorded a regressive role leading to ecological deterioration through land fragmentation, deforestation, overgrazing, erosion, siltation, salination, soil acidification, etc.

Boserup, on the other hand, reversed the Malthusian hypothesis suggesting that it is population growth and increased subsistence requirement, not vice versa, that determine agricultural development in general and food production in particular (Boserup, 1965). Simon (1986) believes more people means more exchange of ideas that leads to advancement of knowledge and technology, and thereby, increased food production. Tiffen et al. (1994) also claim even under African circumstances population growth could lead to sustainable intensification. Similarly, Binswanger and Ruttan (1978) as well as Hayami and Ruttan (1985) hold the view that population growth would lead to innovation of increasingly labour-intensive technologies by

altering factor price ratios. Here population growth is accorded a progressive role: - increasing market size, changing factor proportions, inducing technological progress and creating demand for institutional change (e.g. land tenure) that reduce transaction costs and would lead to increased market efficiency.

Nonetheless, both the neo-Malthusian and the neo-Boserupian schools have failed to explicitly recognise the fact that the complex interaction between population, resource and welfare does not take place in an institutional, political and ecological vacuum. Institutional arrangement is a salient mediating factor of the linkages between rural demographic change and rural development (MacNicoll and Cain, 1990). This has led to the development of the third perspective that does not identify itself with any one of the polar Malthusian - Boserupian view. Instead, the latter perspective contends that the Malthusian trap or the Boserupian type response could be a possible outcome. The outcome is determined by an incentive structure, in terms of land tenure security, market and technology available to farm households and how that is influenced by policies (e.g. Panayotou, 1994), adding another dimension to the debate. For instance, the most recent study on the relationship between global food production and population growth concludes: "*technological optimism and ecological pessimism are both misguided*". (Gilland, 2002:61).

To summarise, all the alternative perspectives are important, but none of them, standing alone, is sufficient to explain the complex and dynamic interaction between population, resource and welfare. For this very reason, Lipton (1990) argues that the theoretical perspectives often seen as competing and with different policy implications are indeed complementary. Hence, only case studies guided by a broader analytical framework that systematically integrates the alternative perspectives provide more reliable and useful information for situation specific policy formation and implementation.

1.3 DEFINITIONS AND DELIMITATION OF THE RESEARCH PROBLEM

The population-resource-welfare nexus debate is controversial as apparent from the foregoing discussion. At the national level, most scholars, following the Malthusian line of argument, blame Ethiopia's food and environmental poverty primarily on population pressure (e.g. Belay, 1995; Seyoum, 1996; Tegegne, 1996), while few

others (e.g. Rahmato, 1996; Singh, 1998) make non-demographic factors at least equally responsible. Land tenure, market, technology and the presence and effectiveness of grassroots level institutions for the sustainable management of common property regimes are among the non-demographic factors.

In fact, there is no convincing evidence in the literature that indicates if SSA's population ceases to grow, either income per capita will automatically increase or/and sustainable natural resource management (NRM) is guaranteed. To the contrary, SSA's economy will continue to decline unless the economic stagnation is reversed even with zero population growth rate (Sen, 1994).

Moreover, international experiences indicate the possibility of natural resource degradation under different demographic scenarios: - increasing, declining and without population pressure (Blaikie and Brookfield, 1987). Empirical studies in SSA have further provided cases of sustainable rural livelihoods improvement as well as both rural livelihoods and natural resource impoverishment with increasing population pressure on the land (see Templeton and Scherr, 1997). Surely, as Jolly and Torrey (1993) conclude, research in this area has not yet led to a body of knowledge on which public or scientific consensus has developed. The debate is not yet over.

The fundamental reason for the divergent views is that there is no simple and straightforward relationship between demographic change, human welfare and sustainability. Implications of rural demographics for human welfare and the sustainability of NRM are influenced by a host of institutional, political, technological and agro climatic (climate, soil type, and slope characteristics) factors. The relationship between income and environmental pressure varies within countries and even across households (Hunter, 2000). According to MacNicoll and Cain (1990), implications of different agrarian systems, within a country, for the pace of productivity change, for labour absorption and for income distribution is different. It is possible to have both a positive and a negative correlation between population density and the quality of NRM in a country as reported by Rahmato (1996) for Ethiopia. A very recent study in southern Ethiopia further observed that the pathways of environmental and livelihoods change are different across agro-ecological zones and across households with different resource endowments (Konde *et al.*, 2001).

Similarly, Murton (1999) found sustainable intensification on richer farms and 'involution' on poorer farms, proceeding side by side within a village in the highly publicised case of the Machakos District of Kenya.

If these claims are indeed acceptable, generalisation based on aggregate studies is imprecise and less insightful. However, most of the studies, including those reviewed earlier, have emphasized aggregate or macro level (international/national) investigation with little attention to dynamics at household and community level. Besides, most of the studies failed to explicitly account for the role livelihood diversification into off-farm/non-farm can play to absorb additional labour and possibly to reduce pressure on the natural resource. Studies at such level overstate, understate, or misrepresent the impact of demographics and could lead to inappropriate policy recommendations (Panayotou, 1994). Decisions concerning fertility, use of the local natural resource base are reached at and implemented within households, but the interface of population, natural resource and welfare at a spatially localised level has been a relatively neglected subject in empirical analyses in rural development (Dasgupta, 2000).

Context specific policy, technological and institutional solutions are required to ensure sustainable rural development in circumstances of diverse local situations. Designing and implementing context specific development strategies that integrate livelihood needs of the local people with sustainable NRM, in turn, calls for a thorough understanding of alternative livelihood strategies of the rural households (Jabbar *et al.*, 2000). Empirical evidence from northern Ethiopia indicated that resource and welfare outcomes of rural demography are different across different livelihood strategies (Pender *et al.*, 2001).

> *"It is very important that preconceptions about what the poor do- what there livelihood strategies are- should be put aside. It has been common in the past to make untested assumptions about the poor, and as a consequence, to misdirect support." DFID (Department for International Development), 1999: DFID's facts sheet 2.5:2*

It is against this background that the research was initiated to understand and explain livelihood strategies of rural households and communities in the HHs in the context of

increasing population pressure to address the existing knowledge gap in this regard. Rural households are neither undifferentiated nor passive victims; it is generally accepted that they adapt to the changing resource base and opportunities in a variety of ways in order to enhance or protect their livelihoods. Households' livelihood strategies may involve changing the land use strategies, diversifying livelihoods to off-farm and non-farm and changing demographic behaviour (migration and fertility) in response to the dwindling local natural resource base to mention, but a few.

Livelihood strategies pursued by rural households and rural communities could be effective in ensuring both food security of the households and the sustainability of NRM. For example, the reduction of fallowing practice as soil fertility maintenance as a result of continuous cultivation under increasing population pressure could, with a commensurate increase in the use of chemical fertilisers, manure and agro-forestry practices, increase production to feed the increasing mouths without necessarily causing soil fertility depletion. Also the demographic behaviour of rural households might not be as rigid as we usually think. For instance, a study in Nepal found that the increasing environmental scarcity lowered the demand for more children at household level (Loughran and Pritchett, 1998, cited in Dasgupta, 2000). Nonetheless, if increasing environmental scarcity means reduced availability and accessibility of water and fuelwood, this may increase demand for girls' labour, reducing their participation in schooling with negative repercussions on fertility decline (Cleaver and Schreiber, 1994).

Alternatively, the gradually evolving indigenous strategies may fail to sufficiently cope or totally breakdown, with the fast increasing demographic pressure. In this circumstance, the natural resource base could be compromised and thereby poverty-degradation cycle could be exacerbated as a result of households' desperate quest for survival, particularly in the absence of effective external intervention.

External interventions and the broader institutional and policy context may influence households' livelihood behaviour and thereby the quality of NRM. Smallholder farmers need appropriate technology, market incentives, access to investment capital and assurance that they would reap benefits of their investment in land improvement in the medium to long-term to pursue a sustainable intensification path. External

intervention could augment assets needed for sustainable rural livelihoods such as labour (through training, health and nutrition) and natural resource base through provision of irrigation infrastructure, investment in soil and water conservation, etc. Conversely, ill-conceived external interventions or appropriate, but ineffectively implemented external interventions could constrain local response and possibly have negative repercussions on rural livelihoods and the sustainability of NRM.

Rural institutional arrangements such as family formation and inheritance systems influence the extent of disparity between private and social costs of reproduction and perceived incentive to pursue socially desirable demographic behaviour at household and intra-household level (MacNicoll and Cain, 1990). In other words, 'externalities' may be created in reproductive choices. Furthermore, lack of effective institutional arrangements or collective action at the grassroots level to control access to communal forest, grazing land and water resource could lead to degradation.

The central concern of the thesis is, therefore, to uncover these possible sources of tension at household and community levels in order to inform policy and development interventions at regional and national level. Yet, it should be clear at the outset that it was not the intention of this research to test specific hypotheses or formally establish cause-effect relationships between demographic change, human welfare and the quality of the natural resource management. The thesis had two modest objectives: 1) to understand what it is that rural households and communities in the HHs are doing to protect and/or improve their livelihoods in the context of the fast declining cropland area per capita and per household, and the prevailing institutional, technological, policy and physical environment; and 2) to assess whether the sustainability of NRM is compromised in the process.

1.4 SPECIFIC OBJECTIVES OF THE RESEARCH

The overall objective of the research is to understand, assess human welfare outcomes and highlight sustainability implication of, rural livelihood strategies pursued at household and community level in the Hararghe Highlands in the context of the growing population pressure and the prevailing broader institutional and policy context, and the physical environment. The specific objectives of the research were:

1. to critically review the evolution and salient features of institutional and policy environment of the country in order to be able to understand whether it facilitates or constrains the realisation of sustainable rural livelihoods at the grassroots level in the subsequent analyses;
2. to develop and describe rural households' typology in order to examine diversity in livelihood behaviour in the subsequent analyses;
3. to identify and describe land use strategies pursued at household and community level;
4. to investigate the nature, the extent and determinants of livelihood diversification and the role of reduced access to land in the households' diversification decision;
5. to explore whether and to what extent households' family size preference or achieved/intended fertility is responsive to the increasing natural resource scarcity, cropland in particular;
6. to assess human welfare outcomes, in terms of food security status, of livelihood strategies pursued by households; and finally
7. to highlight sustainability implications of livelihood strategies pursued at household and community levels.

1.5 RELEVANCE OF THE STUDY FOR RURAL DEVELOPMENT POLICY AND PRACTICE

It is generally accepted that one of the reasons for failure of many rural development initiatives in SSA at macro level is the inadequate attention and recognition given to local level specific circumstances and initiatives in solving development problems (Taylor and Mackenzie, 1992). Detailed understanding of intricacies, strengths and weaknesses of rural livelihood systems and the aspiration of the concerned rural people is imperative if past failures are to be avoided (Binns, 1995). The linkages between local livelihood strategies and the macro institutional and policy context deserve equal attention. Rural poverty reduction strategy should reinforce local strategies that are sustainable. Therefore, we have recently witnessed a paradigm shift away from macro policies towards micro policies and interventions at village, household and individual level (Ellis, 2000b).

This study contributes to the shift in analysis and action. It provides insights into livelihood strategies of the rural households and communities; assesses welfare outcome; and underscores the major implications of local strategies for the sustainability of NRM in the HHs. Such information is needed to enrich the debate on what would be the appropriate rural development strategy, for the study area and the country at large, that strengthens successful local strategies and provides an enabling environment for sustainable rural livelihoods.

The research is also timely. The Ethiopian government is currently engaged in formulation of a 'National Poverty Alleviation Strategy'. At the heart of the 'Poverty Alleviation Strategy' being debated by the academics and the public at large is as to how to realise sustainable rural development. The respective regional governments would subsequently adapt the details of the national strategy being designed to their local specifics. The insights this research is expected to provide may be a useful input to such initiatives in the country in general and in the Oromia Region in particular.

Moreover, the research represents, to the researcher's knowledge, the first attempt in the HHs, and possibly in Ethiopia, to conduct such a comprehensive analyses of population, resource and welfare interface at spatially localised level. The research used rural livelihoods approach and borrowed concepts and theories from agriculture economics, natural resource management, economic demography and rural sociology.

Most importantly, the research may challenge the current sector-based approach to rural development in the study area that assumes farming to be the only livelihood option for rural households; it thus focuses on increasing efficiency of smallholder agriculture in order to achieve food self-sufficiency while neglecting household level food security and the emerging off-farm and non-farm sector as a potential alternative source of employment and income. It may also challenge the current uniform, untargeted rural development interventions amidst diversity in resource endowments, and as a consequence, diversity in livelihood strategies across households and communities.

In short, the livelihood analysis is expected to identify livelihood related opportunities and constraints; it may also provide local insights and identify the priorities of rural households that inform higher level policy; and may explain how the prevailing structures and processes affect rural livelihoods at the grassroots level. The latter may, in turn, provoke discussions and consultations on how to support sustainable rural livelihoods and mitigate adverse welfare and environmental consequences of unsustainable livelihood strategies.

1.6 CONTRIBUTIONS OF THE RESEARCH TO THE KNOWLEDGE AND INSIGHTS INTO RURAL DEVELOPMENT PLANNING

As indicated earlier, the investigation was conducted with the ultimate aim of enriching the current debate on what type of institutional innovations and development interventions would be needed to support sustainable rural livelihoods in the study area in particular and in the country at large. However, the current study also contributes to the methodological approach in studying rural development problems.

The research is carried out for the higher research degree in rural development planning, and the nature of the problem itself requires a multi-disciplinary approach. Hence, the thesis embarks on an effort to systematically integrate alternative perspectives regarding the population –resource –welfare nexus, and relevant issues and concepts from agricultural economics, natural resource management, economic demography and rural sociology. It then demonstrates the practical application of the comprehensive framework for analysing rural livelihoods in the context of population pressure on a case study basis. In the process, the thesis constructively contributes to the debate on the 'Sustainable Livelihood Framework' (SLF), while suggesting a more practical approach.

There is a tendency in practice to apply the SLF in a static manner. A simple enumeration of livelihood activities as farm and non-farm, and indicating income contributed by each activity is inadequate. There is a need to go further to uncover how each activity is done and why people do the activity the way they do it. Whilst investigating farming as a component of rural livelihood strategies, for instance, one should be prepared to go further to examine the prevailing land use strategies and

how they have evolved over-time. This is more insightful than halting the analysis prematurely after dividing farm strategies into cash crop production, subsistence crop production and livestock-rearing activities, and indicating income from each activity. There is a need to investigate the motives and consequences of land use strategies, say a shift to the production of high-value crops such as chat, in detail. Besides, historically, demographic adjustments such as migration, delayed marriage and fertility control within marriage have always been part of rural strategies in the face of demographic pressure. Although temporary migration is treated as a component of livelihood diversification strategies in the SLF, permanent migration and fertility issues are overlooked in the SLF. Furthermore, the SLF makes the research agenda open-ended, and thus costly and unmanageable. The theoretical background and analytical skills required to understand all aspects of rural life simultaneously is such that a research guided by the SLF would likely result in a superficial analysis, and a package of policy recommendations without priority and sequence. The framework for analysing rural livelihood strategies in the context of population pressure, which is developed and applied in this thesis, is therefore relatively more comprehensive, yet specific for a practical application.

The current study also reverses the conventional way of looking at the research problem. The population –resource –welfare interactions are studied at spatially localised level since the ultimate decisions concerning fertility and the use of the local natural resource base are reached at and implemented within households and communities. The rural households are deliberately put at the centre of the analysis. Thus, unlike other similar studies, the current study does not start from the identified 'problems' (fast population growth, natural resource degradation and food insecurity). Rather, it looks into the livelihood behaviours of the rural households and communities (their decision making processes, their priorities, motivations behind their decision, their livelihood strategies, etc.), and how local livelihood strategies are influenced by the macro institutional and policy context. It then looks at the issues of food security and natural resource management as rural livelihood outcomes.

Furthermore, the thesis deliberately puts the neglected issues of diversity and rural differentiation in development studies in SSA in general, and in Ethiopia in particular, at the centre of the analysis. To this effect, the qualitative and quantitative techniques

of developing a typology of rural households (wealth categories) are combined and used in an innovative way.

1.7 AN OVERVIEW OF THE STUDY REGION

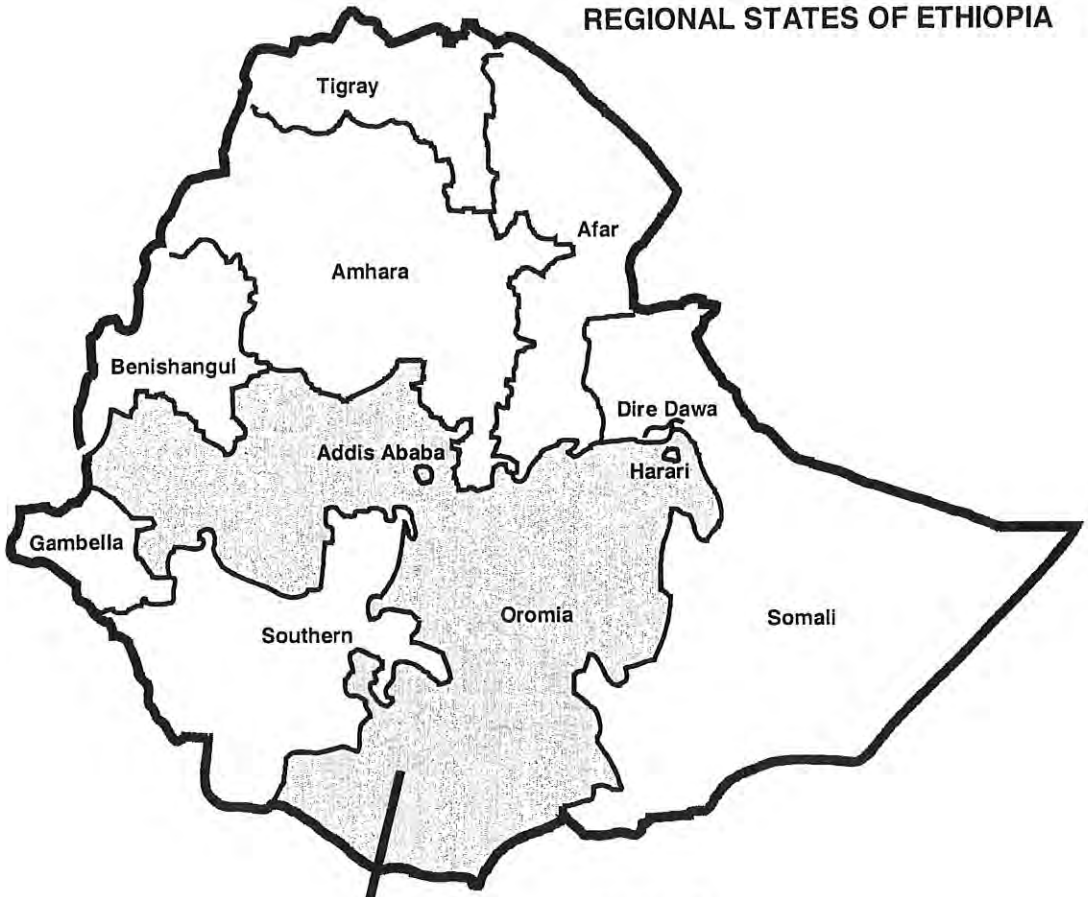
1.7.1 PHYSICAL AND SOCIAL SETTINGS

The Hararghe region consists of the East Hararghe zone and the West Hararghe zones of the Oromia region. It is located in Eastern Ethiopia (map 1A). Geographically, the region is located south of Djibouti and west of Hargessa town of Somali at about 300 kms and 250 kms, respectively (Klingele, 1998). The Ethio-Djibouti railway passes through the region and air transport links the region to Djibouti, Hargessa and the capital Addis Ababa. There is a gravel road; being upgraded to concrete asphalt, linking the two zones in the region to the capital, Addis. This gives the region a relatively better transport networks in the country.

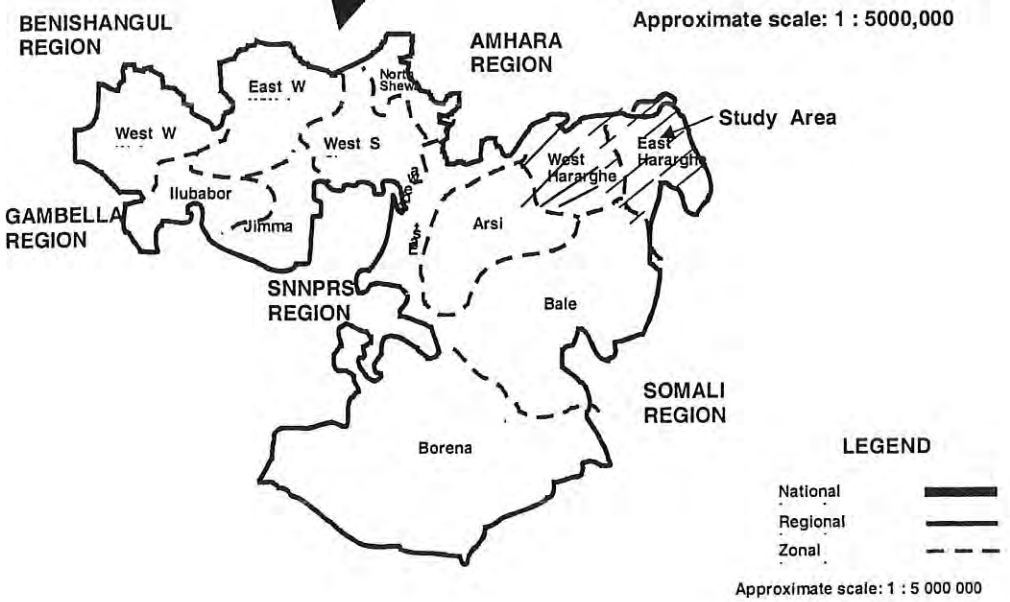
The majority of the Hararghe population (83%) lives in the countryside and depends on farming (highland and midland) and livestock rearing (lowland) for its livelihoods. The rural population of Hararghe is predominantly Oromo in ethnic origin and Muslim in religion. The other ethnic minorities' population living in the region include the Amahara and, the Afar and Somali pastoralists. Extended family is the common type of family structure and polygamy is common among the Muslim Oromo. However, polygamy is less common among the Amaharas and the Christian Oromos who migrated to the region from the north and the Central Highlands of the country in the late 19th century.

Agro-climatically, Hararghe encompasses highlands (15 - 20%), midlands (35 - 45%) and lowlands (30 - 40%) with altitude ranging from 1000 to 3405 meters above sea level. Annual average rainfall ranges from 700mm in the lowland to nearly 1200mm in the upper highlands. Hararghe gets biannual rainfall, the *belg* (short rain) from end of February to the middle of May and the *meher* (long rain) from July to end of September.

MAP 1A:
REGIONAL STATES OF ETHIOPIA



MAP 1B:
OROMIA REGIONAL STATE
Approximate scale: 1 : 5000,000



Land preparation for the long cycle crops, sorghum and maize, is carried out during *belg*. *Belg* rain also allows limited production of small cereals such as barley and wheat in midland and upper highland. *Meher* is the main season for farming activities. While the average precipitation is generally considered adequate for viable rainfed agriculture, its abnormal distribution and amount exposes crops to frequent weather hazards (Storck *et al.*, 1990).

1.7.2 CROP AND LIVESTOCK PRODUCTION

Sorghum is the staple crop in the region followed by maize. Sweat potato is extensively cultivated during unfavourable season (season of low rainfall or abnormal distribution of rainfall) to cope with food insecurity (Kingele, 1998). Small cereals such as tef (*Eragrostis tef*), barley, wheat and millet are produced in the West Hararghe highland. Legumes such as horse bean, and haricot bean are grown usually intercropped with maize and sorghum. The staple crops are mainly produced for home consumption, with the exception of teff. The staple crops are sold only where cash crop production is limited to cater for cash needs of the households in cereal - dominated areas.

Chat (*Chata edulis*), a mildly stimulant leaf or shrub chewed fresh by the people in the Horn of Africa and some Arab countries is the most important cash crop with growing importance in terms of resources committed to its production, the cash it generates and its multiplier effect on the local economy. It enjoys a growing domestic and export markets, is less affected by diseases and earns stable income though heavily taxed. On the contrary, coffee is the traditional cash crop with declining importance. The chief reasons are severe problem of coffee berry diseases (CBD) and declining world prices despite exceptional quality of Hararghe coffee. Hence, it is being replaced by chat in the HHs. It retains its importance only in certain pockets of the West Haraghe Zone such as the Boke District, which is known for its exceptionally favourable agro-climate for coffee production and far from the main road network. The production of chat requires proximity to the road networks since it has to be fresh when it reaches the ultimate consumers, both domestic and foreign. Vegetables such as onion, cabbage, carrot and root beet are also produced as cash

crops mainly for export to Djibouti. However, their commercial production is limited in irrigated valleys of the East Hararghe zone.

Livestock constitutes an integral part of the farming systems of the HHs. Livestock is the source of draught power, cash, soil nutrient (manure), milk and means of accumulation. For the lowlanders it is their main source of livelihood. Development of the livestock sector is constrained by drought in the lowland and diminishing grazing land in the midland and highland of the region.

1.7.3 LABOUR RELATIONS AND METHODS OF PRODUCTION

Land and labour constitute the major resources of the farm households and it is land that is the most limiting factor (Storck, et al., 1990). Hararghe farmers, like their counterparts in the other parts of Ethiopia, have only usufruct rights over the land they cultivate. Ethiopia's farmers are organised at grassroots level under Peasant Associations (PAs). The responsibility of PA includes periodic rural land redistribution and land administration. However, land redistribution has effectively been phased out and there is no extra land to be distributed by PAs. Practically, all the available land has been put under cultivation. Inheritance is the only means of access to land for new entrants in the farming activity. In fact, the possibility for sharecropping and/or leasing land is open though limited.

Mainly family labour is used for agricultural activities. Local labour organisation called '*guuza*' and '*faraqaa*' are also used to mobilize additional labour during peak season. Men carry out field activities such as land preparation, weeding and harvesting. Women are mainly responsible for household chores and feeding animals especially cows and small ruminants. Women also assist their husbands during harvest in case of labour scarcity (Storck *et al.*, 1990). Marketing of dairy products, perishables and chat in small quantities are also within women's domain. Of course, men who are heads of households carry out marketing of chat and perishables in large quantities. Though men seem to dominate resource allocation decisions, there is evidence that wives are consulted (Emana, 2000).

Herding and scaring of birds and monkeys are the duties of children. Children assist their mother fetc.hing water, collecting fuelwood and looking after their young

siblings. Older children assist their father ploughing, weeding and harvesting (CARE-Ethiopia, 1995b). This indicates that children are important sources of labour at their early age. The children's labour service obligation is also extended to blood relatives effectively making children a group asset and childbearing social responsibility (CARE-Ethiopia, 1995).

In the region, oxen and bulls are widely used for land preparation. Draught power per household or arable land has declined dramatically due to diminishing grazing land. A hand hoe made of a stick with a metal point locally called '*dongora*' is used in the absence of a pair of oxen for land preparation. The extent of application of improved crop and livestock husbandry practices varies from place to place.

1.8 THE SURVEY AND DATA

1.8.1 SAMPLING PROCEDURE

Conventionally, random sampling which gives each and every item in the entire population equal chance of being included in the sample will result in a sample that better represent the population. The exact sample size can be determined statistically based on certain critical parameters at an acceptable level of probability (Leedy, 1997). However, very often researchers make practical decisions about sampling method and sample size based on the scope and objective of their enquiries and resource availability (Kothari, 1994).

In this study, a multistage sampling, a combination of purposive and stratified systematic random sampling, procedure was followed to select the study sites and the sample households. First, three representative study sites were selected purposely and then sample of households was drawn using proportional systematic random sampling technique. The proportion of female-headed households in the total population of households at each selected study site was obtained from households lists provided by respective PAs for the proportional sampling.

A study by an NGO (CARE-Ethiopia, 1997, cited in Klingele, 1998) categorises the study region into five economic systems as a basis for food risk mapping. These are:

- Cereal major system
- Cash crop major system

- Cereal and cash crop major system
- Agropastoral (livestock major and cereal minor) system
- Pastoral system

The agropastoral and the pastoral systems were not considered for selection of the study sites since the study is limited to the highlands. Then, three sites were selected purposely based on the diversity of the economic systems of the HHs, the extent of population pressure as perceived by the local Ministry of Agriculture (MOA) staff and accessibility during the rainy season. These sites are Alemaya, Kuni and Sabale. These sites are dispersed over three districts in the two zones and at least two PAs from each site were included in the study. The local extension agents or leaders of Peasant Associations (PAs) provided lists of households at each site. The households were then stratified according to the gender of households' heads and proportional sample (in order to include female-headed households) was drawn from the lists by the systematic random sampling technique.

Table 1.2: Peasant associations and districts covered by the study

Peasant Association	District	Zone	Number of sampled households
Finkile	Alemaya	E. Hararghe	30
Fendisha Lencha	Alemaya	E. Hararghe	22
Gobe Selama	Alemaya	E. Hararghe	27
Kuni Segaria	Chiro	W. Hararghe	35
Walargi	Chiro	W. Hararghe	18
Sabale PA-1	Kuni	W. Hararghe	37
Sabale PA-2	Kuni	W. Hararghe	28
Total			197

The total sample size at the beginning of the study was 225. Seventy-five households (just over 10% of a PA's population on average) were randomly selected from each site. However, some households lost interest and withdrew their cooperation due to 'interview fatigue' during the second or the third phase of the survey. Some others did not give complete information that could be utilized for the analysis. This brought the final sample size down to 197 households. Nevertheless, the study was quite successful in terms of encompassing different categories of farmers- the better-off and the poor, male-headed households and female-headed households, young and old and, Muslim and Christian were all fairly represented. Therefore, reasonably representative information in terms of the categories of households and the economic

systems was obtained to develop livelihood typology and to examine similarities and differences across sites and among different households. Nonetheless, there could be some degree of sampling bias since the sample size is small and accessibility was one of the criteria used to choose the study sites. The bias is not all significant, and has a very little influence on the analysis and the conclusions drawn.

1.8.2 DATA AND DATA COLLECTION METHODS

Taking into account the objectives of the investigation and the conceptual framework that has been adapted to the purpose of this research (Chapter 2), the primary data was collected on the following variables:

- Household characteristics such as size, age, sex, education, religion and household members relationship to the household head.
- Households' livelihood assets such as land and its quality, number and type of livestock owned, farm implements, house type, tape and/or radio ownership, labour and its quality in terms of age, sex, education and health status, savings and grain in store.
- Access to soft and hard infrastructure such as education, health and family planning, irrigation, market, extension, credit and improved inputs.
- Livelihood activities such as food and/or cash crop production, livestock rearing, forestry, off-farm and non-farm activities.
- Soil and water conservation practices.
- Gender division of labour and decision-making.
- Constraints in respective areas of activities.
- Production, sale, purchase, income and grain available for consumption.
- A once-off anthropometric measurements- age, sex, height, and related data.
- Data related to fertility and migration.

The fieldwork was conducted from mid of March 2001 to mid of January 2002. Both the conventional sample survey methods and participatory methods were used in a complementary way to collect the required data. Two rounds of questionnaire surveys, once-off anthropometric measurements, one round of group discussions, personal observation, case studies of selected households and focus group discussions were undertaken.

Sets of structured questionnaires administered by enumerators under the close supervision of the researcher and a trained field assistant was used to collect detailed quantitative data. The questionnaire was pre-tested as part of enumerators training in the field. Adjustment was then made to the questionnaire based on feedback obtained from the pre-test exercise and a review of the literature on farming systems of the study area. The responses were obtained from all relevant household members, i.e., not only from household heads. For example, wives provided information related to family planning. Female enumerators were used to avoid communication barrier while interviewing women. Through out the fieldwork, every sample household had been visited at least five times.

A Public Health Officer from the Faculty of Public Health at Alemaya University provided technical assistance in the execution of once-off anthropometric data collection. This survey also provided an opportunity to visit each and every sampled household. It was during this time that case studies of selected households were carried out.

Group discussions at each research site, attended by representatives selected from both the sample and non-sample households, were in fact used at the exploratory stage of the fieldwork. The group discussions, summarised in a field notebook on the spot, gave important insights into a number of community level issues. Among others, insights were obtained on the general picture of the prevailing farming systems (resources, cropping systems, technology, yield, etc.) and changes happening over-time, general perceptions of problems and solutions and emerging livelihood strategies in each site. Participatory group wealth ranking exercises at each site were used to identify categories of farmers in terms of wealth and local wealth ranking criteria.

Oral historians and transact walks together with discussions with knowledgeable elders of the communities had helped to get an overview of change in the land use systems over-time at each research site. This was done due to the absence of time series data that relates to demography and land use. Qualitative information pertaining to fertility and gender relation was obtained through focus group discussion. Furthermore, supplementary secondary data was collected from NGOs,

zonal agricultural and planning offices, CSA, National Bank of Ethiopia, research reports and government policy documents.

Table 1.3: Summary of data collection methods

Data collection method	Type of data and purpose	Source
Questionnaire survey	Socio-economic date to test certain relations	Sample households
Nutrition survey	Once-off anthropometric measurements to determine nutritional aspect of food security status of households	Preschoolers, school-age and adolescents from the sample households
Case studies	Socio-economic data to describe certain facts and patterns such as the land use systems	Limited purposely selected sample households
Group discussions	Community level information to identify the prevailing livelihood strategies and understand local context at exploratory level, identify local wealth ranking criteria and get a limited data to use as a reference against which household level data are checked	Sample and non-sample Households
Focus group discussions	Fertility and gender related issues	Sample and non-sample
Review of reports, policy documents and publications	Secondary data to get general information related to the study and to be used for triangulation purpose	Banks, NGOs, zonal offices and universities

1.8.3 DATA QUALITY CONTROL MEASURES

One general concern about survey-based research in a subsistence farming area is data reliability. A number of factors, beyond the control of an investigator, could affect data reliability unless conscious efforts are made to minimise the error. In the study area suspicion, dependency, high level of illiteracy and non-existence of record keeping practices are the main problems.

First, the uncertainty related to land right, the peasant-government relations that historically based on forced surplus extraction, villagisation, cooperativisation and military conscript have made the Ethiopia's peasantry suspicious. An elder in one of the PAs covered by this study justified the prevailing high level of suspicion among the peasantry by saying, " a r*ope seems a snake in the dark to a person who saw a snake in the light."*

Second, limited number of households in some of the study sites had received grain and edible oil for free or through FFW programs. This experience has created a

certain degree of 'dependency'. This means some farmers were reluctant to cooperate when they learnt that immediate benefit was not forthcoming.

Third, keeping the record of inputs used and costs incurred in the production process, and recording produce, crop and livestock proceeds, off-farm and non-farm income is still remote to most of the Ethiopia's peasantry even in the 21st century. Besides, different members of the households partake in numerous small transactions throughout the year further complicating the issue.

Last but not least, the lack of any tangible improvements so far in the rural livelihoods as a result of external interventions has also created a certain degree of resentment among the peasantry. As a result, some households were at times reluctant to tell the truth, underestimate their resources and exaggerate their problems or even uncooperative. Nevertheless, these problems are not typical to the current research although professional correctness requires one to openly admit it. "*Rural people have learned from experience to keep some of their activities hidden, especially from government, which has a tendency to control, regulate or tax such initiatives.*" *(Taylor, 1992:)*

The necessity for taking measures to ensure reliability of the data by reducing the inevitable errors to an acceptable level was imperative. Data quality control procedure suggested and applied by Storck *et al. (1997)* in the same area was followed to this end. The procedure entails checking consistency and plausibility. The reported size of cultivated area was checked against plots allocated to different crops, amount of inputs used, such as seed and fertilisers. Balancing, such as cash inflow and outflow comparison was also carried out. Cash inflows and cash outflows cannot be stretc.hed without limit though not necessarily balanced (Storck *et al.*, 1997).

Triangulation, i.e., comparing information from different data sources, is another method used for data quality control. First, the group discussions conducted at the very beginning at each site had helped to find out the maximum, the minimum and the average conditions (holding size, milk production per lactation, yield and revenue from crop production with-and-without irrigation and/or improved husbandry). In

addition, secondary data from previous research, GOs and NGOs reports were also used for cross checking. In this way discrepancies and outliers were identified and corrections were made to improve the reliability of the data.

1.9 DATA ANALYSIS

The nature of the enquiry demanded both the qualitative and quantitative data. It then follows that both the qualitative and quantitative data analysis techniques were employed independently or in combination as deemed necessary. Verbal description, interpretation and appreciation of facts, highlights of household and community level case studies, and descriptive statistics form part of the qualitative analysis.

Multivariate techniques such as discriminant analysis, multivariate linear regression model and regression on limited dependent variable form part of the quantitative analysis. The discriminant analysis was employed to objectively confirm the number of socio-economic categories of the sampled households constructed through group wealth ranking exercise. The other advanced econometric models served to identify and test relative importance, in terms of statistical significance, of variables of interest. The underlying statistical and econometric theories of the chosen quantitative data analysis methods are briefly reviewed in the following section for the subsequent appropriate application and interpretation of the results.

1.9.1 DISCRIMINANT ANALYSIS

Discriminant analysis is one of the multivariate statistical techniques used either for interpreting differences among known groups or classifying subjects into groups on the basis of a set of measurements (Stevens, 1986). It is the appropriate statistical technique when the dependent variable is categorical and independent variable is metric (Everitt, 1991). It has been successfully used in studies of loan repayment risk analysis (Kebede and Kassa, 1998), in classifying farmers into homogenous groups for technology adoption studies (Emana, 2000) and many other studies in the social, medical and biological sciences. The equation takes the following form:

$$D = W_1 + W_2 + W_3 + - - - + W_nX_n$$

Where, D = is discriminant score;

W_i = discriminant weight for variable i;

X_i = independent variable i.

The multivariate discriminant procedure, like multivariate regression, drives a linear combination of independent variables that maximises between groups to within group differences (Anderson et al., 1958). The between to within group differences quotient is called eigen value and the larger its value the maximum the separation between groups or the maximum the discriminating power of the function under consideration (Stevens, 1988). Wilks' lambda, which is inversely related to Eigen value, and canonical correlation are used to test the significance of the discriminating canonical functions (Klecka, 1980). Canonical correlation, the value of which ranges from 0 to 1, measures the degree of relatedness between the groups and discriminant functions. Wilks' lambda, on the other hand, measures group differences over several variables. The value of Wilks' lambda ranges from zero to one; as an inverse measure, the smaller the value of lambda the greater is the separation between group centroids relative to within group dispersion. The percent of original grouped cases correctly classified by the model, taking into account prior membership probability, is used to assess the overall fit of the model (Anderson et al., 1958), like R^2 in the multiple regressions.

Generalised distance function, particularly Mahalanobis D^2 and group membership probability are commonly used for classification purposes once the number of groups and predictors are known (Klecka, 1980). Cases are classified into the groups with the smallest D^2 after calculating the squared distance for each group in the former, while in the latter, a case is classified into a group for which it has a highest probability of belonging. Both procedures are supplementary since classification based on squared distance assigns a case to a group that most likely resembles its profile (Klecka, 1980). The SPSS software package, based on Bayer's rule, classifies cases into appropriate groups using their discriminant scores. The probability function for classifying cases with given discriminant scores is given as follows:

$$P(Gi/D) = \frac{P(D/Gi)\,P(GI)}{\sum_{i=1}^{g} P(D/Gi)P(Gi)}$$

where, P(Gi) is the prior probability;

P(D/Gi) is the conditional probability;

P(Gi/D) the posterior probability; i = 1, - - - g are groups

1.9.2 MULTIVARIATE LINEAR REGRESSION MODEL

The multivariate linear regression model econometric specification is given as follows:

$$y_i = \delta_o + \sum_{i=1}^{m} \delta_i \chi_i + u_I$$

Where y_i = dependent variable

χ_i = explanatory variables

δ_o = intercept

δ_i = parameters to be estimated

u_I = disturbance term

OLS method is used for parameter estimation and the standard t and F statistics is used to test significance of individual variable and goodness of fit of the model respectively.

1.9.3 MULTIVARIATE LOGISTIC REGRESSION MODEL

Binary logistic regression model is a probability model frequently used when dependent variable assumes a value of zero or one (Aldrich and Nelson, 1984; Hosmer and Lemeshaw, 1989; Liao, 1994; Gujarati, 1998). It differs from the linear regression model in two aspects: 1) its conditional mean is bounded between zero and one; and 2) the error term follows binomial rather than normal distribution with mean zero and variance equal to P_i (1- P_i).

Although there are alternative probability functions, such as probit probability function, that can accommodate dichotomous outcome variable, logit probability function is usually preferred for its mathematical simplicity, flexibility and ease of interpretation. Hence, we opted for logistic regression based on the theoretical consideration and the nature of our dependent variables that assume the value of

one for favourable response and zero for unfavourable response. Mathematically, the logistic distribution function, following Gujarati (1998), can be specified as:

$$P_i = \frac{1}{1 + e^{-Z_i}}$$

where: P_i is probability of an event occurring and Z_i is a function of n explanatory variables (x) expressed as:

$$Z_i = B_o + \sum_{i=1}^{n} B_i X_i$$

For a nonevent, the probability is just one minus the event probability

$$1 - \frac{P_i}{1 + e^{-Zi}}$$

Dividing probability of an event occurring with the probability of a nonevent occurring and further simplification will give us:

$$\frac{P_i}{[1 - P_i]} = e^{Zi}$$

The ratio Pi / (1- Pi) is known as the odds ratio, i.e., the odd in favour of being in the category of interest. Finally, multivariate logistic econometric model is obtained by taking the natural logarithm of the last equation and by introducing disturbance term u_i.

$$Li = \ln \left(\frac{P_i}{1 - P_I} \right) = B_o + \sum_{i=1}^{n} B_i X_i + u_i$$

Where: b_i, the coefficient for the i^{th} predictor, estimates the change in log odds of being in the category of interest on the response for a one-unit increase in the i^{th} predictor, controlling for all other predictors in the model (Demaris, 1992).

Logistic regression parameters are estimated by a method called Maximum Likelihood Estimation (MLE) instead of OLS estimation as in the linear regression model. MLE produces estimates that are unbiased, efficient and estimates that follow normal distribution like OLS facilitating hypothesis testing. The only difference is MLE is nonlinear which creates computational difficulty and requires larger sample size (Aldrich and Nelson, 1984).

The Wald statistic that compares the maximum likelihood estimate of the slope parameter to an estimate of its standard error can be used to test statistical significance of individual predictors. Hosmer and Lemeshow's measure of goodness of fit (R_L^2) can be used instead of R-square in OLS although there is some disagreement among authorities (Field, 2000). Insight on overall performance of a logit model can be obtained from percent of originally grouped cases correctly predicted by the model.

1.10 LIMITATIONS OF THE RESEARCH

First, the scope of the research is broad and it is relatively less focused of necessity. The research attempted to comprehend rural livelihoods in its entirety like any other rural livelihoods analysis. It looked into natural resource endowment and use, level of technology, households' participation in the factor and product markets and, the extent and determinants of livelihood diversification. The study further investigated migration and fertility as an aspect of rural livelihood strategies and, evaluated welfare outcomes and underscored sustainability implications of livelihood strategies pursed at household and community level. The role of physical, institutional, technological and policy environment in shaping livelihood strategies at the grassroots level and influencing human welfare and sustainability outcome could not be overlooked either. While the livelihoods approach is superior in providing a coherent picture of the actual local circumstances, it is data intensive and requires multidisciplinary research. Therefore, a trade-off between analytical rigour and comprehensiveness is inevitable in research of this nature.

In the second place, two approaches are commonly followed in the empirical literature to capture responses to population pressure such as changes in the land use systems at village or higher level. Some researchers compare villages assumed

to be similar in different aspects such as altitude, cropping systems, land tenure, access to technology and proximity to the market, but population density or the multivariate regression method is employed where the number of sample villages are sufficiently large. Others use longitudinal data to understand changes resulted from growing population density over time. The researcher could find neither villages that were 'similar' in relevant variables and, at the same time, had significantly different population densities in the HHs, nor specific longitudinal data for the study sites that is ideal to understand the dynamics of rural livelihoods.

The non-existence of the most preferred type of data limited the analysis to cross-sectional household data though attempt was made to capture the dynamics of rural livelihoods through interviews using techniques such as subjective trend analysis and group discussions with knowledgeable elders of the communities and other key informants. Apparently, the insufficiency of cross-sectional household data in terms of empirical socio-economic evidence prevented a detailed analysis of household livelihoods and hence the determination of ideal development strategies. Particularly the analysis of change in the land use strategies under population pressure was partially based on stylised facts supported by limited case study materials and personal observation.

Thirdly, arguments related to the impact of institutional and policy constraints on rural livelihoods and sustainable use of the natural resource were based on arguments and logics well established in the rural development literature. It was found impractical and beyond the scope of resource and time bound Ph.D. thesis research, such as this, to test each and every relation empirically. Nonetheless, the information provided by related empirical studies carried by other researchers in the same area or in the country was used to substantiate certain arguments and make the discussions contextually relevant.

1.11 THE ORGANIZATION OF THE THESIS

The next chapter, Chapter 2, reviews the concepts, the theoretical perspectives and empirical evidences related to the main themes of the thesis. It develops an appropriate conceptual framework for analysing rural livelihoods in the context of population pressure. Chapter 3 critically, but briefly, reviews the evolution and salient

features of the broader institutional and policy environment in Ethiopia. This helps to better understand how and to what extent institutional and organisational factors constrain or facilitate the achievement of sustainable rural livelihoods at the grassroots level. Chapter 4 deals with the description of the economic systems of the study sites and socio-economic characteristics of the sample households. It provides the basis for establishing homogeneous spatial units and presents household typology as a starting point for the subsequent analyses.

Results of the analyses, qualitative and quantitative, of rural livelihood strategies in the HHs (the land use systems, livelihood diversification and, migration and fertility) in the context of diminishing arable land area per household and per capita are presented in Chapter 5. Chapter 6 is concerned with determining human welfare outcome, i.e., food security status of rural households, and highlighting sustainability implications of livelihood strategies pursued at household and community levels. It then revisits livelihood strategies and livelihood outcomes in the HHs in an attempt to develop the major livelihood typologies for the study area in order to show the bigger picture.

Finally, the thesis will wind up by summarising the focus, the research method and the major findings of the research, and by drawing certain conclusions and recommending interventions that may need to be made in order to realise sustainable rural livelihoods in the HHs in Chapter 7.

CHAPTER 2
A REVIEW OF CONCEPTS, THEORETICAL PERSPECTIVES AND EMPIRICAL EVIDENCES

2.1 INTRODUCTION

This chapter selectively reviews the concepts, the theoretical perspectives and empirical evidences, particularly in SSA, related to the main themes of the investigation. The emphasis of the chapter is on the possible courses of action that rural households and communities could pursue, i.e., rural livelihood strategies, at the local level to ensure their food security on a sustainable base in the context of growing population. Institutional and organisational factors, market conditions, technology and government policies, and socio-economic and socio-cultural factors conditioning livelihood strategies at the grassroots level thereby influencing human welfare and sustainability outcomes of rural livelihoods are equally given due attention.

The chapter starts by clarifying the concept of 'population pressure' in the next section as an organising concept that forms the context of the study. It then turns to a review of the theoretical and empirical literature on the alternative livelihood strategies of rural households in the context of population pressure. These include land use systems, rural livelihood diversification and demographic adjustments. This is followed by a brief discussion of the concept of 'food security' and its relation with rural livelihood strategies. It is assumed that the ultimate goal of the strategies pursued by rural households in SSA is to ensure their members permanent entitlement to sufficient food.

Following the discussion of the concept of food security, a synthesis of the literature review on the interactions between demography and rural livelihood strategies, and welfare and resource outcomes are presented. The next section develops a comprehensive framework for rural livelihoods analysis in the context of population pressure on the basis of the insights provided by the literature review. A summary of the key issues and the basic principles are presented in the final section of the

chapter. The insights gained from this chapter would inform the analyses of specific rural livelihood strategies in the subsequent chapters.

2.2 THE CONCEPT OF POPULATION PRESSURE

Though 'population pressure' is among the most frequently used concepts in the rural development literature, its clear definition is rarely given. Grigg (1980) reviewed the limited attempts made to define population pressure precisely by agricultural economists and identified the following three alternative definitions of what he calls 'overpopulation'.

The first definition is derived from the famous work of Malthus entitled 'An Essay on the Principles of Population' first published in 1798. According to this definition, overpopulation is said to exist when output per head declines and mortality level increases to the extent that population of the country in question ceases to grow. This definition is refuted due to its disregard for technological change and the assertion that a rise in per capita food production or income would necessarily lead to population growth and the re-creation of poverty.

The second alternative definition uses the concept of 'optimum population' (see also Nurkse, 1953). When the population of a given country is below the optimum level OP (Figure 2.1) that country cannot benefit from economies of scale. Specialisation is difficult, fixed overheads are divided among few people and some factors of production cannot be used at an economically optimum scale. At this stage, subsequent increase in population increases average product since marginal product is greater than the average product until the level OP is reached. As the population grows beyond OP, both average product and marginal product decline though total product still rise. In the optimum theory, therefore, a country with a population size of less than OP is said 'underpopulated' and a country with a population size of more than OP is said 'overpopulated'.

Although the 'optimum population' theory is conceptually appealing, its assumptions are unrealistic. It assumes all factors of production to be constant. It recognises neither the possibility of increasing area under cultivation through technological advances nor the possibility of change in the capital stock of a country.

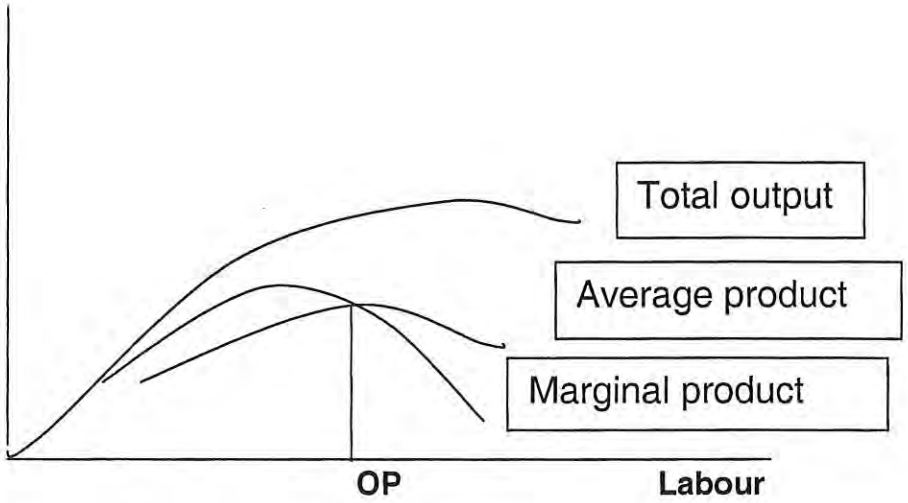


Figure 2.1: Labour force, output growth and 'optimum' population

The third definition related to the optimum population theory is the concept of the 'marginal productivity of labour'. Over population is said to occur when an additional unit of labour practically produces nothing, and rather reduces the total product. Many development economists believe that surplus labour exists in developing countries' agricultural sector and can be transferred to industry or service sectors without affecting the total agricultural product (Lewis, 1954; Fei and Ranis, 1961). However, this conclusion based on the common dualistic model (agriculture and urban non-agriculture) is misleading since it neglects the third sector, rural non-agricultural production (Grabowski, 1995).

According to Warriner (1964), overpopulation is said to exist in a country if wage rates fall due to faster growth of agricultural labour force relative to other resources, land and capital in particular. Although labour-based intensification could postpone unemployment where land is scarce, Warriner argues, the limit will soon reach in the absence of capital to augment the productivity of land, making the decline in output per head inevitable.

Limited attempts were also made to empirically measure population pressure in some countries. Two approaches were commonly used: the production approach and the consumption approach. The former approach starts with estimating the labour force required for agricultural activities of a given area and then compares this with the available actual labour force to assess the degree of unemployment and/or underemployment. The latter approach starts with establishing acceptable level of standard of living (or poverty line) either in terms of income or consumption. Then, it estimates the number of persons that can be supported by the available agricultural resource and technology at the living standard considered acceptable.

Binswanger and Pingali (1988, cited in Pingali, 1990) used the concept of 'agro climatic population density' as a standard population density measure: the number of people per million kilocalories (kcal) of production potential at a given technology level. They observed that this procedure dramatically changes the ranking order based on the commonly used simple population density (the number of persons per square kilometre of land/agricultural land).

'Population pressure index' was used in Nepal to empirically identify over-populated and under-populated districts (Shrestha *et al.*, 1999). The total rural population of each district, total land area of each district and the carrying capacity of each district were used to drive population pressure index (PPI). The carrying capacity of the districts was estimated based on gross value of district level outputs (crop, livestock and forestry) and national per capita income. Carrying capacity (P1) is equal to gross value of primary products divided by national per capita income. The value of the population pressure index can be negative, zero or positive to indicate underpopulation, optimum population or overpopulation, respectively. Population pressure index (PPI) per square kilometre of a rural area is defined as follows:

$$PPI = \frac{P - P1}{A}$$

where: P: is the total rural population of a district

P1: is the estimated number of rural inhabitant in a district who can be supported (carrying capacity of each district)

A: is the total land area of each district

Finally, the concept of 'minimum size' was used in the HHs (Adnew and Storck, 1991) to estimate the extent of population pressure. There are two alternative assumptions that could be used to determine the minimum size of agricultural land required by an average household to meet its minimum calories requirement, cash needs for basic goods and services, and limited investment (Haile Gebrial, 2000). These are: 1) level of income that can be generated given the actual activities in which the households engaged; and 2) calories that can be produced assuming all the available agricultural land are allocated to grain production. Adnew and Storck (1991) adopted the first assumption, which is in fact more realistic in the context of the HHs. Then, they concluded that two-third and three-fifth of the sample households cultivated less than the assumed minimum land size required for subsistence, respectively, under existed and assumed improvement in technology (10 % increase in yield).

Table 2.1: Comparison of actual average size and minimum size of cultivated land required (ha)

	E. Hararghe	W. Hararghe	East & West
Actual holding size per household	1.13	0.88	0.99
Actual holding size per adult equivalent	0.23	0.17	0.20
Minimum size required per AE	0.25	0.23	0.23
Percentage of holdings less than the minimum size	62.5%	76.9%	67.7%
Percentage of holdings less than minimum size under IT*	56.9%	68.7%	**60.6%**

* IT stands for improved technology Source: Adnew and Storck, 1991

According to Grigg (1980) both the production and consumption approaches have drawbacks to measure the extent of population pressure. The production approach neglects issue of land use, differences in quality of labour in terms of education and health status and peak season labour requirement in the context of rainfed agriculture. It is also possible that labour required to produce the essential non-market goods and services are neglected in the calculation. In the consumption approach, the standard of living considered 'adequate' is static and subjective and does not account for the status of income distribution.

Due to the practical limitations of both the production and consumption approaches, Grigg (1980) suggested the use of proxy indicators instead of attempting to measure population pressure quantitatively. The indirect indicators suggested by him are: level of landlessness, increased land rent or increased land related conflict where land market is 'thin' or 'missing', shortage of grazing land and increased intensity of land use. These symptoms of population pressure have been observed in the study area since the early 1980s as indicated in the introductory chapter.

To sum up, the sheer number of persons per square kilometre, the most frequently used simple population density, does not really tell anything important about the degree of population pressure in a country or a village. The other advanced methods based on the production or the consumption approach are not without problem too. Yet, we have to try to approximate the extent of population pressure for policy and monitoring purposes. The 'population pressure' concept is a relative and a dynamic concept the extent of which at a given point in time is determined by taking into account endowment of natural resource, human's capability, cropping systems and production technologies in use and alternative employment / income opportunities within and outside an area which are by themselves subject to change.

2.3 POPULATION PRESSURE AND CHANGE IN THE LAND USE SYSTEMS

The role of population growth in stimulating agricultural intensification, either labour or technology based, is now a solidly established fact (Boserup; 1965; Binswanger and Ruttan, 1978; Grigg, 1980; Hayami and Ruttan, 1985; Simon, 1986: Pingali, 1987; Tiffen *et al.*, 1994). The intensification of production system involves increased frequency of cultivation and increased use of labour and/or purchased input to the same piece of land. Increased subsistence requirement (Boserup, 1965) and changing factor price ratio (Hayami and Ruttan, 1985; Binswanger and Ruttan, 1978) are the fundamental mechanisms through which population pressure stimulates intensification process. Governments' deliberate policy interventions may also induce intensification process (Lele and Stone, 1989).

The population growth and concomitant increase in subsistence requirement necessitates a shift from an extensive farming such as the long fallow to the short fallow and finally to the annual cultivation system (Boserup, 1965; Pingali, 1987). At

an early stage of development, land is abundant and labour is scarce, thus favouring extensification that uses less labour, and perhaps less capital. This situation would be reversed with population growth; labour becomes abundant and land becomes scarce encouraging the substitution of the abundant factor (labour) for the scarce factor (land) (Binswanger and Ruttan, 1978; Hayami and Ruttan, 1985), and/or bringing previously uncultivated land under cultivation through more investment in drainage, terracing, etc..

As the labour-based intensification process is intensified the law of diminishing marginal return stars to operate. The return to labour starts to decline requiring long hours work to maintain per capita food production (Boserup, 1965). Eventually, a stage is reached where fallowing and crop rotation as traditional soil fertility maintenance practices are substantially reduced or totally cease to exist. This would lead to 'soil mining' and decline in per capita output unless significant investment is made in drainage, terracing and most importantly in soil fertility maintenance. At this stage, the increasing shortage of grazing land would reduce livestock population and the quantity of manure available for fertilisation, making the substitution of inorganic fertilisers for organic fertilisers a feasible option.

The population growth could also induce institutional innovations like a movement towards a better-defined property rights (National Research Council, 1986). This could, in turn, bring about land tenure security and encourages investment in soil conservation. However, population pressure is not the only factor that could stimulate intensification. Access to the market does play an important role (Pingali, 1990; Smith et al., 1994). Improved access to the market through improved road networks and communication reduces marketing costs and increases producer prices. Improved access to the export market and higher prices provide an incentive to increase the production of cash crops. Intensification could be achieved by using purchased inputs that augment land productivity.

The total reliance on market incentives may not be sufficient for sustainable intensification of smallholder farms. The availability of external technologies appropriate to the local agro climate and socio-economic situations and improved

smallholder farmers' access to them would be needed to accelerate the intensification process. The government can play a significant role to encourage shifts to the production of higher-yielding and high-value crops. This can be achieved through investment in technology generation and dissemination systems, market infrastructure and through provision of credit service including the 'judicious' use of subsidies. This process has been termed as 'policy-led intensification' (Lele and Stone, 1989).

Employment and income diversification reduces risks associated with innovation and encourages adoption of improved technologies (Grabowski, 1995). Non-farm income can be invested in agriculture (a substitute for formal credit) or may serve as a collateral to facilitate access to credit to accelerate the intensification process (Reardon, Crawford and Kelly, 1994) in circumstances where the insurance and credit markets are 'thin' or 'missing'. However, Low (1986) claims that the availability of higher paying wage employment opportunities and the availability of cheap market consumer goods have contributed to the migration of the male, young and relatively educated members of the indigenous farm households in the southern Africa's settings. This, Low argues, denied the critical labour needed for intensification and commercialisation of the subsistence sector in southern Africa. Whether Low's finding has any relevance to explain agricultural stagnation in the other SSA countries, Ethiopia in particular, is however debatable. It is equally true that factors that increase the return to time spent on farm activities would tend to reduce the motivation to migrate (Demeke, 1996).

A number of empirical studies in SSA have confirmed that declining farm size under population pressure could encourage sustainable intensification (Ramaswamy and Sanders, 1992; Tiffen *et al.*, 1994; Abdoulaye and Lowenberg-DeBoer, 2000; Gray and Kevane, 2001). Nonetheless, these studies reiterated that rural households should have access to external technologies, be well connected to the market under improved transport and communication, be guaranteed land tenure security, and have access to institutional credit for sustainable intensification of smallholder farms to accompany the increasing population pressure in SSA. For instance, one of the recent studies used a panel data in the Mechakos District of Kenya to empirically establish that proximity to urban centres and profit from coffee boom of the 1970s

were as important as higher population density for the smallholder farm transition to productive and sustainable land use practices (Zaal and Oostendorp, 2002).

2.4 POPULATION PRESSURE AND RURAL LIVELIHOOD DIVERSIFICATION

Studies of the rural off-farm/non-farm activities are usually pursued along rural industrialisation, rural labour market and rural livelihoods (Bryceson, 1993, cited in Demeke, 1996). The literature on the rural off-farm/non-farm is vast and touches upon a number of issues such as the function of the rural labour market, farm-non-farm linkages, non-farm and income distribution, demand for and supply of rural non-farm products, whether the rural non-farm persists with development. This section limits itself only to a brief review of the literature related to rural livelihood strategies.

With population growth, labour becomes abundant and agricultural land becomes small in size and fragmented at inheritance making income from farming inadequate for subsistence. Rural households would then like to shift a portion of their labour to off-farm/non-farm activities where the marginal productivity of labour is positive (Grabowski, 1995). This strategy is termed 'livelihood diversification'. According to Ellis (1998), livelihood diversification is more than activity and income diversification. It includes property right, social and kinship network and access to institutional support. *"Livelihood diversification is the process by which rural families construct a diverse portfolio of activities and social support capabilities in order to survive and to improve standard of living".* Ellis (1998:1)

The literature argues that livelihood diversification has become a common livelihood strategy among rural households in SSA (von Braun and Pandya-Lorchh, 1992; Reardon *et al.*, 1992; Lipton *et al.*, 1996; Dercon and Kirshnan, 1996; Reardon, 1997; Ellis, 1998; Ashley and Carney, 1999; Reardon *et al.*, 2000; Ellis, 2000). The available empirical evidence further indicates that activity and income diversification is central to rural livelihoods in SSA (Barrett, Reardon and Webb, 2001) and off-farm and non-farm employment already accounts for 40% to 45% of average income of African rural households with increasing importance over-time (Bryceson and Jamal, 1997; Reardon, 1997). An increasing number of rural households in SSA allocate part of their labour and the other livelihood assets to different off-farm and non-farm activities (Reardon, 1997) including:

a) employment in the rural non-farm labour market;
b) self-employment in the local non-farm sector;
c) employment in the migration labour market; and
d) employment in the farm labour market.

Land scarcity is not necessarily the only reason for rural livelihood diversification. Different households pursue diversification strategy for various reasons. An excellent review of the determinants of income diversification in SSA is found in Reardon (1997) and the most recent one in Ellis (2000a). Ellis summarises reasons for livelihood diversification as seasonality, risk strategy, as response to labour and credit market failure, asset strategies and coping behaviour and adaptation. Although Dercon and Kirshnan (1996) acknowledge the role of risk behaviour in diversification decision, they argue that comparative advantage of rural households in terms of resource and skill endowment has more explanatory power. Barrett and Reardon (2000) found that inter-and-intra household diversity in activity and income source is caused by heterogeneity in endowment of resource and skill lending support to the Dercon and Kirshnan's proposition.

In short, livelihood diversification could come from necessity or choice (Ellis, 2000a) or push and pull factors (Barrett and Reardon, 2000b) or practiced as an asset accumulation strategy or coping mechanism. Some households engage in off-farm and/or non-farm because it is a lucrative activity and others drawn into it because they have little choice (Barrett *et al.*, 2000a). The latter is considered as a 'symptom of poverty', while the former is a desirable outcome of agricultural growth (von Braun, 1990). For Ellis (2000a) livelihood diversification is a survival strategy for most of rural households in precarious economic environment of SSA that makes difference to rural life and hence should receive policy support. In his own words:

> *" Livelihood diversification is a pervasive and enduring characteristic of rural survival, reflecting the continuing vulnerability of rural livelihoods. The task of policy is to facilitate rather than inhibit diversity, by improving mobility, providing information, reducing entry barriers, and dismantling controls on private smallscale activities. Diverse livelihood systems are less vulnerable than undiversified ones"* (Ellis, 2000a: 298-299)

Whatever the motives behind, we have recently witnessed a growing interest among policy analysts and policymakers in developing countries in rural livelihood diversification. Lanjouw and Lanjouw (2000) have summarised reasons for the renewed interest in the sector from the perspective of national economic interest as follows:

- The sector's perceived potential in absorbing a growing rural labour force and slowing rural-urban migration given limit to arable land.
- Even if the sector does not generate very high labour income, in an environment with seasonal or permanent underemployment, any utilisation of labour can contribute to rising total income.
- The rural off-farm/non-farm sector's distributional role given the high transaction costs involved in taxes and transfers
    a) given that the sector produces lower quality goods and services more heavily consumed by the poor, good health of this sector has indirect distributional benefits via lowering prices to the poor;
    b) it is a source of employment for the landless and the near-landless who cannot find sustenance in agriculture;
    c) diversification into off-farm and non-farm activities is a way of smoothing income and consumption over years and seasons for people with limited risk coping mechanism in terms of saving/credit or insurance; and finally
    d) growth in the sector can result in a tightened agricultural labour market, rising wages and/or reducing underemployment

2.5 POPULATION PRESSURE AND RURAL DEMOGRAPHIC BEHAVIOUR

Historically, deliberate or spontaneous demographic adjustment had been among the strategies used by agrarian societies of Western Europe in advent of fast population growth and declining arable land size cultivated by households. Demographic adjustment was used in situations where technological advance was inadequate to synchronise growth in food production with the population growth (Grigg, 1980). In this regard, migration and fertility are the two prominent demographic phenomena.

Migration refers to the movement of people in space that may result in change of the place of residence (Oucho and Gould, 1993). The nomadic pasturalists move from

place to place seasonally in search of better pasture and water for their livestock. Farmers may move from densely populated areas to sparsely populated high potential areas as long as the freedom of movement is not restricted by physical, socio-economic or political factors. There are cases where some governments of SSA, Ethiopia for example, made deliberate attempts to resettle people from high density and degraded area to low density area with better agricultural land or vice versa.

Rural – urban migration caused by land shortage and poverty is the most common in SSA. Inequality can be another cause for rural-urban migration. For example, land reform in Iran pushed out those who lost access to land and pulled out those who received land to cities (Mohtadi, 1990). The availability of lucrative non-farm employment opportunities in towns can also act as an incentive for rural-urban migration (Low, 1986).

Rural-urban migration often involves part of members of rural households and creates the phenomena of 'one household, two families' (Weisner, 1972 cited in Oucho and Gould, 1993). Those who migrate usually remit part of the income generated from migratory employment in order to keep family ties and ensure that they are accepted should they return to the homeland (Oucho and Gould, 1993). Rural – urban migration of this type is one of the most common ways of rural livelihood diversification in developing countries (Ellis, 2000a). This type of diversification strategy makes larger family size advantages as it provides enough labour both for diversification into non-farm activities and agricultural tasks where households heavily depend on their own labour supply as witnessed by experience in southern Africa (Low, 1986; Toulmin, 1992, cited in Reardon *et al.*, 2000)

In Western Europe, delayed marriage and the proportion of adults remained unmarried had been a more important demographic adjustment to population pressure than fertility control (Grigg, 1980; Foote, Hill *et al.*, 1993). Rules of family formation in North – Western Europe required the accumulation of property before a person could marry and establish a new family which took too long time during the time of hardship thereby delaying and, in some cases, discouraging marriage (McNicoll and Cain, 1990). The experience of Asia and SSA is different from that of

Western Europe. The joint family system in Asia and the lineage system in SSA encourage early marriage by allowing the accommodation of newly married couples within the existing households (McNicoll and Cain, 1990).

Family size reduction through fertility control within marriage is the other most important aspect of demographic adjustment in the context of population pressure. Theoretically, the diminishing cultivated land size leads to reduction in demand for children labour. However, whether rural households in SSA are willing to control fertility in response to the increasing population pressure and deepening poverty is doubtful. While the mortality rate of children has dramatically declined as a result of improved access to health service, the empirical evidence indicates that fertility rates remain higher in most of the SSA countries (Dasgupta, 2000). As a result, some go to the extent of arguing that mortality and fertility are isolated from economic reality in the SSA (Bengtsson and Gunnarsson, 1994).

A host of socio-cultural and socio-economic factors are contributing to the SSA's paradox. Cultural factors that are heavily influenced by religious belief system encourage and reward higher fertility (Cadwell and Cadwell, 1987). Economically, African parents receive a number of economic benefits from reproduction. Children in Africa are important source of labour during their childhood, a source of support during old age, a substitute for a well-functioning capital and insurance markets or government pension plan (Foote, Hill *et al.*, 1994). Uncertain land rights, as is the case in Ethiopia, may limit the function of land as insurance, biasing households' decisions in favour of large family size (Devany and Sanchez, 1977, cited in Kirsten and Kirsten, 2000). In a situation where there is no effective land policy, large family size is a crucial instrument to convert open-access resource into private property through 'capturing' (Panayotou, 1994).

In addition, cash remittance from children who enter the urban sector can help reduce rural poverty (Bengtsson and Gunnarsson, 1994). Children are means of diversifying skills and social ties that help rural households deal with economic and political hardships (Bledsoe, 1994). Further, the fact that children are considered as the common property of extended families, and the cost of raising them is shared through social networks contribute to the unwillingness of the society to control

fertility in SSA (Bledsoe, 1994). The cost-sharing practice and conformity to accepted norms with regard to the desired family size create externalities in reproductive choice (Dasgupta, 2000).

Last, but not least, due to gender inequality in decision making husband makes fertility decision and may benefit more from children's labour service while the wife shoulders the burden of childbearing and rearing. This situation influences fertility decisions of African households. A high level of gender equity is generally considered as a necessary condition for fertility decline. However, MacDonald (2000), after making distinction between what he calls 'individual-oriented social institutions' and 'family-oriented social institutions', argues that achievement of gender equity in the former and persistence of gender inequity in the latter have resulted in lower fertility rates in developed countries. In other words, retaining gender inequity in the family-oriented institutions encourages rather than discouraging fertility decline.

Nevertheless, as females' education level and their rate of participation in the labour market increase through economic growth and development, fertility tends to decrease as a result of increased value of females' time (Willis, 1994). The expansion of modern education could, however, affect fertility decline negatively in some SSA countries where it leads to the erosion of traditional taboos against premarital sexual practice, immediate (before 3 years) postpartum female sexual practice and a failure to practice total abstinence once a woman has become a grandmother (Dasgupta, 2000). Consumer theory similarly suggests that parents tend to forego quantity for quality as their level of income increases in much the same way as higher income encourages consumers to shift from inferior goods to more expensive goods instead of having more of the same inferior goods (Becker, 1960 cited in Willis, 1994).

Development projects could also induce couples preference for a higher living standard to larger families (Booth and Sundrum, 1984, cited in Lipton, 1990). In a study of economic factors affecting fertility in developing areas of South Africa, Fairlamb (1990) confirmed that mothers respond to economic and social constraints by adjusting fertility to opportunities cost and social benefits of children, and concluded that providing services that parents get from their children such as

drinking water, electricity and better access to pension and social security investment combined with compulsory schooling could reduce demand for children. Rural development project could also induce fertility decline by reducing child mortality through better health and nutrition as both are positively related (Maglad, 1994).

The initial findings of a multi-country (India, South Africa and Botswana) research project seems to point to the possibility of fertility reduction and lessened population pressure on soil and water resources through the redistribution of agricultural land and other assets in favour of the rural poor and increased efficiency in resource use (Rwelamira *et al.*, 2001). An extensive and critical review of the empirical studies in this area similarly concluded that as rural income increases through redistribution of resources and/or efficient use of available resources, family size approximately follows an inverted u-shape, i.e., first rises and then falls (Kirsten and Kirsten, 2000). The reason is that improvement in the living situation, particularly nutrition, increases natural fertility and reduces child mortality in the short-run. Effective demand for fertility control can only be created in the long-run when sustained effort is made to reduce child mortality and to increase females' level of education and rate of participation in the labour market (Lipton, 1990).

Finally, the role of family planning program in inducing fertility transition should not be overlooked. Increased contraceptive use through effective family planning program adopted and pursued at higher levels of government played a key role in accelerating fertility decline in poorest countries such as Bangladesh amidst high child mortality rate (Cleland et al., 1994, cited in Caldwell, 1999).

Both the theoretical arguments and empirical works show that social development policies can effectively be engineered to decrease the demand for children and increase the costs of rearing children and thereby induce fertility transition that facilitates the desired demographic transition in SSA to reduce pressure on soil, water, pasture and forest resource. Demographic transition gives Africans a 'breathing space' to accumulate capital needed for commercialisation of agricultural production and development of industrial and service sectors, i.e., structural transformation of the economy, to use the jargon of development economics.

2.6 RURAL LIVELIHOOD STRATEGIES AND ENTITLEMENT TO FOOD

In this study, it is assumed that the ultimate goal of a rural household's livelihood strategy is primarily to ensure food security of its members. Food security at a household level is defined as *a permanent access of households to nutritionally adequate food for active and healthy life* (World Bank, 1986: 1). A household's food security is said ensured when everyone has access to food, the access is permanent and the amount is adequate or meets the minimum nutrition requirement of all members. This means that food security at household level does not automatically translate into food and nutritional security for all members of the household unless equality of intra-household allocation of food is ensured and individuals have the ability to take enough food and convert it into energy. Conversely, food insecurity at household level refers to either a household's temporary failure to acquire enough food (transitory food insecurity) or permanent failure to acquire enough food (chronic food insecurity) or cyclical food shortage (cyclical food insecurity) caused by factors such as weather (Maxwell and Frankenberger, 1992).

If ensuring food security of members is accepted as the ultimate goal of livelihood strategies of a rural household, it is then logical to assess success and failure of livelihood strategies of a given rural household in terms of its contribution to the household's income and food consumption on a sustainable basis. Food security is not necessarily the same as food self-sufficiency (Sen, 1981). Intensification of subsistence crop production enhances households' direct entitlement to food while cash crop production and livelihood diversification enhance households' income-based entitlement to food. Revenue generated from cash crop sales can, however, enhances households' direct entitlement to food if it is reinvested in farming and used for external input based intensification of subsistence crop production.

Rural households' livelihood strategies and food security are not only affected by households' human and non-human resource endowments, but also by the physical, social and policy environment (Hoddinott, 2001). Physical environment determines the ranges of economically viable livelihood options. Social networks determine households' access to crucial livelihood assets, the ranges of livelihood options and access to social insurance during the time of hardship. Besides, effectiveness of popular participation, collective action and benefit sharing are affected by local social

dynamics. The food security of households is further influenced by government policies such as land, marketing and pricing policies. Risks such as natural risk (e.g. drought), market risk (e.g. price), risk caused by action of the state (e.g. removal of input subsidies) and social risk (e.g. conflict) affect households' food security and can limit the sustainability of rural livelihoods. An increase in the level of adversity and frequency of occurrence of these risks could gradually lead to the erosion of livelihood assets that would, in turn, lead to reduced resilience of rural livelihoods to seasonal and cyclical shocks.

Rural households could pursue livelihood strategies that are effective both in addressing food security and ensuring the sustainability of NRM. Alternatively, rural households' food security strategies could undermine the sustainability of NRM and exacerbate the poverty-degradation cycle. Rural livelihood strategies, food security and the sustainability of NRM are inextricable phenomena in agrarian societies such as Ethiopia. Hence, they should be looked into simultaneously, not despite the complexity involved.

2.7 POPULATION, RURAL LIVELIHOODS AND SUSTAINABILITY: A SYNTHESIS

Understanding the HHs rural households' livelihood strategies in the context of population pressure and determining human welfare outcome and highlighting sustainability implications of livelihood strategies pursued by households are the essential tasks of this investigation. In this study, sustainability refers to the use of soil, water, pasture and forest resource in a way that enhances or at least maintains their quantity as well as quality in the long-term. As a summary of review of the literature, a simple schematic representation of the processes through which population pressure and rural livelihood strategies could be positively related to sustainable natural resource management is developed and presented (Figure 2.2).

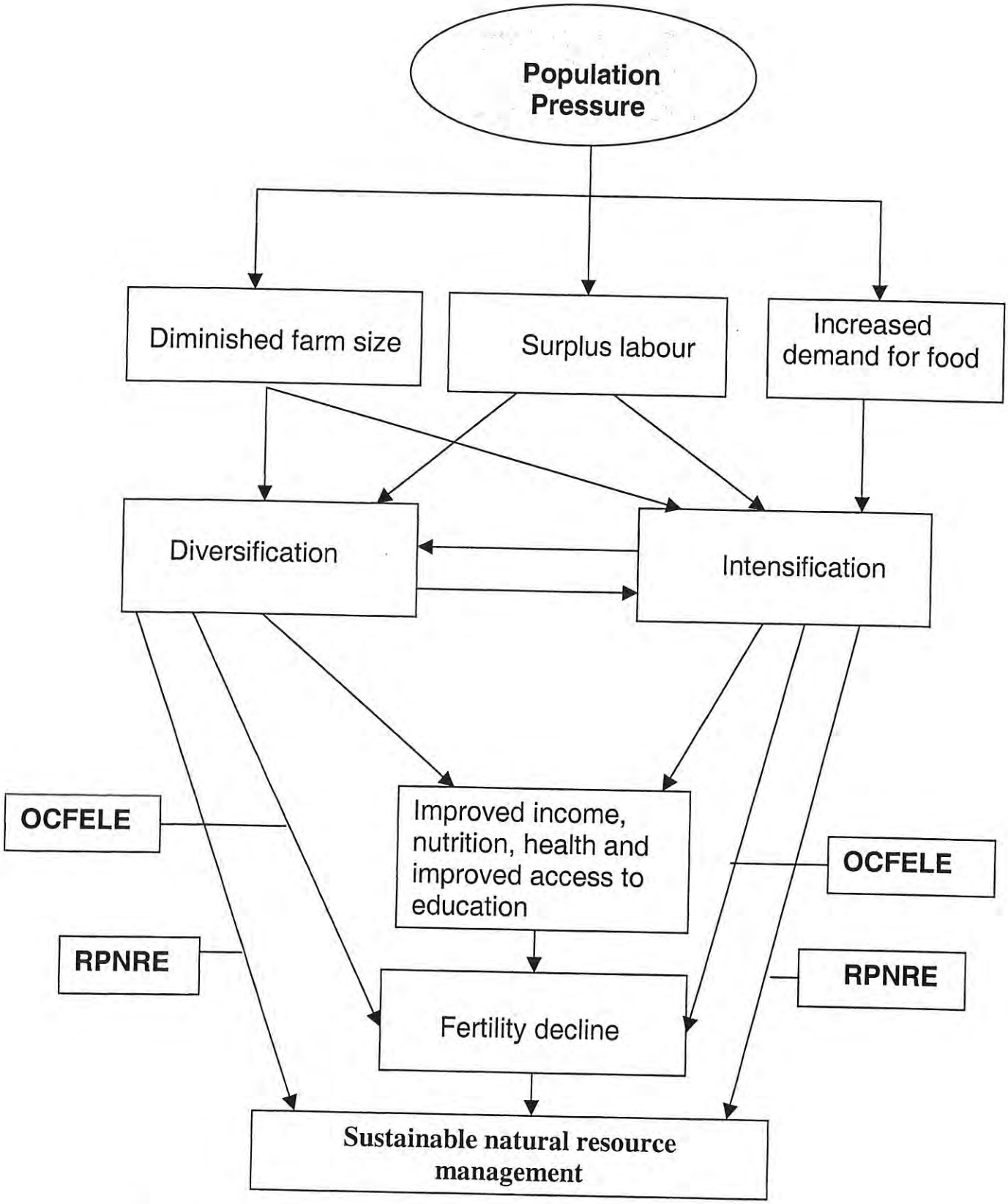


Figure: 2.2: Positive effect of population pressure on rural livelihood and natural resource.

Population pressure leads to the intensification of production system through increased demand for food - Boserup effect (Boserup, 1965), and/or change in factor price ratio- Hayami, Ruttan and Binswanger effect (Binswanger and Ruttan, 1978; Hayami and Ruttan, 1985) and also through deliberate government intervention called policy-led intensification (Lele and Stone, 1989). Diminished farm size and concomitant decline in return to labour in farming under population pressure may encourage rural households to diversify their livelihoods in order to ensure their food security (Grabowski, 1995).

Intensification and diversification are related to each other in a complex and dynamic way. They are not only competing with each other for resources but also complement each other in a number of ways. The existence of high wage employment opportunities in the non-agricultural sectors along side subsistence agriculture, as in southern Africa (Low, 1986), could attract quality labour from rural area to the detriment of the latter. Conversely, high return to labour in farming as a result of increased productivity and favourable pricing policy discourages diversification into off-farm and non-farm activities (Demeke, 1996).

The intensification of production system stimulates rural non-farm production through forward, backward and consumption linkages (Haggblade, Hazell and Brown, 1987). Linkages could also run from the rural non-farm to agriculture. Rains identified three such linkages: demand, supply and motivation related (Rains, 1990, cited in Grabowski, 1995). The expansion of rural non-farm activities increase the demand for farm output, supply inputs needed for agricultural intensification and availability of non-farm goods, in turn, motivates farmers to increase production to raise cash needed to purchase the newly available consumer goods. Non-farm income can be invested in agriculture (a substitute for formal credit) or used as a collateral to facilitate access to credit that accelerates the intensification process (Reardon, Crawford and Kelly, 1994). Livelihood diversification reduces risks associated with innovation encouraging adoption of improved technologies (Grabowski, 1995).

Successful intensification and diversification could together lead to improvement in the households' level of income, nutrition, health and access to education. This, in turn, leads to fertility decline through improved access to information, delayed

marriage, decreased child mortality and increased opportunities cost of female labour (opportunities cost of female labour effect (OCFELE). Technological progress increases productivity of land, decreasing the size of land required for subsistence production and releasing land for high-value crops production. The increased productivity as a result of technological progress reduces the pressure on the soil and water resource (reduced pressure on natural resource effect (RPNRE)) and shifts to the production of high-value crops provide resources for investment in soil conservation. When diversification involves rural-urban migration or participation in non-natural resource based non-farm activities such as trade, it also takes some pressure off the natural resource (RPNRE). Finally, the fertility decline coupled with reduced pressure on the natural resource could potentially lead to sustainable use of soil, water, forest and pasture resource.

Nevertheless, the flow diagram (Figure 2.2) depicts only the optimistic view. No such a simple and straightforward relationship exists between demographic change, human welfare and the quality of NRM as implications of demographics for human welfare and the natural resource management are more complex and influenced by a host of policy, institutional, technological and agro climatic factors. These so-called "mediating" or "conditioning" factors, superimposed on the interaction, ultimately dictate the cumulative effect of the complex interaction, be it positive or negative and hence, deserve careful deliberation.

First, there is a need for land tenure security in order to induce sustainable intensification of smallholder production system. Land tenure and land use policy determine the behaviour of people in using the natural resource. Land ownership security on its part has significant impact on land value, investment, input use, and output (Reyna and Downs, 1988 cited in Adal, 1999), and even influences fertility decisions as mentioned earlier. According to economic theory, land tenure security creates an incentive to invest in conservation and land improvement because people are assured of reaping the benefits. Land tenure security is said to improve access to institutional credit required for investment in land conservation and improvement through its function as collateral especially for medium-and long-term loans. Land tenure security and ownership title are believed to reduce asymmetric information

about land ownership and quality and thereby land transaction costs (Deininger and Binswanger, 1999). This then leads to an efficient allocation of resource by facilitating the land market that encourages transfer of land from the less efficient to the more efficient users.

Feder and Onchan (1987) found that in Thailand farmers with secured access to land received a significantly higher amount of institutional credit; the probability of investing in land improvement is significantly higher on titled plot; and possession of land title is related to higher capital formation and higher capital land ratio. Similarly, Moor and Nieuwoudt (1998) confirmed, in their study of Zimbabwe, that farmers with more exclusive and assured property right to land are more likely to invest in land improvement and complementary inputs; and productivity and gross income is higher on farms with more secure access to land in the southern African context.

However, Gray and Kevane (2001) claimed that in Southwestern Burkina Faso investment is used both as 'a soil-building and 'a tenure-building strategy' in the context of population pressure and increasing uncertainty in land right. Brasselle *et al.* (2002) provided additional empirical evidence that the causality could run from investment to tenure security and also argue that basic use rights are sufficient to induce farmers to make land-specific investment without necessitating their holding of many transfer rights based on their work in Burkina Faso.

Equally important is that land tenure security should not necessarily be equated with the private ownership of land. The fact that communal land tenure systems in most part of SSA are flexible, dynamic, and guarantee more security than the conventional wisdom derived from experience of the Western Europe persuades us to believe (Rukuni, 2002). Customary tenure rights could evolve towards more inalienable individual right under demographic pressure and increasing commercialisation of agriculture (Bruce et al., 1993). Superimposing alien land tenure systems without the sufficient understanding of the indigenous ones has created more insecurity and alienation of certain groups, such as women, from the land over which they had traditional use rights in many countries (see Brautigam, 1992 for the case of The Gambia and Sierra Leone).

In the second place, unlike in the past, Boserup's autonomous technical innovation solely based on market incentives is no longer sufficient to prevent the Malthusian crisis to happen in SSA at the current rate of population growth and growing land scarcity. The experience of some SSA countries with growing population pressure without gains in agricultural productivity has demonstrated the insufficiency of Boserup's type response. Lele and Stone (1989) showed that per capita food production growth rate coincided with population growth rate in SSA in countries where governments made heavy investment in research, extension and infrastructure. The labour-based and 'capital-deficient' intensification will ultimately lead to a diminishing return per unit of successive labour input and 'soil mining' unless supplemented by technology and capital to augment land productivity.

Indeed the development of the modern public agricultural research and extension system is a demand-driven institutional innovation in the context of population pressure (Binswanger and Ruttan. 1978) to achieve a quantum leap in the increase of production and productivity. It was this successful institutional innovation and the technologies generated and disseminated by the research and extension systems that freed hundreds of millions of people from poverty (IFAD, 2001). Nonetheless, the mere existence of research and extension system cannot guarantee desirable benefit. Research and extension organisations should have organisational capacity, technical capability and right attitude to respond to the complex and changing needs of smallholder farmers. A sustained political support is paramount important since research and extension system cannot deliver the expected results overnight. For example, it took almost hundred years for the US research and extension to develop and make significant impact on agricultural production and productivity (Borlaug, 1988). However, the time required for developing agricultural technologies like improved cultivars could be reduced substantially with the advent of biotechnology in the new millennium.

Thirdly, an improved access to the markets must be ensured to reduce marketing costs and increase producers' prices that act as an incentive to increase production through sustainable intensification. Improved rural infrastructure increases adoption of improved technologies, productivity, wage and income. In Bangladesh, improved rural infrastructure increased agricultural production by 32%, households' income by

about 33 % and wage income by 92 % (Ahemed, 1994). In Malawi, the higher percentage of farmers near main roads used oxen, fertilisers, and ploughs compared to farmers farther a way from main roads (Devres International, 1980 cited in Ahmed, 1994). In Africa, villages with better infrastructure had fertilisers cost 14 % lower, wage 12 % higher and crop production 32 % higher than villages with poor infrastructure (IFPRI, 1990 cited in IFAD, 2001). In addition, reducing transport costs could improve food security status of rural households by reducing costs of obtaining consumption goods including food (Hoddinott, 2001).

Rural roads encourage diversification in villages' economies by opening up markets for labour, artisan products and agricultural produces (IFAD, 2001). In Tigray, northern Ethiopia, rural roads development had contributed to the commercialisation of agricultural production, reduced burning of dung fuel, increased yields and increased food availability, and improvement in the quality of grazing land and water (Jabbar *et al.*, 2000).

Last, but not least, rural development strategies of governments have a significant role in converting population pressure to positive outcomes. Sustainable intensification of smallholder farming must be supported deliberately and on a sustained basis through improved access to inputs, credit and favourable pricing policy (Lele and Stones, 1989). Also very important, deliberate and sustained effort must be made to improve women's decision-making power and their access to education, productive employment, health and family planning service in order to create demand for limiting births within marriage and accelerate the urgently needed demographic transition in SSA.

2.8 A FRAMEWORK FOR ANALYSING RURAL LIVELIHOOD STRATEGIES IN THE CONTEXT OF POPULATION PRESSURE

Analysing livelihood behaviours of rural households and the underlying causes of their behaviour is a daunting task. A framework is needed to break the complex human behaviour into its constituent parts so that the human mind can effectively and systematically deal with it. It is the analytical framework that guides the investigation, which should determine the nature of data required, and the method of

acquiring the necessary data. An analytical framework also serves as a 'lens' through which a researcher looks into and interprets behaviours.

As indicated earlier, the population and development literature predicts a regressive as well as a progressive role of rural population growth. The role of institutional arrangements in mediating the interaction between demography and rural development is equally emphasised. The empirical literature further claims that welfare and resource outcome of rural population growth vary across countries, in different agrarian systems and among different households. Moreover, rural livelihoods involve a number of activities, other than farming. Rural livelihood strategies encompass different economic activities including diversification into off-farm/non-farm, investment strategies, reproductive choice, choice of place of work and residence (migration).

A number of alternative conceptual and analytical frameworks to analyse rural livelihoods in general and the effect of population growth in particular have been suggested in the literature. Nevertheless, the frameworks either concentrated on agriculture and natural resources and do not explicitly account for the possibility of diversification into off-farm/non-farm or neglect the importance of demographic adjustments such as delayed marriage, fertility control within marriage and migration (e.g. Templeton and Scherr, 1997).

The only exception to the above is probably the 'sustainable rural livelihood framework' suggested by the Department for International Development (DFID, 1999) and subsequently improved by Ellis (2000). However, the framework is static, de-emphasises permanent migration; and neither the analytical framework nor the empirical analysis does include fertility behaviour as an aspect of rural livelihood strategies despite the inclusion of 'reproductive choice' in the definition of rural livelihood strategies. Furthermore, if application of the SRLF is attempted in the research context without any adaptation, it makes the research agenda open-ended and the research costly and unmanageable. The theoretical background and analytical skills required to understand all aspects of rural life simultaneously is such that it likely results in superficial analysis and violates the principle of 'optimal ignorance'. A package of policy recommendations without means for prioritising and

sequencing them is also the likely outcome of research guided by such an open-ended framework.

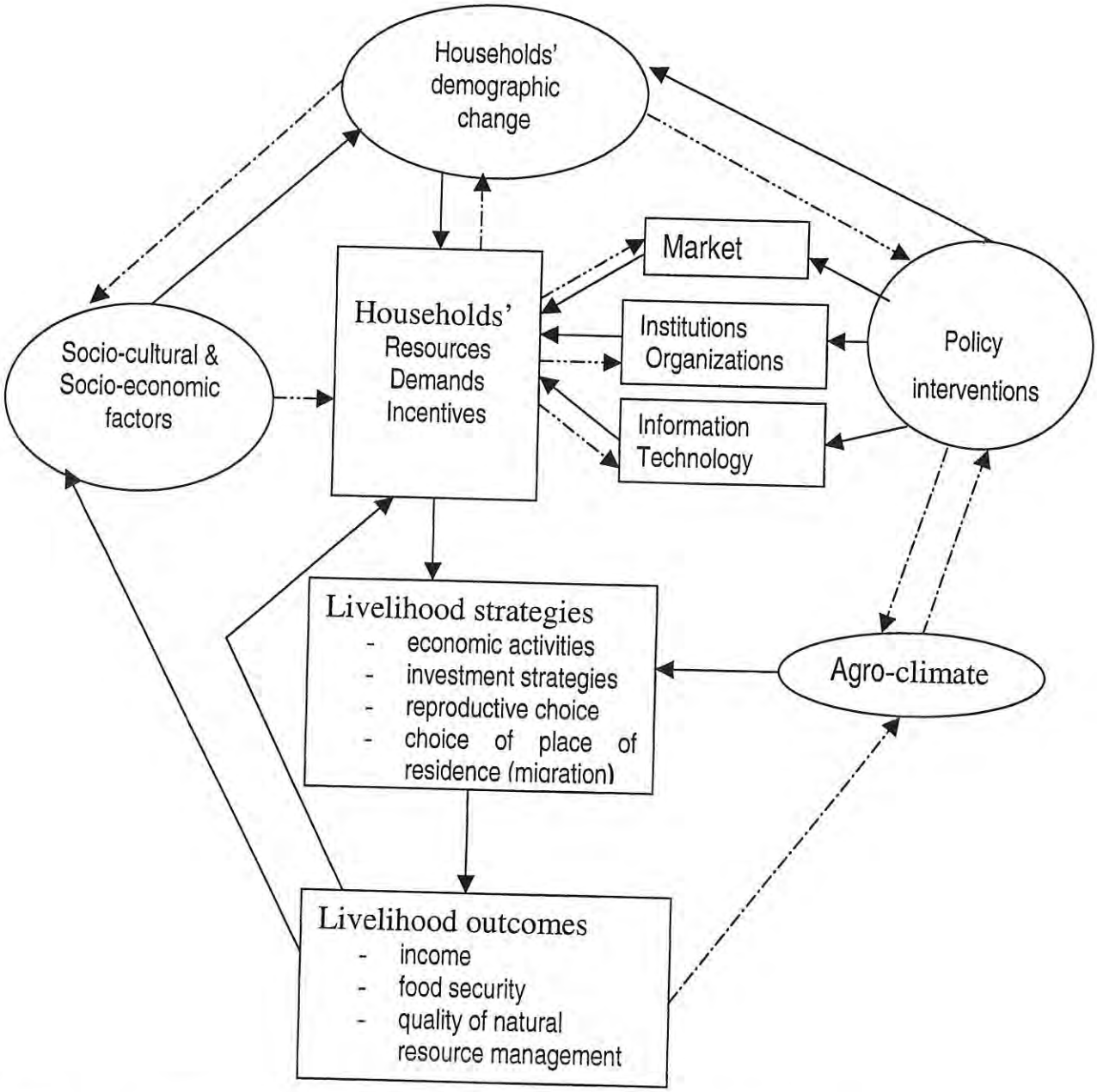


Figure 2.3: A framework for analysing rural livelihood strategies in the context of population pressure.

There is thus a need for a specific, but comprehensive framework that can accommodate all the contesting paradigms and all aspects of rural livelihood strategies under demographic pressure. This alternative framework must explicitly account for the macro and micro socio-economic factors that influence households' livelihood behaviour at the grassroots level and shouldn't assume the final outcome a priori. Despite their shortcomings, the rural livelihood framework (Scoones, 1998; Ashley and Carney, 1999; Ellis, 2000), the microeconomic conceptual framework for hilly land management (Templeton and Scherr, 1997) and the framework suggested by von Braun *et al.* (1991) to analyse commercialisation of agriculture under population growth have informed the current framework (Figure 2.3). The latter has the following 'unique' characteristics that make it more relevant and appropriate for the purpose of this research:

- it does not assume the welfare and resource outcome of rural livelihood strategies a prior; hence it embraces all the contesting paradigms;
- it is a comprehensive framework, i.e., it accommodates all aspects of rural livelihood strategies (farming, non-farm, reproductive choice and migration). It is also comprehensive in a sense that it accounts for all the so-called 'mediating' or 'conditioning' factors; and
- it is dynamic as, for example, shown by the feed back mechanisms.
- further, the framework can be applied at household or higher level and it can even be used for analysing the effects of rural depopulation as well.

2.9 SUMMARY AND CONCLUSION

Rural households pursue different livelihood strategies to ensure food security of their members in the circumstance of diminishing availability of agricultural land under population pressure. Agricultural strategies could include cropland expansion, labour-based intensification and capital and technology based intensification. Rural livelihoods may also involve employment and income diversification through temporary and seasonal migration, wage labour, crafts and trades. Delayed marriage, migration and an attempt to control fertility through limitation of births within marriage constitute another aspects of rural livelihood strategies.

Whilst most livelihood decisions, including land use, employment and income diversification and, migration and reproductive choices are made at household or

community level, they are influenced by macro level factors – institutions, national policy, organisations, social relations and agro-climate. It is only when we have a better grasp of these 'mediating' or 'conditioning' factors that we can be able to understand and explain local livelihoods behaviour and association, if not causation, between rural demographics, welfare and the quality of NRM.

Local livelihood strategies may be effective to improve food security status of rural households on a sustainable base or the strategies households pursue may focus on the satisfaction of their immediate needs at the expense of natural resources, the very base of their livelihood, risking both the long-term sustainability of NRM and their own livelihoods. Rural livelihood strategies, food security and the sustainability of NRM are inextricable phenomena in agrarian societies such as Ethiopia. Hence, they should be looked into simultaneously. The suggested comprehensive framework for analysing rural livelihoods in the context of population pressure would help to investigate the complex livelihood behaviours and the underlying causes in an effective and a systematic way.

CHAPTER 3
ETHIOPIA'S SITUATION: PROCESSES AND STRUCTURES

3.1 INTRODUCTION

> *" Population and rural development relationships are modulated by society-specific patterns of social organization and by the rules and routines of economic and political behaviour, in short, by the society's institutional structure. To ignore this structure is to assume that institutional patterns are uniform and constant across societies or change indeterminate."* (McNicoll and Cain, 1990:3)

The fact that rural livelihoods decisions at household and community level concerning farming, livelihood diversification, migration and reproductive choice are influenced by organisational and institutional factors, market conditions and technology was well elaborated in Chapter 2. Furthermore, views regarding organisation, institution, market, technology and the overall policy environment needed to strengthen local strategies and to create an enabling environment for sustainable rural livelihoods were also deliberated upon at length in chapter 2.

This chapter critically reviews the land tenure institution, institutional and organisational factors in NRM, and smallholder farmers' access to the market and appropriate and profitable technologies, and the overall policy environment of the country. Understanding the evolution and salient features of the country's specific institutional and policy settings facilitates the subsequent analyses of rural livelihood strategies and appropriate interpretation of findings of the study. In other words, it helps to comprehend and explain how the prevailing structures and processes condition (facilitate/constrain) local livelihood strategies and influence human welfare and sustainability outcomes. It is appropriate to place the review in a historical perspective as the prevailing rural livelihood strategies and, human welfare and sustainability outcomes are the cumulative results of the past as well as the present specific settings of the country.

The conclusion drawn from the review in the final section of the chapter will reveal that a lot remain to be done to do away with the uncertainty related to the right to land, to improve the strategies for NRM, improve smallholder farmers' access to the market and to strengthen and make the national technology generation and dissemination systems demand-driven and client-oriented.

3.2 EVOLUTION OF THE LAND TENURE INSTITUTION AND UNCERTAIN RIGHTS TO LAND

Ethiopia had one of the most complex and the most change resistant land tenure system until the 1974 revolution (Cohen and Weintraub, 1975). The *rist* system (communal ownership) and the tenant holding (sharecropper arrangement) were the two most common ones. However, the tenancy system was the commonest particularly in the south (Rahmato, 1993), including the HHs.

The northerners, the Amhara and the Tigre descendants, who conquered peoples of the south, mainly the Oromo, during the Minilik II became the landlords who determined distribution of plots and security of holding (Cohen and Weintraub, 1975). After Minilik's conquest, substantial proportion of communal forest and grazing land were converted into *de jure* crown land or distributed to officials, soldiers and supporters of the Abyssinian emperors. The tenants, the indigenous peoples of the south, became "virtually an outcast in its homeland and culturally subordinate as well" (Rahmato, 1993:248).

In this classical feudal land tenure system, the absentee landlords made little contribution to the production process, but expropriated as much as half of the harvest of their subjects via rent, tribute and taxes (Cohen and Weintraub, 1975). The tenancy system was stagnant, exploitative, insecure and serious impediment to progress (Rahmato, 1993). Singh summarised the situation as follows:

> *"The landlord elements and the bureaucrats were out to 'appropriate both human and natural resources'. - - - The peasants no longer had access to traditional natural resources, and the tie between him and the local environmental resources snapped. For his bare physical survival, he actively and consciously began to 'mine' this resources." (Singh, 1998: 302-303)*

The March 1975 land reform was successful in abolishing the archaic and exploitative feudal land tenure system in rural Ethiopia. It made land the 'collective property of the Ethiopian People' or to make it clear 'state property', and gave the former tenants and all others who were willing to cultivate the land personally usufructuary right with holding size ceiling of 10ha. The policy prohibited private ownership of rural land and transfer of use right via sale, exchange, mortgage, lease or any other means (Rahmato, 1984). The Peasant Associations organised after the land reform were empowered to undertake periodic land redistribution and land administration. The land allotment committee of respective PAs distributed land of different qualities to all rural households based on family size. Yet, the land reform was not successful with regard to ameliorating uncertainty related to the right to land since farmers had no fixed agreement or contract with the state. Mammo (1999) argues that the reform indeed disempowered smallholder farmers and gave the central government power to pursue whatever rural development strategies it saw would fit regardless of support or opposition from the former.

Besides, although it is generally accepted that the land reform has effectively achieved its equity objectives and resolved the previous land related ethnic conflict, eviction through villagisation, cooperativisation, establishment of large-scale state farms, involuntary resettlement and national parks affected millions (Rahmato, 1994). The eviction and marginalisation of smallholder farmers coupled with the frequent periodic land redistribution by PAs to accommodate the demand of households established after the first round land redistribution for agricultural land led to land fragmentation and land tenure insecurity. This had a disincentive effect on the growth of production and productivity (Adal, 1999). The land policy is further believed to discourage both rural-rural and rural-urban migration. This was due to the fact that access to rural land according to the policy was based on residential area and non-use and/or a long absence would result in the loss of use right.

Moreover, the land policy hard hits the communal pasture and natural forest. The policy, like its predecessor, alienated the local people from the common resource. The indigenous common property regime use and management systems were destroyed. No viable alternative was, however, put in place to effectively enforce

sustainable NRM at the grassroots level. This led to the conversion of the common property regime into *de facto* open-access.

The current Ethiopian People's Revolutionary Democratic Front (EPRDF) party led government has made no fundamental change on the land policy of its predecessor. The limited changes that have been introduced include easing the restrictions on hiring of labour, leasing land, transferring usufruct right to legal heir. In the 'new' land policy, state ownership of rural land has been retained and even made a constitutional issue. The following excerpt from a seminar opening address by the country's Vice Minister of Agriculture illustrates the issues at stake (Ejigu, 2000: XI). *" All land is property of the state and it may not be sold or mortgaged. The constitution guarantees that rights of individuals to improvements they make to land, including the right to bequeath, transfer, remove or claim compensation for such improvements if the right to use expires."*

In addition, the land policy in effect envisaged the continuation of periodic rural land redistribution by PAs, leaving the land tenure insecurity problem unresolved again as apparent from the following excerpt taken from the policy. *" a rural land allocation measures taken at intervals, upon decision of the community, with a view to assigning holding rights in a fair and proportionate manner as well as to demarcating land for communal use by peasant." Article 2, sub article 4 (as cited in Adal, 1999:216)*

In general, smallholder farmers of the country have never, in history, been granted secured land tenure. The policy of alienating rural households and communities from the natural resource has never been changed since the regime of Minilk II. No attempt has been ever made to enable local communities to jointly use and manage state owned forest plantation. In fact, the vice minister indicated, in the opening address quoted above, that efforts were underway to issue land title certificates to ensure security of holding. This promise still remains unrealised! Nonetheless, land tenure security is a relative term. The extent of land tenure security can be judged by looking at its four components: excludability, duration, assurance and robustness (Roth, Wiebe and Lawry, 1993, cited in McCulloch, Meinzen-Dick and Hazell, 1998). Table 3.1 provides an overview of the extent of cropland tenure security in Ethiopia.

Table 3.1: An overview of cropland tenure security in Ethiopia

Tenure right	Extent	Remark
Use right	high	Includes the right to grow crops, trees and make permanent improvement
Transfer right	medium	Does not provide the right to sell and mortgage
Exclusion right	Medium	PAs have the power to confiscate the land.
Duration	Uncertain	Land redistribution can be conducted any time by PAs
Assurance	High	PAs can enforce an individual right to land

3.3 ORGANISATIONAL AND INSTITUTIONAL FACTORS IN THE NATURAL RESOURCE MANAGEMENT

The national government (including the previous) has pursued different strategies to ameliorate the adverse impact of rural livelihood behaviour on the sustainability of NRM in Ethiopia and in the HHs. The strategies include reforestation and soil conservation campaigns, regulations and provision of incentives.

In the past regime, most of smallholder farmers in Ethiopia participated in the planting of trees on deforested areas and on soil and water conservation activities on steeper slops in their respective PAs. The approach was, however, too top-down. The forestry department of the MoA often planned the campaign single-handedly without any consultation with the local people and enforced compulsory participation on the farmers through leaders of the respective PAs. For example, failure to participate in the campaign could result in financial fine or denial of access to service cooperatives' shops where goods could be purchased at a relatively lower price (Tefera, 1995).

The campaign failed to deliver the expected results. The failure was caused not only because of the top-down planning and implementation, but also due to the failure on the part of the concerned department to innovate the necessary institutional arrangements. Effective grassroots level institution that could enable the local communities to jointly use and manage the common property regimes was missing.

As a result, most of the plantations were converted into *de facto open-access* once established. Table 3.2 provides some insights into institutional problems in managing common property regimes.

3.2: An overview of forest and grazing land tenure security in Ethiopia

Tenure right	Extent	Remark
Use right vested in the community	High	Includes the right to grow crops, trees and make permanent improvement
Transfer right	Low	Does not provide the right to lease, rent, sell and mortgage
Exclusion right	Low	Open to anyone from and outside the community
Duration	Uncertain	Land redistribution can be conducted any time by PAs
Assurance	High	PAs can enforce group right

Included in the regulation were the law that prohibited cultivating land with gradients of more than 30% and restrictions on felling trees and trade in forest and forest products such as timber, fuelwood and charcoal. The later was enforced through checkpoints established for the purpose and commonly known as 'forest policing'. However, the regulation strategy did not produce the expected result. The major reason is that rural households continue to relay on forest and forest products for their energy demand in the absence of alternative sources of energy; as a source of income to supplement the insufficient farming income; and as a source of additional cropland to produce more for the growing population in the absence of improvement in the productivity of land.

Food for Work program was also used as an incentive to promote soil and water conservation activities. There are at least two theoretical explanations to justify this incentive strategy. First, the prevailing land tenure system is such that households are less willing to invest in soil and water conservation. Secondly, the high prevalence of rural poverty may lead to higher discount rate of future income and thereby divert attention from a long-term investment in the natural resource conservation to the gratification of immediate needs. The incentive strategy had produced better result than the former two strategies. Although some empirical studies showed that the conservation structures that were developed through FFW program was totally or partially removed by some households due to their vested interest in the continuation of the programs (e.g. CARE-Ethiopia, 1996), other studies

reported that the probability of maintaining the conservation structures developed through similar programs was higher on steeper slopes where households' perception of the erosion problem was high (Shiferaw and Holden, 1998).

3.4 ACCESS TO THE MARKET AND MARKET INCENTIVES

The problem of access to the market by smallholder farmers has three dimensions (IFAD, 2001): the physical (distance from market), the political (inability to influence the terms upon which to participate in the markets) and the structural (lack of market intermediaries). These indicators are used to briefly assess the extent to which the smallholders' have access to the markets in Ethiopia.

In the countrysides, infrastructure is poorly developed to facilitate smallholder farmers' access to the market. The country has one of the world's lowest ratios of road per person estimated at merely 90cm (van Braun and Webb, 1994). Many of the urban towns in the country do not have all weather roads connecting them to the surrounding rural areas. Only 20% of the country can be reached by modern transport (Lirenso, 2000). Usually farmers have to travel for hours and days on foot carrying their produce on their backs (women) or heads (men) to sell on the market and to buy inputs and consumables from the market. The non-availability of consumer goods in rural areas is by itself discouraging for the commercialisation of smallholder production. "*Farmers in Ethiopia received a mere one-third of the final price, compared to Asian farmers who got 70 to 80%. Marketing chain often took 20 to 30 days to go from producers to consumers, which, otherwise, could take 2 to 3 days, if there were enough road structure available.*" *Gebre Medine, 2003 as cited on Addis Tribune news web page.*

The enormous gap between farm gate prices and consumer prices is the indication of market inefficiency and high transaction costs. It is not uncommon in this part of the world to have surplus grain with very low prices at one corner of the country and deficit or even famine with exorbitant prices at other corner of the country. This is mainly due to the poor road condition and higher transport cost. The fact that the income of the urban and rural people, particularly in the food deficit areas is very low also means that effective demand for agricultural produces is equally a serious constraint. Besides, smallholder farmers have no price information and the majority of

them are illiterate. Farmers usually dispose of their produce at offered prices and are often cheated on the weighting scale.

Moreover, between 1975 and 1990, smallholder farmers were required to sell part of their produce (given quotas) to the government Agricultural Marketing Corporation (AMC) at artificially low prices. The marketing board through license requirements and grain checkpoints intentionally limited interregional grain trade. On the other hand, high inland transportation costs of inputs such as fertilisers ranging from 22% to 68% of the CIF cost (cost at port of entry) of DAP (Diammonium Phosphate) and urea (Howard *et al.*, 1999) has made the use of chemical fertilisers beyond the reach of many smallholder farm households. This would mean low adoption rate of fertilisers and low productivity. Haile Gebrial (2000) summarised his observation as follows: " - - - *in the process, peasants carry the burden of marketing inefficiency twice over, that is, as buyers of fertilizers and as sellers of grain.*" (Haile Gebrial, 2000:108)

The government has since the early 1990s removed the official barriers in grain marketing, abandoned interventions in pricing of agricultural produces and dismantled most of the former AMC's local branches. AMC played a major role in input provision, enforcing grain quotas and fixing prices. The agricultural market liberalisation process has accelerated following the Structural Adjustment Programs (SAPs) spearheaded by the World Bank and the IMF. The trade liberalisation coupled with devaluation of the Birr and, presumably, reduction in export tax following SAPs was generally expected to increase returns to production of tradable agricultural produces. This in turn supposed to create conducive environment for accelerated growth of the agricultural sector.

However, the high transaction costs due to poor state of the rural roads and other physical infrastructure, asymmetry in market information, high rural illiteracy rate, lack of skill and local organisations such as marketing coops have continued to limit the smallholders' access to the market. Uncertainty and high transaction costs are barriers to technical change and to invest in new crop technologies aggressively and desperately promoted by the MoA profitably. The rates of technical change and production growth are not only the function of available technologies, but also of

market incentives (Boughton et. al, 1995, cited in Jayne, 1998). Devaluation of the national currency, the Birr (8.7 birr = $ 1 U.S. dollar), in 1993, the removal of input subsidies and pan-territorial pricing in 1996, high interest rates after liberalisation of the financial market have made the use of land productivity enhancing inputs economically less attractive and beyond the reach of the majority of smallholder farmers in the post SAPs. The empirical evidence provided by the International Food Policy Research Institute (IFPRI) (Gebre Medine, 2003 cited in Addis Tribune news web page) supports the argument.

> *"As the ratio of input prices to maize prices increased from 1.7 in 2000 to 9.0 in 2002, maize production became highly unprofitable business that farmers abandoned their crop in the field and reduced their fertiliser use by up to 20%. This accompanied with poor weather, will likely result in a drop in maize production by 52% and in an overall cereal production by up to 15% in 2003." Gebre Medine, 2003 as cited in Addis Tribune news web page.*

Moreover, the premature retrenchment of the AMC in the circumstances where transaction costs are high and private traders are yet to develop to takeover the role of the parastatals could also lead to more market uncertainty, widely fluctuating producer prices and high input prices. This would, in turn, discourage sustainable intensification. For instance, in some African countries such as Tanzania, dismantling of the parastatals after the SAPs led to some retrenchment from farmers part towards crop requiring few purchase inputs and offering either quick or stable, but a low return (Bryceson, 2000). The World Bank itself admitted that the expected levels of competition and private traders participation in agricultural marketing has not been realised in Ethiopia due to constraints related to access to capital, inadequate market infrastructure and high transaction costs (World Bank, 1999, cited in Devereux, 2000).

The overall implication of the review in this section is that intervention by government in improving market infrastructure and encouraging institutional innovation to reduce uncertainty and transaction costs of exchange is required. Such intervention is needed to integrate the semi-subsistence and semi-open Ethiopia's rural economy to the mainstream national and global economy. This, in turn, will accelerate

commercialisation of smallholder production, sustainable intensification and rural livelihoods diversification.

3.5 ACCESS TO APPROPRIATE TECHNOLOGIES

The modern agricultural research and extension systems were first conceived in England by the establishment of Edinburgh Laboratory in 1842 and Rothamsted Experimental Station in 1843 (Ruttan and Binswanger, 1978). They were introduced to SSA between 1930 and 1959 (Eicher, 1989). Agricultural research and extension began in Ethiopia relatively late. The history of agricultural research in Ethiopia began in 1952 with the establishment of the then Alemaya College of Agriculture (now Alemaya University) based on the US land grant college model. Alemaya had handed over its national research and extension mandates to the MOA and the Institute of Agricultural Research (the current Ethiopian Agricultural Research Organisation or EARO) in 1963 and 1965 respectively. By 1974, there were only 124 agricultural extension agents and 72 specialist agents in coffee production in Ethiopia (ECA/FAO, 1981 cited in Tefera, 1995). At approximately the same time, Kenya, a country with population of a half of Ethiopia, already had 5,277 extension agents on payroll (Schulz, 1983).

It can be argued that it is not more than a decade since smallholder farmers in Ethiopia began to experiment with modern agricultural technologies on a significant scale. In the 1950s and 1960s, agricultural sector as a whole was neglected by policymakers of the country due to the 'industry first' argument of the period. The Ethiopian Imperial Government's policy document, for example, indicated that there was no need to change the traditional peasant methods of production (Mengisteab, 1990). It was only in the Third Five Year Development Plan (1968-1973) that agricultural development got a cursory attention due to increased realisation of continued stagnation of the sector, the growing dissatisfaction and restlessness of the rural population and pressure from the donor community (Mengisteab, 1990). Yet, few tenants had benefited from the rural development programs and projects initiated by the SIDA and the World Bank in the Central Highlands of Ethiopia and south of the country. This was due to the insecure and exploitative feudal land tenure system and limited area coverage of the projects.

In the post-revolution period (1975 - 1990), the main objective of agricultural development became the development of large-scale mechanised socialist agriculture through establishment of state farms and promotion of producers' co-operatives. The most dominant smallholder sub-sector was excluded by the policy. Agricultural extension personnel, agricultural inputs and input loans were systematically directed to the socialist sectors. For instance, 85% of agricultural credit, 50% of fertilisers and 79% of improved seeds was allocated to state farms and producers' co-operatives that jointly accounted for only 5% of the total cultivated land and 4% of the total national crop production (Belete, 1992).

Moreover, an ILO Mission to Ethiopia in the early 1980s observed that Ethiopia "*has systematically under-invested over along period in rural infrastructure – roads, power, irrigation, storage and processing facilities – and in health, education and training of its rural population*" (ILO/JASPA, 1981, quoted in Livingstone, 1990:296). Military expenditure that had reached 37% of the country's GNP by 1991(Tekabe, 1998, cited in Devereux, 2000) is also believed to have diverted scarce resource from rural and agricultural development programs.

Unlike the two previous regimes, the development of smallholder farms is at the centre of the Agricultural Development Led Industrialization (ADLI) in the development strategy of the ruling party (EPRDF). The aggressive agricultural extension program launched in 1994 by the same government has enormously improved peasant farmers' access to productivity-enhancing crop technologies, extension advice and input loans. The total cultivated area on which inorganic fertilisers were applied increased from 1,845,000ha in 1990/91 to 2,764,000ha in 1997/98. The total volume of inorganic fertilisers applied increased from slightly over 1 million *quintals* in 1990/91 to an annual average level of over 2.5 million *quintals* (one quintal = 100kg) from 1995/96 to 1997/98. The number of personnel in extension and veterinary services has also increased significantly (CSA, 1998, cited in Seyoum, 2000). The government again committed itself to invest up to 1.5% of GDP in agricultural research (government web page).

There are, however, still challenges ahead to make the NARS and extension system of the country responsive and efficient to bring about concrete and sustainable

impact on production and productivity and to ensure sustainable NRM. Ethiopia's NARS has a shortage of highly trained and experienced researchers since its inception, yet it is one of the SSA NARS known for their inability to retain senior staff (Eicher, 1989) due to low pay and unattractive working environment. Ethiopia's NARS has also experienced frequent restructuring and change of mandates that might result in loss of 'institutional memory'. The latter has serious negative repercussions from innovation point of view since concerted and sustained effort is required to produce the desirable results. The overall result is that agricultural research in the country is still rudimentary, and profitable production and conservation technologies are largely unavailable (Shiferaw and Holden, 2000).

Equally important is the fact that farmers in Ethiopia have never been given opportunities to influence the research and extension agenda. Research topics are determined more by the interest of the researchers than what ought to be searched (Goshu, 1995). Unless the poor farmers have power to participate in deciding technological choice, they are unlikely to benefit (IFAD, 2001). The fact that the level of dissemination and the adoption rate of existing productivity-enhancing crop technologies are disappointingly low and the agriculture sector fails to feed the increasing mouths and to fulfil its other basic functions are partially the reflection of the NARS' and the extension system's Achilles' heel.

On the credit side, promising efforts are underway to reverse the prevailing an unacceptable situation of the NARS for better. The World Bank had approved a loan amounting to 60 million U.S dollars to strengthen agricultural research and training of the country, and to create an enabling environment for smallholder farmers to influence research agenda at the local research centres (Addis Tribune News, June 6, 1998). This is a move towards the right direction. The policymakers and the concerned scientists have now a challenge ahead and a bright future as well in their move forward!

3.6 SUMMARY AND CONCLUSION

The interaction between rural population, natural resource and human welfare does not take place in an institution free environment. It is the prevailing society-specific broader institutional arrangements and policy environment that mediate the interaction between population growth and rural development and influence welfare and sustainability outcomes of rural livelihood behaviour.

This chapter has attempted to present a critical review of the evolution and salient features of the institutional and policy settings in Ethiopia in a historical perspective. The review has been conducted with the aim of understanding the degree to which an enabling environment has been created for the realisation of sustainable rural livelihoods in the context of rapidly changing man-land ratio. The chapter attempted to critically look into the land tenure institution, organisational and institutional factors in NRM, smallholder farmers' access to the market and appropriate technologies and the overall agricultural policy environment in the country.

In general, the review revealed that smallholder farmers in Ethiopia have never been granted land tenure security and have never been given the opportunities to use and manage the common property regime collectively at the grassroots level. Participation by the farmers in the input and output markets has been constrained by the high transaction costs due to poor infrastructure, information asymmetry, illiteracy and inability of smallholder farmers to influence the terms of market participation. On the policy front, it became evident from the review of the available evidence that smallholder sub-sector in this country has been neglected, purposely discriminated against and exploited by all account. Until recently, no genuine effort has been made by policymakers of the country to improve smallholder farmers' access to appropriate technology and to create price incentive through the adoption of agricultural policy that makes farming profitable. All of these factors have seriously limited the motivation and capacity of the smallholder farm households to respond to the unprecedented demographic pressure in an environmentally sound manner. We shall see this in detail in the subsequent chapters.

CHAPTER 4
ECONOMIC SYSTEMS OF THE RESEARCH SITES AND SOCIO-ECONOMIC CHARACTERISTICS OF THE HOUSEHOLDS

4.1 INTRODUCTION

It is generally accepted that rural communities and rural households respond differently to the changing resource base and opportunities unless they are undifferentiated 'homogenous group'. In reality, households are usually differentiated in asset endowment, income and social status. Agro-climate (climate, soil type and slope) and access to the market may also vary from area to area with important implications for rural livelihoods. It is the differentiation that explains the usually reported diversity in livelihood strategies and differential impact of external interventions in many SSA countries and in areas within a country, a region, a district or a village in the empirical rural development literature.

For example, a very recent study in southern Ethiopia revealed that the pathways of environmental and livelihood changes are not only different across agro-ecological zones but also across households with different resource endowments (Konde *et al.*., 2001). Similarly, Murton (1999) reported sustainable intensification on richer farms and 'involution' on poorer farms, proceeding side by side within the same villages in the highly publicised case of the Machakos District of Kenya. We have also seen in the previous review of empirical studies in SSA that differential resource endowment at household level could lead to diverse livelihood strategies.

The study sites and the sample households were selected for this investigation in such a way that livelihood diversity both across research sites and among different households would be captured. The first section of this chapter describes the economic systems of the study sites. Description of the socio-economic characteristics of the sampled households follows the development of households' typology for the study area. Representatives of the respective sites had developed households' typology using local criteria through participatory Rural Appraisal (group wealth ranking exercise). Then, discriminant analysis technique was applied to test the statistical validity of the number of groups and to refine group membership of the

misclassified cases. The result shall be used for further analyses in the subsequent chapters.

4.2 ECONOMIC SYSTEMS OF THE RESEARCH SITES

4.2.1 ALEMAYA

Alemaya's farming economy is best characterised as chat-dominated, highly market-oriented and intensive. The altitude of the three PAs covered by the study ranges from 1800m to 1950m above sea level. The average annual rainfall for Alemaya is about 900mm. The majority of croplands are fairly flat and 75% of the farmers regarded their cropland fairly fertile. The average landholding for the sample households is 0.97 ha, and about 71% of the households cultivate cropland size of less than half a hectare. The cropland in Alemaya is relatively more fragmented with 71% of the cropland divided in to 2 to 3 plots. About 80% of the sample households have access to irrigation water. The Alemaya research site is situated close to the two big cities of Harar and Dire Dawa at a distance of, respectively, about 20 km and 40 km within a walking distance from the paved road, which means this site has relatively better access to the market, both domestic and export.

Chat is the major crop both in terms of area covered and revenue generated in two of the three PAs covered by the study as elsewhere in the district. In the third PA situated at the shore of the Alemaya Lake (Finkile PA), vegetables production prevails over chat production. Both chat and vegetables are primarily produced for export to Somalia and Djibouti from Dire Dawa that has an air link with the former and both air and rail links with the latter. In the area, chat and vegetables also enjoy substantial and growing domestic market.

Sorghum is the major food crop followed by maize in the study area as elsewhere in the HHs. However, maize is increasingly becoming the leading staple crop in Finkile PA. Finkile farmers prefer maize to sorghum for its short cycle that allows planting of potato in October. Maize yields are obviously higher than that of sorghum though the former is more sensitive to moisture stress and soil fertility. The fact that the soil at Finkile is deep and rich in clay content means moisture availability and higher soil water retention capacity reduces the risk of drought. Livestock income plays a supplementary income and saving opportunities.

Farming in Alemaya is the most intensive in the region by all accounts. Labour is scarce despite the average cropland holding of only 0.183 ha per adult equivalent (consumption unit) and there are 2.79 person equivalent (worker unit) per ha. For example, more than 43% of the sample households used hired labour in the 2000/2001 cropping season. Most of the labourers came from the other less developed neighboring districts. Almost all households used inorganic fertilisers (97.5%) in the same season. It was also only in this area that a substantial number of farmers reported that they had used purchased pesticides for crop protection. Tractor hire service is available partly as a response to the declining households' oxen ownership due to the increasing shortage of grazing land. The value of farm implements/ha, yield of the major staple crops and income per hectare are the highest in the HHs.

4.2.2 SABALE

The farming economy of Sabale could be characterised as chat-cereal and moderately intensive farming. The altitude of Sabale ranges from 1900m to 2500m above sea level. It is situated at a hillside and prone to serious soil erosion. The Sabale area receives annual average rainfall of just over 1000mm. The majority of the croplands are on steep slope. The average cropland holding for the sample households is about 0.6 ha, and only 46% of the farmers regarded their land as fairly fertile. The cropland in Sabale is highly fragmented and 94% of the households cultivate less than a hectare. Just over 30% of the households have access to intermittent surface irrigation water. Regarding access to market, Sabale is located at about 30kms from the third big town of the region, Chiro, and at about 230 to 250 kms from Harar and Dire Dawa, but it is 5 to 7kms from the district town of Badessa.

Coffee has been the traditional cash crop in this area. However, chat is replacing coffee as the major cash crop recently due to the coffee berry diseases, high cost of pesticide following the removal of subsidies and low and volatile world coffee prices. The third major chat collection and processing point of the region is Badessa where chat is purchased for selling at Addis Ababa market or for exporting to Somali and Djibouti via Dire Dawa. Teff, the favourite food grain in Ethiopia, is also grown on small scale as a source of cash.

Sorghum is the major food crop followed by maize. Small cereals including teff and millet are also grown mainly as secondary crops. Sweet potato is extensively cultivated especially during unfavourable season (season of low and/or abnormal rainfall) to cope with food insecurity. Livestock, particularly dairy, income plays a significant role in financing grain purchase during the season of scarcity.

Farming in Sabale is moderately intensive. Only 5% of the sample households reported that they had used hired labour. This should not be surprising given the smallest average per adult equivalent cropland holding (0.14 ha) and the highest person equivalent per hectare of 4.17. However, more than 36% of them used inorganic fertilisers and/or improved maize cultivars in the 2000/2001 cropping season. Yield of maize is reasonably high when inorganic fertilisers and improved cultivars are used. Purchased pesticides are rarely used unless provided by the MOA for free.

4.2.3 KUNI

Farming economy in Kuni area is extensive, combining cereals and livestock. The altitude of this site rages from about 1900 to 2200m above sea level. The rainfall situation is similar to the Sabale area. The majority of croplands have moderately steep slopes although some croplands are on steeper slopes. The average cropland size for the sample households is 0.97 ha Alemaya, when adjusted to per adult equivalent it is 0.22 ha better than 0.18ha for Alemaya. Sixty eight percent of the farmers judged their land as fairly fertile and only 68% of them cultivate croplands with size of less than a hectare. The cropland is also relatively less fragmented in Kuni. Less than 20% of the households have access to limited irrigation water. In terms of access to the market, Kuni is closer to Chiro than Sabale by about 10 kms, but the latter is closer to the district town of Badessa.

Crops grown in Kuni include sorghum, maize, barley, wheat, oats, onion and horse bean. This area is part of the cereal-dominated zone of the region where cash crops play relatively insignificant role. Onion is the most important cash crop, but not cultivated by all households. Chat plays a secondary role in terms of both the area covered and revenue generated. Rather, this is the area where livestock plays a very

significant role. Some communal grazing land is also available though under serious pressure from encroachment of cropland. Increasing grazing land shortage has already been manifested by the emergence of 'grass market'.

The level of intensification of farming in Kuni is rather low. Only 19% of the sample households reported that they used inorganic fertiliser in the 2000/2001 cropping season. Though use of hired labour was reported by 17% of the households, it was later learnt that the labour was used mainly for livestock keeping (shepherds). Nevertheless, multiple cropping is more common in Kuni area as compared to the Alemaya and Sabale areas. Barley is planted in April and harvest in July, and then replaced by horse bean. Maize is planted in May and harvested in October, and then replaced by onion where irrigation is available. Onion is, in turn, harvested in February and replaced by barley in April and so forth.

Table 4.1 presents a summary of the salient agro-climatic and socio-economic features of the three research sites. This will facilitate the examination of the interaction between rural livelihood strategies and, the agro-climatic and socio-economic environment in the subsequent analysis.

Table 4.1: Summary of the basic features of the study sites

	Alemaya	Sabale	Kuni
Crop land	Scare, moderately fertile	Highly scarce, less fertile	Less scarce, moderately fertile
Major soil type	Deep clay soil	Light shallow soil	Light shallow soil
Slope of cropland	Flat	Slopping	Slopping
Perception of soil erosion	Not serious	Very serious	Very serious
Access to irrigation	High	Moderate	Low
Access to market (proximity)	Very high	Moderate	Moderate
Role of cash crop	Very high	Moderate	Low
Major cash crop	Chat and vegetables	Chat	Onion
Role of livestock	Moderate	Moderate	High
Opportunities for expansion of cropland	None	Low opportunities	Moderate opportunities
Level of capital intensification	High	Moderate	Low

Source: Own survey and observation

4.3 TYPOLOGY OF HOUSEHOLDS

Rural socio-economic differentiation is more the rule than the exception in SSA, although the degree may vary from country to country. Ethiopia is not immune to this despite the conventional wisdom that the land reform and other measures of the past regime (between 1975 and 1990) have eliminated rural differentiation in the countryside (Amare, 1999; Haile Gebrial, 2000). *"Any conviction that the land reform and subsequent rounds of redistribution of agricultural land have succeeded in controlling tendencies of peasant differentiation should be discarded. Significant differences remain among strata of peasant households in terms of their capacity to access means of agricultural production including land." (Haile Gebrial, 2000:283)*

Asset endowment is at the heart of rural differentiation. Asset endowment determines 'bargaining power' of households in exchange relations (Haile Gebrial, 2000). In other words, transaction costs of participating in the factor and product markets are not the same across households. As a result, strategies pursued to ensure food and income security will differ (Barrett *et al.*, 2000). It follows then that any meaningful analysis of rural livelihood strategies should logically start from the appreciation of rural differentiation. This kind of analysis generates important information that assists in predicting responses and effects of policy and project interventions at micro level, and thereby leading to better targeting. *"Always it is important to take a socially differentiated view of livelihood strategies in order to focus support in the most appropriate area." DFID, 1999:fact sheet 2.5:2.*

A typology approach is used to conceptualise differentiation among different households. A typology is a procedure (qualitative and/or quantitative) for developing and describing relatively homogenous groups of households and/or communities who face more or less similar constraints and incentives, hence expected to be affected by external influence similarly (Perret, 1999).

Two approaches are commonly used to get a 'snapshot' of household differentiation in terms of stratification (Haile Gebrial, 2000). Conventional surveys can be used to collect data on key variables (from the researcher's perspective) by which socio-economic strata of households is determined objectively through statistical rigours

such as cluster analysis. Alternatively, PRA techniques such as group wealth ranking can be employed to define socio-economic categories based on local perception and local criteria. Nonetheless, both have drawbacks: the former does not capture 'non observable' aspects of differentiation, whereas in the latter case people's perception and emerged criteria could differ from locality to locality making comparison and generalization difficult (Haile Gebrial, 2000). Thus, this study employed both the subjective and objective techniques in a complementary way to exploit the strengths of both approaches for better result. Group PRA exercise had been used to elicit information on the existing socio-economic categories and local wealth ranking criteria. Discriminant analysis was then applied to validate the number of socio-economic groups and to refine classification of the cases further.

4.3.1 LOCAL PERCEPTION OF WEALTH CATEGORIES AND WEALTH INDICATORS

Identifying local terminology for the different socio-economic categories was the starting point of the PRA exercise for developing typology of households. Four such terms were identified and elaborated during group discussions at different sites (Table 4.2). However, the group discussions revealed that all the four socio-economic categories were not necessarily prevalent in all areas. Farmers in the West Hararghe believed that the higher socio-economic class locally called *Tujaara* no longer existed in their area, while farmers in the East Hararghe cash crop area believed that this socio-economic category existed or was in the making. Finally, it was decided to retain only three groups because the highest socio-economic class accounts for a very negligible proportion (not more than 5%) of the households where the group agreed it existed.

Table 4.2: Local terminology for socio-economic categories

Local Term	English Equivalent
Tujaara	Well to do or rich
Foyya'a	Better-off
Ofdanda'a	Self-sufficient/less poor
Miskiina	Poor or impoverished

Source: own survey

Identification of local wealth ranking criteria was the second step once the socio-economic categories were identified. A number of such criteria, mostly related to

resource endowments, were suggested. Although the suggested proxy indicators fail to distinguish between causes and results of socio-economic differentiation, they can serve the purpose of developing households' typology. The suggested local proxy indicators of wealth are elaborated below.

- *Land and its attributes such as size, fertility, slope and irrigation*

Cropland was considered as a crucial asset in the livelihood of the rural households. The better-off farmers have relatively bigger, fertile, irrigated and flat land. Participation in the land market was also considered as a good proxy indicator of the different socio-economic categories. Cropland is most of the time rented-out, sold or given to sharecropper by the poor who has no access to other resources such as oxen, seed and labour. Yet, some farmers believe that, although very important, land is not always the most important determinant of wealth. According to these farmers, some people are less poor not because they have use rights over more than an average size and quality land, but because they worked harder and succeeded in non-farm activities such as grain and livestock trade. However, the income from the lucrative non-farm activities could also be used to rent-in land.

- *Ownership of oxen and other livestock*

Ownership of oxen and other livestock such as cows and donkeys were unequivocally considered as the crucial indicator of socio-economic status of a particular rural household. A pair of oxen is not only important in timely land preparation, but also for getting access to other factors of production. There is a local arrangement where those who do not own a pair of oxen exchange their labour service for oxen service, i.e., plough land of oxen owner for two to three days in exchange for one oxen-day service. It is oxen owners who usually rent-in and sharecrop land. Cows provide milk, replacement stock and are an important source of cash income in areas closer to town. Ownership of donkey is crucial as the most important means of transport for those engaged in trade, such as grain trade, and cash crop producers. Donkeys can also be rented to generate significant income particularly in cash crop areas. Above all, livestock is the most important means of accumulation and risk management strategy in the area, given the land tenure system.

- *Adult male labour*

Labour was considered a critical factor in rural differentiation, as particularly expressed by the female-headed households. The poor are most of the time the elderly, the sick or the female-headed household. Because of labour shortage, they usually rent-out their land or give to sharecropper or sell, though selling land is illegal.

- *Cash crop*

Ownership of irrigated chat or perishables was also identified as a good proxy of income and socio-economic status particularly in high and moderate commercialised areas of Alemaya and Sabale.

- *Type of house*

The type of house (tine-roofed versus thatched houses) owned was also suggested as a proxy indicator of socio-economic status of households. There is most visible difference across the sites with respect to the proportion of tine-roofed houses. For instance, the majority of the houses at Alemaya site are tine-roofed, bigger and some have even cemented wall, whereas the reverse holds true for the other sites.

- *Ability to send children to school (particularly secondary school)*

As reported by the farmers, children of the poor do not usually go to school. They have to either go to town for street vending to get some money and buy food or work on the better-off farm to get paid in kind (grain) or cash, or serve the better-off households as shepherds to get their daily bread and a calf after year.

- *Off-farm / Non-farm income and type of employment*

The type of non-farm/off-farm activities in which households members are engaged was also suggested as a proxy indicator of socio-economic strata. The rich or better-off households participate in lucrative and capital-intensive non-farm activities like rural shop, chat, and livestock and grain trade. In contrast, the poor usually resort to the less remunerative off-farm and non-farm activities like labour, petty-trade, food and drink sale, food-for-work, etc..

- *Technology use*

Those who used fertilisers and/or improved seeds were perceived as the less poor or the better-off. This is quite acceptable since the less poor have the necessary resource and risk bearing ability and also preferred by extension staff.

- *Food self-sufficiency and/or security status*

Households who are food self-sufficient throughout the year or are not seriously affected during unfavourable seasons were also identified as the better-off since it implies better access to the means of production and technology and better risk bearing ability.

4.3.2. VALIDITY TEST AND REFINEMENT OF GROUP MEMBERSHIP

As indicated earlier, the community representatives identified three socio-economic categories – the poor, the less poor and the better-off. Then, during the PRA exercise, the names of the sample households were called one by one and the representatives sorted out the households into the three socio-economic categories. This subjective analysis has been supplemented by discriminant analysis to test the validity of the number of socio-economic categories and to reclassify the misclassified cases.

The procedure began by the selection of predictor variables for the analysis. This was necessary because all the variables identified by the farmers, although relevant, could not be used for discriminant analysis due to the need to control serious violation of the basic assumptions of the model. Some variables were excluded due to multicollinearity problems and others could not be used because they are not metric or not normally distributed. Accordingly, four predictor variables were chosen (Table 4.3), the necessary adjustment to outliers was made and the analysis was done using SPSS version 11 discriminant analysis software.

Table 4.3: Tests of equality of group means (pooled)

Variables	Wilks' Lambda	F	Sig.
Consumption unit (adult equivalent)	.794	24.954	.000
Tropical livestock unit	.292	232.380	.000
Years of food shortage in the past five years	.801	23.809	.000
Total cash income	.685	44.175	.000

First, separate discriminant analyses were run for each research site. The model for Alemaya and Kuni sites suggested three groups owing to two significant canonical functions (not reported), whereas the model for Sabale suggested two groups since only one function was significant (also not reported). The discriminant analysis using pooled sample gave two significant functions (Table 4.4) indicating three groups. The previous three groups have been retained to facilitate comparison across sites. The confusion matrix, the measure of overall fit of the model, showed that 78.4 % of original grouped cases were correctly classified (not reported) which is indeed a good result since prior group membership probability was taken into account. Structural matrix, which shows contribution of each discriminating variables, is given in Table 4.5.

Table 4.4: Test of significance of group of functions (pooled)

Test of Function(s)	Wilks' Lambda	Chi-square	Sig.
1 through 2	.240	271.824	.000
2	.920	15.858	.001

Source: own analysis

Finally, the limited misclassified cases were identified and reclassified on the basis of Mahalanobis squared distance and posterior group member probability discussed under Section 1.8.1. The model predicts a case belongs to a group with the largest posterior probability, based on discriminant scores. The confusion matrix indicated that predictive power of the model improved significantly after the misclassified cases were reclassified (87% of the originally grouped cases are correctly classified taking into account priory membership probability).

Table 4.5: Structure matrix (pooled sample)

	Functions	
	1	2
Tropical Livestock Unit	.915*	.051
Total cash income	.461*	.399
Consumption unit	.340*	-.020
Years of food shortage in the past five years	-.302	.748 *

* Largest absolute correlation between each variable and any discriminant function

Source: own analysis

Table 4.6 shows the final classification results. As expected, Alemaya site is relatively richer with 70% of its population categorised as less poor or better-off as opposed to Sabale site where the majority (54%) is poor. In fact, only 15.4% of households in Sabale are categorised as the better-off households. This also explains why earlier separate discriminant analysis for Sabale provided only one significant function suggesting two groups instead of three.

Table 4.6: The summary of household typology, by site

Household typology	Research sites			Total
	Alemaya	Kuni	Sabale	
Poor	24 (30.4%)	25 (47.2%)	35 (53.8%)	84 (42.6%)
Less poor	32 (40.5%)	17 (32.1%)	20 (30.8%)	69 (35%)
Better-off	23 (29.1%)	11 (20.8%)	10 (15.4%)	44 (22.3%)
	79 (100%)	53 (100%)	65 (100%)	197 (100%)

Source: own analysis

Having developed a typology of the households as rigorously as possible, the next section describes in detail the socio-economic characteristics of the sample households capitalising on the result of this section. The aim of this exercise is to see if the socio-economic differentiation provides any distinct livelihood strategies households and communities pursue, as discussed at the outset, in the subsequent chapters.

4.4 SOCIO-ECONOMIC CHARACTERISTICS OF THE HOUSEHOLDS

4.4.1 FAMILY SIZE AND STRUCTURE

The size and age structure of rural households give crucial information in livelihood analysis since they are directly related to endowment of labour force, consumption and fertility behaviour. Family size in the HHs is higher than the national average of 5 persons per household and shows a significant variation across the sites. Mean values of variables related to family size and structure by site are given in Table 4.7a with the test of significance of difference between the means.

Table 4.7a: Mean value of family structure, by site

	Alemaya	Kuni	Sabale	Average	Significance level
Family size	7.27	5.66	5.32	6.2	0.000
Children < 5 years	1.57	0.96	0.85	1.07	0.001
Children 5 to15 years	2.87	1.7	1.91	2.2	0.000
Worker unit (person equivalent)	2.8	2.9	2.5	2.7	not sign
Consumption unit (adult equivalent)	5.3	4.5	4.2	4.7	0.000
Dependency ratio	2	1.6	1.7	1.8	0.000

Source: computed from own survey

Similar analysis was further carried out by household type (Table 4.7b). The additional interesting information that has come out from this analysis is that the mean value of 'adult male' number in a household is highly significantly different across household types confirming farmers' suggestion to include this variable in the wealth ranking criteria.

Table 4.7b: Mean value of family structure, by types of household

	Poor	Less poor	Better off	Average	Significance level
Family size	4.9	6.57	8.05	6.2	0.000
Children < 5 years	1.01	1.23	1.36	0.97	Not sign
Children 5–15 years	1.56	2.49	3.14	2.2	0.000
Adult male	1.3	1.5	2.1	1.5	0.000
Adult female	1.2	1.4	1.6	1.4	0.036
Worker unit	2.3	2.7	3.5	2.7	0.000
Consumption unit	3.8	5.0	6.0	4.7	0.000
Dependency ratio	1.7	1.9	1.9	1.8	0.010

Source: computed from own survey data

4.4.2 EDUCATION

The high rate of illiteracy has been one of the major bottlenecks in rural development in Ethiopia as elsewhere in SSA. The education levels of households' heads in particular and the education levels of households members in general affect households' livelihood in various ways. Among others, decisions related to livelihood activities, investment and reproductive choice are all influenced by households' level of education hence education deserves due attention.

The illiteracy rate is very high in Sabale about 72% and relatively low in Alemaya nearly 46%, while the figure for Kuni is 64%. This figure is comparable to illiteracy rate in the country estimated at 55% and 75% for men and women respectively (World Bank, 1997 cited in Emana, 2000). A similar pattern was also observed bys household type with the highest illiteracy rate among the poor households and the lowest among the better-off households. Furthermore, variance analysis showed significant difference (at 0% probability) of mean number of children attending school among different household types pointing to the fact that the better-off household, followed by the less poor, tend to send more children to school. This again confirms the farmers' suggestion to include the ability to send children to school as one of the socio-economic grouping criteria.

4.4.3 NON-HUMAN ASSETS

The central role of livelihood assets other than human resources in livelihoods of the rural household is apparent. Indeed, assets such as land, water, farm implements and livestock are more constraining than human resource in the context of population pressure. The simple descriptive statistics (Table 4.8) shows mean distribution of non-human assets by household type. As expected, the better-off households have access to relatively bigger, fertile, irrigated and flat land and own more livestock.

The box-plots (Figure 4.1) show the distribution of the crucial livestock asset in the area by household type and by sites. Boxplots show the median, interquartile range, outliers, and extreme cases of individual variables. Livestock is more unequally distributed than cultivated land as expected since the periodic land redistribution based on family size has reduced the role of cultivated land size as a source of

household differentiation. If land has indeed any role in rural households' differentiation, the quality rather than the sheer size matters.

Table 4.8: Mean distribution of cultivated land, livestock and farm implements, by types of household

	Poor	Less poor	Better - off
Landholding size (ha)	0.58	0.75	1.15
Holding size per adult equivalent (ha)	0.173	0.170	0.204
Irrigated land (ha)	0.04	0.10	0.22
Percent of farmers regarding their land infertile	58.3%	23.2%	18.2 %
Oxen/bull owned	0.20	0.68	1.39
Cow/heifer owned	0.71	1.49	2.58
Goats /sheep owned	0.69	1.01	1.89
Donkey/horse owned	0.12	0.35	0.80
Chicken owned	1.32	1.91	5.61
Total tropical livestock unit owned	1.02	2.62	4.51
Value of farm implement (birr)	176	424	1994

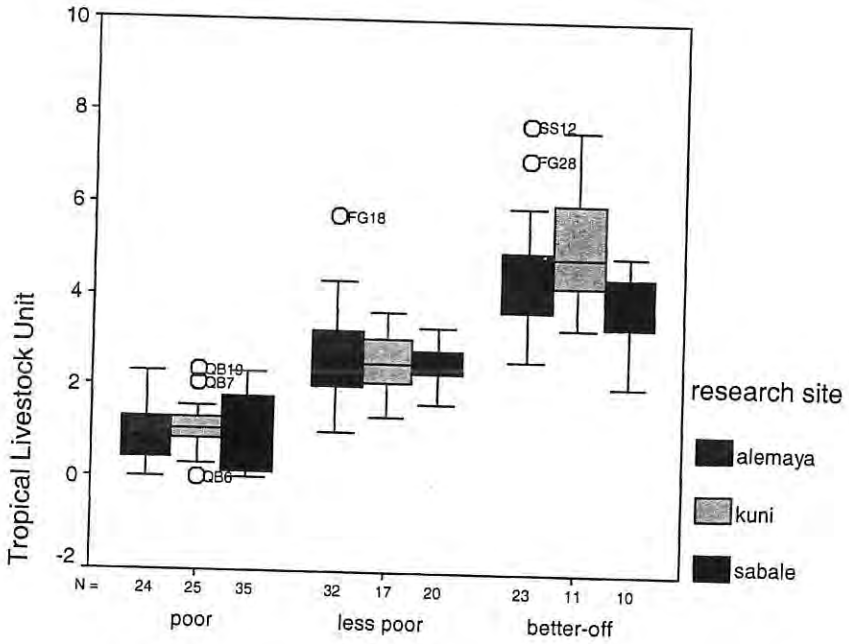


Figure 4.1: Box-plot distribution of livestock in tropical livestock unit

Source: developed from own field survey data

4.4.4 SAVINGS AND ACCESS TO CREDIT

Financial capital, i.e., cash and convertible assets, is a very important asset in rural livelihoods not only to finance agricultural inputs and non-farm activities, but also to protect loss of crucial livelihood assets such as cattle due to seasonal food shortage,

illness or death. Where livestock, rather than cash, is a preferred form of saving, access to credit, particularly from formal financial institution, can make a difference to rural life.

The three categories of households are differentiated in ability to save, ability to access formal credit and the purpose for which credit is needed. As Table 4.9 indicates not only the majority of the poor households couldn't save cash and access formal credit but also use the small amount they borrow from informal sources at exorbitant interest rate for consumption purpose. The table also shows that NGOs have been successful in reaching the poor as far as credit is concerned through their targeted programs for which they have to be commended.

Table 4.9: Ability to save cash and access credit, by types of household

	Poor	Less poor	Better off
Saved cash	16%	32%	40%
Borrowed from bank	15%	30%	41%
Borrowed from NGO	23%	17%	14%
Borrowed for consumption	22%	13%	18%

Source: own field survey

The poor and the better-off households have differential credit needs too. For instance, the better-off households such as in Alemaya cash crop zone need credit to acquire irrigation facilities such as pump and wells and to open rural shops, and the like, whereas the poor households or in the relatively poorer site credit is needed for non-farm activities such as trade activities, dairying, fattening, and so on. The MoA extends loan only for the purchase of fertilisers and improved seeds. Ironically, very few number of the respondents expressed need for input loan. This indicates a mismatch between smallholder farmers' need for credit and the available credit services in addition to the accessibility problem.

4.5 GENDER DIMENSION OF DIFFERENTIATION

Finally, the data set was disaggregated by gender of heads of the households to scrutinise whether the observed economic differentiation follows gender line, that is, if there is any association between socio-economic class and being female-headed or male-headed household. From the 48 female-headed households in the sample 60.4%, 31.3% and 8.3% were, respectively, categorized as poor, less-poor and

better-off households. In contrast, 36.9%, 36.2% and 26.8% of male-headed households were categorised as poor, less-poor and better-off households respectively. Female-headed households are surely over represented in the lowest socio-economic stratum in terms of endowment of crucial human and non-human resources (Figure 4.2).

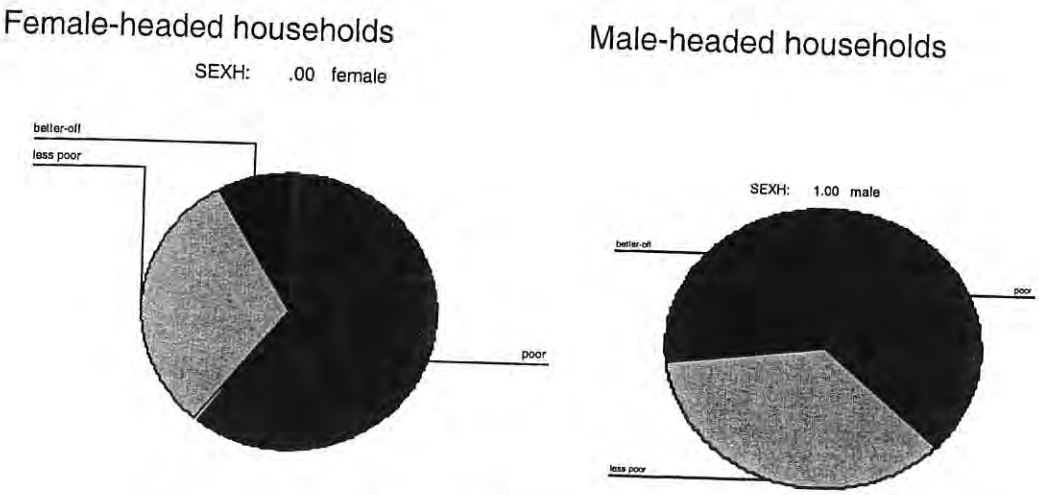


Figure 4.2 Socioeconomic categories by gender of household head

Most of the female-headed households are labour constrained, less educated, have access to small, infertile and non-irrigated land, own relatively small number of livestock, less farm implement; and they save less and their access to institutional credit is relatively limited as apparent from Table 4.10.

Table 4.10: Socio-economic differentiation by gender of heads of households

Socio-economic indicators	Female-headed	Male-headed
Attended formal education	16.7%	48.3%
Mean family size	5.02	6.57
Mean number of adult male	1.02	1.68
Mean TLU owned	1.8	2.54
Mean Cultivated land size (ha)	0.61	0.82
Cropland regarded as infertile	52.1%	33.2%
Mean irrigate land area (ha)	.05	.12
Mean value of farm implement	185 birr	825 birr
Saved cash	20.8%	28.8%
Borrowed from the banks	14.8%	27.4%

Source: own survey data

4.6 SUMMARY AND CONCLUSION

The type of support the resource-poor households and the better-off households need in their quest for food security may differ and one may target specifically the food insecure, the female-headed or the elderly households. Besides, the extent to which households depend on exploitation of the renewable natural resource to get their immediate needs met may be different across households. Better targeting can be achieved only through thorough understanding of the existing socio-economic categories and locally specific key indicators of group membership.

This chapter has conceptualised and described the key physical and socio-economic differentiations across the research sites and among the households. The results of the analysis indicate that the 1975 land reform and subsequent measures of the socialist government between 1975 and 1990 in Ethiopia had indeed weakened rural differentiation, particularly that based on cropland area over which households have use right. However, differentiation still exists to some degree or is in the making, though not at all comparable to the type of differentiation in other countries such as South Africa or Brazil. The livestock and human resource endowments with the quality of cultivated land, though not size, are the main sources of differentiation. The disaggregated data by gender of heads of the households further highlights that female-headed households are disproportionately represented in the poorest socio-economic stratum. The study showed a 'snapshot' of rural differentiation. Nonetheless, rural differentiation is a dynamic process whereby households may shift from one type to the other.

The overall implication of the analysis is that households have differential access to livelihood assets, face heterogeneous constraints and incentives and, therefore, may pursue different food and income security strategies. An appreciation of rural socio-economic differentiation at the outset would enable policy analysts not to consider rural community as an 'undifferentiated homogenous group' and recommend untargeted intervention that may result in differential impact on the different socio-economic categories.

CHAPTER 5
RURAL LIVELIHOOD STRATEGIES IN THE HARARGHE HIGHLANDS

5.1 INTRODUCTION

The extensive literature review in Chapter 2 has thrown some light on the alternative livelihood strategies that rural households and rural communities could pursue to ensure income and food security of their members in the context of population pressure. Population pressure induces an intensification of the production system owing to increased subsistence requirements and changes in factor price ratios. Deliberate government interventions such as the provision of market infrastructure, price incentives, land tenure security, credit, information and technology could also induce such intensification. Diminishing farm sizes and a decline in return to labour in farming under population pressure may encourage rural households to diversify their employment and sources of income. In rural areas, livelihood diversification is achieved, for example, by temporary and seasonal migration, wage labour, crafts and trades. Delayed marriage, migration and an attempt to control fertility by limiting births within marriage are important aspects of rural livelihood strategies in response to an increasing scarcity of natural resources.

Having this information, this chapter looks into livelihood strategies at the household as well the community level in the context of population pressure in the Hararghe Highlands. Qualitative and quantitative data obtained from the rural livelihoods survey formed the database for the analyses discussed in this chapter. Limited secondary data were used to supplement the cross-sectional household level data where the latter was insufficient to substantiate some of the arguments. In first section of the chapter there is an overview of the extent to which the arable land area cultivated per household has diminished over-time in the study area. The roles of demographic and non-demographic factors in the process are discussed. This section serves to confirm the increasing scarcity of arable land in the study area.

The analyses of rural livelihoods in this chapter are divided into three main sections. The first section (Section 5.3) is concerned with the identification, qualitative

description and/or quantitative analysis of land use strategies at the household and community levels. The next section presents an analysis of the nature, the extent and determinants of rural livelihood diversification. It shades more light on diversity in livelihood diversification behaviour across sites and among different households, and assesses the role of reduced access to cropland in households' diversification decision. The final section of the analysis focuses on the role of demographic adjustments, i.e., migration and fertility, in rural livelihood strategies. The section on migration and fertility specifically explores whether there is any relationship between family size preferences or the achieved/intended fertility and access to cropland along with other socio-economic and socio-cultural variables believed to influence the demand for children and rural households' fertility decisions. The main observations from the empirical analyses of rural livelihood strategies in the HHs in this chapter are summarised in Section 5.6.

5.2 DIMINISHING LANDHOLDING SIZE IN THE HARARGHE HIGHLANDS

A rapid decline in the cropland area available per household or adult equivalent is now more the rule than the exception at all the research sites. On average, a household in the study area cultivates 0.8 ha of cropland (seeTable 5.1). The results of the survey confirm the average land holding size in the region as calculated from the CSA sample survey. The later estimated average cropland size per household at 0.82 ha for the East Hararghe Zone and at 0.93 ha for the West Hararghe Zone (Tadesse, 1998).

Although they are only rough approximates, the estimations reported in Table 5.1 illustrate that the average cropland area per household has declined by 50% from nearly 1.5 ha just before the land reform of 1975 to about 0.8 ha in 2000/2001. The reported decline in average cropland area since 1975 may initially seem less than one would expect, given the rate of population growth in the area, which is estimated at 3% per annum, doubling every 20 years. However, the survey result can be accepted as a reasonable approximation of the actual scenario on two grounds:

- the periodic redistribution of communal grazing land and sometimes forest land by leaders of the PAs until the late 1980s helped to accommodate the

demand by newly established households for cropland, reducing further subdivision and fragmentation of holdings at inheritance to some degree; and

- the family system in the research area which tends to accommodate newly married couples within existing households may be obscuring the actual situation.

Table 5.1: Change in the cultivated land size per household over-time

	Number of respondents	Minimum In ha	Maximum in ha	Mean	Std. Deviation
Cropland size just before the land reform (1975)	72	0.00	13.00	1.6905	1.91245
Cropland size just after the dismantling of coops (1990)	157	0.17	5.50	0.9209	.72130
Current cropland size (2000/2001)	197	0.00	3.00	0.7669	.43723

Source: Own survey data

The picture would undoubtedly have been different had data on the cropland area per adult equivalent for the comparable periods been available. The current average cropland area per adult equivalent in the HHs is 0.18 ha. This figure is less than the minimum size considered adequate for subsistence (0.23 ha) by an earlier study (Adnew and Storck, 1992). Using this benchmark, 72% of the sample households (or by site, 81.5% in Sabale, 73% in Alemaya and 58% in Kuni) cultivates a cropland area per adult which is equivalent to or less than 0.2 ha. Hence, households do not have the minimum size required for subsistence. However, the cut-off size is subject to change depending on technology, crop mix and prices over-time.

The reduced size and fragmentation of cropland holdings in the HHs are, however, not only the consequence of rural population growth. There are various other causes. Among others, the past land policy of the country played a role. As was clearly indicated by representatives of the local community during group discussions and the findings of other researchers (McDowell and de Haan, 1997), the land policy that was in effect in Ethiopia between 1975 and 1990 discouraged rural-rural and rural-urban migration. According to this policy, access to agricultural land was determined by residential area and required the beneficiaries to stay in the PA to cultivate the land personally. On the one hand, this land policy restricted free movement of labour and, on the other hand, it encouraged larger family sizes due to periodic land redistribution according to family size.

Restricted voluntary demographic adjustments and limited employment opportunities for unskilled labour outside agriculture have kept the opportunities cost of labour employed in subsistence farming very low. Hence, although they do not see farming as a preferred occupation, it is the only viable option for the fast growing rural youth population. This has led to a 'levelling down' of cropland area and land fragmentation through periodic land redistribution and subdivisions of holdings at inheritance.

It seems as if the obverse of Low's observations in southern Africa (Low, 1986) has occurred in Ethiopia as far as the movement of labour is concerned. This is due to the policy barrier as well as limited employment opportunities outside subsistence farming. Interestingly, the final outcome is, however, similar. There is a stagnation of the subsistence sector. Nevertheless, the cases Low presented to explain the stagnation of the subsistence sector in SSA are in explaining the Ethiopian situation.

5.3 LAND USE STRATEGIES

The demand for more food rises as the population grows and/or household income increases. To meet the increasing demand for food, changes in the land use strategies are required. Bringing more land (forest or pasture) under cultivation also called extensification (extensification can be considered a special form of intensification), is one possible land use strategy to produce more food. Land use is intensified spatially and temporally to maintain per capita food production where the opportunities for further expansion of cropland is exhausted. Land use intensification is achieved in a number of ways. These include reducing the fallow period or increasing the frequency of cultivation, spatial intensification such as intercropping, shifting to the production of high-value crops, and labour and capital investment in land productivity-enhancing indigenous or external technologies. Soil and water conservation activities and the adoption of inorganic fertilisers, improved cultivars and selected agro-chemicals are examples of the latter land use intensification strategies.

Decisions concerning land use are made at household and community levels, but the se decisions are influenced by macro-level processes such as access to the market and technology, government policies regarding land use and ownership. In

particularly, clearly defined property rights and effective collective action are among the most important prerequisites for encouraging wider adoption of land productivity-enhancing and natural resource-conserving technologies. However, the extent of tenure security and the collective action needed for sustainable NRM differs according to the spatial and temporal dimensions of individual technologies (McCulloch *et al.,* 1998). For example, the adoption of inorganic fertilisers requires neither long-term tenure security nor collective action. Nonetheless, a higher degree of tenure security and effective collective action at a higher level, say at district level, are both essential for sustainable watershed management. Equally important in the context of subsistence farming is the cash expenditure needed and the risk involved in adopting new technologies. Resource-poor subsistence farmers are more likely to take up technologies the adoption of which require no or little cash outlay and technologies the adoption of which involve low risk. Thus, local land use strategies are the result of complex interactions among the attributes of technologies, macro- and micro-economic variables and agro-climatic factors.

This first section discussing the livelihood analyses closely examines the land use strategies pursued at the household and community levels in order to maintain or enhance rural livelihoods in the research area. Case study materials and cross-sectional household data are used to describe the local dynamics in the absence of time series data for the study sites that relate demographic change with changes in land use systems. Qualitative and quantitative data analysis techniques have been employed to complementary each other in identifying determinants of investment in land productivity-enhancing technologies. The roles of the market, the local physical environment and government policy in the process of change in land use strategies are discussed when and where they are relevant to relate the micro with the macro economic factors. Although references are made to the implications of rural livelihood behaviour, in terms of land use systems, for sustainable use of the renewable natural resource, these issues are discussed only later in the thesis. The final chapter of the thesis deals with welfare outcomes and the sustainability implications of rural livelihood strategies.

5.3.1 Cropland Expansion

Extensification (bringing more land under cultivation at the expense of forest and grazing land) has long been the most common strategy in the HHs, as elsewhere in the country, to produce more food as required to feed a growing population. Detailed discussions and transact walks with groups of knowledgeable elders in the communities in the study area helped the researcher to identify areas formerly covered by natural forest and communal pasture and to understand the direction and pattern of expansion of croplands and settlements in the last three to five decades, in the absence of quantitative information.

A case study from the Sabale site is presented here to highlight the dynamics of the extensification strategy. The Sabale site was selected for the case study because it roughly represents the general situation of both research sites (Sabale and Kuni) in the West Hararghe Zone where an extensification strategy has continued to be employed at the present, and also because Sabale has more or less the same topography with Kuni (Figure 5.1). However, the other arguments regarding the extent and consequences of following an extensification strategy are based on observations made in all the PAs covered by the investigation.

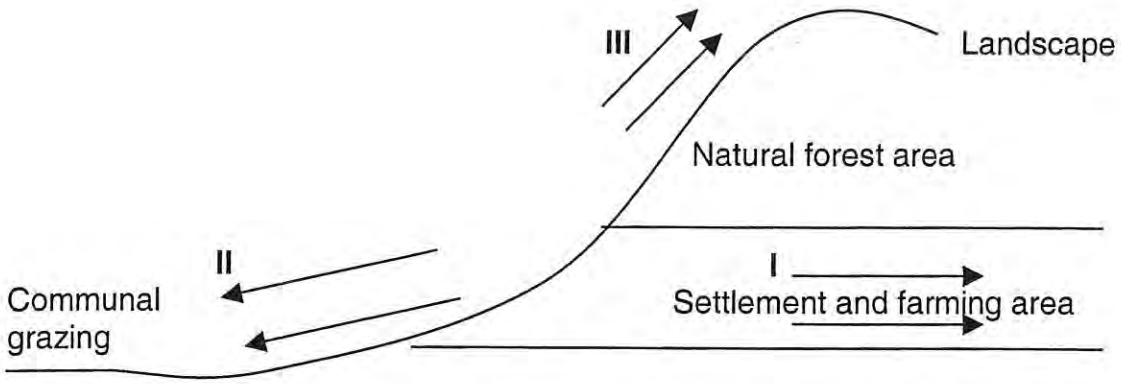


Figure 5.1 Spatial and temporal aspects of expansion of agricultural land in Sabale

Source: Developed by the author from group discussions and field observations

The expansion of croplands and settlements in Sabale followed a typical pattern (Figure 5.1) and has, interestingly, created spatially disaggregated socio-economic classes. The land on the middle of the slope was the original area where people lived and which they cultivated. The land at the bottom of the hill, though fertile, was

swampland, there was a water-logging problem and this land was less preferred in the past when land was abundant and labour was scarce. The dense forest area up the hill was difficult to clear; the soil on the upper slope is shallow, light and highly susceptible to erosion and it harbours crop pests such as monkeys and apes and was therefore also less preferred.

The areas between the dispersed homesteads were large enough to accommodate the demand of newly established households for cropland, in stage I. The cultivation area expanded horizontally within the original settlements, limited by the boundaries of PAs at inheritance and through periodic land redistribution after 1975. This strategy helped the community to accommodate the demand for cropland by the growing number of newly established households, first, by a conversion of 'unutilised land' to cropland and, second, by subdivision of land.

In stage II, the cultivation area expanded vertically further down to communal pasture (formerly unused for crop production) using increasing labour available due to natural population growth. Finally, in stage III, it expanded to marginal land and the steeper upper slope, formerly covered by communal natural forest, with further population growth. Currently, steeper slopes as steep as 50% are cultivated, particularly at the two sites in the West Hararghe Zone. Hand hoes are used for land preparation, because oxen cannot be used on such steep slopes. It is also interesting to note that the households cultivating moderately steep land tend to be older (in terms of the family cycle) and economically better-off, whereas marginal areas are cultivated by the relatively younger (more recently established) and poorer households.

The first obvious consequence of the extensification strategy is land degradation through soil erosion. The sample households mentioned this problem as the third major constraint to crop production after land scarcity and scarcity of working capital. Another study on one of the districts included in this study, the Chiro District, estimated that over 81% of soil erosion was caused mainly by the practices of cultivation on steeper slopes and runoff from surrounding fields (Tefera et al.., 2000).

The second consequence is a shortage of grazing land due to the expansion of crop cultivation to pasture areas. This was mentioned as the main constraint to animal

production, preceding a lack of capital to buy large livestock for rearing. So, for instance, the land use data provided by the local extension agents stationed in the two adjacent PAs in Sabale show that the communal pasture area has diminished to only 10 ha. In addition, 10% of all the sampled households, most of them in Kuni, reported limited grazing land (less than 0.1 ha each) over which they hold individual use rights. The remaining communal grazing land in most of the study sites has already been subdivided and converted into cropland or put under the management of PAs (PAs enclose and sell the grass to households in the dry season), due to increasing conflict over access.

Box 5.1: Coping with the increasing shortage of grazing land in the Hararghe Highlands

Livestock are a source of draught power, cash, soil nutrients (manure), meat and milk, a means of accumulation and a hedge against the risk of food insecurity for the people in the HHs. The dwindling grazing land is the major obstacle to rearing livestock. As a coping strategy, free grazing has been changed to stall-feeding and crop residues have become the main source of animal feed. For example, sorghum is preferred for its tall stack and is sown in high density to be thinned and fed to livestock later in the season. Of the sample households 24% reported growing grasses on their farm boundaries or on soil bunds for animal feed. In Alemaya, some farmers around The Hamaressa Edible Oil Factory reported that they had started purchasing A by-product (cake) to feed their animals. In some areas in Alemaya, bulls are bought from the lowlanders instead of rearing own bulls and are used for ploughing for two seasons after which they are fattened and sold to the local butchery to be replaced by other bulls. Farmers have also developed an exchange strategy to cope with the oxen shortage caused partly by the shortage of grazing land. Those who have only a single ox each combine and use them in turn and those who do not have any oxen exchange their labour for a few oxen days or look after the oxen of their neighbours (feeding and watering them) to have access to them for land preparation.

Source: Developed from own field observation, interview and survey

Some households reported earnings from grass sales, while others reported that they had borrowed money from neighbours or relatives to buy grass for their livestock. The emergence of the 'grass market' is a clear indication of the great scarcity of grazing land. It was also observed that households and communities have developed strategies to cope with the shortage of animal feed (Box 5.1). These strategies include changing the traditional free grazing system to stall-feeding, modifying crop

selection criteria by including stalk or straw quantity, growing grasses, buying feed, buying bulls instead of raising them, combing and exchanging of oxen power. It is also interesting to note here that the shrinking of grazing areas resulting from the expansion of cropland (extensification) has simultaneously generated intensive livestock feeding practices.

Moreover, as the survey results reveal, the selling by women of timber, charcoal and wood as fuel as a supplementary source of income has become a thing of the past and has been replaced by the selling of sorghum stalk for animal feed or feulwood. Farmers, particularly women, now have to travel a long way to find shrubs for fuelwood or to make charcoal to sell it in the nearest rural market. They have already found that selling wood and charcoal is the most unattractive and unsustainable livelihood diversification strategy available to them.

All these changes can be taken as proxy indicators of the extent to which cropland has replaced traditional communal grazing and natural forest due to an extensification strategy. The next important question that needs to be looked at is the reasons for the widespread adoption of the relatively unproductive and environmentally unsustainable extensification strategy in the study area. Although it is beyond the scope of this study to establish the relative importance of the different factors contributing to the expansion of cropland to the communal forest and grazing areas, it can be asserted that demographic change, government policy and stagnant production technology have all played their part in the process (also see Chapter 4).

Population growth is perhaps the most important reason for the adoption of an extensification strategy. The population size Sabale and other sites in the study area has undoubtedly more than doubled in the last three decades. When PAs were formed in the mid-1970s, a PA was supposed to have an average of 300 households and 800 ha of land. About 700 households, on average, currently reside in a PA. This indicates the degree of population growth since the formation of PAs, immediately after the land reform of 1975.

The increasing labour supply available due to natural population growth was first used to intensify crop production on land with a medium slope since it was closer to

residences, fairly fertile and workable. As more and more labour was applied to the fixed cropland area and capital investment continued, production and productivity started to decline due to deteriorating soil fertility. This encouraged an expansion of cropland first, to grazing land then to forest areas.

Presumably, the grazing land was the first option for expansion for at least two reasons. One is physical, the other legal. The bottomland of the soil toposequence is fertile and has a better water holding capacity, and as a consequence, it provides a better yield and reduces drought risk. Besides, the land use policy of the country prohibits, at least in theory, the cultivation of land with a gradient of more than 30%, but it does not say much regarding a restriction on the expansion of cropland to communal grazing areas as long as the leaders of the PAs give their blessing.

As discussed earlier, it is generally believed that the country's land use policy has discouraged the demographic adjustments. Leaders of the PAs have been distributing communal grazing land and forest areas periodically as they saw fit without any regard for sustainability to the households formed after the first round of land distribution. Moreover, the land policy has destroyed the indigenous common property use and management by the community and has effectively converted communal grazing and forestland into *de facto* open-access. The households cultivating crop next to a communal forest, grazing areas and, to a limited extent, public roads, slowly extend their cropland frontiers every year in the absence of effective restriction by the leaders of the PAs. The same ineffective policy and deepening poverty has encouraged some households, for example in Sabale and Kuni, illegally to settle on and cultivate land with very steep slopes which is highly susceptible to soil erosion during the change of political regimes. In some cases they have bribed PA committee members entrusted with land distribution and land administration responsibilities. Rahmato (1996:303) made similar observations at the national level:

> *"In the decades since the 1960s, massive destruction of forests and oodlands occurred on three significant occasions: in the mid-1960s when the imperial regime proclaimed that all large-scale forests belonged to the state; in 1975 following the land reform and expropriation of all forests; and at the fall of the DERG."*

Neither the imperial nor the socialist government has made a genuine effort to encourage sustainable intensification of smallholder farming through the provision of appropriate land productivity-enhancing and soil-conserving technologies, improved smallholder farmers' access to the market and investment capital, or the adoption of favorable pricing policies that make farming profitable. For instance, the marketing and pricing policies of the socialist government indirectly discouraged sustainable intensification of the smallholder sector by enforcing compulsory grain sales to the AMC at artificially lower prices and by deliberately creating physical barriers to interregional grain trade by the establishment of checkpoints and license requirements. Hence, until a decade or so, extensification, together with labour-based, but 'capital-deficient' intensification, was practically the only viable option to respond to the growing demand for food to feed a rapidly growing population in the absence of market incentives, appropriate and profitable crop and conservation technologies, and the effective policies needed to ensure land tenure security and reduce externalities in the NRM.

5.3.2 LAND USE INTENSIFICATION

Land use intensification is the second land use strategy that can be adopted in agriculture to produce more to feed a growing population especially where the option of further expansion of cropland has been exhausted, as is the case in the study area at present. A distinction has to be made at the outset between the two broader categories of land use intensification strategy due to their far-reaching implications from a sustainability point of view. The first is labour-based intensification, also called 'capital-deficient intensification' (Reardon, 1999, cited in Barbier, 2000). The second category of intensification, preferred on the ground of sustainability, entails the use of more capital and technology to produce more from a given piece of land. The latter can be termed external input-based intensification.

5.3.2.1 Labour-based Intensification

Labour-based or 'capital-deficient' land use intensification has been the strategy most widely adopted in the study area, West Hararghe in particular, in response to the increasing scarcity of land. Traditional crop rotation practices have been reduced substantially, despite a high level of awareness among smallholder farmers of the

role of crop rotation in maintaining the fertility of the soil and controlling diseases. The possible reasons for these undesirable land use practices from sustainability point of view are highlighted by the case study set out in Box 5.2.

Box 5.2: "Sorghum dies seven times and resurrects seven times"

Sorghum is the staple crop in Hararghe, but it had to compete with maize, teff, wheat and barley in the past. The production of sorghum has increased substantially in the recent years, beating all the other cereals, including maize, the crop that the extension system has been aggressively promoting. Asked about the reasons behind this trend, the farmers replied: "Sorghum dies seven times and resurrects seven times". Risk of crop failure as a result of unfavourable weather (abnormal timing and amount of rainfall) has become the rule of life. The farmers prefer sorghum due to its resilience to the vagaries of the weather. Sorghum is preferred to maize for its storability, the quality of its 'injera', the suitability of its stalk for animal feed and fuelwood though it requires more labor and gives a lower yield in comparison to maize. According to the farmers, once maize dies it can never be resurrected. Hence, sorghum is grown every year to reduce the risk of crop failure and it is commonly intercropped with chat.

Source: Developed from own field observations, interviews and surveys

It was further learned that almost all the households have abandoned the practice of leaving part of their arable land fallow for limited seasons to maintain soil fertility. Only six farmers (3% of all the sampled households) reported leaving part of their cropland fallow during the survey season. Whether it was the intention of these farmers to do so to maintain soil fertility is doubtful, as the reasons for leaving part of the arable land uncultivated for a season or so could be a lack of oxen, labour or seed as was discovered in a follow-up discussion with the key informants.

Box 5.3: Capital deficient intensification leads to soil mining and a yield decline

Getachew Belete is 35, married and a father of three sons. He cultivates 0.6 ha of land that he inherited from his father. His mother lives with him. Asked about his main problem, Getachew replied; "It is the scarcity of cropland. Due to the land shortage, I abandoned leaving part of my cropland fallow and practising crop rotation. The soil has no rest, I grow chat intercropped with sorghum and maize every year. I cannot keep livestock and use the manure for fertilisation due to a lack of money to buy the livestock and due to the shortage of grazing land. I can't afford commercial fertilisers either. Now, the soil is exhausted, and as a consequence, the crop yield is declining from year to year. I harvest not more than a *quintal* (100kg) of sorghum from a *timad* (0.125 ha) of land. Our fathers used to harvest as much as 2.5 *quintals* per *timad* during those good old days. My wife has rejoined me recently after two years of separation because I could not support my family."

Source: Developed from own field observations, interviews and surveys

The land use intensification strategy could also take the form of crop succession (multiple cropping) and intercropping (mixed cropping). Farmers in the upper highlands of Hararghe usually practise double cropping in order to maximize the benefits from the bimodal rainfall. Farmers who have access to water for small-scale irrigation also practise double cropping in the lower highlands or in the mid-altitude areas of the HHs. The strategy of growing cash crops in combination with food crops with different maturity periods ensures that households have a seasonally distributed flow of food supply and income, besides spreading the labour requirements for farming activities throughout the year (Figure 5.2).

Intercropping has a number of advantages: it reduces the susceptibility of crops to pests and diseases; it increases the nitrogen level in the soil when legumes are incorporated; and it suppresses weeds and ensures variety and nutritional balance in household food supplies (Ruthenberg, 1984). In the East Hararghe Zone, particularly in the Alemaya area, chat is intercropped with sorghum, maize and haricot beans. Intercropping is also practised in the West Hararghe Zone, but to a lesser degree. Moreover, the survey indicates that resource-poor households tend to practise intercropping more intensively than better-off households. This probably reflects more of a subsistence orientation and risk aversion behavior among resource-poor households than among better-off households.

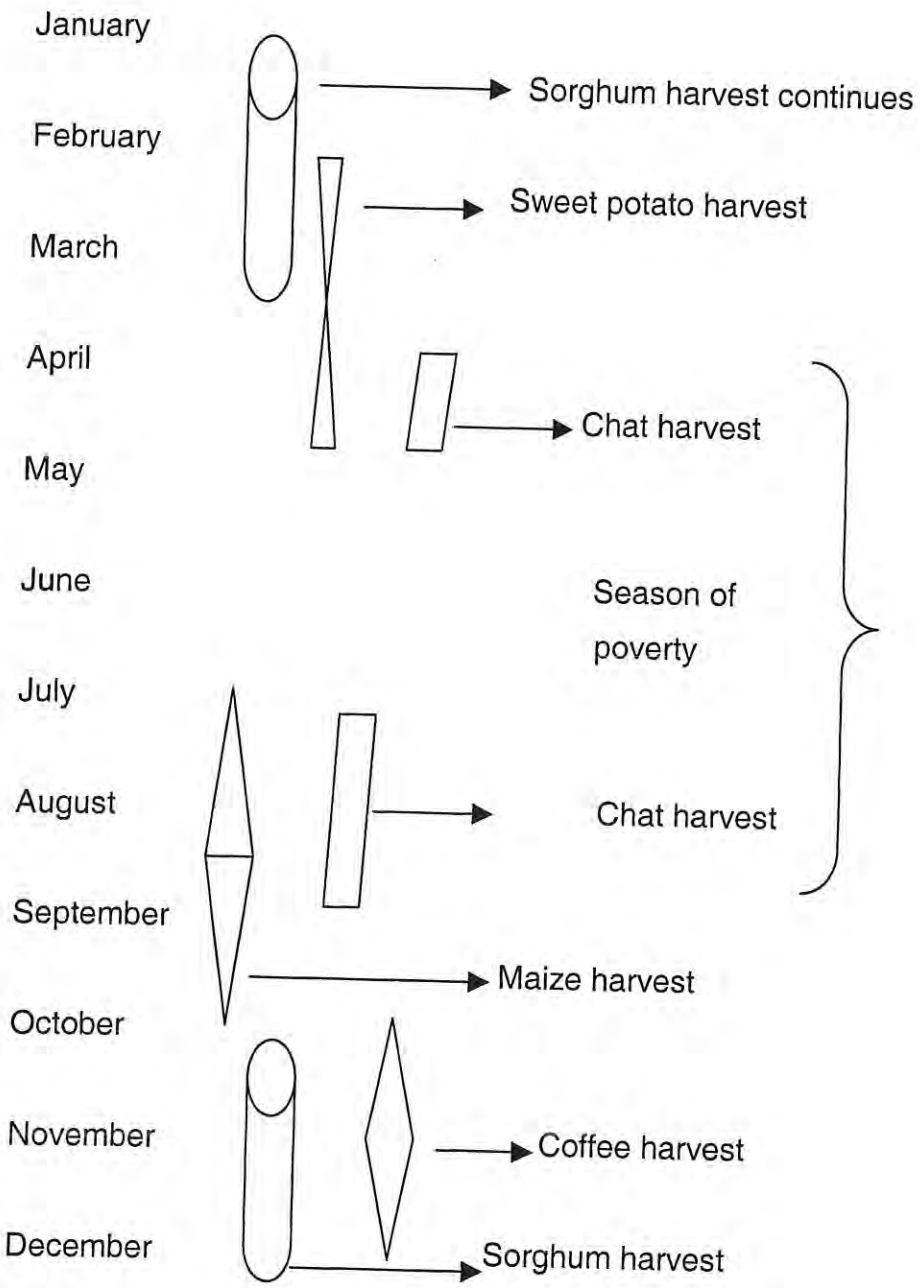


Figure 5.2 Food and income availability calendar for the upper highlands

Another less visible, yet commonly practised, land use intensification strategy in the area includes planting different varieties of the same crop and spatial synchronisation of the cropping system with micro-soil properties. In order to exploit their different desirable qualities, as many as three to four different cultivars of the same crop (such as sorghum) are planted within the same plot. Some of the cultivars are early-maturing; others are less preferred by birds, thus reducing the requirement for children's labour for scaring birds; still others are either high-yielding, suitable for particular purposes such as animal feed (with a tall stalk), as making local beer; or

less affected by storage pests, etc., Maize is usually planted on the bottomland of the soil toposequence and sorghum is planted on the upper slope. This is done to synchronise soil micro-properties with the requirements of the crops. As one moves down the slope, soil water retention capacity increases with increasing soil clay content. Therefore, maize is planted on the bottom of the slope to obtain a better yield and reduce drought risk, because maize is more susceptible to moisture stress and a lack of soil fertility than sorghum.

5.3.2.2 The Production of High-value Crops

A shift to the production of high-value crops is another land use intensification strategy available to farm households, but it does not automatically follow from higher population density. It requires changes in factor costs to be reflected in agricultural pricing and marketing, land tenure and crop research policies (Lele and Stone, 1989). As the case study of chat production demonstrates, smallholder farmers' response in terms of resource allocation to seize opportunities created by strong market incentives surpasses expectation. There are cases where farmers could shift their land and other resources to high value crops production with little or no external support.

The most interesting development in the HHs that is clear even to a casual observer, as far as a shift to high-value crop production is concerned, is the dramatic expansion of chat production. As Table 5.2 portrays, the proportion of arable land allocated to the production of chat (sole and intercropped) has substantially increased since the early 1990s with far-reaching consequences for the land use system and people's livelihoods. By contrast, the production of coffee, the crop that generates 60% of the export earnings of the country, has declined substantially in the same period. It is believed that the main reason for the decline in coffee production in the HHs is coffee berry disease and the increased cost of protection since the removal of subsidies following the implementation of the SAPs from the early 1990s. For example, the 1999/2000 post-harvest crop assessment by an NGO in collaboration with the zonal offices concerned reported a 40% to 60% decrease in coffee production in most of the major coffee growing areas in the West Hararghe Zone (CARE – Ethiopia, 2000) due to the CBD alone.

Table 5.2: Trends in food crop and cash crop production in the Hararghe Highlands since the early 1990s (percentage of households that grow/used to grow the crop in question)

	Decreased substantially	Decreased a little	Remained the same	Increased a little	Increased substantially
Maize Sole	18.3%	25%	20.2%	15.4%	21.2%
Maize intercrop.	-	14.3%	50%	14.3%	21.4%
Sorghum sole	25.5%	35.7%	24.5%	7.1%	7.1%
Sorghum intercrop.	6.7%	14.6%	7.9%	22.5%	48.3%
Chat sole	-	4.7%	11.6%	**53.5%**	**30.2%**
Chat intercrop.	-	2.2%	4.4%	**16.5%**	**76.9%**
Coffee	**73.7%**	10.5%	5.3%	10.5%	-

Source: own field survey

This assessment goes with the findings of another study that indicated decreasing interest in coffee production among Hararghe farmers (Kingele, 1998). Interestingly, Ellis (2000b) observed a similar trend in some Tanzanian villages, where dairying has replaced coffee after the introduction of SAPs. Ironically, the reform package known as SAPs was primarily meant to increase the production of tradable agricultural commodities such as coffee.

Although other high value crops, such as vegetables in the Finkile PA and onions in the Kuni Sagaria PA, are important, chat deserves some space and thought since it is central to rural livelihoods in the HHs, given its importance in terms of the quantity of resources, land in particular, allocated to its production, the revenue it generates and its growth multiplier effect on the local economy in general. The following case study describes in more detail the expansion of chat production in the HHs.

A case study of market induced change in the land use strategy: the dramatic expansion of chat production in the HHs

Chat (Catha edulis) is a perennial tree crop mainly grown in Eastern Ethiopia. The people who live in the Horn of Africa and in some Arab countries chew young fresh leaves of chat as a stimulant. Very little is known about the effect of chat on the human physiology. It is, however, said that chat increases blood

sugar levels and improves blood circulation. This provides energy, which helps workers to withstand fatigue and improves the concentration of students when reading.

The main chat production area in Ethiopia is the HHs. It has, however, been observed that chat production has also been expanding in other regions, especially in areas south of the capital, Addis Ababa. In some areas of the HHs, in particular the chat-belt of Alemaya, it was found that the area of cropland allocated to chat is as high as 75% of the total arable land (SCF/UK, 1996). The proportion of the total arable land allocated to chat in the survey area ranges from 21% in Kuni (Chiro District) to 54% in Alemaya. It was also observed that the majority of irrigated land is allocated to chat production. In addition chat consumes most of the scarce organic manure in farm households. It is not uncommon to find farmers diverting some of the inorganic fertilisers provided on credit by the MoA for crop production to chat production. Indeed, Hararghe farmers have to be admired for their indigenous technical knowledge of the way they manage their chat fields. The farmers have developed appropriate spacing, defoliation time and other cultural practices, variety selection and disease control methods including the use of chemicals such as DDT. All of this was done independently, without any government involvement or assistance from farmers' associations.

Both legal and illegal channels are used to export chat. The volume of chat exported legally from the HHs was about 200 metric tons (Mt) in 1948 and reached 1,400 Mt in 1958 (Klingele, 1998). According to the local branch of the National Bank of Ethiopia, the volume and value of chat exports from the region rose from 2, 746 Mt and 30.2 million birr in 1977 to 3, 496 Mt and 114.4 million birr in 1986 (National Bank of Ethiopia, 1986). Ethiopia earned 618.8 million birr in hard currency in the year 1999/2000 by exporting 15, 684 Mt of chat (National Bank of Ethiopia, 2001). Chat had become the second most important earner of foreign exchange next to coffee by 1999/2000, as is shown in Figure 5.2.

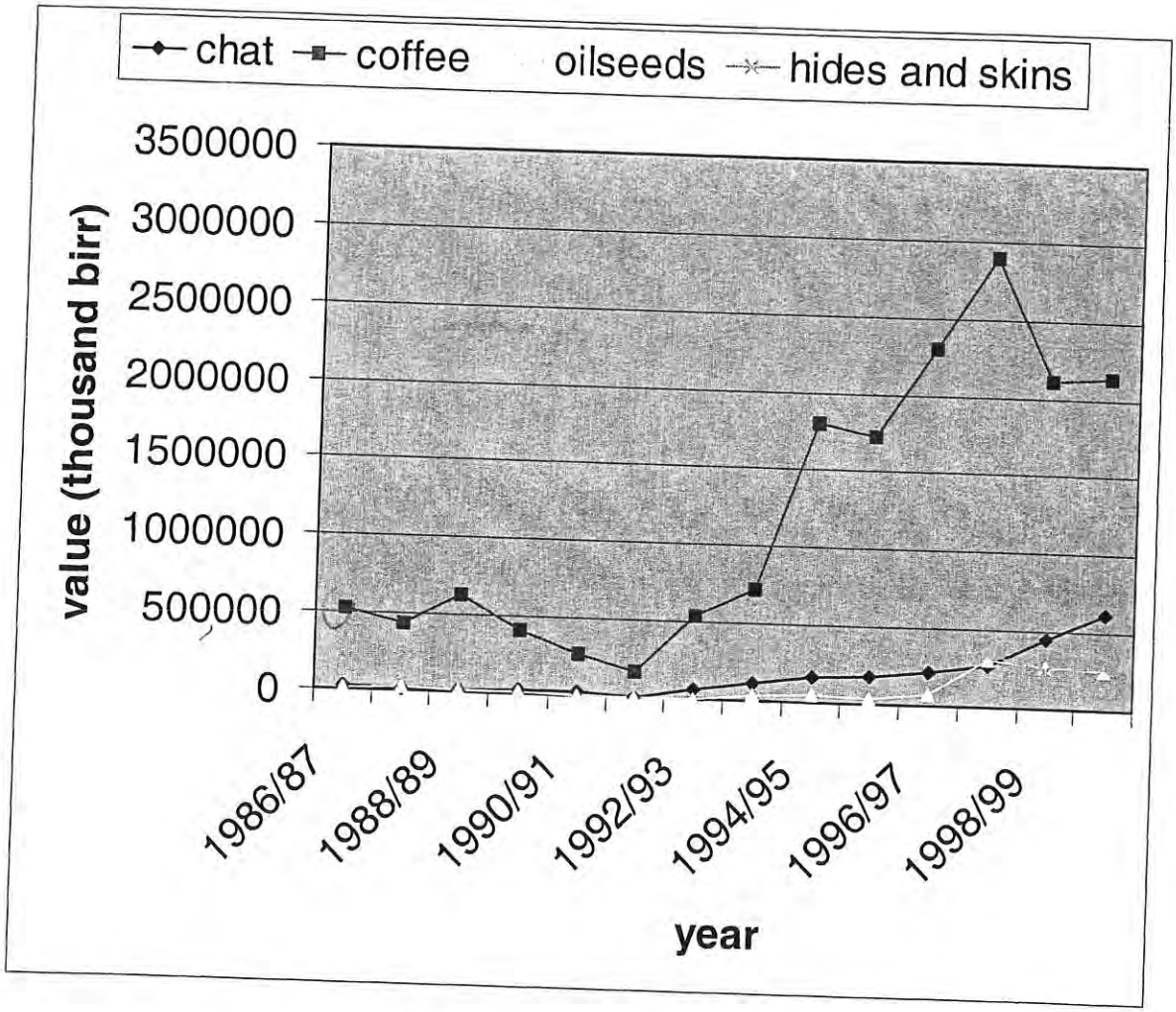


Figure 5.3:Value of main agricultural exports (in thousand birr)

Source: Developed from data reported by the National Bank of Ethiopia (2001)

The fact that chat production is replacing staple cereals and coffee is interesting for a number of reasons. Unlike coffee and cereals, chat has never directly benefited from research, extension advice and credit services. Besides its alleged effect on human health, the MoA is concerned that the expansion of chat production might have negative repercussions for the food security of households and on the foreign exchange earnings of the country. Chat is also blamed for decreased productivity, as people waste valuable working time sitting and chewing it for hours. No empirical evidence is available yet and it is not clear whether abusing chat is any different from abusing alcohol.

There are a number of factors that contribute to the expansion of chat production in the HHs. The first, and perhaps the most important factor, is the growing domestic and export markets for chat and improved access to these markets through an improved transport network. The export market is

substantial and expanding. This includes countries such as Djibouti, Somalia and Arab countries such as Yemen. It is also exported to Europe, but is banned in Canada and the US. The HHs' location and its superior transport network have played an important role in the expansion of chat, since the product has to reach its final destination fresh (and therefore fast transport is needed). In the domestic market it is quite evident that chat chewing has become a recreational activity and now also forms part of the culture of the urban youth.

The export price of chat has also been rising since the mid 1970s (Gebissa, 1994, cited in Degefa and Nega, 2000). While chat enjoys a relatively stable price in the world market, coffee suffers from both fluctuating export volumes and prices. Coffee berry disease, the increasing prices of chemicals since the removal of subsidies under the SAP and declining world coffee prices have all contributed to the decline of the coffee sector in the HHs. Producing chat has thus become a viable and important alternative to ensure continued cash income. Chat production has another advantage: chat can be harvested at least twice a year under rainfed agriculture and five times per year under irrigation. This ensures that households have a well-distributed flow of income.

Another economic reason for the growing interest in chat production is related to its cost of production relative to that of other competing enterprises. Labour is the most important cost item in the production of chat. The rapid population growth in the HHs has provided enough family labour or access to cheap hired labour for labour-intensive production, making chat production feasible. In the second place, chat is hardly affected by any disease, except some damage by insects that can easily be controlled by locally developed methods at little or no cost. The need for minimum off-farm inputs makes chat production compatible with poor farmers' limited access to credit. Table 5.3 gives an overview of the relative profitability of chat in the HHs economic systems.

Table 5.3: Income possibilities for staple foods and the main cash crops in the HHs

	Food crops		Cash crops			
	Sorghum	Maize	Coffee	Chat	Potato	Onion
Yield/ha – rainfed (kg)	700-1200	1000-1300	400-700	700-1000	5000-7000	3500-8000
Gross income/ha (birr)	560 – 1800	700- 1820	4800-11200	16100-23000	7500-10500	9100-20800
Production cost	Low	Low	Low-high	Low	High	High
Average net income	Low	Low	Medium	High	Medium	Medium-high
Risk factor	Low-medium	Low-medium	High	Low	High	Medium-high

Source: Klingele (1998)

Economic considerations are very important in peasant farmers' resource allocation decisions; however, there are other equally important factors that should be accounted for to understand their complex decision-making processes. Risk is one such factor. Although the average precipitation in the HHs is generally considered adequate for viable rainfed agriculture, its amount and abnormal distribution exposes crops to frequent weather hazards (Storck *et al.*, 1997). Intercropping is one of the widely used indigenous strategies to manage risks associated with weather, diseases and pests. Chat is less affected by these risks and perfectly suited for intercropping unlike, coffee. Chat is usually intercropped with sorghum, a crop preferred for its drought tolerance.

Finally, the topography of the HHs coupled with the cultivation of steep slopes and diminishing vegetation cover, has made soil erosion a critical problem in the HHs. Although land tenure insecurity is generally believed to discourage investment in soil improvement in the country, Hararghe farmers practise different soil conservation methods as a survival strategy. The farmers have always chosen soil and water conservation methods that take little land out of cultivation, although the improved conservation methods promoted by the extension service take more land (Sutcliffe, 1995). Thus, planting chat hedgerows on sloping land is preferred to other methods as an economically attractive conservation method that at the same time generates some income.

5.3.2.3 Investment in Land Productivity-enhancing Technologies

Extensive land use, such as forest, bush and grass fallow IS associated with little or no investment in land improvements (Pingali and Binswanger, 1987), whereas intensive land use systems under population pressure like reduced fallowing practise or multiple cropping, are usually supplemented by replenishing soil fertility and investment in soil and water conservation (Boserup, 1965). From this it follows that increased population density is implicitly correlated with investment in land improvement (Templeton and Scherr, 1997). This sub-section looks at the extent to which the intensive land use in the HHs is commensurate with investment in land improvement and the adoption of crop technologies such as inorganic fertilisers in order to increase production while maintaining the capability of the land for future use.

- *Investment in Soil and Water Conservation*

Soil and water conservation activities are mainly labour-based and are very important and widely adopted forms of intensification in the HHs. The topography of the HHs,

the cultivation of steeper slopes and the diminishing vegetation covers make soil fertility depletion through soil erosion a very critical or, to use the farmers' own phrase, a 'life threatening' problem in the area. Despite the problem of land tenure insecurity in the country, Hararghe farmers routinely practise soil and water conservation as a survival, if not as an investment, strategy. Pagiola (1994, cited in Templeton and Scherr, 1997) similarly argues that poor cultivators who have no better option outside subsistence farming have a greater incentive to protect the source of their sustenance.

According to the survey results (Table 5.4), more than 85% of the sample households had some conservation structures on their cropland with a steep slope. Investment (in terms of labour) in conservation activities tends to increase with altitude and the slope of the cropland. Grass strips or the planting of chat hedgerows on croplands with steeper slopes usually supports physical structures. Furthermore, Adnew (2000) observed that intercropping annuals with perennials tends to increase with the slope of cropland in the same area. Eucalyptus trees are widely planted around the homesteads in areas where land is relatively less scarce, Kuni in particular. Besides conserving soil, the trees are highly demanded for construction and for their attractive price on the market.

Moreover, almost all the sample households making a living from cultivating steep slopes expressed their intention of continuing to use the conservation methods previously introduced through FFW programmes beyond the lifespan of the programmes. This is contrary to the concern often expressed in the literature regarding the sustainability of this type of intervention, due to farmers' vested interest in the continuation of such programmes. This interest in conservation activities may be an indication of the increasing understanding of the farmers concerning the relationship between land degradation and the deterioration of their livelihoods. The farmers' own phrase 'life threatening' used above, to express the extent of the soil erosion problem in their areas supports to this argument. Consistent with this observation, an empirical quantitative analysis in the Central Highlands of Ethiopia revealed that the likelihood of keeping conservation structures developed through FFW programmes by households is higher on steeper slopes, where the perception of the soil erosion problem is higher.

Table 5.4: Type of conservation structure used by households

	Frequency	Percent
Flood diversion	18	9.1
Stone bund	39	19.8
Soil bund	75	38.1
Soil bund with grass strip	33	16.8
Stone and soil bund	3	1.5
Don't use	29	14.7
Total	197	100.0

Source: Own field survey

Few farmers, however, applied inorganic fertilisers on steeper slopes. One plausible explanation for the limited use of purchased fertilisers is the fact that it is predominantly the resource-poor and relatively young households who desperately struggle to make a living in such difficult condition and thus cannot afford inorganic fertilisers. Yet affordability is not always the main problem. One respondent from a female-headed household in Sabale, for instance, indicated that she could not use inorganic fertilizers, although she was willing and able to do so, using proceeds from chat sales. The reason is that if fertilisers were applied on cropland with such a slope, they would easily be washed away by erosion. Hence, she pleaded for technical assistance from extension to do something about it. This observation conforms with the insights from an empirical analysis in the Babile District of the East Hararghe Zone (Emana, 2000) that reported a negative and significant correlation between the proportion of plots on steep slopes and the adoption and intensity of use of inorganic fertilisers at household level.

- *Investment in Crop Technologies*

As the preceding analysis has indicated, labour-based and 'capital-deficient' intensification would, sooner or later, lead to soil mining, declining yield and eventually to food and environmental poverty, unless a transition is made to capital- and technology-based land use intensification. Only a few households in Alemaya invest in irrigation facilities such as pump and well construction for irrigated chat and perishables production. Thus, the use of purchased inputs, such as inorganic fertilisers and improved seed that increase the productivity of land, and labour are the key investments to support the growing population in a sustainable way. However, like the shift to higher-value crops, the shift to sustainable intensification does not automatically follow higher population density. It requires demand-driven research

and extension, an efficient input delivery system, improved access to rural finance and, above all, market incentives.

Almost all the sample households had reportedly applied organic fertilisers on their croplands (manure, leaf litter and household trash) in the study area. However, the amount of manure applied is declining along with the decline in the livestock population, as a result of increasing vulnerability to food insecurity, dwindling grazing land and recurrent drought. Furthermore, crop residues are no longer left on the farm as they used to be. Crop residues are removed from the farm to be fed to livestock, used for construction, fuelwood or sold on the market for similar purposes.

An expert estimate indicates that for each 4000kg of crop maize produced on a hectare of land, 200kg of nitrogen, 80kg of phosphate and 160kg of potassium are removed from the soil (Higgins, cited in Lele and Stone, 1989). Given this rate of absorption of the basic soil nutrients by crops, limited availability of organic fertilisers and increased frequency of cultivation, there is no alternative to increased use of inorganic fertilisers to increase production without further soil fertility depletion. In fact, it is with this understanding that the MoA has been aggressively promoting the use of inorganic fertilisers and improved seed by farmers through the national extension programme called the Participatory Demonstration and Training Extension System (PADETS), in the country, including the HHs at least since 1994.

About 55% of the sample households used chemical fertilisers at the rate of 74kg/ha in the 2000/2001 cropping season. The application rate is more than twice that the national average of 31kg/ha (Shank, 1996). As usual, the average figure obscures important variation across sites and between different households. As summarised in Table 5.5a, the percentage of farmers who use chemical fertilisers and the rate of application vary within the HHs, ranging from 17% and 12kg/ha in Kuni to 97.5% and 166kg/ha in Alemaya. It seems as if there is a positive and strong correlation between the extent of commercialisation of a site and the rate of adoption and the intensity of chemical fertilisers use. Clear variation was also observed in the use and the rate of application of chemical fertilisers among different socio-economic groups (Table 5.6b). Variance analysis indicates that the difference in mean inorganic

fertilisers application (kg/ha) between the household types is statistically significant at a zero percent probability.

Unlike with inorganic fertilizers, the use of improved seed in the HHs is quite low. Only 17% of the households reported that they had used improved seed, mainly maize. The high price of improved seed was mentioned often as a reason for their low adoption rate, as was the case with fertilisers, However, the most important reason proffered by those farmers who were willing and able to use the technology is associated more with the inability of the research system to come up with improved varieties, particularly of sorghum, which not only give a higher yield than the local cultivars, but also satisfy other locally desirable attributes that could be ascertained through participatory research.

Table 5.5a: Technology use, by site

	Kuni	Sabale	Alemaya	Overall
The percentage of farmers who use inorganic fertilizers	17	35.4	97.5	55.3
Average amount of fertiliser use (kg/ha)	12	12	166	74
The percentage of farmers who use improved seeds	17	21.5	12.7	16.8
The percentage of farmers who use pesticides	0	6.2	78.5	33.5

Source: own field survey

Table 5.5b: Technology use, by types of household

	Poor	Less poor	Better-off	Overall
The percentage of farmers who use inorganic fertilizers	35.7	63.8	79.5	55.3
Average amount used (kg/ha)	31	78	150	74
The percentage of farmers who use improved seeds	7.1	20.3	29.5	16.8
The percentage of farmers who used pesticides	17.9	40.6	52.3	33.5

Source: own field survey

Hararghe farmers apply many complex criteria, such as yield, price, resistance to common diseases and moisture stress, stalk height, storability, suitability to make local food, susceptibility to bird attack, etc.., to evaluate the relative advantages of new cultivars, as the earlier sorghum case indicated (Box 5.2). Indeed, empirical analysis has indicated that farmers' perception of the overall quality of improved cultivars is found to affect adoption decisions in the area significantly (Emana, 2000). In general, peasant farmers prefer varieties that guarantee a reasonable yield with a

low coefficient of variation to higher yielding varieties that entail high risk, especially in areas such as the HHs, characterised by risk and uncertainty (also see Ellis, 1993).

The use of chemical fertilisers with the local cultivars is a common practice in Hararghe. This is a cause for concern, since local varieties are generally believed to be less responsive to chemical fertilisers. For instance, Howard *et al.*. (1999) reported that the yield response to fertilisers (Urea and DAP) used in maize production declines dramatically without the use of hybrid seed. The practice of using fertilisers with local cultivars may make fertilisers use economically less attractive with negative repercussion for sustainable use.

Much also remains to be done to promote appropriate use of crop protection chemicals to reduce pre-harvest and post-harvest losses, estimated to range from 20% to 30% by farmers (CARE-Ethiopia, 1996). Reducing such losses can substantially contribute to farm households' food security. The use of pesticides can substantially reduce storage losses and enable farmers to store their grain to sell it at higher prices later in the season. The input loans policy of the MoA that requires farmers to repay input loans immediately after the harvest is one of the main problems in this regard (Howard *et al.*, 1999).

Finally, in the study, a multivariate binary logistic regression model as described in Chapter 1 was developed and estimated to formally identify and test the statistical significance of the determinants of inorganic fertilisers use in the HHs to achieve greater insight into local dynamics related to technology use.

Table 5.6: Definition of variables for assessing the determinants of fertilisers use

Variable	Expected sign	Variable description
Gender of household head	+	Dummy male-headed household = 1
Age of household head	?	Age in years
Have formal education	+	Dummy, favourable response = 1
Have access to extension	+	Dummy, favourable response = 1
Borrowed from formal source	+	Dummy, favourable response = 1
Distance to the nearest market	-	Walking distance in minutes
Cropland size per adult equivalent	-	Cropland (ha) / consumption unit
Livestock ownership	+	In tropical livestock unit
Grow chat for market (chat covers at least 10% of cropland)	+	Dummy, favourable response = 1
Participate in off/non farm activities	?	Dummy, favourable response = 1
Income from crop sale	+	Gross income

The first model (Table 5.7a) was estimated to test the direction and strength of the relationship between access to cropland and inorganic fertilisers use, in line with the objective of the study, alongside the other conventional explanatory variables in adoption studies related to personal traits, institutional and socio-economic factors. Cropland holding size per adult equivalent, instead of just cropland holding size, was chosen as it is used in the study as a proxy indicator of population pressure at household level. Growing chat was included as a dummy variable to achieve more insight into the impact of increasing chat-based commercialisation in the area on the adoption of technologies, in this case, chemical fertilisers. The parameter estimates are set out in Table 5.7a.

Table 5.7 a: Logistic regression estimates of the determinants of the adoption of chemical fertilisers in the HHs

	B	Wald	Sig.
Gender of head	1.039	3.927	.048
Age of head	-.034	3.762	.052
Has formal education	.034	.005	.946
Has access to extension	1.757	6.959	.008
Has access to formal credit	8.484	.153	.696
Distance to the nearest daily market	-.049	4.752.	.029
Cropland size per adult equivalent	-1.847	.958	.328
Grows chat	2.050	18.961	000
Tropical livestock unit	.006	.002	.967
Participate in off-farm and/or non-farm	-2.050	14.854	000
Constant	1.08	.75	.386
-2 log likelihood	142.282		
Adopters correctly classified	88%		
Non-adopters correctly classified	79.2%		
Hosmer and Lemeshow goodness of fit test (x^2) = 10.985 Significant at 0.203			

Source: Own data and analysis

An alternative model (Table 5.7b) was also estimated with two objectives in mind. In the first place, the sheer quantity of resources such as land does not indicate anything about quality. For example, a farmer with half a hectare of fertile and irrigated land can be much better-off than another farmer with a hectare of infertile land that is not irrigated. The revenue a factor of production generates may be a better index of quality in such circumstances. Using revenue generated by different enterprises for the estimation provides further insight concerning which income

source(s) is (are) more likely to be invested in land productivity-enhancing technologies. An estimation of the alternative model also emerged from an attempt to build a model with better predictive power.

Table 5.7b: Logistic regression estimates of the determinants of the adoption of chemical fertilisers in the HHs (alternative model)

	B	Wald	Sig.
Gender of head	.835	2.119	.146
Age of head (year)	-.031	2.416	.120
Has formal education	.065	.013	.910
Has access to extension	1.322	3.39	.066
Has access to formal credit	8.717	.193	.661
Distance to the nearest daily market	-.062	5.15	.023
Income from grain sale	.002	1.712	.191
Cash crop income	.002	19.879	.000
Income from livestock	.000	.205	.651
Participate in off-farm and/or non-farm	-.931	2.689	.101
Constant	-.042	.001	.977
-2 log likelihood	106.016		
Adopters correctly classified	84%		
Non-adopters correctly classified	92.2%		
Hosmer and lemeshow goodness of fit test (x^2) = 5.398 Significant at 0.714			

Source: own data and analysis

All the variables included in both models have expected signs. Although the level of significance for some variables and the predictive power of the two models are not the same, all the variables found to be significant in Model 5.7a are also significant in the alternative Model 5.7b, indicating similar conclusions about the determinants of chemical fertilizers adoption decisions. The goodness of fit of the models, as measured by the percentage of original grouped cases correctly predicted exceed 80%, and the Hosmer and Lemeshow's goodness of fit tests showed that both models fit the actual observation reasonably well.

The results of the analysis showed a tendency for an inverse relationship between population densities at household level, as measured by cultivated land per adult equivalent, and the decision to use fertilisers. At first glance, this result seems to support the Boserupian hypothesis when intensification, as in this case, means increased capital expenditure per unit of cropland. The fact that the average cultivated area per household in Sabale is less than that in the Kuni area, but that the

percentage of farmers using fertilisers and rate of its application in Sabale is twice as high as that in Kuni, makes the result robust. However, the relation is not significant enough to draw any solid conclusion as to whether the Boserup hypothesis holds up in the context of the study area.

Many other adoption studies have found a positive and significant or an insignificant relationship between cultivated land size and the adoption of technology. Emana (2000) found a positive, but insignificant relationship between holding size and adoption, as well as the intensity of the use of chemical fertilisers. In the same study, the relationship between the adoption of improved seed and cultivated land size was positive and significant for improved maize varieties, but negative and significant for improved sorghum variety. Alene *et al.,* (2000) also reported a positive and significant relation between the adoption of improved maize varieties and the area of cultivated land in the Western Ethiopian Highlands settings with different farming systems. It is not clear whether the conclusions of these studies would still hold if cropland area per adult equivalent were used, instead of cultivated area, controlling for multicolinearity, given the fact that family size and landholding size are highly and positively correlated in Ethiopia, due to periodic land redistribution according to family size.

The findings concerning a positive and highly significant effect of the increasing chat-based commercialisation in the HHs on the adoption as well as on the intensity of the use of chemical fertilisers is clear and solid, both at the household and community levels (see Table 5.6, Table 5.7a and Table 5.7b). Proximity to the nearest daily market, the other commercialization-related variable, as measured by walking distance (in minutes), has a negative and significant influence on adoption decisions. The probability of fertilisers use decreases with increasing distance from the market.

All the other significant variables made the theoretically expected contribution in explaining adoption behaviour. Access to extension services is positively and strongly correlated with the use inorganic fertilisers. The negative sign of participation in non-farm and off-farm activities probably shows the participating households' liquidity constraints or limited ability to bear the risks associated with technology

adoption, as a result of their extreme poverty. This issue is explored in detail in the subsequent sections dealing with rural livelihood diversification.

The role of proceeds from grain sales in the adoption of chemical fertilizers, though positive, is only marginally significant. The results seem to contradict the assumption of the MoA that farmers pay back fertilisers loans by selling the additional grain obtained as a result of their adoption of the technology. A survey at the national level has revealed that of the farm households who used fertiliser technology, more than 44% used it to produce extra grain for consumption and paid fertilisers credit from the sale of cash crops, high value grains such as teff, livestock and labour income (Shank, 1996). The later findings support the results of the current analysis and throw some light on the important role that the commercialisation of smallhoder production could play in accelerating the adoption of grain technologies.

5.4 LIVELIHOOD DIVERSIFICATION

Agricultural land is already over congested in the HHs. The size of the pieces of arable land cultivated by most of the households (72%) has diminished far below the estimated minimum size required for subsistence. Of course, there is undoubtedly unexploited potential to increase land productivity substantially and thereby improve the living standards of those trapped in subsistence farming, given the current disappointingly low level of land productivity. Nevertheless, realistically the hope that farming will continue to absorb the fast growing rural labour force in the HHs without further serious ecological damage seems unlikely to be realised.

Experience elsewhere in SSA has shown that off-farm and non-farm activities provide supplementary or alternative employment and income where the scenario of reduced access to land and declining farm sizes prevails. Hence, off-farm/non-farm employment can potentially play a significant role in rural poverty alleviation. The available empirical evidence shows that activity and income diversification is central to rural livelihoods in SSA (Barrett, Reardon and Webb, 2001) and that off-farm/non-farm employment already accounts for 40% to 45% of the average income of African rural households, with increasing importance over-time (Bryceson and Jamal, 1997; Reardon, 1997). Nonetheless, land scarcity is by no means the only reason for rural livelihood diversification, as was discussed at length earlier (see Chapter 2).

This second section of Chapter 5 investigates rural livelihood diversification strategies and endeavours to establish empirically the determinants of livelihood diversification into off-farm and non-farm activities in the HHs, with special attention to declining access to agricultural land and differential asset endowments. A livelihood activities composition analysis and an income portfolios analysis have been carried out using simple descriptive statistics. In the descriptive analysis, the livelihoods survey data has been disaggregated by household type and by site in order to capture the roles of these variables in explaining diversity in livelihood activities and income diversification strategies. Finally, a logistic regression model was developed and estimated to assess household level determinants of rural livelihood diversification into off-farm and non-farm activities and the role of population pressure in this process.

5.4.1 COMPOSITION OF LIVELIHOOD ACTIVITIES

Activities are the particular uses to which productive assets are put (Barrett and Reardon, 2000:11). The activities performed by rural households can be categorised in different ways. One method of grouping them is to decide whether activities use natural resources as input or not (Ashley and Carney, 1999). Natural resource-based activities include farming (growing crops and rearing livestock for subsistence and/or for the market), collection of items such as fuelwood and fruit, rural to rural migration in search of better grazing or cropland, and other natural resource-based non-farm activities such as timber making. Non- natural resource-based activities include trade, services, manufacturing, remittance and other transfers. Livelihood activities can also be categorised by sector (farm vs non-farm), by function (wage vs self-employment), and by space (local vs migratory) (Barrett and Reardon, 2000).

Rural households in the HHs participate in a number of activities other than crop production for consumption and sale. An analysis of the survey data identified livestock and many off-farm/non-farm activities in which households have been engaged.

- *Livestock-rearing activities*

Almost all the households (95%) participate in livestock-rearing activity. Most of the poorest households keep only a couple of chickens, one goat or none, but are considered to be participants in livestock-rearing activity in the analysis, thus inflating the rate of participation. The percentage is misleading, as it implies that this activity is equally accessible to the different categories of households (unless the data is disaggregated by the type of livestock kept to see whether there is any entry barrier as reflected by the extent of participation). The problem is resolved in Table 5.8, by incorporating the intensity of participation as measured by the type and the numbers of livestock kept by households.

The results in Table 5.8 show that poor households participate less intensively than the other two groups in livestock-rearing activity, particularly with regard to the large ruminants. There is a direct correlation between the extent of participation in livestock activity and wealth. Capital constraints are the most frequently mentioned problem used to explain households' involvement livestock production after the animal feed problem. This probably confirms that the participation of the poor in livestock-rearing activities is inhibited by a lack of own capital and the non-existence of an ability to access formal credit to invest in the livestock activity by the resource-poor households.

Table 5.8: The rate of participation in livestock-rearing activities, by types of household

Activity	Poor	Less Poor	Better-off
Oxen/bull kept			
0 – 0.5*	83.4%	0%	0%
1 – 1.5	16.7%	53.6%	47.7%
2.00 – 5	0%	7.2%	38.7%
Cow/heifer			
0 – 0.5	40.5%	4.3%	0%
1 – 1.5	50%	55.1%	15.9%
2 – 7	9.6%	40.5%	84.1%
Goats/sheep			
0	73.8%	60.9%	52.3%
1 – 2	16.6%	23.2%	25%
3 and above	9.6%	15.9%	22.8%
Donkey/horse			
0	98.5%	65.2%	36.4%
1-2	1.2%	34.8%	50%
> 2	0%	0%	13.7%

TLU was divided into two when households keep livestock belonged to others and share the benefits.

Source: Own survey

- *Off-farm and non-farm activities*

The off-farm and non-farm activities in which the households engaged mostly as a supplement to insufficient farming income and to a lesser extent as a sole source of livelihood, include labour, trade, food processing, fuelwood and charcoal sales, rural crafts and remittances from migrant household members.

Wage labour is employed for farm activities, the on-farm processing of chat, the processing of chat at collection points (district towns) and the loading and unloading of trucks transporting agricultural produce to the market, and fertilisers and household supplies to rural villages. Women's labour is employed in restaurants in the nearby town on a daily basis for making *injera (Ethiopian pancake)* and local drinks. Employment in the FFW programmes of the GOs and NGOs in soil and water conservation activities are also included under labour.

The chat trade, the grain trade, the livestock trade, rural shop, the second-hand clothes trade and petty trade (the latter exclusively engaged by women), are all included in the trade category. It was later learned that this procedure fails to distinguish between the more remunerative and capital-intensive types of trade activity dominated by the 'haves' and the less remunerative and less capital-intensive types of trade activity such as petty trade, dominated by the 'have-nots'.

Carpentry, metal work, pottery, etc., which are very rare in the study area, are included under rural crafts. The making and selling of *injera*, local drinks and cooked maize, sweet potatoes, eggs, etc. are classified under food processing. Remittances, as one way of livelihood diversification, are treated both as an activity (expressed as a percentage of households received in kind and/or as cash remittances from immigrant members) here, and as income in the income portfolios analysis in the next subsection.

Table 5.9a: Participation in off-farm/non-farm activities in the HHs, by types of household (expressed as percentage of participants)

Activity	Poor	Less poor	Better-off	Total
Labour	41.05%	33.96%	23.3%	35.96%
Trade	24.21%	39.62%	40%	31.46%
Food processing	16.84%	9.43%	3.33%	12.36%
Remittance	9.42%	13.21%	26.67%	13.48%
Rural crafts	3.16%	3.77%	3.33%	3.37%
Firewood/charcoal sales	5.26%	0%	0%	3.37%
Does not participate in off-farm/non-farm activities	26.2%	46.4%	52.3%	39.1%

Source: Computed from own survey data

Table 5.9b: Participation in off-farm/non-farm activities in the HHs, by site (percentage of the participant)

Activity	Sabale	Kuni	Alemaya	Total
Labour	46.34%	35.19%	16.67%	35.96%
Trade	20.73%	31.48%	52.38%	31.46%
Food processing	20.73%	9.26%	0%	12.36%
Remittance	7.32%	18.52%	19.05%	13.48%
Rural crafts	3.66%	5.56%	0%	3.37%
Firewood/charcoal sale	1.22%	0%	11.9%	3.37%
Does not participate in off-farm/non-farm activities	16.9%	35.8%	59.5%	39.1%

Source: Computed from own survey data

Quite a significant proportion (60%) of the households in the study participate in the different off-farm/non-farm activities. Wage labour and trade provide most of the employment opportunities, whereas rural crafts and fuelwood and charcoal sales are the least important in the diversification of livelihood activities. As discussed earlier, diminishing forest resources as a result of unwise exploitation, concomitant with the fast population growth and the ineffective land policy of the country, explain the reduced importance of charcoal and fuelwood sales as an alternative source of rural livelihoods. The decreased importance of rural crafts can probably be associated with the low intensification level of farming in the study area and the weak backward linkages between the farm and the non-farm sectors. The availability of cheap synthetic household goods from the urban manufacturing sector and/or imports such as plastic products and the past regimes' land policies that intentionally discouraged diversification in rural livelihoods might have played a role as well.

Box 5.4 a: Why do poor households diversify their livelihoods?

Mrs Sinke Beyene heads a household in Sabale. The household has 0.64 ha of cropland and has no livestock except for four goats. She had to sell an ox to cover costs of the hospitalization of her husband before his death. After her husband died, she sold the only remaining ox for his 'kurban' (a religious feast in memory of the dead). Then, she sold a cow the next year to buy grain for her family, as the harvest of the season was very poor. At the time of the survey, Sinke's two sons were involved in the FFW programme from which they obtained 175 kg of wheat and 10 kg of cooking oil. Sinke, usually travels to the nearby town (about six km) on foot to make 'injera' and the local alcoholic drink 'arake' for restaurants. With the money she gets, she buys grain or injera at the end of the day for daily consumption. She also participates in some petty trade from which she makes about 180 birr.

Source: Own field interview and informal discussion

Table 5.9a and Table 5.9b show another interesting dimension of rural livelihoods, namely, diversity across sites and among different household types. The rate of participation in wage labour is higher among poor households and among sites with a higher proportion of poor households. Alemaya is the better-off site with highly intensive farming where the labour demand is high (43% of the households used hired labour in 2001/2002); yet the labour comes from the neighbouring, less developed districts. This may imply that participation in wage labour is unattractive and that those engaged in it are mainly drawn into it by poverty. In other words, the opportunities cost of labour employed in faming is high in more commercialised villages.

The rate of participation in a more remunerative trade, which needs start-up capital, human capital and in some cases social capital, is relatively higher among the better-off households and at the better-off site. This picture would have been clearer had petty trade, a less remunerative type of trade exclusively practised by women either from female-headed or poor households, been categorized separately from the other types of remunerative trade such as the chat trade, rural shops and the livestock trade. Farm households in Alemaya participate more in the later remunerative trade activities than the other two sites. The availability of cheap labour, which can be hired for peak season farming activities, facilitates the process. In this case, one may argue that non-farm /off-farm activities are practised more as an asset accumulation strategy than as a survival strategy (Box 5.4b).

The situation regarding remittances is not very different (Box 5.4b). Better-off households often foster the sons of their poor neighbours or relatives to serve as shepherds, have the ability to hire additional labour during the peak season in case of labour shortage or organize *guuza*. Thus, the better-off can afford to invest in their children's education as a long-term livelihood diversification strategy. Better-off households also have better social networks to further their economic interests by the migration of some of their members to nearby towns, and regions, or even to abroad. Thus, the latter earn more remittances than their poor counterpart. The observation (by sites) follows a more or less similar pattern.

Box 5.4b: Why do better-off households diversify their livelihoods?

Mr Abduselam is 42, married and lives with his other two married brothers in Alemaya. The household owns 12.7 TLU, two pumps and 3.5 ha of land. The household earned 5,500 birr by selling surplus grain, 30, 000 birr from vegetable sales and 3000 birr from chat sales. They made another 3000 birr from renting out the pump, 1000 birr from milk sales and 1500 birr from their village shop. Four of the family members (two brothers, a sister and the mother) live in Canada as migrants. This household could always get cash remittances on request from the migrant members. During the survey season 2001/2002, it received 3000 birr in cash. The household also indicated a plan to get a loan from the bank to buy a truck to get involved in transport services as commercialisation is in the making in the area.

Source: Own field interview and informal discussions

5.4.2 INCOME PORTFOLIOS

The stream of activities leads to a stream of benefits, in other words, livelihood outcomes. Livelihood outcomes consist of increased income, improved food security, reduced vulnerability to shocks, stress or seasonality, and sustainable use of local natural resources (Ashley and Carney, 1999). Conversely, unsuccessful livelihood strategies could lead to outcomes that are the obverse of the former, such as, reduced income, food insecurity, increased vulnerability and unsustainable NRM.

This section deals with the income dimension of farm households' livelihood diversification. Income at a given point in time is commonly considered the most direct and measurable outcome of the livelihood process (Ellis, 2000), although

conceptually the benefit could be much broader than just income in cash and in kind (Barrett and Reardon, 2000). Barrett *et al.* (2000:10) classify income sources of rural households into the following:

- retained output for own consumption; food crop sales (sales of cereals, pulses and tubers produced by the household);
- cash crop sales;
- proceeds from sales of livestock and unprocessed animal products (eggs, milk and honey); and
- off-farm and non-farm income (unskilled labour for wages or a salary and income from trade, commerce or skilled labour employment).

The average estimated total annual income of the households in the HHs as a whole is 4042.9 birr or about 856.5 birr per adult equivalent. Alemaya has the highest average annual income of about 6562 birr or 1228 birr per adult equivalent, while Kuni has the lowest average annual income of about 2338.4 birr or 523.8 birr per adult equivalent. Cash crops account for 34% of the annual income of these households, followed by a retained output for consumption that contributes 28%. Surprisingly, off-farm/non-farm income accounts for 20% of the annual income, more than the income from livestock and grain sales, which, respectively, contribute 15% and 3% of the average annual income of the households. The low level of income from grain sales confirms that there is limited surplus grain production for the markets in the HHs.

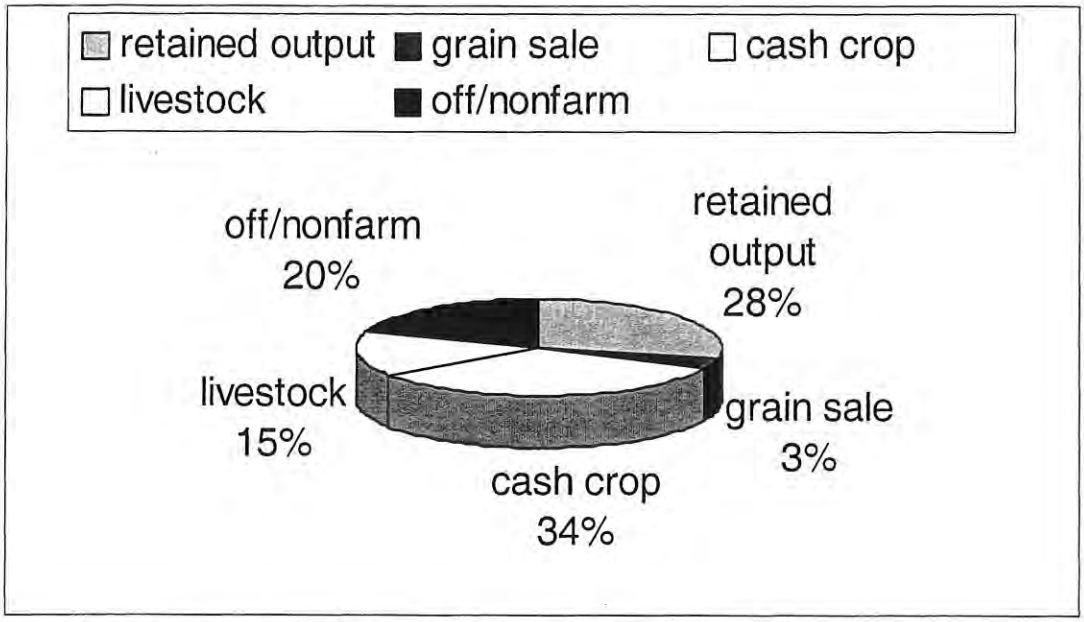


Figure 5.3: Mean household income portfolio, all sites

Source: Computed from own survey data

A number of interesting observations can be drawn from the income portfolios analysis (Table 5.10a and Table 5.10b) by site and by household types with regard to livelihood diversification behaviour. Off-farm and non-farm income is more important for the poor households and at the sites where cash crops contribute less to livelihood. The poor earn approximately the same proportion of income from subsistence crops, cash crops and off-farm/non-farm activities. Cash crop income is more important for better-off households and the better-off site. The revenue generated from chat sales accounts for 28.7% of the average annual income of these households and about 85% of cash crop income. This makes chat the single most important cash crop in the study area.

The households in Sabale earn a disproportionately higher cash income from livestock, because they tend to sell more milk to purchase grain and consume less, unlike at the other sites and the better-off households. Whether the general tendency of increasing sales of milk in pre-urban areas has a negative effect on children's nutrition is not known. However, women normally control the cash income from the sale of milk and milk products. The later may increase the probability that the cash obtained from milk sales is spent on children's welfare.

Table 5.10a: Mean household income portfolios, by types of household (as a proportion of the total income which is = 1.00)

Income source	Poor	Less poor	Better-off	Total
1. Crop total	0.594	0.681	0.725	0.653
-retained output	0.304	0.273	0.262	0.284
- grain sale	0.025	0.046	0.033	0.034
- cash crop of which chat	0.265 *0.248*	0.362 *0.289*	0.429 *0.361*	0.335 *0.287*
2. Livestock	0.115	0.173	0.161	0.145
3. Off/non-farm	0.290	0.146	0.114	0.201

Source: Own survey and computation

Table 5.10b: Mean household income portfolios, by sites (proportion of the total income which is = 1.00)

Income source	Sabale	Kuni	Alemaya	Total
1. Crop total	0.597	0.493	0.812	0.653
-retained output	0.273	0.315	0.271	0.284
- grain sale	0.027	0.030	0.043	0.034
-cash crop of which chat	0.296 *0.286*	0.148 *0.114*	0.498 *0.407*	0.335 *0.287*
2. Livestock	0.201	0.157	0.091	0.145
3. Off/non-farm	0.203	0.350	0.096	0.201

Source: Own survey and computation

In line with Ellis (2000b), diversity indices were estimated in an attempt to come up with summary statistics that simultaneously account for both income shares and participation shares. The inverse of the market concentration index, also known as Herfindahl-Hirschman index (Chang, 1997, cited in Ellis, 2000), in this case a diversification index, was used to the calculate diversity index for each household and the statistics were then summarised by household type and by site, using the mean and the standard deviation. Mathematically, the inverse market concentration index can be expressed as follows:

$$IMCI = \frac{1}{\sum_{I=1}^{n} Xi^2}$$

where IMCI = the inverse of Herfindahl-Hirschman index

Xi^2 = the square of proportional contribution to total income of each activity.

The diversification index summarised in Table 5.11 generally indicates that Sabale has more diverse sources of employment and income, and that less-poor households tend to have more diverse sources of income than the poor households. Unfortunately, the result does not give a concrete indication of the relationship

between the extent of diversification and poverty (Table 5.12) due to the high standard deviation. Further analysis is needed in order to draw concrete conclusions. The next subsection addresses this issue.

Table 5.11: Mean diversification indices, by site and types of household

	Poor	Less poor	Better-off
Mean index value	2.62	2.92	2.65
Std. Deviation	0.81	0.77	0.77
	Sabale	Kuni	Alemaya
Mean index value	3.11	2.57	2.52
Std. Deviation	0.74	0.78	0.72

Source: Own survey and computation

5.4.3 DETERMINANTS OF DIVERSIFICATION

The descriptive sections on the composition of livelihood activities as well as income portfolio analyses have already indicated some of the determinants of diversification into the off-farm and non-farm sector. The analyses so far seem to suggest that the poorer and the less commercialised households participate in and earn disproportionately from off-farm and non-farm activities than the less-poor and the more commercialised households. A binary logistic regression model was developed and estimated in order to examine the relative importance of these and the other pertinent variables rigorously and, most importantly, to determine empirically the role that population pressure, as measured by cropland area per adult equivalent, plays in the decision to participate in off-farm and non-farm activities. Table 5.12a specifies the parameters used for modeling the diversification behaviour of the households.

Table 5.12a: Definition of variables for assessing the determinants of participation in off-farm/non-farm activities

Variable	Expected sign	Variable description
Age of household head	?	Age in years
Education of head	+	Years of schooling
Adult male in household	+	Number
Adult female in household	+	Number
Livestock ownership	-	In tropical livestock unit
Cropland area per adult equivalent	-	Cropland (ha) / consumption unit
Distance to the nearest market	-	Walking distance in minutes
Cash crop income	-	As a ratio of total income
Level of food self-sufficiency	-	Scale 1 = self-insufficient 5 = produce surplus

Table 5.12 b displays estimates of the coefficients and level of significance of the determinants of involvement of the households in the HHs in off-farm and non-farm activities. The prediction power of the model is high and the model fits the actual observations reasonably well.

Table 5. 12b: Logistic regression estimation of the determinants of diversification into off-farm and non-farm activities in the HHs

Variable	B	S.E.	Wald	Sig.
Age of household head	-.009	.018	.262	.609
Education of head	.051	.237	.047	.829
Adult male	.448	.252	3.149	.076
Adult female	-.053	.271	.038	.845
Cropland area per adult equivalent	-7.000	2.166	10.440	.001
Livestock ownership	-.170	.148	1.321	.250
Distance to the nearest market	-.031	.020	2.411	.120
Cash crop income	-4.710	.994	22.440	.000
Level of self-sufficiency	-.451	.203	4.913	.027
Constant	6.073	1.330	20.866	.000
Percentage of correct prediction	78.4			
Hosmer and Lemeshow test	X =7.204	Df	8	0.515
- 2 Log likelihood	163.551			

Source: Own data and analysis

The results indicate that insufficient cropland holding per adult equivalent, food self-insufficiency and low revenue from sales of the cash crops are the main variables that significantly explain households' involvement in off-farm/non-farm sector. The number of adult males in a household is positively and significantly associated with participation in off-farm and non-farm activities, probably due to gender diversity in access to and the ability to participate in off-farm and non-farm activities. The distance to the nearest market is another variable found to be important in explaining the diversification behaviour of the households, at a 12% level of significance. Perhaps, these results indicate that the physical distance from the nearest market can be a barrier to participation in off-farm and non-farm activities. The other non-significant variables have theoretically expected signs.

In conclusion, although different households pursue different diversification strategies for a variety of reasons, the results of the logit analysis generally support the hypothesis that rural households in the HHs pursue livelihood diversification strategies more as a survival strategy than as an accumulation strategy.

5.5 DEMOGRAPHIC BEHAVIOUR OF RURAL HOUSEHOLDS

This third and final section of the analysis of rural livelihoods is concerned with the demographic aspects of rural livelihood strategies. Population growth influences the amount and quality of livelihood assets. An increase in the population of a country, a region or a particular village increases the labour force available, decreases the availability of agricultural land and increases the demand for food and non-food products. Nonetheless, the direction of influence could also run from livelihood assets to demographic change. The demand for more children is high as a means to expand own control over part of the common property regimes by 'capturing' (Panayotou, 1994) in situations where natural resources are abundant and access is open. Conversely, the demand for child labour could decrease and the cost of ringing up children could increase with reduced access to natural resources in general, and arable land in particular, if there is an increasing man-land ratio. The later reduces households' incentive for large families or for having many children.

Delayed marriage, migration and an attempt to control fertility by limiting births within marriage are other aspects of rural livelihood strategies in the context of population pressure. Thus, this section assesses the migration and fertility situation in the HHs. The section does not focus on migration, since its role in the livelihood strategies of rural households in the HHs is limited. Instead, the next subsection, dealing with migration, only provides some statistical evidence on the migration situation and briefly discusses the reasons for the generally low level of both rural-rural and rural-urban migration in Ethiopia. Subsection 5.5.2 forms the core of the section. The later sub-section rigorously explores the relationship between family size preference or achieved/intended fertility and access to cropland along with the other pertinent socio-economic and socio-cultural variables. In other words, it endeavours to establish whether and to what extent the demand for children and households' perceptions regarding the advantages of having large family sizes or many children have been changed given the increasing land-man ratio.

5.5.1 MIGRATION

Autonomous rural-rural or rural-urban migration in search of pasture, more productive cropland and off-farm/non-farm employment is a common demographic phenomenon across SSA. The situation in Ethiopia during the last three decades, including the HHs, has probably been exceptional in this regard. The only exception is the lowlands, where the pastoral system predominates and mobility is central to survival, and the politically motivated involuntary resettlement programmes of the previous government and massive population displacement in some parts of the country due to conflict or political instability.

According to the rural livelihoods' survey results, about 13.5% of the sample households had at least one migrant member. The figure is comparable with the national figure of 13% (CSA, 1994, cited in Degefa and Nega, 2000). Employment, marriage, education and family separation, in that order, are identified as the main reasons for a change of place of residence. It also seems as if the tendency to migrate is high in relatively less intensive and less commercialised farming area, such as Kuni. However, members of better-off households tend to migrate more within the same site. In terms of gender and age group, young males tend to migrate more than young females in the HHs, although the reverse is true at the national level, according to the 1994 census (cited in Degefa and Nega, 2000).

Table 5.13 reflects is surprisingly different figure from that of the reported livelihoods survey results and field observations. One possible explanation is that the CARE-Ethiopia baseline survey has underestimated the level of migration, despite its large sample size, probably because a narrower definition of migration was adopted. The alternative explanation might be that the migration situation of the region has changed since the CARE-Ehiopia 1995 survey, although it is hard to believe that it has changed to such an extent. Nevertheless, the CARE-Ethiopia survey provides important supplementary information regarding the generally low level of migration and indicates that rural-rural migration predominates over other types of migration and that the need to earn some additional income is the dominant motive for migration. The later finding confirms the results of the current survey.

Table 5.13: Migration situation in Hararghe

Variables	Chiro		Kuni		Hararghe region	
	Cases	Percent	Cases	Percent	Cases	Percent
Migration	468	100	184	100	881	100
- occurred	20	4.2	4	2.2	44	5
- not occurred	437	93.4	172	93.5	810	91.9
- not reported	11	2.4	8	4.3	27	3.1
Who migrated?	20	100	4	100	44	100
- family	4	20	1	25	8	18.2
- head of HH	5	25	2	50	15	34.1
- elder son	9	45	1	25	12	27.3
- wife and daughter	1	5	0	0	7	15.9
- relatives	1	5	0	0	2	4.5
Where did they migrated to?	20	100	4	100	44	100
- neighbouring PAs.	2	10	1	25	8	18..2
- neighbouring district	13	65	1	50	25	56.8
- nearest town	2	10	2	25	6	13.6
- outside the region	2	10	0	0	4	9.1
- unknown	1	5	0	0	1	2.3
Why did they migrate?	19	100	4	100	35	100
- additional income	12	63.2	2	50	22	62.9
- pasture and water	1	5.3	1	25	3	8.6
- drought	3	15.8	0	0	4	11.4
- conflict	3	15.8	1	25	6	17.1

Source: CARE- Ethiopia, 1995

Why has the level or the rate of migration remained very low in the HHs in particular, and in the country in general? There are a host of reasons for this. First, as indicated elsewhere in the thesis, the previous government deliberately discouraged rural-urban and rural-rural migration through its land policy until the early 1990s (Box 5.5). The periodic land redistribution by PAs until the late 1980s provided cropland to everyone who was willing and able to cultivate it personally, a measure that eliminated landlessness, one of the most frequently cited reasons for rural-urban migration in SSA. The same policy also restricted access to cropland within one's own residential area, a PA. The later measure is believed to have discouraged rural-rural migration.

Box 5.5: Deliberate restrictions on free labour movement in Ethiopia

Ethiopia illustrates an extreme case of the desire to control population movements. It is a very large country with remote areas and a predominantly subsistence rural economy. However, from the overthrow of Selassie and the socialist revolution in 1974, up the 1990s, the dominant ideology and planning aimed to control population movement, including in the countryside. During this period 'voluntary' migration was much lower in Ethiopia than in the rest of Sub-Saharan Africa, and it was not until the recent lifting of restrictions that migration was made easier. But at the same time, 'involuntary' politically-induced population displacement and resettlement occurred on an unprecedented scale and led to enormous population shifts, largely within rural areas.

Source: *McDowell and de Haan, 1997*

Although the restriction on the free movement of labour has been lifted, the heightened ethnic politics in the country and associated administrative barriers have replaced the previous policy bottlenecks for environmentally sound spatial distribution of the rural population since the demise of the previous government in 1992 (Devereux, 2000).

Also, generally, there are limited employment opportunities in Ethiopia outside subsistence farming, due to the expropriation of emerging private commercial farms after the 1975 land reform and their subsequent conversion to subsistence farms or highly mechanized state farms. The manufacturing sector is neither well developed nor sufficiently labour-intensive to provide sufficient employment opportunities for a growing and relatively more educated urban labour force, let alone less educated rural migrants.

Human and animal diseases such as tse tse fly and malaria and the need for public provision of basic economic and social infrastructure have hindered migration from the densely populated and degraded highlands to the lowlands. It was precisely for this reason, among others, that the previous regime's resettlement programmes failed in the HHs, despite some good intentions.

5.5.2 HOUSEHOLDS' SIZE AND FERTILITY PREFERENCE

Has the increasing scarcity of natural resources, particularly of agricultural land, changed households' demand for children or their preference for large family sizes in

the HHs? The answer is not straightforward. It is common practice to study the effect of population growth on natural resources. Nevertheless, influence could also run in the opposite direction, from natural resource scarcity to population growth. Still, the final result of the interaction is not known.

On the one hand, the diminishing landholding size under population pressure is expected to increase the cost of bringing up children and to decrease the demand for child labour in farming activities. These factors, taken together, are theoretically expected to reduce the incentive for large family sizes or for the maintenance of high fertility rates. On the other hand, the increasing scarcity of natural resources such as water, fuelwood or animal feed increases the demand for child labour, particularly daughters, in the absence of alternative sources of cheap labour, and with a high infant mortality rate, especially if people have to travel a long distance to collect fuelwood, fodder and to fetch water. This could increase fertility further, and thereby increasing the pressure on the local natural resource base (Cleaver and Schreiber, 1994; Dasgupta, 2000).

5.5.2.1 The Demand for Children

It is apparent from the above introductory remarks that understanding the role of child labour in the rural economy of the study area is a good starting point in a fertility analysis, although the economics of the demand for and the supply of child labourn is not necessarily expected to be the only factordictate rural households' reproductive choices.

Young children are important sources of labour in the HHs. Herding and scaring away birds and monkeys are the duties of children. Children, particularly daughters, assist their mothers by fetching water, collecting fuelwood and looking after their youngest siblings. The relatively older sons assist their fathers in ploughing, weeding and harvesting activities (Table 5.14a). The labour service obligation of children in the HHs could also be extended to blood relatives, effectively making children a group asset and childbearing a social responsibility (CARE-Ethiopia, 1995b). This type of child rearing cost-sharing, as well as benefits sharing social arrangements, may result in some degree of externalities in fertility decisions.

Table 5.14a: The extent of participation of children in different farming and household activities in Hararghe

Activities in which children participate	Chiro Percentage of respondents	Kuni Percentage of respondents	Hararghe region Percentage of respondents
Herding	61.5	53.2	61
Scaring away birds	35.7	37.2	36.4
Fetching water	23.3	21.7	22.3
Collecting fuelwood collection	18.5	15.6	17.3
Weeding	18	13	16.5
Harvesting	15.4	12.8	14.6
Ploughing	14.1	12.8	14

Source: CARE-Ethiopia (1995b)

The information generated by the CARE-Ethiopia survey (5.14a) is a bit outdated ,although one would not realistically expect a significant change in the demographic situation of the region within less than a decade. In fact, as Table 5.14b shows, the majority of the households still hold positive perceptions about the importance of the labour provided by their children. About 25% and 66% of the sample households, respectively, perceive their children's labour as 'very valuable' and 'valuable'. Only 8.9% of the households perceive their children's labour service as less valuable. This simple descriptive summary of the households' perceptions seems to indicate that the better-off households and the relatively better-off site, Alemaya, value children's labour services more. The later findingscan be explained by the level of the intensification of farming that determines the level of the demand for labour for farming activities.

Table 5.14b: Parents' perceptions of the value of their children's labour services in the HHs

	Not valuable	Valuable	Very valuable
Sabale	13.8%	79.3%	6.9%
Kuni	13.8%	51.7%	34.5%
Alemaya	2.9%	61.4%	35.7%
Poor	15.9%	58.7%	25.4%
Less poor	5.5%	74.5%	20%
Better-off	2.6%	66.7%	30.8%
Average	8.9%	66.2%	24.8%

Source: Own survey data

Nonetheless, the demand for children's labour services is expected to decrease and the cost of raising children to increase in the HHs in the near future, due to the tiny land sizes, the improving provision of safe potable water in nearby villages, the change of the grazing system from free grazing to stall-feeding, the deepening

poverty in environmentally fragile villages and the increasing enrolment of children in schools

Another underlying reason for rural households' preference for having large family sizes or many children may be the need for insurance for old age, particularly in circumstances of 'missing' or 'thin' capital and insurance markets or government pension plans as is the case in Ethiopia. Information was collected to get some insight into households' perception of the value of their children as a source of support for old age. Summary of the results of the survey is set out in Table 5.15a and Table 5.15 b.

Table 5.15a: Parents' perceptions of the value of their children as a source of old age support, by types of household

Old age expectation of source of support	Poor	Less poor	Better-off
Children	66.5%	25%	9.4%
Perennial crop	38.6%	38.6%	26.6%
Both children and perennial crop	35.4%	38%	26.6%
Others	28.6%	28.6%	42.9%

Source: Own survey data

Table 5.15b: Parents' perceptions of the value of their children as a source of old age support, by site

Expectation of sources of support for old age	Sabale	Kuni	Alemaya
Children	43.8%	31.3%	25%
Perennial crop	75%	15.9%	9.15%
Both children and perennial crop	17.7%	13.9%	68.4%
Others	36.7%	19.5%	43.8%

Source: Own survey data

The results show that the insurance value of children is given more weight in the absence of other resources or means as substitutes. The poor seem to rely more on their children for old age support, whereas quite a substantial proportion of the better-off households (42.9%) mentioned other sources of old age support. Included in the latter are building and renting houses, moving to town to start business, opening rural shop and leasing land. It seems as if the 'old age insurance argument' is weak in terms of its ability to explain the better-off households' demand for children, although the reverse seems true for the resource-poor. The observation across the sites (Table 5.15b) follows the same pattern.

The other noteworthy finding is the value of perennial crops, mainly chat and, to a lesser degree, eucalyptus trees, as old age insurance, despite the insecure and uncertain right to land, which is theoretically expected to discourage such long-term investment. Perennial crops, particularly chat, further serve as an important means of intergenerational transfers of wealth in the area, substituting for or supplementing the dwindling livestock resources which have traditionally been the preferred means of accumulation.

Furthermore, the weakening or total break down of the traditional community-based support system and deepening poverty could also increase reliance by parents on their children as support for their old age. According to a study conducted in the Habro District, adjacent to the Kuni District, numerous traditional welfare organisations, such as *Afosha* and *Zaka,* that used to cater for the social and economic needs of the community, including assisting the sick, looking after orphans and providing burial services to bereaved families were already disappearing with the secular decline in the livelihoods of households in the early 1990s (Diriba, 1994). Confirming Diriba's observation, an elder in the Kuni area indicated that the traditional community-based support system was on the verge of breakdown under the prevailing situation of deepening poverty, and due to increasing vulnerability to recurrent drought (Box 5.6).

Box 5.6: Weakening community-based support systems

Today everyone is poor and/ or getting poorer, unlike in the past. Drought occurs more frequently. When drought occurs, it usually hits a larger area.Under these circumstances, it is hardly possible during a time of hardship to borrow any grain or money, let al.one expect support, either from one's neighbours or relatives living far from the village. Maybe those who have educated sons or daughters working for the government in towns face fewer serious problems than others.

Source: Own field interviews and group discussions

5.5.2.2 Status of Women and the Family System

Women play an important role in the HHs in all aspects of rural livelihood activities and in ensuring food security of the households. They are responsible for household

chores and feeding animals, especially cows and small ruminants. They occasionally assist in harvesting when there is a labour scarcity (Storck et al., 1990). Marketing dairy products, vegetables and chat in small quantities fall within the women's domain, although men carry out the marketing of chat and perishables in large quantities. The women also participate in different off-farm and non-farm activities, mainly in ones related to trade. Despite their crucial role in household livelihood, women have virtually no decision-making power in the HHs.

Hararghe rural families, like families elsewhere in Ethiopia, are highly patriarchal. Women generally have low status in the family institution and in society at large. The majority of them are uneducated; they are not perceived to own productive resources such as land, livestock, farm implements, etc.; they also do not control income generated by the use of these resources, unless they are *de jure* household heads. Even though they may be consulted, men or husbands dominate decision-making pertaining to every aspect of rural livelihoods, including reproductive choice.

Polygamy is culturally acceptable among the Hararghe Muslim community. A man can have more than one wife, as long as he believes he has the capacity to support a large family. Polygamy is less acceptable, although not impossible, among the Amharas and the Christian Oromo counterparts. Despite this difference, the family system in the HHs in general is such that newly married couples are usually accommodated within existing households. This system encourages early marriage (the estimated average age at first marriage for females is 16.8 years, with a modal value of 16 years in the survey area). The family system also leads to what McNicoll and Cain (1990:18) termed the 'proliferation of households'. Furthermore, the family institution makes newly married women subordinate to other members of the extended family, most importantly to the mothers-in law and the fathers-in-law. Theis means that the wife has to surrender the power of making decisions concerning childbearing not only to her spouse, but also to his father and mother. In short, wives shoulder the burden of bearing and looking after children, while husbands and extended family dominate fertility decisions and benefit disproportionately from the children. The following remark by McNicoll and Cain (1990:19) concerning the role of the family system in fertility decisions is quite relevant: *"The persistence of corporate*

lineage groups permits the diffusion of reproductive costs and sustains the separation of fertility interests of husband and wife, impeding fertility decline."

Interesting disparities between husbands and wives were observed with regard to the desired number of children and decisions regarding contraceptive use. Wives usually set the desired number of children at a lower level than their husbands and were also far less resistant to the idea of contraceptive use than their husbands. During the fieldwork, a limited number of wives were observed using family planning service and obtaining contraceptives provided by a trained local woman in the PA. This was done without the knowledge of their husbands, risking their relationships and social acceptance in their society if caught, as thee past experience of other women has proved.

On the credit side, the practice of breastfeeding (usually for at least two years) in the area and cultural taboos related to sexual practices do contribute to limiting fertility to some extent. There is strict disapproval in the community of premarital sexual exercise, procreation outside wedlock and a failure to respect limited postpartum sexual abstinence. Perhaps, this is one of the most contentious areas in the role of modern education in bringing about a decline in fertility. If modern education is not sensitive to local culture and is accompanied by the erosion of such important cultural taboos, as is already happening in local towns and cities, then its expansion to the rural areas will work against indigenous fertility control. Sex education and improved access to family planning information and contraceptives with an increased level of female education could, however, compensate for the negative effects of the expansion of modern education.

5.5.2.3. Resource Endowments and Demographic Behaviour

The socio-economic and socio-cultural factors of the study area that have potent inducements to maintaining higher fertility rates in the HHs have been identified and discussed. This subsection is concerned with an empirical exploration of whether and to what extent the increasing resource scarcity and the general level of poverty in the study area influences family size preference or fertility decisions.

Age specific fertility rate and total fertility rate are variables commonly used to measure fertility in the population and development literature. Proxy indicators of the achieved and intended fertility levels are favoured in this study, since neither the sampling frame nor the sample size was to enable the researcher to estimate the preferred fertility variables accurately. For the purposes of this study, subjective intended fertility levels, as measured by the number of children a woman of a reproductive age would like to have and current contraceptive use and the intention to use contraception considered sufficient to reflect, respectively, the households' future intention to control fertility within marriage and current deliberate action. The results of the descriptive analysis of differences in demographic characteristics across the sites and among households are summarised in Table 5.16a and Table 5.16a.

Table 5.16a: Differences in the demographic characteristics (mean), by types of household

	Poor	Less-poor	Better-off	Level of sign
Family size	4.92	6.57	8.05	0.000
Children less than 5 years old	1.01	1.23	1.36	0.197
Children 5- 15 years old	1.56	2.49	3.14	0.000
Child-adult ratio	1.10	1.47	1.49	0.013
Child-female adult ratio	2.34	3.11	3.55	0.004
Children alive	3.73	5.09	5.46	0.000
Children died	1.37	1.07	1.56	0.367
Desired number of children	5.44	6.16	7.41	0.001
Heard about family planning	88.2%	94%	91.7%	.386 (x^2)
Have used contraceptive	17.1%	20.3%	11.1%	.508(x^2)
Have intention of using contraceptive	49.3%	46.9%	22.6%	.036(x^2)
Cultivated cropland area (ha)	0.58	0.75	1.15	0.000
Cultivated land per adult equivalent (ha)	0.17	0.17	0.20	0.277
Income per adult equivalent	580	915	1309	0.000

Source: Own data and analysis

There is a general tendency to a significant and inverse relationship between most of the proxy indicators of achieved and intended fertility and the socio-economic category of the households. Wives current contraceptive use and the intention to use are used as indirect measures of their deliberate action to limit family size at present and their intention to do so in future, respectively. The later in turn sheds some light on the link between fertility behaviour and poverty, and that follows the same pattern as the former. Resource-poor households display small family sizes, express a desire to have a lower number of children and they show interest in controlling their fertility more than the better-off households. The current high level of participation and the

intention to participate in family planning by the resource-poor households is a reflection of their interest in keeping their fertility levels low. Differences in demographic characteristics across the sites follow the same pattern. The relatively commercialised site (Alemaya in particular) with a higher level of income also has relatively larger family sizes and a higher level of intended fertility.

Table 5.16b: Differences in the demographic characteristics (mean), by site

	Sabale	Kuni	Alemaya	Level of sign
Family size	5.32	5.66	7.27	.000
Children less than 5 years old	0.85	0.96	1.57	000
Children 5- 15 years old	1.91	1.70	2.87	0.000
Child-adult ratio	1.18	0.9	1.71	0.000
Child-female adult ratio	2.60	1.91	3.79	0.000
Children alive	4.08	4.16	5.29	0.010
Children died	1.26	1.20	1.40	0.799
Desired number of children	5.35	4.83	7.48	0.000
Heard about family planning	94.8%	97.6	84.7%	0.033 (x^2)
Have used contraceptive	12.5%	38.1%	8.2%	0.00(x^2)
Have intention of using contraceptive	60.4%	36.7%	33.3%	0.011(x^2)
Cultivated cropland area (ha)	0.59	0.86	0.85	0.000
Cultivated land per adult equivalent (ha)	0.16	0.21	0.17	0.081
Income per adult equivalent	633	563	1253	0.00

Source: Own data and analysis

The cropland size the households cultivate is positively and strongly associated with family size and intended fertility when data is disaggregated by household type, but the association is weak or not clear across sites. There are obvious reasons for this finding. Sheer size captures neither the quality of the land in terms of location, fertility, topography, irrigation, etc. nor the level of intensification, including intensification in terms of return per unit of land. So, for example, the average size of cropland households cultivate in Kuni is high, but it is less irrigated and less intensively cultivated than land either in Alemaya or Sabale, as reflected by average income per adult equivalent. As a result, it is weakly related to demographic characteristics.

Finally, the determinants of achieved fertility (current household size) and intended fertility (the number of children wives of a reproductive age would like to have in their lifetime) were identified and their relative importance was empirically assessed using

the OLS method to obtain more insight. The results of the analysis set out in Table 5.17.

Although the intended fertility as it is used in the study is subjective, it provides, together with the preceding descriptive analysis, a number of important insights regarding household level determinant of fertility behaviour. The estimated model explains about 50% of the variation in intended fertility and there is not a large deviation between what the theory predicts and the results obtained.

Table 5.17: OLS estimates of the determinants of the actual family size and the number of children desired by a women of a reproductive age in the HHs

Dependent variable	Family size		Intended fertility	
Variable	B	Sig	B	Sig
(Constant)	1.045	.129	3.546	.000
Religion (1 = Muslim)	.101	.807	.301	.547
Age category of mother*	.658	.096	-1.83E-02	.979
Age category squared	-9.09E-02	.074	-6.15E-02	.571
Mother 's level of education	-1.78E-02	.941	-.199	.453
Children alive	.511	.000	.602	.000
Cropland area	2.006	0.000	-.595	.232
Tropical Livestock Unit	.331	.003	.267	.039
Site (Alemaya = 1)	8.773E-02	.998	1.22	.012
Has used contraceptive	-.458	.228	-.823	.086
R – square	.576		.508	
Adj. R-square	.547		.468	
F	19.949	.000	12.638	.000

Source: Own data and analysis

** age category: 1=17-24, 2=25-29, 3=30-34, 4=35-39, 5=40-44, 6=45-49, and 6= >= 50*

The cultivated land area in hectares, as expected, is positively and significantly correlated to household size, but negatively correlated to the desired number of children. It is not significant in the later. The probable explanation for this is that the quality of the land and the level of intensification rather than its sheer size matter more in explaining intended total fertility. The fact that Alemaya is positively associated with the current household size and positively and significantly related to the desired number of children supports this argument.

Livestock ownership in TLU positively and significantly explains the current household size and the desired number of children. As the previous descriptive analysis showed (5.14), herding is the responsibility of children. Dercon and Kirshnan (1996) also found a positive and significant relationship between the availability of

child labour and the probability of households' participation in livestock-rearing activities in their diversification study in one of the villages in the HHs.

The number of children alive is positively and significantly related to both family size and the desired number of children. One may normally expect an inverse relationship between the number of children alive, as an indicator of low mortality rate, and the desired number of children. In search of an explanation for this seemingly paradoxical result, the unprocessed data was scrutinised seriously. It was found that many of the women interviewed reported a number at least equal to the number of children alive during the time of the survey as the number of children they would like to have. This is understandable, since failure to do so by mothers might create a moral dilemma associated with considering some of their children already born unwanted, regardless of the difficulty they might face in looking after them. Moreover, some respondents may have misunderstood the question or had difficulty in answering about the number of children they desire or would prefer to have.

The level of education of the mother, though not significant, is negatively related to both the family size and the desired number of children. The negative sign of the mother's education coefficient highlights the potential role that females' education can play in bringing about a decline in fertility in the area. The coefficient for the mother's education is unsurprisingly insignificant as a result of the low females' literacy rate in the study area as elsewhere in the country.

The use of modern contraceptive methods by women in their reproductive age is usually used as a proximate determinant of the level of intended total fertility. Differences in fertility goals are reflected in the decision to use or not to use contraception (Dasgupta, 2000). The variable 'ever used contraceptive' has a negative coefficient in the household size model as well as in the intended fertility model. It is not significant in the former. Contraceptive use is negatively and significantly correlated with the number of children a woman would like to have in her lifetime. This means that current contraceptive use is a reasonable predictor of the level of intended total fertility.

From the study it seems that the poorer a household is, the smaller its size. A possible explanation might be that poor households have a smaller family size because of high child mortality rates. However, further analysis does not support this argument, since there is no significant difference among the socio-economic categories in the reported number of deaths of children (see Table 5. 16a). Another possible explanation is that when the initial level of household income is very low, the total fertility rates would rise with income, as per the 'inverted u' hypothesis and hence, the better-off households have relatively larger family sizes. However, the most plausible explanation for the study area is that most of the poor households are recently established households (85%), female-headed households (60% and elderly housheols (40%) whose family sizes are obviously small. The fact that the members of the community in the study area are predominantly Muslim may also explain why the family sizes of the better-off tend to be larger, since the religion allows polygamy, provided that the man can sustain the family. Besides, the finding that the family size of poor households tends to be smaller, despite the fact that the poor rely more on children for support in terms of old age seems unexpected. Nonetheless, a distinction has to be made between the decisions to have children from the decisions on the number of children (an analogy to the decision to use a given technology versus the decision on the extent of its use). Further research is recommended to verify the inverse relationship between wealth and family sizes in the study area, since the current study is mostly exploratory, given its multi-disciplinary nature.

In conclusion, resource-poor households and sites tend to perceive population pressure partially caused by high fertility rates as a problem. These households showed positive intentions, backed by some deliberate actions, to limit their fertility in response to the problem, where encouraged and provided with the means to do so. Nevertheless, the relatively better-off households, particularly in Alemaya, do not perceive the increasing resource scarcity as a serious problem for them to worry about. Members of the later group believe that their quality of life is far better today, despite the small and fragmented holding size, thanks to higher income from the commercial production of chat and perishables.

Interestingly, investment in children's education as a long-term livelihood diversification strategy was unanimously endorsed, particularly among the better-off

households and in Alemaya, as the preferred method to fertility control in response to diminishing access to agricultural land. Unfortunately, it seems as if the scarcity of cropland has strengthened the traditional gender discrimination related to investment in children's education in poorer areas. Intensive group discussions uncovered disturbing evidence that some parents prefer to send sons to school rather than daughters not only because of the traditional bias against females, but also because of the fact that daughters do not have a socially legitimate claim over part of their parents' land upon their marriage. In addition, sons have the social responsibility of looking after the elderly. This development deserves due attention as it has a negative impacts on the long-term fertility transition in the region.

5.6 SUMMARY AND CONCLUSION

This chapter presented the results of in-depth analyses of rural livelihoods in the HHs. The analyses looked into land use strategies, livelihood diversification and migration and fertility as components of the livelihood strategies pursued by rural households and communities. These livelihood analyses have been conducted in the context of population pressure on the land and constraining agro-climatic, institutional and policy factors. The analyses have revealed that households in the HHs pursue complex, diverse and continuously evolving livelihood strategies.

Cropland expansion at the expense of forest and grazing land was found to have been the most common strategy to maintain per capita food production until very recently. Currently, there is no potential for further expansion of cropland frontiers in the HHs. Intensive land use is an alternative land use strategy in the context of the increasing man-land ratio. Three types of intensification strategy have been identified and analysed. These include increased cropping intensity (both spatially and temporal), a shift to the production of high-value crops and investment in soil conservation and soil fertility maintenance. Labour investment in soil and water conservation tends to increase with the slope of the cropland and a perception that soil erosion is sever, and cash crop growers invest more in external input-based intensification of staple crop production to compensate for a shifting of land to the production of high-value crops.

The households further pursued livelihood diversification strategies, usually to supplement farming income and, in a few cases, as an alternative to farming. Livelihood diversification strategies in the area include extensive and intensive (stall-feeding) livestock rearing, and employment and income diversification through temporary and seasonal migration, wage labour, crafts and trades. The households' income portfolios analysis showed that cash crop income is more important for better-off households and better-off sites, whereas off-farm and non-farm income is more important for poor households, and in villages where cash crops contribute less to rural livelihoods. Subsistence crop production, cash crop production and off-farm/non-farm activities contribute roughly the same proportion to the average income of poor households. Most of the off-farm and non-farm activities in the area are related to farming, in other words they vary with crop income and are highly influenced by the performance of farming activities.

The application of logistic regression has confirmed that, in general, survival strategy takes precedence over accumulation strategy in households' livelihood diversification decisions in the area. Among other things, tiny land holding sizes per adult equivalent, low levels of food self-sufficiency and low proceeds from cash crop sales increase the probability that households' will participate in largely less remunerative and intermittent off-farm and non-farm activities.

The final section of the chapter dealt with migration and fertility as an aspect of rural livelihood strategies. Rural migration has been found to be less important in the area in households' livelihood strategies due to institutional and administrative constraints and limited employment opportunities in the other sectors of the economy. Only about 13% of the sampled households reported one or more migrant household member(s) at the time of the survey. Employment, marriage, education and family separation, in that order, were identified as the main reasons for a change in the place of residence. It was also learnt that rural-rural migration predominates over other types of migration and that the need to earn additional income is the dominant motive for migration.

The fertility analysis first looked at the prevailing socio-economic and socio-cultural factors that could influence fertility decisions in the study area. Then it empirically

explored whether and to what extent increasing natural resource scarcity (of arable land in particular) influences households' demographic behaviour. The qualitative analysis underscored that the prevailing family system, which accommodates newly married couples within existing households, low levels of female education and the generally low status of women in the community and their low decision-making power, including fertility decisions, in the family institution, externalities in reproductive choice, a total absence of alternative sources of old age insurance or government support mechanisms, and the collapse of the traditional community-based support system under deepening poverty and increasing vulnerability were all found to have a negative on fertility decisions.

According to the results of the quantitative exploratory analysis, there is a positive and statistically significant relationship between family size and resource endowment (agricultural land). The poorer a household is, the smaller its size in the HHs. Resource-poor households and sites tend to perceive large family sizes as a problem and in response they displayed positive intentions, backed by some deliberate actions in terms of participation in family planning, to limit their size. However, investment in children's schooling as a long-term livelihood diversification strategy was unanimously endorsed, especially among the better-off and in Alemaya, as the method preferred to fertility control to deal with increasing population pressure on the land. Unfortunately, it seems as if households tend to send sons to school rather than daughters, since socially, girls, unlike boys, cannot legitimately claim part of the land over which their parents hold use right up when they get married. This may have negative repercussions for long-term fertility transition, given the fact that females' levels of formal education are negatively related to the current family size, as well as intended fertility in the area, consistent with the theory.

Finally, the most important crosscutting finding that came out clearly throughout the three main sections of the chapter is that: rural households are differentiated in terms of resource endowment, they face different constraints and incentives and therefore pursue different livelihood strategies in farming, off-farm and non-farm, and in reproduction. Livelihood behaviour is diverse across households and sites. Overall, this observation raises questions about the current untargeted and uniform interventions based on the assumption that only farming and the intensification of

staple crop production for household food self-sufficiency is the remedy for all rural development ills and equally important to all households. Indeed, the poorest of the poor have so far benefited little from the MoA's crop production intensification campaign.

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.

CHAPTER 7
CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

This final chapter presents a summary of the thesis. It deduces relevant conclusions and forwards suggestions that may help to realise sustainable rural livelihoods in the Hararghe Highlands of Ethiopia. To this effect, the chapter is organised as follows. First, a brief summary of the background of the research and the problems addressed in the thesis are presented. This is followed by a brief description of the analytical framework that has guided the investigation and the research method used to acquire the relevant data and analyse the data. A wrap up of the major findings of the investigation is presented following the summary of the research method. Finally, the chapter winds up after making relevant conclusions and forwarding certain recommendations.

7.2 THE FOCUS AND THE PURPOSE OF THE THESIS

It is quite evident from all the available evidence that contemporary rural Ethiopia and the Hararghe Highlands are both characterised by fast population growth, accelerated natural resource degradation and deepening poverty. Hence, finding ways of achieving sustainable rural livelihoods is a formidable challenge. Sustainable rural livelihood is the one that generates sufficient living for the rural households to lead an active and a healthy life, whilst enhancing or at least maintaining the quantity and the quality of the renewable natural resource base.

Population and development theories predict either a regressive role of rural population growth through land fragmentation, deforestation, overgrazing, erosion, siltation, salination, soil acidification, etc. or a progressive role of rural population growth through increasing market size, changing factor proportions, inducing technological progress and creating demand for institutional innovations. Others emphasise institutional arrangements, arguing that the interactions between rural demography and rural development do not take place in an institution free environment.

In addition, the implications of rural demographics for human welfare and the sustainability of NRM are not only influenced by a host of institutional, political, technological and agro-climatic (climate, soil type, and slope characteristics) factors, but also vary across countries, in different agrarian systems within a country and across households in a village. Moreover, it was argued that decisions concerning fertility and the use of the local natural resource are reached at and implemented within households, but the interface of population, natural resource and human welfare at a spatially localised level has been a relatively neglected subject in empirical work in rural development.

The above observations have led to the conclusion that generalisation based on aggregate studies is imprecise and less insightful. Context specific policy, technological and institutional solutions are required to realise sustainable rural livelihoods in the circumstance of diverse local situations. The designing and implementation of context specific development strategies that integrate livelihood needs of the local people with sustainable NRM, in turn, calls for a thorough understanding of alternative livelihood strategies of rural households and communities. The latter is very important not to commit a limited resource available for rural development based on untested assumptions about the rural poor and its livelihood strategies.

Against this background, the researcher accepted the challenge to understand and explain rural livelihoods in the HHs. It assessed the human welfare outcome and underscored the sustainability implications of livelihood strategies pursued at household and community levels in the HHs in the context of the growing man-land ratio and the prevailing institutional, policy and agro-climatic factors. Specifically, the thesis has addressed the following issues: 1) critically reviewing the evolution and salient features of institutional and policy environment of the country in order to be able to understand whether it facilitates or constrains the realisation of sustainable rural livelihoods at the grassroots level in the subsequent analyses; 2) developing and describing rural households' typology in order to examine diversity in livelihood behaviour in the subsequent analyses; 3) identifying and describing land use strategies pursued at household and community levels; 4) investigating the nature,

extent and determinants of livelihood diversification and the role of reduced access to land in households' diversification decision; 5) exploring whether and to what extent households' demographic behaviour such as migration and household size or achieved/intended fertility are responsive to the increasing natural resource scarcity especially cropland; 6) assessing welfare outcome, in terms of food security status, of livelihood strategies pursued by households; and finally 7) highlighting sustainability implications of livelihood strategies pursued at household and community level.

To the researcher's knowledge, this study is the first attempt in the HHs, possibly in Ethiopia, to conduct such a comprehensive analyses of population, resource and welfare interface at a spatially localised level, using the livelihoods approach and drawing on concepts and theories from agriculture and natural resource, economic demography and rural sociology.

The rural livelihood analysis was expected to identify livelihood related opportunities and constraints, provide local insights and identify priorities of rural households that inform policy at higher levels. It was also expected to explain how the prevailing structures and processes affect rural livelihood behaviour at the grassroots level. The information generated by such research is believed to enrich the current policy debate on how to create an enabling environment to strengthen sustainable rural livelihoods and mitigate adverse welfare and resource consequences of unsustainable rural livelihood strategies.

7.3 ANALYTICAL FRAMEWORK AND RESEARCH METHOD

Analysing livelihood behaviour of rural households and underlying causes of their behaviour is a daunting task. A framework was needed to break the complex human behaviour into its constituent parts so that the human mind can effectively and systematically deal with it. It is an analytical framework that guides the research that should determine the nature of the required data, method of acquiring the necessary data. Analytical framework also serves as a 'lens' through which a researcher looks into and interprets behaviour. It further helps to systematically organise the reporting of research results.

A number of alternative conceptual and analytical frameworks to analyse rural livelihoods in general and the effect of population growth in particular have been suggested in the literature. Nevertheless, the available frameworks either concentrate on agriculture and natural resources and thus do not explicitly account for the possibility of diversification into off-farm/non-farm or neglect the importance of demographic adjustments like delayed marriage, fertility control within marriage and migration (e.g. Templeton and Scherr, 1997). Although the SLF (DFID, 1999; Ellis, 2000) provides a better option, it has its own shortcomings. The latter framework is static, de-emphasises permanent migration, and neither the analytical framework nor the empirical analysis does include fertility behaviour as an aspect of rural livelihood strategies. Furthermore, if application of the sustainable rural livelihood framework, as suggested by DFID, is attempted in the research context without any adaptation, it makes the research agenda open-ended and the research costly and unmanageable.

There was thus a need for a specific, but comprehensive framework that can systematically integrate all the contesting paradigms and accommodates all aspects of rural livelihood strategies in the context of rural demographic pressure. Hence, an alternative framework that explicitly accounts for the macro and micro socio-economic factors influencing rural livelihoods behaviour at the grassroots level, that accommodates all aspects of rural livelihood and that does not assume the final livelihoods outcome a priori was developed (Figure 2.3), and guided the investigation. However, the SLF (Scoones, 1998; Ashley and Carney, 1999; Ellis, 2000) and the 'microeconomic conceptual framework for hilly land management' (Templeton and Scherr, 1997) and the framework applied by von Braun *et al.* (1991) to analyse commercialisation of agriculture under population growth have informed the current framework despite their shortcomings.

Three research sites (Alemaya, Sabale and Kuni) were selected for the study purposely. The sites were selected to capture the different economic systems in the HHs in terms of the level of commercialisation of production and also taking into account the severity of land scarcity as perceived by the local MoA staff and accessibility during the rainy season. One hundred and ninety seven households

were then selected using proportional (to include female-headed households) systematic random sampling procedure from the lists of households provided by the respective PAs for the study.

The fieldwork was carried out from mid of March 2001 to mid of January 2002. A combination of the conventional survey methods (questionnaire surveys and once-off anthropometric measurements) and the participatory methods (group discussions, focus group discussions, group wealth ranking, transact walks, case studies, personal observations) were used to acquire the necessary primary data on different aspects of rural livelihoods. Each sample households had been visited at least five times during the fieldwork. The supplementary secondary data was obtained from zonal agriculture and economic planning offices, research reports, government policy documents, national statistical abstracts and reports of NGOs involved in rural development activities in the HHs.

The fieldwork generated qualitative as well as quantitative data. Verbal description, interpretation and appreciation of facts, highlights of household and community levels case studies, and descriptive statistics constitute part of the qualitative analyses. The multivariate techniques such as variance analysis, discriminant analysis and linear regression analysis, and a logit probability model, were used to analyse the quantitative data.

7.4 SUMMARY OF THE MAJOR FINDINGS OF THE THESIS

As it was rightly argued, it is the country-specific institutional arrangements and the overall policy environment that shape rural livelihoods behaviour at the grassroots level and thereby determine whether rural population growth is accompanied by a sustainable or an unsustainable rural development. Hence, Chapter 3 briefly, yet critically, reviewed the evolution and salient features of Ethiopia's institutional settings and the overall policy environment. It looked into the land tenure institution, organisational and institutional factors in NRM, access to the market and profitable productivity-enhancing and resource-conserving technologies by smallholder farmers in a historical perspective.

The review uncovered the fact that smallholder farmers of Ethiopia have never been granted land tenure security and have never been given the opportunities to use and manage the common property regimes collectively at the grassroots level. The farmers' participation in the input and output markets have been constrained by high transaction costs due to the poorly developed infrastructure, information asymmetry, high level of illiteracy and inability of smallholder farmers to influence the terms of market participation. On the policy front, it became evident that the smallholder sub-sector in this country had been neglected, purposely discriminated against and exploited by all account. Until recently, no genuine effort has been made by policymakers of the country to improve smallholder farmers' access to appropriate technologies and to create price incentives through adoption of favourable agricultural policies. All of these factors have had negative repercussions on the motivation and the capacity of the smallholder farm households as far as responding to the unprecedented demographic pressure in a sustainable way is concerned.

The economic systems of the three sites covered by the study were described in detail in Chapter 4 in order to see their influence on households' livelihood strategies at the latter stage. Because the SRLF requires socially disaggregated analysis, Chapter 4 primarily dealt with conceptualising, developing and describing rural household typology. Group wealth ranking exercises has been used to develop socio-economic categories of the households and to identify a number of local wealth ranking, most of which are resource-based criteria. Discriminant analysis was then applied to objectively confirm the number of socio-economic groups and to reclassify the limited misclassified cases on the basis of Mahalanobis squared distance and posterior group membership probability.

It became apparent from the results of the analysis that the 1975 land reform and subsequent measures of the socialist government between 1975 and 1990 in Ethiopia had indeed weakened rural differentiation. However, some degree of differential access to livelihood assets still exists or is in the making. Livestock and human resource endowment with the quality of cultivated land, though not size, are the main source of differentiation. Poor, less-poor and better-off, in that order, accounts for 42.6%, 35% and 22.3% of the entire sample households. Most of the resource-poor households live in Sabale (53.8%), whereas relatively few of the

resource-poor (30.4%) live in Alemaya. Further, the disaggregated data by gender of heads of the households highlighted that female-headed households are over represented in the lowest socio-economic stratum. On the whole, the analysis showed that households have differential access to livelihood assets, face heterogeneous constraints and incentives and, therefore, pursue different food and income security strategies.

Having examined the specific macro institutional and policy context of the country (Chapter 3) and the micro level differential access to livelihood assets (Chapter 4), Chapter 5 was concerned with the in depth qualitative and/or quantitative analyses of rural livelihood strategies at household as well as at community level. In the chapter, households land use strategies, livelihood diversification and, migration and fertility behaviour in the context of diminishing access to agricultural land were investigated extensively and intensively. The analyses revealed that households in the HHs pursue complex, diverse and continuously evolving livelihood strategies.

Cropland expansion at the expense of forest and grazing land was found to have been the most common strategy to maintain per capita food production until very recently. Currently, there is no potential for further expansion of cropland frontiers in the HHs. Intensive land use is an alternative land use strategy in the face of the increasing man-land ratio. Three types of intensification strategies have been identified and analysed. These include increased cropping intensity both spatially and temporally, the production of high-value crops and investment in soil conservation and soil fertility maintenance.

As predicted by Boserup, labour-based intensification has intensified with the increasing population pressure on the land to maintain per capita food production. Land use is maximised temporally through double and multiple cropping. The bimodal distribution of rainfall in the upper highlands and access to irrigation in the lower highland have made possible combining the production of crops with a short and a long maturity period in a season. The synchronisation of cropping patterns with micro soil quality (fertility and water holding capacity) variation is also an aspect of spatial intensification. The intensification practices help to maximise benefit and minimise risk and thereby stabilise aggregate output.

The production of high value crops such as chat and perishables is the second form of intensification (in terms of value from a given unit of land). Improved access to the market and high return have driven the shift to chat and vegetables production. This happened in areas where the soil has higher water retention capacity or where some small-scale irrigation (surface or otherwise) is available.

Investment in land improvements, i.e., labour-based soil and water conservation activities and use of purchased chemical inputs such as inorganic fertilisers are the other forms of intensification strategy. The adoption of crop and conservation technologies maintains soil fertility and increases productivity.

Soil and water conservation measures like ridges, bunds, terraces and planting of chat hedgerows are extensively practised on steeper slopes and forestland converted to cropland to deal with the problem of soil erosion. It was observed that labour investment in soil and water conservation activities increases with the slope and perception of soil erosion severity. Physical conservation structures (soil/stone bunds) are commonly reinforced by biological methods (planting chat hedgerows, grass strips, etc.). For the same purpose, perennials are intercropped with annuals on steeper slopes. This suggests that the increasing land scarcity together with the increasing threat of land degradation to survival is gradually increasing households' willingness to invest their labour in soil and water conservation activities.

The amount of organic fertilisers applied to the cropland has declined substantially along with the decline in the livestock population in the HHs. Thus, the use of purchased chemical fertilisers and high yielding cultivars is another important intensification strategy. The empirical quantitative analysis has indicated that the probability of the adoption and the intensity of use of inorganic fertilisers are influenced more by cash crop income than grain income. Cash crop growers invest more in technology based staple crop production in order to compensate for the shift of land to the production of high-value cash crops. Although the coefficient for cropland per adult equivalent in the logistic regression model has a negative sign, indicating a tendency to a positive association between land scarcity and the probability of using inorganic fertilisers, it failed to be significant.

The households further pursue livelihood diversification strategies, usually to supplement farming income and in a few cases as an alternative to farming. Livelihood diversification strategies in the area, besides crop production, include extensive and intensive (stall-feeding) livestock rearing, and employment and income diversification through temporary and seasonal migration, wage labour, crafts and trades. Subsistence crop production, cash crop production and off-farm/non-farm activities contribute roughly the same proportion to the average annual income of poor households.

Some households pursue livelihood diversification strategies for survival and others for accumulation. However, the empirical analysis has confirmed that, in general, survival takes precedence over accumulation strategies in households' diversification decisions. Among other thing, tiny arable land sizes per adult equivalent, low levels of food self-sufficiency and low proceeds from cash crop sales increase the probability that households will participate in the largely less remunerative and intermittent off-farm and non-farm activities. Most of the off-farm and non-farm activities in the area are related to farming, in other words they vary with crop income and are highly influenced by the performance of farming.

The final section of Chapter 5 dealt with migration and fertility as an aspect of rural livelihood strategies. Rural migration has been found to be less important in the area in households' livelihood strategies due to institutional and administrative constraints and limited employment opportunities in the other sectors of the economy. Only about 13% of the sampled households reported one or more migrant household member(s) at the time of the survey. Employment, marriage, education and family separation, in that order, were identified as the main reasons for a change in the place of residence. It was also learnt that rural-rural migration predominates over other types of migration and that the need to earn additional income is the dominant motive for migration.

The fertility analysis first looked at the prevailing socio-economic and socio-cultural factors influencing fertility decisions in the study area. Then it empirically explored whether and to what extent increasing natural resource scarcity (of arable land in

particular) influences households' demographic behaviour. The qualitative analysis underscored that the prevailing family system, which accommodates newly married couples within existing households, low levels of female education, and the generally low status of women in the community and their low decision-making power, including fertility decisions, in the family institution, externalities in reproductive choice, a total absence of alternative sources of old age insurance or government support mechanisms, and the collapse of the traditional community-based support system under deepening poverty and increasing vulnerability were all found to have a negative impact on fertility decisions.

According to the results of the quantitative exploratory analysis, there is a positive and statistically significant relationship between family size and resource endowment (agricultural land). The poorer a household is, the smaller its size in the HHs. Resource-poor households and sites tend to perceive large family sizes as a problem, and in response they displayed positive intentions, backed by some deliberate actions in terms of participation in family planning, to limit their size. This may suggest that the increasing population pressure is slowly stimulating the demand for lower family size.

However, investment in children's schooling as a long-term livelihood diversification strategy was unanimously endorsed, especially among the better-off and in Alemaya, as the method preferred to fertility control to deal with increasing population pressure on the land. Unfortunately, it seems as if the households prefer to send their sons to school rather than daughters. This is because socially, girls, unlike boys, cannot legitimately claim part of the land over which their parents hold use right when they get married. This may have negative repercussions for long-term fertility transition, as females' level of formal education is negatively related to the current family size as well as intended fertility in the area.

The first concern of the last analytical chapter of the thesis, Chapter 6, was assessing human welfare outcomes of the rural livelihood strategies in terms of food security status of the concerned households. Having looked at the pros and cons of alternative indicators to measure food security status of households as an outcome, caloric consumption was selected. Cereals account for 74% of the total calorie

consumption of an average rural household in Ethiopia. The net quantity of cereals available for consumption at household level for the study period was, thus, believed to be a good proxy indicator of food security status of the households. Besides, it was estimated that 236 kg of cereals is needed per adult equivalent per year to meet the minimum daily calorie requirement of 2 200 kcals. The same quantity was used as a cut-off point to distinguish the food secure households from the food insecure households in the study area.

Alemaya is the most food secure. Less than 33% of the households in Alemaya did not have sufficient quantity of cereal to meet the minimum calorie requirement. On the contrary, Kuni is the least food secure with more than 71% of the households not being able to meet the minimum calorie requirement, while the figure for Sabale is about 61%. By types of household, 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 in the three sites in the HHs are food insecure. The figure is comparable to the national food insecurity figure of 52% for rural households.

The results of the binary logistic regression analysis of household level determinants of food security status has indicated that cropland size per adult equivalent, commercial production of chat and vegetables, and TLU owned are correlated positively and significantly with the households' food security status. Participation in off-farm/non-farm activities has a negative sign and insignificant in predicting food security status of the households. This corresponds with the limited scope of the off-farm/non-farm economy in the survey region. Indeed, as the earlier analysis showed, it is the food insecure household who usually pursue diversification strategies as a coping mechanism.

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 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, 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 previous food security analysis.

The major implications of the livelihood strategies pursued by households and communities in the HHs for sustainable management of renewable natural resources were also highlighted in Chapter 6. A narrower definition of the concept of 'sustainability' was used for the purpose of this study. A sustainable rural livelihood strategy was taken as 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, increasing scarcity of natural resource and 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 the risks involved in the adoption of resource-conserving and productivity-enhancing technologies.

In addition, the households have attempted to diversify their livelihood 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 reduce the risk of food insecurity during unfavourable agricultural seasons nor plays a significant role in terms of reducing the unprecedented pressure on the land. An interesting desirable change in rural households' perception in areas of fertility and family planning was 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 the farms, nor the degradation problem can sufficiently be explained by population growth alone nor are 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, a stage is reached where the rate of change is so fast that indigenous strategies are failing to cope with the rapid changes particularly in the absence of external intervention. External interventions and supports are needed in the form of market incentives, alternative technology and an enabling institutional and policy framework. Thus, it is asserted that if there is a 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, rural livelihood strategies and livelihood outcomes were revisited and an attempt was made to develop a typology of rural livelihoods. Three such types were identified and the one that combines large-scale cash crop production with high external inputs staple crop production, intensive dairy production, and lucrative trade was found to be more successful in terms of human welfare and sustainable use of the renewable local natural resource-base as well.

7.5 CONCLUSIONS

This thesis has attempted to address the urgent and essential questions of welfare outcomes and sustainability implications of rural livelihood behaviour in the context of population pressure in the HHs of Ethiopia, accounting for the 'conditioning' or 'mediating' factors. An alternative framework for analysing rural livelihoods in the context of population pressure was developed and guided the analyses. The framework has made possible the systematic integration of all the contesting population-welfare- natural resource paradigms for unbiased and balanced analysis. It also integrated relevant issues and concepts from agricultural economics, natural resource management, economic demography and rural sociology. Then the practical application of this comprehensive and a more practical framework for analysing rural livelihoods in the context of population pressure was demonstrated on a case study basis.

The current study is different from other similar studies in that it reversed the conventional way of looking at the research problems. The population –resource – welfare interactions were studied at spatially localised level since the ultimate decisions concerning fertility and the use of the local natural resource base are reached at and implemented within households and communities. The rural households were put at the centre of the analysis, and the investigation looked into livelihood behaviours of the rural households and communities (their decision making processes, their priorities, motivations behind their decision, their livelihood strategies, etc.), and how local livelihood strategies are influenced by the macro institutional and policy context. It then looked at the issues of food security and natural resource management as livelihood outcomes. The neglected issues of diversity and rural differentiation in development studies in SSA in general and in Ethiopia in particular have also been deliberately put at the centre of the analysis. To this effect, the qualitative and quantitative techniques of developing typology of rural households (wealth categories) were combined and used in an innovative way.

The results clearly indicate that the subdivision of agricultural land into tiny, in some cases economically unviable, plots and land fragmentation at inheritance and re-emergency of landlessness have accompanied the unprecedented population explosion in the HHs. Inappropriate government policies, the 'missing' or 'thin' markets, and the fragile and risky physical environment have worsened the problem. Furthermore, the less client-oriented and inefficient technology generation and dissemination systems have failed to supplement successful local strategies and to effectively build the capacity of the rural households at the required pace to respond to the demographic pressure. For instance, appropriate and profitable crop and conservation technologies are scarce, and the rate of adoption of the available ones has been disappointingly low.

Consequently, the majority of the rural households in the HHs are food insecure. Moreover, the rate of change in the physical environment following the demographic change is so fast that the indigenous countervailing innovation and adaptation have reached the point where they could not cope any longer in the constraining social,

economic, institutional and policy environments. This has generally led to adverse sustainability outcomes of rural livelihood strategies, particularly in farming.

Nevertheless, rural households are not a 'homogenous group'. Contrary to the conventional wisdom in the country, there is substantial differentiation in endowment of livelihood assets across the sites and among different households, in fact the former being more pronounced than the latter. The poor, such as the female-headed households, the elderly and the recently established younger households who are eking out a living by cultivating marginal land do not only face uncertainty related to the right to land and have limited access to publicly provided services, but also face an absolute shortage of crucial resources needed to form a viable rural livelihoods – land, labour, cattle, etc.

The rural households in the HHs are differentiated in resource endowment, have different incentives, face different constraints and, therefore, pursued different livelihood strategies in farming, off-farm and non-farm, and in reproduction. The livelihood behaviour is diverse across sites and among different households. It follows that the nature and the extent of welfare and sustainability outcomes of rural livelihoods are different from site to site and from household to household. Therefore, one type of rural livelihood can be more successful than the other in terms of food security and the sustainable use of the natural resource base. The rural livelihood type that integrates cash crop production with high external input intensive staple crop production was found to be the most promising and sustainable one. This supports the observation in a very recent publication (Govereh and Jayne, 2003) regarding the potential synergies between cash cropping and food crop productivity in the SSA's context where the capital and insurance markets are 'missing' or 'thin'.

In conclusion, the observation regarding diversity in rural livelihoods questions the current untargeted and uniform intervention that is based on the assumption that only farming and the intensification of staple crop production to achieve households' food self-sufficiency is the remedy for all rural development ills and equally important to all households. Indeed, the poorest of the poor have hitherto benefited little from the MoA's crop production intensification campaign. Further, the thesis challenges the over simplified generalisation in the literature concerning welfare and resource

outcomes of rural demographic pressure in the Ethiopia's settings as if the interactions between them were taking place in an institutional, political and agro-climatical vacuum and as if rural households in a country, a region, a sub-region or a village were a 'homogenous group'. Relatively sustainable rural livelihoods could exist alongside unsustainable rural livelihoods in a sub-region or village.

The most important policy implication of the thesis is that there is an urgent need for decentralisation of rural development planning and building of the capacity of institutions functioning at the grassroots level so that they may be able to understand local rural livelihoods. It is the local institutions that should design innovative and locally specific integrated interventions. Ensuring active popular participation in the development process is equally important to support sustainable aspects of rural livelihoods and mitigate adverse impacts of unsuccessful rural livelihood strategies.

7.6 POLICY RECOMMENDATIONS

A number of policy implications have come out naturally from the rural livelihoods analysis. Some of them are of national in nature and must be addressed at such level, while others are typical to the study area. Some of the recommendations can be implemented in a short-term, whereas others can only be implemented in mid-term or long-term. Furthermore, the recommendations are not necessarily exclusive; they complement and reinforce each other and must be integrated while designing development intervention. For convenience of presentation, most of the recommendations are organised in the order in which they were implied in the analysis. These recommendations clearly reflect the central arguments of the thesis that realising sustainable rural development in the face of increasing demographic pressure requires more than having measures that address higher rural fertility rates alone.

7.6.1 IMPROVING STRUCTURES AND PROCESSES

Ensuring land tenure security

The land tenure insecurity is the most important problem that must be addressed should Ethiopia realise sustainable rural development. Insecure land tenure in the country and its negative repercussions on the efficiency and sustainability of NRM has long been recognised. Unfortunately, the current government seems determined

to retain the status quo. The government argues, from a social equity point of view, that 'commoditisation' of land would recreate rural inequality, encourage distress disposal of land by the poor rural households which would, in turn, lead to landlessness, rural-urban migration, unemployment and rural social unrest. Therefore, retaining the public ownership of rural land and periodic land redistribution, it was argued, are the only way to ensure the rural poor's access to agricultural land (prime minister Meles Zenawi, 2000, cited in Devereux, 2000). Experience elsewhere in SSA in land titling (e.g. Kenya, Botswana and Nigeria) partially supports this argument (see Cleaver and Schreiber, 1994).

Nevertheless, a counter argument to the government view is that allowing the prevailing land tenure system to remain rigid and unresponsive to the rapidly changing rural demography and physical environment can only postpone the problems the government is much concerned about. It undoubtedly aggravates the already worse food and environmental poverty situation in the country, which would eventually lead to collective failure. The hard fact on the ground forces a realistic observer to believe that the possibility of continuing the policy of further land redistribution, as envisaged by the land policy, as a 'sponge' that absorbs the growing rural labour force in the Ethiopia's Highlands has reached its maximum limit. The 'sponge' has already been saturated. The cropland size cultivated by the majority of the rural households has been diminished into what has been called a 'starvation plot'.

In the second place, as insights from empirical analysis of rural households' copping strategies in the circumstances of food insecurity in Ethiopia and elsewhere in SSA indicate, avoiding the disposal of productive capital such as draught power, live alone cropland, is the first priority of rural households even in situation of famine. Rural households would prefer to get starved rather than risking their future productive capacity to the last minute, until the situation is totally out of control. Similarly, Cleaver and Schreiber (1994:57) argue that "*smallholders anywhere in the world are extremely reluctant to mortgage, and hence risk losing, their land*" where such transaction is legal.

In short, the current land tenure system has failed to ensure land tenure security and it seems that there is no alternative left for policymakers of the country except trying the 'unknown', and therefore, fear-provoking alternative. Indeed, the possible political economic explanation for the rigid current policy stance of the government, beyond its understandable concern for social equity, is the fact that land is the most important source of power for the federal and regional governments to exercise control over the rural people. This is to the detriment of the empowerment of the latter and the development of self-reliant community-based governance. Transparency together with active popular participation, for example, can reduce the risk of the legal and administrative systems manipulation by the economic and political elites for their own benefit at the expense of the majority of the rural poor. The government should face, with support from the donor community, the challenge of ensuring land tenure security whilst designing strategies to minimise the accompanying negative social consequences.

Land tenure security, however, should not always be equated with private ownership of land. An innovative solution ought to be sought to address the government's concern and strike the balance between social equity and efficiency in consultation with all stakeholders. The sooner some initiatives in this direction are launched is the better. Perhaps, the regional governments may be given the mandate to formulate a land policy appropriate to their respective regions since the extent of land scarcity varies from region to region, despite the capacity problem for formulation and implementation of such crucial and politically sensitive policy. The necessary technical support can be mobilised from the federal ministries, higher learning institutions, research institutions and NGOs to circumvent the capacity problem.

Natural resource management strategies cannot be seen in isolation from the general land policy. It is necessary for the government to give up claim of ownership on the natural resource at local level since this has, arguably, alienated the rural people from the resource and has made the resource *de facto* open-access. Empirical studies in many countries have indicated that the success rate of government land use regulation and land policy to ensure sustainable NRM has been very low. Fortunately, introducing institutional change in this area is politically less sensitive than introducing change that affects cropland on which individual

households hold use right. As an alternative to privatisation, the local community could be encouraged and given the necessary technical support to own, use and manage the local natural resource base, including forest, soil, water and pasture in environmentally sustainable way. This needs a policy that grants land right to the local community in exchange for management responsibility with the necessary implementation modalities put in place to effectively enforce the latter at the grassroots level.

The elimination of open-access to fuelwood is also believed to correct the distorted price of the latter (that reflects only transportation cost) and encourages tree planting (agroforestry) on individually used plots (Cleaver and Schreiber, 1994). Searching for alternative source of energy and promoting energy saving affordable technology such as stove should also be taken into consideration to gradually reduce rural as well as urban dependence on forest as the sole source of energy. This has an additional advantage of reducing women's workload with favourable effect on fertility. Spearheading the emergence of small-scale alternative construction material manufacturing such as bricks making and promotion of their wider use not only creates a substitute for the dwindling forest resource, but also generates alternative employment opportunities.

Improving the smallholders' access to the markets

Improving smallholder farmers' access to the market is another area which though well recognised, still needs due attention. Smallholder farmers do respond to strong market incentives even in the absence of functional research and extension as the chat case has clearly demonstrated. By implication, the government intervention via research and extension in the absence of market incentives would most probably fail and lead to inefficient use of scarce resources. Thus the priority of the government should be doing away with the barriers to smallholder farmers' market participation from medium to long-term. The constraints include physical (distance), political (inability to influence the terms of trade because of illiteracy, lack of organisation and information) and structural.

Investment in rural roads, reinitiating development of marketing cooperatives on voluntary basis, creating an enabling environment for increasing private traders

participation in agricultural marketing, providing marketing information to farmers (e.g. through marketing cooperatives) and revitalising parastatal marketing corporation are needed. The parastatal marketing corporation can play a vital role in supplying inputs, basic household goods and procuring output particularly in remote inaccessible areas until the private traders and cooperatives develop their capacity sufficiently to entirely takeover the activities. The measures could together help to address the barriers to market participation by smallholder farmers.

Improving the efficacy and efficiency of research and extension

Once the enabling environment and the necessary incentives are put in place, investment in agricultural research and extension plays a very crucial role. The initiatives that are already underway to build the capacity of the NARS and the extension system and to re-orient them to address the real needs of their clients have to be sustained with determination.

What is needed to mobilise the necessary financial and technical resources required for the envisioned restructuring and transformation of processes, and to implement the other recommendations yet to be discussed are:

- the government's determination to get its priorities right, including avoiding unproductive use of the scarce resources of the country; and
- convincing and working with the donor community in partnership to shift their attention from their current emphasis on mitigating short-term food deficit through food aid distribution to providing the necessary supports to realise sustainable rural livelihoods.

7.6.2 BUILDING HOUSEHOLDS' LIVELIHOOD ASSET BASE

The problem of the absolute shortage of assets crucial to form viable rural livelihoods, at household and/or community level, is as critical as the quality of natural resource management problem in the Hararghe Highlands. Active intervention of GOs and NGOs is needed to assist communities and households, particularly the resource-poor, in building up rural livelihoods assets. The intervention in this line encompasses investment in rural physical and human capital such as feeder roads, safe potable water, education, health, soil and water conservation, reforestation or establishing community woodlots and assisting development of

indigenous small-scale irrigation infrastructure and ensuring efficient use of irrigation water.

The HHs has relatively better road networks, but feeder rural roads are scarce, and where available they are in bad condition due to lack of maintenance. Provision of safe potable water and health infrastructure in the highlands is improving and should be strengthened. These services are necessary to reduce the demand for females' labour service and child mortality rate with a significant desirable effect on the rates of fertility. The number of rural primary schools in the area is increasing. Most parents saw investing in their children's education as a solution that would enable them to bypass the scarcity of cropland and as a strategy to diversify their livelihoods in the long-term. They almost take for granted that once their sons are educated they would find jobs in the towns particularly in the civil service. This recent development is expected to increase the demand for educational infrastructure. However, there is a need for a special effort to ensure equal gender participation in schooling to deal with the apparent tendency to disfavour investment on female children's education.

Poverty could also divert attention away from investment in resource conservation. The latter is by nature a long-term undertaking and there is huge disparity between the social cost and the private cost of degradation. Therefore, it is to the best interest of the society to bear costs needed for soil and water conservation activities partially or entirely. Assistance from GOs and NGOs is important to establish community woodlots on the deforested and fragile steep slopes. In addition, awareness creation, active grassroots level participation and organisation of users' group are of paramount importance to ensure that the local people own, use and manage the resource in a sustainable manner after phasing out the intervention.

Assisting the development of indigenous small-scale irrigation and promoting the efficient use of water resource substantially contribute to the rural livelihoods. The need for stabilising yield is as important as increasing yield in rainfed agriculture. Assisting the development of small-scale irrigation facilities where unexploited potential exists is an effective strategy not only to reduce drought risk, but also to intensify high value crops production. The indigenous water harvesting technique

such as collecting runoff and directing it to crop fields, which is being practised by some farmers in the area, should also be considered.

Livestock is another very important rural livelihood asset. Livestock ownership is positively and significantly associated with intensification of staple crop production and, food and nutritional security of the households. Unfortunately, the majority of the resource-poor households do not own a cow, an ox or even a couple of goats. The deepening rural poverty and the increasing vulnerability have led to the erosion of this crucial livelihood asset. Replacing the existing exchange system between oxen and labour service that is often unfair to the resource-poor through creation of rental market for draught power may alleviate the draught power shortage for timely land preparation. This may also create alternative livelihoods opportunities for households who would like to engage in provision of such service.

Providing credit service to purchase cow on favourable term can substantially contribute to the improvement of the households' food security and preschoolers' nutrition. Women commonly control income from sales of livestock products, and children are traditionally given priority in milk consumption. An innovative credit strategy used by an NGO (Farm Africa) involved in a dairy goat development project in the area can be considered for large-scale adoption. Farm Africa provides dairy goat to women from poor households. The beneficiaries pay the credit in kind, young dairy goat, after the one they originally received gave birth. The young dairy goat, in turn, is extended as in kind credit to another women. The system works just like revolving saving and credit in cash and was found more sustainable.

7.6.3 RE-ORIENTING THE FOCUS OF RURAL DEVELOPMENT INTERVENTIONS

The current rural development interventions by the government agencies, besides provision of infrastructure, focus on achieving food self-sufficiency through promotion of intensification of staple crops production on subsistence farms. Food self-sufficiency is almost taken as synonymous with food security as the majority of the rural households are assumed to produce their own food. Nonetheless, commercialisation of agricultural production receives cursory attention and there is no government agency with a mandate of supporting rural livelihoods diversification. There is an urgent need, at least in the study area, to shift the focus of rural

development interventions away from food self-sufficiency to ensuring households' food security and to pursuing an integrated approach to rural poverty alleviation. The multifaceted approach should encompass the intensification of staple crop production, commercialisation of agricultural production, natural resource conservation and creation of an enabling environment for rural livelihood diversification.

It is absolutely imperative to promote external inputs (cultivars and agro-chemicals) based intensive staple crop production on smallholder farms as the land frontier has reached its maximum limit in the area. Nonetheless, achieving and sustaining capital and technology based intensive staple crop production on the smallholder farms is one of the formidable challenges that the extension system has faced in many areas. Farmers are either reluctant to adopt productivity-enhancing Green revolution type crop technologies or they discontinue using them after trying for one or two seasons.

Besides the bias of the extension system against the resource-poor households, there are various other explanations for the extension system's failure to create an effective demand for sustainable intensification. The chief ones are liquidity constraint, risk of drought and profitability. Although loans for purchasing inputs (fertilisers and seeds) are available, poor households might not have enough cash to settle the required down payment at the beginning of the planting season to qualify for the loan. The intensification policy hitherto does not include price incentives despite the sky rocketing input prices following the devaluation of the national currency and the phasing out of input subsidies following implementation of the SAPs. Further, there is no provision in the loan policy to either give grace period, refinance adoption of inputs or write-off the loan when farmers are unable to repay the loan due to unfavourable rainfall. The latter, for instance, had forced some households to dispose of their crucial livelihood assets such as oxen to settle the loan with its interest. Besides, the beneficiaries have to settle the loan immediately after the harvest season, where crop prices are at their lowest level.

Arguably, it is to the best interest of the poor and the environment for policymakers to reconsider 'judicious' use of input subsidies in the short to medium term. One of the conventional strong arguments directed against input subsidies is related to its

budgetary burden. One could simply argue that the country cannot afford this. The counter argument is that it is to the best long-term interest of the country and the international donor community as well to invest in the intensification of crop production, including subsidising inputs, so that the rural households can produce enough food for themselves. The latter is apparently better than indefinitely distributing food aid or subsidising consumption with all its negative consequences.

It is worthwhile, in this regard, to experiment, at a pilot level, with other suggested innovative approaches to circumvent the inputs affordability problem. The suggestions include fertilisers-for-work (Shank, 1996) and input subsidy tied with resource conservation requirements on the cropland used by individual households (Shiferaw and Holden, 2000) for their possible future inclusion in input policy. The latter has the potential to address the seemingly paradoxical relationship between adoption of agricultural policy that makes farming profitable and the possibility of increasing natural resource degradation in the empirical literature. Of course, supporting the development of indigenous small-scale irrigation, as mentioned earlier, substantially reduces the risk of crop failure due to drought and thereby encourages the adoption of improved technologies.

Active promotion of commercialisation, i.e., cash crop production is perhaps the most promising and financially the most sustainable way of encouraging intensification of staple crop production. Despite certain reservation by some researchers, from a food security point of view, there are synergies between cash crop production and capital and technology based intensification of staple crop production at least in the Hararghe Highlands (also see Govereh and Jayne, 2003 for a similar finding in Zimbabwe). Higher income from cash crop production has helped the producers to bypass the liquidity constraint to acquire improved seeds and fertilisers. The increased yields of staple grain as a result of technology-based intensification, in turn, has made it possible to shift more land from subsistence crop to cash crop production without compromising the need to reduce food security risks associated with households' over reliance on the market for grain. Cash crop production is positively and strongly associated with higher income, higher rate and intensity of use of purchased inputs and higher yield, and hence improved food security status of households and lessened land degradation problem.

The rural non-farm/off-farm sector provides supplementary or alternative employment and income in the scenario of reduced access to land and diminishing farm sizes. However, the sector has not yet developed in the study area to contribute significantly to the rural households' welfare. Still the contribution of the rural non-farm/off-farm income to income of poor households cannot be undermined. Subsistence crop production, cash crop production and off-farm/non-farm contribute roughly the same proportion to the average annual income of the poor households. The rate of households' participation in off-farm/non-farm activities is also high in cereal dominated less commercialised villages. Therefore, rural livelihood diversification has a potential supplementary role to play in rural poverty alleviation if consciously supported by policy.

7.6.4 REDUCING VULNERABILITY THROUGH INSTITUTIONALISED SOCIAL SAFETY NET

The labour absorptive capacity of farming has declined with reduced access to land, creating a high level of unemployment and underemployment. The labour surplus has increased households' demand for diversifying their livelihoods in situations where rural off-farm and non-farm sector provides insufficient employment opportunities that are highly correlated with farming. Furthermore, the pervasive poverty and the rising risks of food insecurity with recurrent drought have led to the erosion of households' resource base and resulted in worse human welfare situation specially in less commercialised villages. About 53% of the sample households were unable to meet their minimum daily calories requirement even in the 2000/2001 cropping season, which was considered by most of the households as fairly normal year.

An institutionalised social safety net in the form of labour intensive public work programs can be an effective instrument to ameliorate the vulnerability of the rural poor to food insecurity in the medium term. This intervention is consistent with the earlier recommendations and therefore must be integrated. Among others, the need for improving rural infrastructure such as development and maintenance of feeder rural roads and initiating and strengthening soil and water conservation activities is imperative. These can effectively be integrated into, and achieved through, labour

intensive public work programs. Besides creating the necessary physical resource base for sustainable rural livelihoods for the community in the long-term, this kind of intervention enables the nearly assetless rural poor to create assets needed to form viable livelihoods by saving part of the income. The experience of some countries in SSA, including Ethiopia, and Asian countries with labour intensive public work programs could provide important insights as to how similar programs can effectively be designed and integrated into the overall plan for supporting sustainable rural development (see von Braun, Teklu and Webb, 1991).

7.6.5 IMPROVING EFFORTS TO ACCELERATE FERTILITY REDUCTION

Improving the rural households' knowledge of family planning and the availability of contraceptives at the grassroots level is necessary as there is a tendency for changing households' perception in favour of having small family size with the increasing hardship and resource scarcity. However, the supply side intervention should not be emphasised. The formidable challenge is how to create effective demand among the majority of the rural households for small family size. The determination and sustained commitment of the leadership coupled with mobilisation of leaders of PAs and local community groups is imperative to strengthen the emerging change in perception and to use informal social pressure on couples in their reproductive age to use contraceptives (see also McNicoll and Cain, 1990). The promotion of the desirable behaviourial change in the area of fertility can be effected through a variety of means including effective communication, information and education (IEC) programs (Cleaver and Schreiber, 1994).

Moreover, the fertility behaviour of rural households is generally influenced by a number of complex socio-economic and socio-cultural factors. Ensuring land tenure security, reducing vulnerability of households, public provision of social infrastructure such as safe potable water in nearby villages, increasing education and health coverage, and above all empowering rural women through improved access to education, productive employment and improved decision making power in the family institution are needed to bring about meaningful fertility decline. This implies that family planning service provision cannot be seen in isolation and ought to be integrated into the overall policy package recommended for the fruition of the endeavours to realise sustainable rural development.

7.6.6 VOLUNTARY RESETTLEMENT

Voluntary resettlement is actually among the solutions suggested by representatives of the communities themselves during group discussions and also being considered by the local government. It is apparently too late for the family planning service provision to serve as scapegoat since the next generation, entering the rural labour force as farmers in the coming decades, have already been borne. Even at present, the Hararghe Highlands are over-crowded and community woodlots need to be established on the deforested and currently cultivated land with steeper slopes before the land would be converted into barren rock and entirely abandoned. One obvious solution is resettling households cultivating the fragile land and others on voluntary basis in the lowlands located in the neighbouring Bale Zone in the long-term.

However, it is easier to suggest resettlement than practically implementing it! There are technical, economic, social and political issues that need to be carefully thought out before actualising resettlement. First of all, lowlands are generally drier with two short rain seasons both of which are insufficient to grow the traditional staple crops unless irrigation facility is provided with the necessary measures put in place to minimise soil salinisation and irrigation-induced spread of diseases (Gebre Egziabher, 1996). Lowlands are also prone to human diseases such as malaria and animal diseases such as tsetse fly. Irrigation, health, marketing and other social and economic infrastructure must be put in place and the beneficiaries need continuous technical support and food aid until they settle well. Socially, resettlement may result in the breakdown of important fabrics of local social institutions that have created harmony among members of the communities and have helped them to survive a number of hardships at their place of origin. The ITK of the highlanders is probably irrelevant and even in certain cases environmentally damaging in the new environment. Politically, the nomadic lowlanders may not cheerfully welcome the occupation of their territory by agriculturalists with an anticipated detrimental effect on their continuous and free mobility, which is an integral component of their survival strategies. Protecting interests and livelihoods of the pastoralists is, therefore, as important as that of agriculturalists.

7.6.7 INDUSTRIALISATION

Some argue that the country as a whole has no bright future unless it reduces its dependency on the highly risky agricultural sector in the long-term via industrialisation- agro-industry/ labour intensive manufacturing or rural tourism (e.g. Devereux, 2000). Surprisingly, one representative of a community who participated in a group discussion on what the local community considers as a long-term solution to the increasing land scarcity in their locality at one of the research sites seems to share the idea of industrialisation. In his own words:

" My friends suggested that educating our children would solve the land scarcity problem. In my opinion, this is not necessarily the case. We all know one of our sons who recently committed suicide because he couldn't find a job in the civil service after completing his high school education. We also know that some of our educated sons are unable to get job in the civil service and thus are wasting their time by sitting and chewing chat the longest part of everyday. These are additional burdens to our community. I believe that the government should seek ways of promoting industry by forging relationship with the 'faranji' (white people). Those people produce match-box, car window, everything from raw materials available in our locality and sell them to us at exorbitant prices. Let them come to our country with their capital, technology and managerial skills, and create employment opportunities for the local people, generate hard currency for the country and also benefit themselves. It is only in this way that educating our children can solve our problem." *Mr. Ahmed Yuya Tahir.*

The suggestion of industrialisation, to begin with, is attractive and also reflected in the government's so-called ADLI development strategy. However, it is the agricultural sector that has to play the leading role and must provide the necessary resource, and create effective demand for industrialisation to succeed in the Ethiopia's settings. The battle for growth and poverty alleviation in this part of the world is won or lost in the countryside, specifically in the agricultural sector, which has, paradoxically, remained Achilles' heel of the country's economy.

7.7 METHODOLOGICAL RECOMMEDATION

The framework for analysing rural livelihood strategies in the context of population pressure, developed and used in the thesis, was found to be more comprehensive, yet specific. It is flexible and accommodates all the contesting population-resource-welfare paradigms, and systematically integrates all aspects of rural livelihood strategies. Besides, the current framework accounts for the so-called 'mediating' factors. The framework for analysing rural livelihood strategies in the context of population pressure is quite suitable and recommended for analysing rural livelihoods and livelihood outcomes at spatially localised level by a team of experts from agriculture, natural resource, rural demography and rural sociology. The result will enable the multi-disciplinary team for planning rural development not only to come up with a meaningful and well integrated intervention to support sustainable rural livelihoods, but also to achieve effective targeting.

This methodology will assist a planning team to come up with a well integrated programme for rural development which will allow each organisation such as GOs, NGOs and private sectors to perform their respective mandates in their area of competence in a specialised, but integrated manner. This will allow the various role players to do what they are good at or in which they specialise, but at the same time there activities support the common objectives and shared responsibilities.

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Appendix A: Conversion factors used

Conversion factor used to compute consumption unit (adult equivalent)

Age group (years)	Male	Female
< 10 years	0.6	0.6
10 – 13	0.9	0.8
14 – 16	1	0.75
17 – 15	1	0.75
> 50 year	1	0.765

Source: Institute Panafrican Pour le Development (1981) as cited in Storck *et al,* 1991:188

Conversion factor used to compute man- equivalent (lobour force)

Age group (years)	Male	Female
< 10 years	0	0
10 – 13	0.2	0.2
14 – 16	0.5	0.4
17 – 15	1	0.8
> 50 year	0.7	0.5

Source: Here (1986); Johnson (1982); Ruthenberg (1993); Naire (1985) cited in Storck *et al,* 1991:188

Conversion factors used for computation of tropical livestock unit (TLU)

Animal category	Livestock unit
Calf	0.25
Weaned calf	0.34
Heifer	0.75
Cow and ox	1.00
Horse	1.100
Donkey (adult)	0.7
Donkey young	0.35
Camel	1.25
Sheep and goat (adult)	0.13
Sheep and goat (young)	0.06
Chicken	0.013

Source: Storck *et al,* 1991:188

Appendix B:

Yield (kg) of staple cereals in the Hararghe Highlands in normal year (average rainfall situation)

Crop	Yield ranges (kg) per ha
Sorghum	1100 – 1400
Maize	1400 – 1600
Barley	700 – 1000
Wheat	800 – 1300
Teff	600 - 800

Compiled from CARE-Ethiopia Crop Assessment Report, 2000

Appendix C:

Total fertility rates in Ethiopia 1985 – 2020

Year	CSA	World Bank	UN
1984/85	7.5	7.5	6.84
1995 – 2000	6.7	7.5	6.60
2000 – 2005	5.8	7.2	5.94
2005 – 2010	5.3	6.6	5.43
2010 – 1015	4.8	6.0	4.92
2015 – 2020	4.3	5.4	4.41

Source: Compiled by Degefa and Nega, 2000