Land degradation and strategies for sustainable development in the Ethiopian highlands: Amhara Region

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Table of Contents

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Executive summary

This document is a summary of the results of the preliminary phase of the research project to characterise the nature and causes of land degradation in the highlands of the Amhara Region, and to examine the opportunities for more sustainable land management and development. The preliminary phase is based on literature review, consultations with key officials, brief visits to selected field sites and discussions with farmers and key informants, and analysis of existing secondary data. The aim of this phase is to draw upon what is already known about the problems of land degradation and management to help develop research hypotheses and areas of focus for a community survey of 50 *kebeles* that was launched in September 1999. The major objectives of the community survey are to identify the dominant 'pathways of development'[1] in the region and to suggest hypotheses about their causes and implications for agricultural productivity, sustainable land management and poverty. The hypotheses generated will be tested using data collected in subsequent household and plot-level surveys.

1. A pathway of development is defined as a common pattern of change (or stagnation) in agriculture and livelihood strategies, associated with its causal and conditioning factors (Pender et al. 1999b).

Amhara National Regional State (ANRS) is located in the north-western part of Ethiopia between latitude 9°–13°45'N and longitude 36°–40°30'E, with a total area of 170,152 km^2. Of the total area, cultivation and grazing land make up 30% each. Forest, shrub, bush and woodland, bodies of water, and wasteland make up 17%, 4%, and 16% of the total area, respectively, and the remaining 3% is taken up by settlement. The total population is approximately 14.4 million, with an average land holding of 1.7 ha. About 35% of the nation's livestock population is found in the region, with the major feed sources being communal grazing lands, fallow lands, crop residues and stubble.

Soil erosion. Site-specific test plots and experiments in 1987 and 1988 at Soil Conservation Research Project (SCRP) stations in the region show soil loss rates between 0.04 and 212 t/ha per year. About 29% of the total area of the region experiences high erosion rates (51–200 t/ha per year); 31% experiences moderate erosion rates (16–50 t/ha per year); 10% experiences very high erosion rates (>200 t/ha per year); and the remaining 30% experiences low erosion rates (<16 t/ha per year).

Nutrient depletion. Loss of soil fertility is manifested through limited recycling of dung and crop residue in the soil, low use of chemical fertilisers, declining fallow periods, soil and organic matter burning, and soil erosion. Although the farming system in the highlands of Amhara is predominantly mixed crop–livestock, nutrient flows between the two are predominantly one sided, with feeding of crop residues to livestock but little or no dung being returned to the soil.

Deforestation. Removal of forests is prevalent and contributes to land degradation. About 20 thousand hectares of forest is harvested annually in the Amhara Region for fuelwood, logging and construction purposes. Since harvested trees are not replaced and, thus, expose the soil, about 1.9–3.5 billion tonnes of fertile topsoil are washed away annually into rivers and lakes due to deforestation alone.

The direct causes of land degradation, including declining use of fallow, limited recycling of dung and crop residues to the soil, limited application of external sources of plant nutrients, deforestation and overgrazing, are apparent and generally agreed. Factors underlying these direct causes include population pressure, poverty, high costs of and limited access to

agricultural inputs and credit, fragmented land holdings and insecure land tenure, and farmers' lack of information about appropriate alternative technologies. Many of these factors are affected by government policies on infrastructure and market development, input and credit supplies, land tenure, agricultural research and extension, conservation programmes, land use regulation, local governance and collective action, and non-governmental programmes.

Considering the nature and causes of land degradation in the region, policy, institutional and technological strategies for more sustainable, productive and poverty-reducing development are identified. The main hypothesis is that the strategies for sustainable development in any given situation depend largely on the comparative advantage of alternative livelihood strategies in that situation. While many factors determine comparative advantage, we focus on three: agricultural potential, market access and population pressure.

Agricultural potential is an abstraction of many factors that influence the absolute advantage of producing agricultural commodities in a particular place, while access to markets is critical for determining the comparative advantage of a particular location, given its agricultural potential. Population pressure affects the labour intensity of agriculture through the land:labour ratio, and may induce innovations in technology, markets and institutions, or investments in infrastructure; thus, it affects the comparative advantage of labour intensive strategies of development. These three factors interact with each other in complex ways, and we can classify the highlands of Amhara into eight major types, considering two levels ('high' and 'low') of each factor.

In areas with relatively high agricultural potential and good market access, there is strong potential for intensified production of cereals using high levels of external inputs, commercial production of perishable cash crops such as fruits and vegetables, and/or intensive production of commercial livestock products such as dairy and poultry products. There is also strong potential for rural non-farm development linked to agricultural development. Priority initially should be given to intensified cereal production, since the need for food security is likely to constrain farmers' ability to expand production of other (perhaps more profitable) products until cereal production is adequate. Development of credit, and input and output marketing systems will be critical to the success of these pathways.

In areas with high agricultural potential that are more remote from markets, comparative advantage is likely to be greater in production of high-value (relative to volume) non-perishable cash crops such as nuts or coffee, and/or intensified production of easily transportable livestock (e.g. small ruminants). Even more than in areas of good market access, farmers' ability to produce sufficient food is likely to constrain their ability to expand production of such products. Thus, high priority should be given to increased cereal production in such areas with food deficits by use of imported inputs (particularly seeds and fertiliser). This may require subsidising the cost of transporting inputs in the near term, as well as medium- or long-term credit to allow farmers to finance investments in perennial crops.

In areas with low agricultural potential but good market access, development opportunities are likely to be related to investment in irrigation where feasible and profitable; intensification of cereal production using limited amounts of inputs integrated with soil and water conservation, and organic fertility management measures; intensification of livestock production through improved management of grazing lands and development of private woodlots (especially in lower population density settings); and rural non-farm development. These areas are likely to remain deficit producers of food, and so food aid may be needed in the near term, until the development potentials are realised more fully.

Opportunities for agricultural or rural non-farm development are even more limited in areas with low agricultural potential and poor market access. Intensified cereal production using limited amounts of inputs integrated with soil and water conservation practices, and intensified

livestock production is likely to be important. Bee keeping may also be an attractive option in some areas, and could be linked to vegetative regeneration in area enclosures (especially in lower population density settings). Food aid and migration are likely to be essential. Thus, policies with respect to food aid, agricultural extension, education and training in non-farm activities, and land tenure will be of particular importance for these areas.

1 Background

The International Food Policy Research Institute (IFPRI), the International Livestock Research Institute (ILRI) and the Amhara National Region Bureau of Agriculture and Natural Resources (ANRBANR) have entered into a collaborative research agreement to undertake policy research on sustainable land management in the highlands of Amhara Region, Ethiopia. This project is part of the ILRI/IFPRI research programme on 'Policies for sustainable land management in mixed crop–livestock systems in the highlands of East Africa'. Similar projects are being implemented in the highlands of the Tigray and the Oromia regions of Ethiopia, and in Uganda.

The primary purpose of the research project is to identify effective policy, institutional and technological strategies to improve productivity and to curb land degradation and poverty in the highlands of Amhara. This goal is to be achieved by the research itself, and by strengthening the local capacity to conduct socio-economic and policy research related to sustainable land management. The other major objective of the research is to generate and test a set of methodologies and tools for policy research on sustainable land management by generating comparative knowledge from different highland regions of Ethiopia and elsewhere in East Africa that can be applied in many other circumstances.

This document is the result of the preliminary phase of the research project, dubbed the 'characterisation phase'. The objective of this phase is to characterise the nature and extent of land degradation in the highland areas of the region and to identify the major causes. This is based upon review of relevant literature, consultations with key officials, brief visits to selected field sites and discussions with farmers and other key informants, and analysis of existing secondary data and maps.[2] The aims of this study are to draw upon what is already known about the problems of land degradation and management in the highlands of Amhara to help develop research hypotheses and to develop areas of focus for a community survey of 50 *kebeles* to identify the dominant 'pathways of development' existing in the region and to suggest hypotheses about their causes and implications for agricultural productivity, sustainable land management and poverty. [3] The hypotheses generated will be tested using data collected in subsequent household and plot-level surveys, and policy implications will be drawn, emphasising the role of government policies and programmes.

2. A list of secondary data used in the analysis is given in Annex 4. These data are available upon request from the authors.
3. A pathway of development is a common pattern of change (or stagnation) in agriculture and livelihood strategies, associated with its causal and conditioning factors (Pender et al. 1999b).

This document discusses the nature and causes of land degradation in the highlands of the Amhara Region, and constraints and opportunities for more sustainable land management and development.

2 Introduction

The problem of land degradation (soil erosion, nutrient depletion and deforestation) is severe in the highlands of Ethiopia, and especially so in the Amhara Region. For example, soil erosion is a major problem in the region, with the land estimated to be eroding at very rapid rates of 16–50 t/ha per year. Because of erosion, the region accounts for more than 50% of the estimated annual soil loss in Ethiopia (Abegaz Gizachew 1995). The regional government and other organisations are undertaking activities to mitigate the problems and the constraints faced; however, without adequate quantitative information on the magnitude of the problem, causal factors and the effort directed at solving the problem, appropriate policies cannot be effectively designed and implemented.

With very few exceptions, research undertaken on land degradation in the Amhara Region has not focused on the economic, social or institutional factors that affect how farmers manage their land. The biophysical dimension of the problem has been favoured. Consequently, policy response to the land degradation problem has focused on the technical aspects, promoting adoption of specific conservation technologies, such as terraces and bunds. While many conservation technologies have shown promising results in terms of reducing soil erosion and runoff, their effects in terms of crop yields are mixed (Yohannes Gebremichael 1989; Sutcliffe 1993, cited in Fistum Hagos et al. 1999). Nevertheless, the returns do not seem to have motivated farmers to widespread and spontaneous adoption of conservation technologies, unless the costs of the investments are heavily subsidised by public and non-governmental support.

To address the problem of land degradation in Amhara and its linkages to agricultural productivity and poverty, there is the need to take a broader perspective, both in how the problem is defined and in the set of possible solutions considered. For example, despite reported high soil erosion rates, farmers may be more concerned with productivity in the short run rather than benefits of soil conservation in the long run. Furthermore, the net costs of soil erosion to agricultural production may be lower than the costs of declining soil fertility (Sutcliffe 1993, cited in Fistum Hagos et al. 1999). In addition, the nature and causes of land degradation are likely to vary from place to place.

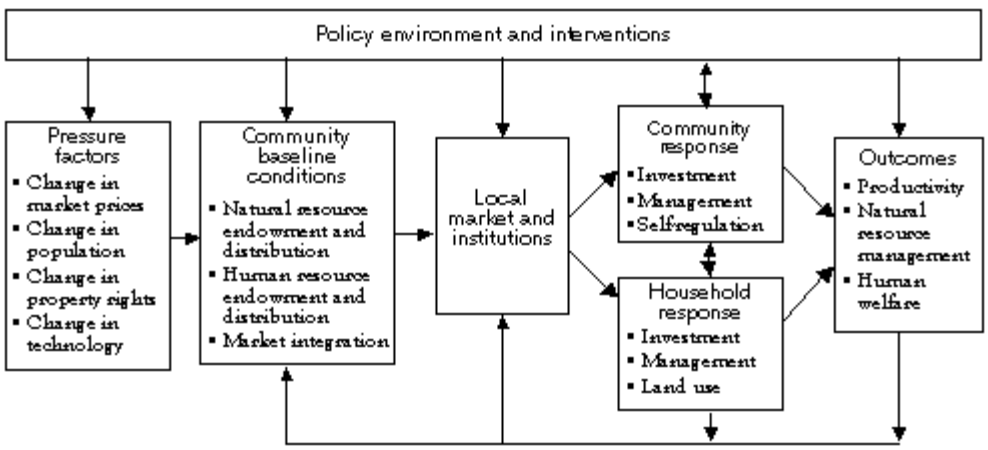
This means that in addition to technical research to identify productive and alternative land management techniques for diverse farming circumstances, research is needed to identify the socio-economic and policy factors that inhibit or favour adoption of more sustainable land management practices. It may be that policy interventions, such as land tenure, land use, infrastructure and market policies, have greater impact than conservation programmes, or condition the potential success of these programmes. For example, lack of credit may reduce farmers' ability to invest in long-run conservation technologies and contribute to farmers' having a short-term perspective (Pender 1996; Holden et al. 1996). Compared with physical conservation technologies, alternative farming practices may be less effective in reducing the total amount of soil erosion per hectare, but more cost effective per unit of erosion reduction and, thus, more likely to be adopted.

Notably, the diverse agricultural and socio-economic conditions prevailing in the region should be taken into account. Of particular interest, among others, are population density, market access and agricultural production potential, which vary considerably from place to place and are very likely to have diverse policy implications in different situations. By accounting for this diversity, we hope that the conclusions drawn from this research will have broad applicability.

3 Conceptual framework

Similar to its sister projects in the highlands of East Africa, the conceptual framework for this research on sustainable land management draws principally from theories of induced technical and institutional innovation in agriculture, which explain changing management systems in terms of changing micro-economic incentives facing farmers as a result of changing relative factor endowments (Boserup 1965; Hayami and Ruttan 1985; Binswanger and McIntire 1987; Pingali et al. 1987; Templeton and Scherr 1997). Additional variables that are also important determinants of resource management have been included. These are inspired by theories of collective action (Olson 1965; Ostrom 1990; Baland and Platteau 1996); market and institutional development (North 1990); rural organisation (Bardhan 1987); and agricultural household models (Singh et al. 1986; de Janvry et al. 1991).

Figure 1 illustrates this conceptual framework. 'Pressure' or 'shift' factors at a national or regional level (e.g. population growth, changes in market prices, development of new technologies and changes in property rights) are assumed to induce, within individual communities, shifts in local market structure, prices and/or local institutions (e.g. local labour and land tenure arrangements). The nature of these shifts will be conditioned by community characteristics, which help to determine local comparative advantage (e.g. human and natural resource endowments, market linkages and local knowledge of natural resource management).



Source: Scherr et al. (1996, cited in Fitsum Hagos et al. 1999).
Figure 1. *Conceptual framework to identify land degradation and land management processes.*

Shifts at the community level induce responses in natural resource management at both household and community levels. At the household level, responses may take the form of changes in land use, product choice, investment and/or land management (intensity, input mix and conservation practices). At the community level, responses may take the form of collective land investments, collective self-regulation of private resource use, changes in management of communal resources, or changes in formal and informal rules of access to natural resources. The net results of these changes in natural resource management are changes in natural resource conditions, productivity and human welfare. Both the responses themselves and changes in the outcome variables, can have feedback effects on community baseline conditions and local markets and institutions, thus contributing to further change and innovation at the local level.[4]

4. The aggregate effects (across communities) of local responses and outcomes also have feedback effects on the pressure factors and public policies on a broader scale. In this project, we will not attempt to measure these aggregate effects.

Public policies may influence this temporal process at various levels: through the pressure factors (e.g. agricultural research programmes, sector price policies, and resettlement policies); by directly influencing community conditions (e.g. restrictions on natural resource use, land-titling programmes and local credit programmes); by influencing household or community responses (e.g. through technical assistance programmes); or by directly intervening in outcome variables (e.g. nutrition programmes and direct forest management by the state).

Currently, available information is not adequate to understand the dynamics of the process and does not provide policymakers with much guidance as to which of these intervention points will be most effective in promoting positive outcomes, key interactions to expect among policies, nor the most appropriate sequence for intervention. Most public action aimed at improving natural resource management in fragile land areas focuses on influencing household, and to some extent, community responses. Yet, it may be more effective to influence local markets and institutions or to invest in community infrastructure, since these may largely determine the nature of household and community responses. However, we have very little empirical evidence that elucidates the relationship between these different levels of policy action, and their effects on key outcome variables. Finding such empirical evidence is a major objective of this project.

4 Setting

To comprehend the problem of land degradation in a given context, it is imperative to examine the community baseline conditions such as the natural resource base, human resources, existing institutions and infrastructure base, and how these baseline conditions interact with one another to influence human responses and, thereby, affect productivity, livelihood and the natural resource base. This section, therefore, considers the setting of the land degradation problem in the highlands of the Amhara Region.

4.1 Natural features

Amhara National Regional State (ANRS) is located in the north-western part of Ethiopia. Geographically, it is situated between latitude 9°–13°45'N and longitude 36°–40°30'E. It is bounded by the Afar, Benishangul, Oromia and Tigray regions in the east, south-west, south and north, respectively, and by Sudan in the west. The total area of the region is estimated at 170,152 km^2, which is about one-sixth of the country's total area (BoA 1997).

The region ranges from 600 m above sea level (a.s.l.) at Metema, North Gonder, to 4520 m a.s.l. at Ras Dashen, North Gonder, which is also Ethiopia's highest point. The wide range of altitude is a major factor in determining the temperature range of the region. Generally, lowland areas (<1500 m a.s.l.) experience hot temperatures, while highland areas (>1500 m a.s.l.) experience relatively cooler temperatures. For example, in the hot to warm submoist agro-ecological zone, where the altitude ranges from 600 to 1400 m a.s.l., the mean annual temperature range is 21–27°C while in the cold to very cold moist zone, where the altitude ranges from 2800 to 4200 m a.s.l., the mean annual temperature varies from 7.5°C to 16°C (CEDEP 1999).

Amhara is made up of four river basins (Abay, Tekeze, Danakil and Awash) and, according to the major geomorphic classification of the country, is comprised of seven geomorphic units. These are:

- the eastern scarps and lowlands
- the North Gonder and Wello degraded areas
- the Gojam and North Shewa plateaus
- the Tana plain
- the Abay and Tekeze gorges
- the western lowland
- the mountainous and afro-alpine zones consisting of Ras Dashen, Choke, Guna, Abune Yosef, Amba Farit and Adama.

About 12 dominant soil types have been identified, with a distribution that is very much influenced by the physiography and geology of the region. The mountainous and degraded landscapes are covered with shallow and stony soils; the undulating and gently rolling areas are characterised by dark red- to brown-coloured deep soils; depressions and flat plains are characterised by black clayey soils; while the foothills consist of alluvial soils. The region is composed of 10 major agro-ecologies (CEDEP 1999) and is dominated (38%) by the tepid to

cool moist zone, which has high agricultural potential.[5] Table 1 shows the major agro-ecologies, area coverage,[6] production constraints and agricultural potential.

5. Within the 10 major agro-ecologies, 18 sub-agro-ecologies exist (BoA 1997).
6. There is disagreement about the area representation of the agro-ecological zones as there are several different estimates depending on the source. Figures shown here are from one of the more recent estimates.

Table 1. *Major agro-ecological zones (AEZs) of Amhara Region.*

AEZ	Description	Area (km^2)	Percentage (%) of total area	Biophysical constraints	Potential/recommendation
SA1	Hot to warm semi-arid	77	0.1	Very low moisture	Moisture conservation and irrigation
SM1	Hot to warm submoist	17,830	10.2	Low moisture	Supplementary irrigation
SM2	Tepid to cool submoist	39,352	22.4	Low moisture	Supplementary irrigation
SM3	Cold to very cold submoist	2,143	1.2	Very cold	Restricted to afro-alpine
M1	Hot to warm moist	27,319	15.6	Soil workability (vertisols)	High agricultural potential
M2	Tepid to cool moist	66,521	37.9	Soil workability (vertisols)	High agricultural potential
M3	Cold to very cold moist	7,041	4.0	Very cold	Restricted annual crops
SH1	Hot to warm subhumid	4,162	2.4	Rugged topography and stony soils	Very high agricultural potential but marginal for perennial crops
SH2	Tepid to cool subhumid	5,316	3.0	Rugged topography and shallow soils	Very high agricultural potential but marginal for perennial crops
A1	Hot to warm arid	3,242	1.8	n.a.	n.a.
	Lake Tana	2,412	1.4	n.a.	n.a.
	Total	175,415	100.0		

n.a. = not available.
Source: CEDEP (1999).

As agricultural production is mainly rainfed, the pattern and duration of rainfall determine the growing period. The mean annual rainfall varies from 300 mm in the east (Habru and Kobo *weredas* of North Wello) to over 2000 mm in the Awi zone in the west, specifically, the Banja Shikudad, Sekela and Guangua *weredas*. Generally, the western parts of the region are characterised as high rainfall and high agricultural potential areas, with precipitation exceeding 1200 mm annually. Low rainfall and agricultural potential areas are found in the North Wello and Wag Hemra zones. The region experiences both unimodal and bimodal rainfall patterns, generally, in the west and east, respectively. In the western part of the region, the growing period varies from a little under 120 days in the North Gonder zone to more than 270 days in the Awi zone. Contrarily, the growing period varies from 45 to 90 and from 60 to 210 days in the eastern and south-eastern parts of the region, respectively (BoA 1997).

Of the 4.64 million hectares of the region's total land area that is suitable for cultivation (about 30% of the total land area), 97% is under cultivation, with cereal production taking up 75% of the total area under crops. Grazing land and pastures each make up 30% of the total land area, while forest, shrub, bush and woodland make up 17%. Wasteland and bodies of water account for 16% and 4% of the total land area, respectively, while the remaining 3% is taken up by settlement (BoA 1999a). Within the Amhara Region, the total irrigation potential is

estimated at 500,000 ha (CoSAERAR 1999).

4.2 Socio-economic features

The total population of Amhara in 1994 was 14.4 million, with close to 90% employed in agriculture and living in rural areas (CEDEP 1999). About 50% of the population is male and the economically active population (people 15–64 years old) is 52%. The population growth rate is estimated at 2.9% per annum (BoPED 1999a). The average farmland holding is 1.7 ha and varies from 0.7 ha in North and South Wello to 2.6 ha in West Gojam (Larsen et al. 1996).

Cereals, pulses, oil crops, spices, vegetables and fibre crops are cultivated annually in descending order of area coverage. Teff is the leading crop (32% of area of cultivated cereals) followed by sorghum and barley (13% each), wheat (11%) and maize (7%) (BoA 1999a). Growing teff accelerates soil erosion, as it demands several ploughings for fine seedbed preparation. Rotation of cereals with legumes and other crops is practised in the region to improve soil fertility.

Approximately 35% of the nation's livestock population (8.9 million cattle, 7.5 million sheep and goats, 1.39 million pack animals and 9.06 million poultry) is found in the region (BoA 1991 Ethiopian calendar). Livestock provide draft power, food, cash income and manure for fertiliser and fuel. Livestock are also an important form of marketable wealth, and provide farmers with economic security in times of crop failure.

The major feed sources for livestock are communal grazing lands, fallow lands, crop residues and stubble. The total annual feed availability from these sources is about 9.1 million tonnes of dry matter, while the total annual demand is 20.6 million tonnes, with a deficit of 11.5 million tonnes (BoA 1997). These estimates suggest that the livestock population is greater than the carrying capacity of the land, due to land degradation and low biomass production. Consequently, the land is exposed to erosion, due to excess removal of vegetation cover and compaction of the soil. Although high livestock stocking rates are often blamed for land degradation, sound livestock management practices, manure application etc. can improve land quality by enhancing soil quality and fertility. However, as long as open access grazing continues and feed production and cut-and-carry stall feeding are not prominent, purchased feed may not count as an important feed source.

Although compared with other regions, Amhara has a high population of livestock, values for average annual milk and meat consumption per capita are low at 9.1 and 3.2 kg, respectively, compared with averages of 14 and 10 kg for the nation. This is primarily because cattle offtake is low (about 7%) and average carcass (meat) weights are only 125 kg (BoA 1997).

Poverty and undernutrition are very severe in Amhara, especially in drought-prone lower agricultural potential parts of the region. A study in South Wello revealed that 91% of farmers did not produce enough food to last them throughout the year while the remaining 9% produced just enough to last them through the year without any surplus for sale (Zealbowesen Asfaw 1998). In a socio-economic survey of the region by UNECA (1996), the majority (about 58%) of households faced food shortages for 5 to 16 weeks of the year (Table 2); however, more than 11% of households had insufficient food for over 6 months of the year.

Table 2. *Food shortage in weeks, South Wello.*

Number of weeks	Number of households	Percentage (%) of households
<5	109	7.1
5–8	302	19.8
9–12	355	23.3

13–16	228	14.9
17–20	140	9.2
21–24	143	9.4
25–28	80	5.2
29–32	84	5.5
33–36	26	1.7
37–40	24	1.6
40+	35	2.3
Total	1526	100.0
Source: UNECA (1996).		

Marketable surplus, even from the high agricultural and surplus-producing zones, is quite low. For example, in Adet *wereda* in West Gojam zone, during the 1996–97 crop season, 72.6% of production was consumed or reserved as seed for the next farming season, and the remaining marketed (Tamiru Sebsbe 1998). Table 3 shows the major reasons why Adet farmers are not food self-sufficient. Shortage of farmland and high fertiliser prices were cited by all farmers as the most constraining factor. Soil erosion was mentioned by 57% of the farmers.

Table 3. *Reasons for not being food self-sufficient in Adet* wereda.

Problems	Percentage (%) of respondents
Shortage of farmland	100.0
High price of fertiliser	100.0
Lack of finance	78.6
Shortage of draft power	75.7
Soil erosion	57.0
Source: Adapted from Tamiru Sebsbe (1998).	

Biomass supplies primarily satisfy the region's energy requirement. Woody biomass, cow dung and crop residues account for 99% of the total fuel needed for domestic cooking and heating in the household sector (BoA 1997). Rural households are totally dependent on biomass for energy. For example, 58% of the energy consumed by farmers in Adet *wereda* is derived from fuelwood, 19% from dung and 23% from crop residues (Tamiru Sebsbe 1998). Only about 9% of the region's population (mostly urban) is supplied with hydroelectric or diesel power (BoA 1997). The majority of the people use fuelwood for cooking.

Infrastructure, such as road transportation, is not well developed in the region. Hence, pack animals and human portage are the major forms of transport. There are 608, 4239 and 782 km of asphalt, all-weather and dry-weather roads, respectively (BoPED 1997–98). The density of roads in the region is low, standing at 35 km/1000 km^2 area and 0.37 km/1000 population (BoPED 1999b). Development of roads is critical to the availability of agricultural inputs and will tend to reduce the prices paid for inputs and increase the prices received for outputs by farmers. In addition, it helps to move food from surplus-producing areas in the west to food-insecure areas in the east.

5 Land degradation and its impact in Amhara Region

Land degradation in the Ethiopian highlands (i.e. areas above 1500 m a.s.l.) has been a concern for many years. Soil erosion, nutrient depletion and deforestation are common, but little has been done to determine their impact on productivity.

5.1 Soil erosion

Loss of arable land due to soil erosion is a widespread phenomenon in the highlands, which account for about 45% of Ethiopia's total land area and about 66% of the total land area of Amhara Region. On steep hillsides, soil losses of and exceeding 200 t/ha per year have been recorded (Kappel 1996). The potential threat of land degradation to the country's fragile economy and food security has been emphasised by several publications (e.g. Wright and Adamseged 1986; Hurni 1988; MNREP 1994: Abegaz Gizachew 1995; Kappel 1996; BoA 1997; NEC 1997; FEC 1998). The threat is credible as about 90% of the population of the Amhara Region lives in the highlands and 90% of the regularly cropped land is found there.

Soil erosion by water is the dominant form of erosion. The areas that are severely affected can be found in Wag Hemra and North Wello followed by North and South Gonder, eastern parts of South Wello and northern parts of North Shewa zones. The soil depth in these places is very shallow (Leptosols), soil fertility is poor and farmers squeeze a living from pockets of shallow soils. Gullies are a frequent and permanent phenomenon everywhere in the region. According to CoSAERAR (1997), Kobo, Gubalafto and Habru *weredas* (all of North Wello) have lost 3700 ha of their 284,950 ha total land area to gullies. In addition to reducing cultivable area, soil erosion and gully formation and expansion reduce the water holding capacity of the soil and, consequently, result in poor crop yields.

The Ethiopian Highland Reclamation Study (EHRS) has developed a 1:1,000,000 scale soil loss rate map, which shows the types of soil degradation processes, causes, severity and extent . The map is based on the universal soil loss equation (USLE) and soil-erodibility and land use maps. EHRS assesses the national soil loss rate as 'moderate to high', which is estimated at 30–100 t/ha per year (Wright and Yeshinegus Adamseged 1986). Depending on land use practices, however, the real rate is claimed to be <2 to >300 t/ha per year (Wright and Yeshinegus Adamseged 1986). Based on the EHRS calculations, the region's soil loss rate is estimated at about 58% of the national rate (BoA 1997; CEDEP 1999). Thus, given that the spatial coverage of the region is only about one-sixth of the nation, the soil loss rate per unit area is very high in the region, compared with other regions. The USLE over estimates net soil losses, since it accounts for erosion off plots above but not sedimentation on plots below. Therefore, the net soil loss may be significantly lower than estimated and, consequently, needs to be interpreted with caution. For example, the Soil Conservation Research Project (SCRP) estimates the national soil loss rate at about 21% less than the EHRS estimate (Dawit Kebede 1996). The study, therefore, concludes that the soil loss from

croplands in the highlands of Amhara is much less than that estimated by the EHRS. Table 4 shows that about 29% of the total area of the region experiences a high erosion hazard (between 51 and 200 t/ha per year) and 31% exhibits a moderate erosion hazard (16–50 t/ha per year). Although, the highest soil loss rate (>200 t/ha per year) occurs in only 10% of the region, it is estimated that this contributes almost 50% of the total soil mass that is moved (CEDEP 1999).

Table 4. *Estimated erosion hazard classes in Amhara Region.*

Erosion classes	Range of soil loss rate (t/ha per year)	Area coverage	
		ha ($\times 10^3$)	Percentage (%)
Very high	>200	1660	10
High	51–200	4796	29
Moderate	16–50	5284	31
Slight	0–15	5020	30
Total	9–300	16,760	100
Source: Abegaz Gizachew (1995).			

The FEC (1998) study indicates that the plain areas of the highlands in Gojam, Awi and the south-eastern parts of the region have a moderate soil erosion hazard. However, as these are currently the most productive and surplus-producing areas of the region, due to the ample rainfall and gentler slopes, these estimates should not be interpreted as though land degradation is not problematic but, rather, as an indication for remedy. Another relevant study conducted in the region is NEC (1997). This study was a soil survey on erosion hazard assessment in the northern parts of the region covering about 56% of the total land area. In the study, 4 zones and 23 *weredas* were identified as soil and water conservation implementation priority areas.

Site-specific test plots and experiments in 1987 and 1988 at SCRP stations in the region show soil loss rates between 0.04 and 212 t/ha per year, which depend on the soil type, slope, vegetation and type of conservation structure (see Tables 5 and 6). Grass cover tremendously reduces soil loss, as runoff is significantly diminished, implying that more water finds its way into the soil. Land under cereal cultivation also had higher soil loss rates than land under legume cultivation (Table 5) and conservation structures significantly reduced soil loss, with *fanya juu*[7] terraces performing better than graded bunds, but not better than grass strips (Table 6).

7. *Fanya juu* is a type of terrace adopted from Kenya. In Swahili, *fanya* means 'throw' while *juu* means 'up'. It thus means, 'throwing up the slope' as opposed to 'throwing down the slope' in the conventional soil bund construction. With *fanya juu*, less cultivable land is taken up by the structure and benching is faster than the conventional soil bund; however, *fanya juu* requires a higher amount of labour.

Table 5. *Soil loss estimates for Soil Conservation Research Project (SCRP) sites in Amhara Region, 1987 and 1988.*

Year	SCRP site	Slope (%)	Soil type	Crop	Runoff (mm)	Soil loss rate (t/ha per year)
1987	Maybar	16	Haplic phaeozem	Maize	63.6	4.5
		37	Stony haplic phaeozem	Barley/horse bean	50.4	11.2
		43	Haplic phaeozem-lithosol	Grass	21.9	0.04
		64	Haplic phaeozem-lithosol	Grass	13.9	0.1

	Andit Tid	23	Eutric regosol	Lentil	273.3	121.8
		39	Chromic cambisol	Lentil	321.2	160.1
		48	Eutric regosol	Fallow	222.9	69.1
		48	Orchic andosol	Lentil	115.3	42.1
	Anjeni	12	Eutric regosol	Teff	836.0	175.6
		16	Eutric regosol	Grass	627.5	14.4
		22	Stony eutric regosol	Wheat	692.2	184.2
		28	Vertic luvisol	Barley/gibto	989.2	210.9
1988	Maybar	16	Haplic phaeozem	Barley/beans	569.9	36.0
		37	Stony haplic phaeozem	Wheat/beans	374.3	53.8
		43	Haplic phaeozem-lithosol	Grass	28.2	0.5
		64	Haplic phaeozem-lithosol	Grass	21.4	0.2
	Andit Tid	23	Eutric regosol	Wheat	583.5	212.4
		39	Chromic cambisol	Barley	703.6	199.5
		48	Eutric regosol	Fallow	586.1	142.6
		48	Orchic andosol	Barley	382.9	152.4
	Anjeni	12	Eutric regosol	Beans	836.7	40.2
		16	Eutric regosol	Grass	620.4	1.6
		22	Stony eutric regosol	Grass	690.7	73.6
		28	Vertic luvisol	Wheat	840.2	199.2
Source: Grunder and Herweg (1991a, 1991b).						

Table 6. *Soil loss estimates for Soil Conservation Research Project (SCRP) experiments in Amhara Region, 1987 and 1988.*

Year	SCRP site and conditions	Conservation structure	Runoff (mm)	Soil loss rate (t/ha per year)
1987	Maybar (slope = 28%; soil = Haplic phaeozem; crop = Horse, bean/ barley/wheat)	Grass strip Graded *fanya juu* Graded bund Control	7.7 10.2 12.1 15.6	0.4 1.2 1.7 1.1
	Andit Tid (slope = 24%; soil = Eutric regosol; crop = Barley/lentil)	Grass strip Graded *fanya* juu Graded bund Control	57.3 113.7 79.9 182.8	3.9 15.0 14.6 43.4
	Anjeni (slope = 28%; soil = Vertic luvisol crop = Barley/gibto)	Grass strip Graded *fanya juu* Graded bund Control	– 441.2 495.8 595.6	– 40.1 45.6 144.0
1988	Maybar (slope = 28%; soil = Haplic phaeozem; crop = Maize)	Grass strip Graded *fanya juu* Graded bund Control	19.7 15.9 15.3 22.0	0.5 0.2 0.5 0.7
	Andit Tid (slope = 24%; soil = Eutric regosol; crop = Peas/beans)	Grass strip Graded *fanya juu* Graded bund Control	607.5 651.3 705.5 685.4	51.6 54.8 85.6 140.8
	Anjeni (slope = 28%; soil = Vertic luvisol; crop =	Grass strip	–	–

	Wheat)	Graded *fanya juu*	282.0	36.1
		Graded bund	345.5	42.0
		Control	481.8	104.0
Source: Grunder and Herweg (1991a, 1991b).				

5.2 Nutrient depletion

Loss of fertility is manifested through using dung and crop residues as household fuels and animal feeds, low use of chemical fertilisers, declining fallow periods, soil and organic matter burning (guie), and soil erosion. Even though the farming system in the highlands of Amhara is mixed crop–livestock, nutrient flows between the two are predominantly one sided, with feeding of crop residues to livestock but little or no dung being returned to the soil. For example, in a household level socio-economic survey of the Amhara Region, even though almost all households (90%) fed crop residues to their livestock, only 40% used manure on their farmlands (UNECA 1996). This phenomenon is common in most of the highlands of Ethiopia, where the nutrient balance is highly negative. Deficits of more than 100 kg of nitrogen/ha per year have been reported for the highlands of Ethiopia, compared with only 15 kg of nitrogen/ha per year in Mali (de Wit et al. 1996, cited in Steinfeld et al. 1998). Furthermore, estimates of soil nutrient loss in Ethiopia show a net removal of 41 kg of nitrogen/ha of agricultural land between 1982 and 1984, and losses projected to reach 47 kg/ha by the year 2000 (Stoorvogel et al. 1993).

5.3 Deforestation

Excess removal of forests is contributing to land degradation. For example, based on population growth (demand) and forest increment (supply), the region recorded a deficit of about 16.6 million cubic metres of wood for fuel and construction in 1996 alone (BoA 1997). About 20 thousand hectares of forest are harvested annually in the Amhara Region for fuelwood, logging and construction purposes. Since harvested trees are not replaced adequately by tree planting, soils are exposed to high intensity of rainfall and about 1.9 to 3.5 billion tonnes of fertile topsoil are washed away annually into rivers and lakes due to deforestation alone (BoA 1997). While there is growing interest by farmers in planting eucalyptus trees, there is a strong debate as to whether eucalyptus should be planted on farmlands or not. Eucalyptus is believed to have a negative soil-moisture impact on neighbouring fields and renders the particular field unsuitable for future crop production. Consequently, current planting is limited mainly to homestead and field boundaries. Reliable data on area coverage, number of trees and annual growth rate of eucalyptus in the region are not available (BoA 1997; AFAP 1999). However, it is argued by many that, existing estimates are conservative. Thus, there is need to update most of the information for proper and effective policy intervention.[8]

8. The Woody Biomass Project is currently making an inventory of trees of different types in the Amhara Region.

5.4 Impact of land degradation

While a substantial number of research studies in the region (e.g. Yohannes Gebremichael 1989; Kassaye Goshu 1997; Ludi 1997; Azene Bekele 1998; Tamiru Sebsbe 1998; Zealbowesen Asfaw 1998) have examined the rate of land degradation, very few have looked at the impact on productivity. SCRP has monitored soil erosion and impact of many physical and biological soil and water conservation practices in the three research stations of the region (Maybar, Andit Tid and Anjeni). Thus, while ample biophysical data have been generated and are available, little quantitative analysis for policy action has been carried out.

The net soil loss from erosion, as reviewed by Kappel (1996), is estimated to range from 20 to 100 t/ha per year, with an annual productivity loss on cropland of 0.1% to 2% of total production for the country (see Table 7). Commenting on the wide variation of the estimates, Kappel (1996) argued that the economic implications of soil erosion in Ethiopia are neither as catastrophic as commonly believed nor negligible. Sutcliffe (1993, cited in Kappel 1996) and Bojo and Cassells (1994, cited in Kappel 1996) argued that soil fertility depletion may be a larger problem than erosion in the Ethiopian highlands.

Table 7. *Soil erosion and productivity loss in Ethiopia.*

	Wright and Yeshinegus Adamseged (1986)	Hurni (1988)	Sutcliffe (1993, cited in Kappel 1996)	Bojo and Cassells (1994, cited in Kappel 1996)
Soil loss (t/ha per year)				
Gross	130	n.e.	n.e.	40
Net	100	42	45	20
Productivity loss (% of total output per annum)				
Potential	n.e.	n.e.	0.7	0.4
Effective	1.8	2.0	0.21	0.12
n.e. means not estimated. Source: Kappel (1996).				

Using 1994 prices, an annual yield loss of 1% of 1992 production was valued at about US$ 7.5 million (Kappel 1996). Belay Tegene (1992), at Gununo experimental station, an SCRP site, showed that there is a high positive correlation (r = 0.92) between topsoil depth and maize yield.

As vegetation cover and quality of soil resources deteriorate, the quantity and quality of water resources also deteriorates. A report on the water supply scheme of rural communities in 6 zones revealed that no more than 2.3% of the people had access to safe drinking water (BoA 1997). Many perennial springs and streams had become seasonal. Monitoring the impact of deforestation, soil erosion and conservation efforts on streams and rivers in particular and bodies of water in general is virtually non-existent. The negative impact of sedimentation on irrigation projects in the absence of catchment treatment is evident at the Borkena and Angereb water resources development projects in South Wello and North Gonder zones, respectively.

The Ethiopian Forestry Action Programme (MNREP 1994) and the AFAP (1999) also describe the land degradation problem in the country and region, respectively, its causes, impacts, and policy and institutional implications. However, these studies are based on land use in 1984 and, thus, the current situation is likely to be different, due to land-use dynamics. Nevertheless, a worsening scenario is envisaged as increasing amounts of forest, bush, grazing land and marshy areas are brought under intensive cultivation to meet the increase in food demand due to increasing population pressure. Already, degraded steep slopes are grazed continuously and are not allowed to regenerate. This phenomenon is observed especially in South Gonder, and North and South Wello zones, where wet and marshy (riparian) areas, which were used previously for grazing, are increasingly being drained for cropping.

6 Causes of and responses to land degradation

One could argue that soil management represents the underlying problem of land degradation, with soil erosion (Figure 2) and nutrient depletion (Figure 3) being two of the most critical manifestations of unsustainable management, and deforestation and livestock management as key factors affecting these problems.

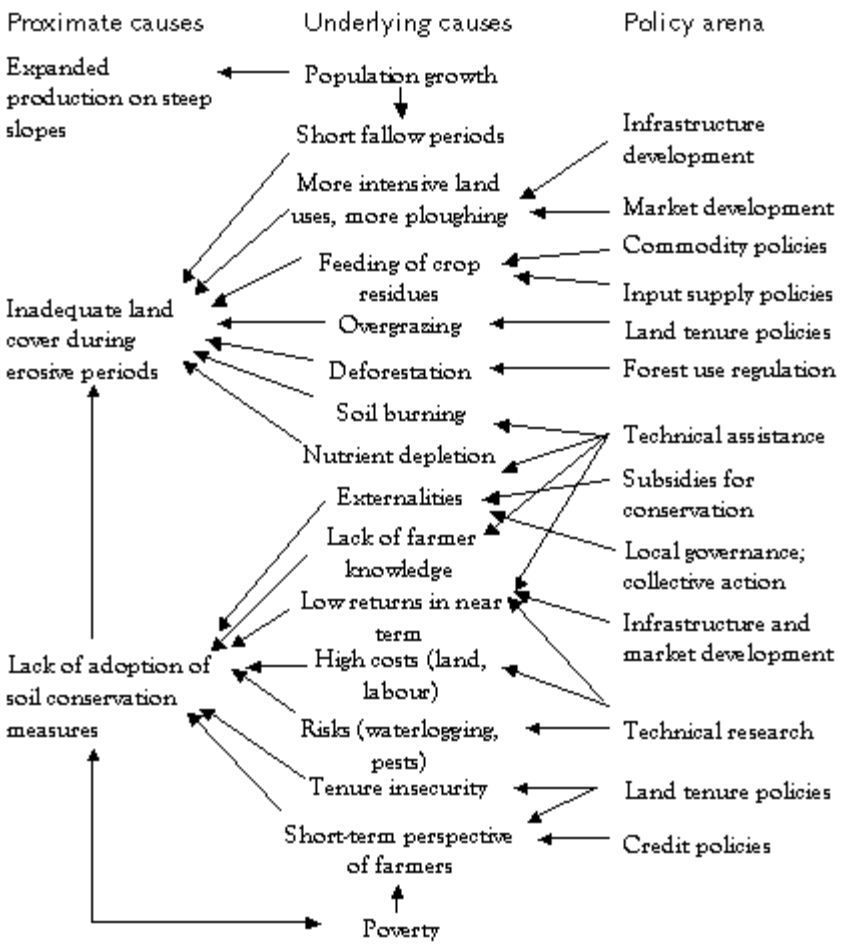


Figure 2. *Causes of soil erosion.*

The direct causes of land degradation are apparent and generally agreed. These include production on steep slopes and fragile soils with inadequate investments in soil conservation or vegetative cover, erratic and erosive rainfall patterns, declining use of fallow, limited recycling of dung and crop residues to the soil, limited application of external sources of plant nutrients, deforestation and overgrazing (see Figures 2 and 3). Many factors underlie these proximate or direct causes including population pressure, poverty, high costs of and limited access to agricultural inputs and credit, low profitability of agricultural production and many

conservation practices, high risks facing farmers, fragmented land holdings and insecure land tenure, short time horizons of farmers, and farmers' lack of information about appropriate alternative technologies. Many of these factors are affected by government policies relating to infrastructure development, market development, input and credit supplies, land tenure, agricultural research and extension, conservation programmes, land use regulation, local governance and collective action, and non-governmental programmes. In what follows, we discuss numerous factors that are believed to have contributed to land degradation in the highlands of Amhara. We categorise these causes and responses to the causes, into natural, socio-economic, institutional and policy factors.

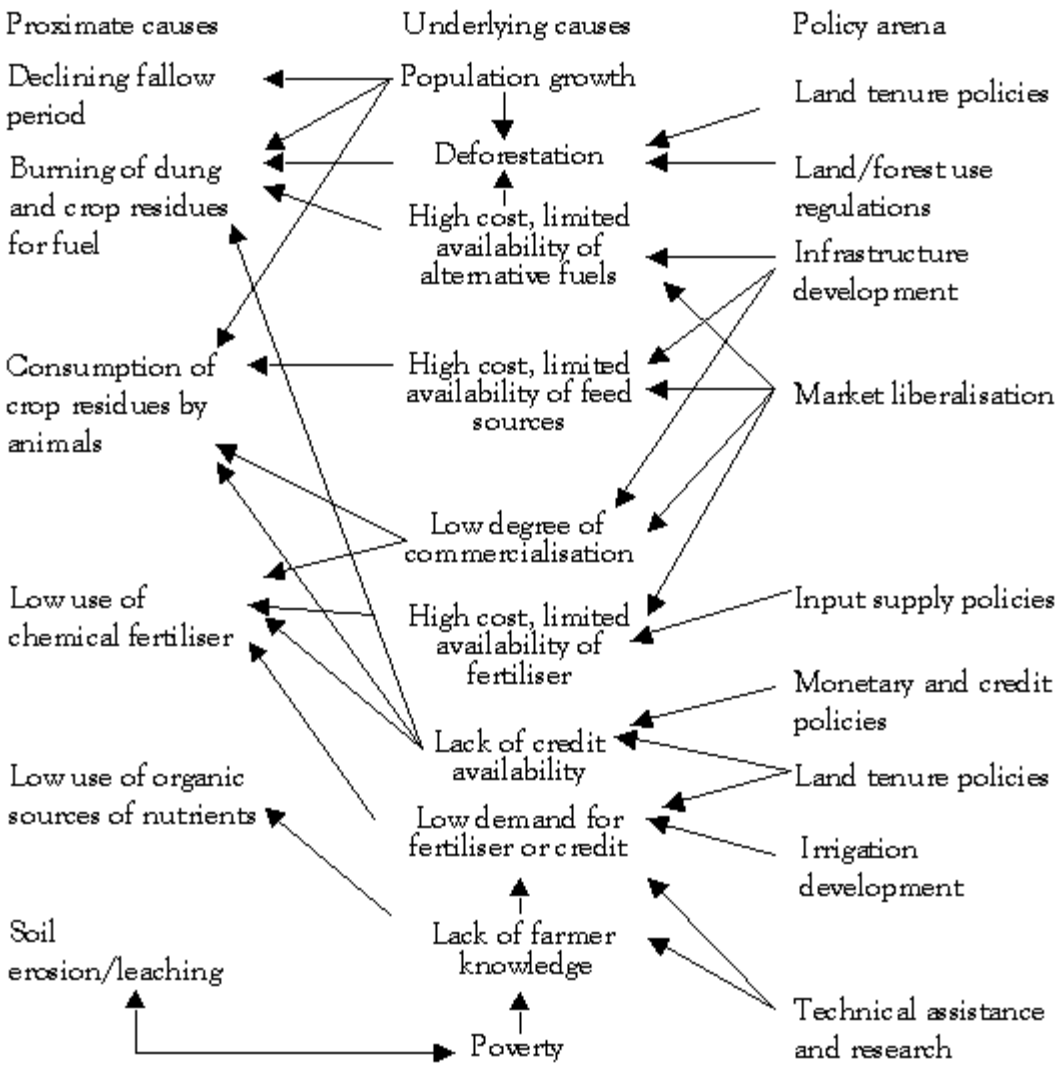


Figure 3. *Causes of nutrient depletion.*

6.1 Natural factors

Of the natural factors causing land degradation, high intensity of rainfall and steep relief are the major ones. The impact of raindrops, with tremendous amounts of energy, on bare unprotected soil starts the process of erosion by water (Hudson 1981; Morgan 1986).[9] The impact of the raindrop causes a splash, which seals off infiltration as the soil pores get plugged with fine particles. Splash erosion grows into sheet erosion and then rill erosion. Eventually, the rills form big gullies, which accelerate the erosion process. The impact of the raindrop depends on the level of soil cover; plant cover is often lacking due to problems of deforestation, over-cultivation and over-grazing.

9. The amount of kinetic energy available from the falling raindrop is measured to be 32 times that of the runoff.

Variation in natural factors, such as rainfall intensity, is significant. For example, in the tropics, 40% of falling rain is said to be erosive, while in temperate areas only 5% is erosive, due to the difference in intensity and snowfall (Hudson 1981). According to the SCRP calculations, about 80% of the total soil loss is attributable to only 20% of the total rainfall each year (Herweg 1997).

Loss of topsoil through runoff is increased by the absence of soil cover, steep slopes and intrinsic soil properties. The problem is particularly serious at the onset of the rains when ploughed fields are without any vegetation cover. Cropping of cereals, particularly teff, aggravates the situation as farmland requires repeated ploughing (heavy pulverisation) before sowing and it remains bare at the onset of the rains. However, teff remains the staple and cash crop for many Ethiopians, it is grown in a wide range of agro-ecologies and the stalks (crop residues) are good sources of feed for livestock. A similar situation exists for finger millet.

The types of soil are also a contributing factor. For example, Regosols, which are common in the North Wello zone, are shallow, poor in nitrogen and phosphorus, and have poor water holding capacity. Vertisols and Leptosols are also common in the region. Vertisols, which are found mainly around Lake Tana, have poor drainage when wet, crack when dry and are poor in nitrogen and phosphorus. Leptosols are shallow in depth due to the underlying hard rock and calcareous material (CEDEP 1999).

Topography is another factor contributing to degradation. The region is characterised by flat to gently sloping plateaus above deeply incised and dissected valleys, connected by steep and long slopes up to 0.5 km in length. It is on these steep long slopes below the escarpments that gullies originate and extend down to the plain fields. Generally, convex slopes are more susceptible to sheet and splash erosion than concave slopes (NEC 1997).

High altitude and cold temperatures in certain areas (e.g. in Meket *wereda*, North Wello zone) do not favour the establishment of trees and so many people rely on farmyard manure for fuel. With cold temperatures too, manure in particular and organic matter in general takes a long time to break down and so the benefits of using manure on soils are not immediate, as farmers in that area revealed to us.

6.2 Socio-economic and institutional factors

Socio-economic and institutional factors affect land degradation through their impacts on farmers' decisions with respect to land use and land management practices, such as ploughing, fallow, use of manure and other sources of organic matter, fertiliser use, and adoption of soil and water conservation measures. A non-exhaustive list of factors influencing these decisions includes population pressure, poverty, land tenure relationships, the nature of local markets, local institutions and organisations, and farmers' perceptions and attitudes. Each of these is considered below, within the context of the highlands of Amhara.

6.2.1 Population pressure

The population of the region is increasing at an alarming rate. In the next quarter of a century, the number of people in the region is expected to reach 32.7 million of whom nearly 26.8 million (82%) will be living in rural areas (CSA 1998b). Population growth can have and has had a deleterious effect on agricultural growth, resource management, and poverty.

Land redistribution, which in recent years has been the only means of formally acquiring

access to land to accommodate new households, has led to severe fragmentation of plots, a reduction of crop fields and insecurity. Reduction of cropland per capita and insecurity have led to reduction in activities such as fallowing, planting trees and investing in conservation structures, while a reduction in cropland per capita has caused cropping and grazing activities to be shifted to hillsides and ecologically fragile areas. For example, UNECA (1996) found that shortage of farmland was cited by 90% of households interviewed in the region as the main constraint to fallowing.

Without adequate alternative sources of energy, population growth increases the demand for fuelwood, which in turn leads to the destruction of forests. It also contributes to the use of crop residues and dung for fuel rather than using them as sources of organic fertiliser to improve the already poor soils. UNECA (1996) revealed that about 94% of the households meet their principal energy demand through fuelwood and dung (Table 8). About 60% of the households did not use manure on their farmlands. When asked why, 73% of them said there was not enough to use as manure (UNECA 1996).

Table 8. *Principal energy sources in Amhara Region.*

Energy source	Number of households using	Percentage (%) of households using
Fuelwood/leaves	1506	76.3
Dung	357	18.1
Crop residues	80	4.1
Other	32	1.6
Total	1975	100.0
Source: UNECA (1996).		

The projected demand for energy in the region in 2000 is 20 million cubic metres of wood equivalent. Of this, 64% would be supplied in the form of fuelwood (BoA 1997). Therefore, unless alternative energy sources are exploited and become available, the rate of depletion of forest resources will continue and increase as population and consequent demand for energy increases.

Shortage of land has its repercussions on livestock stocking rates. Most of the land that is fertile is reserved for crop production, while grazing of cattle and other livestock is limited to hydromorphic valley bottomlands and marginal deforested hillsides. Hillsides that are supposed to be closed off for regeneration are kept under intensive grazing until they are completely bare and then abandoned. This practice increases the amount of time required for natural regeneration, if regeneration occurs at all. One of the major reasons for keeping a large number of livestock, especially cattle, is to sustain oxen supply for draft power. Irrespective of size of land holding, most households strive to keep their own oxen. For a pair of oxen, it is practice to maintain an average of 12 cattle. Note that not all 12 are kept as a follower herd for replacement, as cattle (and livestock in general) are kept for other reasons. Markets for draft power, which could ease the need for farmers to keep their own oxen, are difficult to establish due to peak demand problems and concerns about treatment of the animals (so one usually has to hire the owner as well). Although the desire for keeping cattle for draft power is high, cattle (livestock) also represent a form of wealth and provide a source of income during drought.

The crop–livestock farming system of the highlands shows the interdependence between crop production and animal husbandry. As an adaptation to the expansion of cropland and shortage of grazing land, hillside grazing is practised. Forests have come under severe encroachment not only for direct browsing and grazing, but also for cutting of trees for fuel and construction. Increasingly, hillsides with slopes of 30% or more are being overgrazed and

are rarely allowed to regenerate.

Population pressure can also have positive impacts on land improvement and soil management. By increasing the value of land relative to labour, population growth may induce farmers to make labour-intensive investments in land improvement and soil management, such as planting trees, constructing terraces, composting and mulching (Tiffen et al. 1994; Pender 1998). For example, before the directive to distribute wastelands to landless households for tree and fodder development became official in the region in 1999, since 1997, some communities in the Wello area had already been distributing wastelands to their landless households for tree-planting activities. Such initiatives are, however, constrained by insecure land tenure and absence of a land market.

6.2.2 Poverty

Poverty is very likely to contribute to land degradation for many reasons. When people lack access to alternative sources of livelihood, there is a tendency to exert more pressure on the few resources that are available to them. Bekele Shifereaw and Holden (1997) showed the intensified pressure on natural resources as a vicious cycle in which resource degradation and drought lead to reduced household assets, and reduced household assets in turn affect degradation in the Ethiopian highlands. Deforestation, and burning of dung and crop residues are increased by people's inability to afford, or lack of alternative fuel sources. Electricity and kerosene are expensive and in most cases not available. Even households with electricity supply avoid using it, except for lighting at night. For cooking, most households prefer the three-stone open fire, which is believed to be only 10% efficient in overall thermal energy production and use. Improved stoves, such as the improved biomass fuel-saving *injera* stove, which is believed to be 45–82% more efficient than the three-stone open fire, are not used since they are expensive to construct and, generally, not affordable by rural households.

As with population pressure, however, there are also reasons to believe that poor people may be more likely to conserve their land. Although there is no evidence to support this in the region, poor farmers may have more incentive than wealthy ones to manage what they have carefully, since they may 'own' little else than the land they occupy. Furthermore, they may have few alternative investments available to them, so they may give high priority to investing in the land. Finally, the opportunity cost of poor farmers' labour time may be very low at certain times of the year, encouraging them to make labour-intensive investments in land improvement and soil management.

6.2.3 Land tenure and land policy

Investment decisions on land are affected by tenure security (Place and Hazell 1993; Besley 1995; Gavian and Fafchamps 1996). Communal ownership is believed to lead to mismanagement, particularly, over-grazing and inefficient removal of wood for fuel (Shaxon 1981a, cited in Hudson 1981). The ability to transfer land can also provide incentive to invest in land management, as greater transferability increases the farmer's ability to appropriate the value of his or her investments. Land sales and leasing also allow land to be used by farmers who are able to earn the highest return from it, through mobility of scarce factors of production such as draft animals, farm implements, labour and management ability (Pender and Kerr 1999).

The systems of land tenure that have developed in the Amhara Region have had varying and significant impacts on land management. From a historical perspective, it is believed that the Ethiopian smallholder is uncertain about his or her security of rights to the land. This has led to cultivation for short-term needs rather than long-term yield. Accordingly, no long-term investments are made that would maintain or boost yields, and this has resulted in ecological

damage, which has become almost impossible to reverse.

In Ethiopia, before 1974, the relationship between land users and owners was based on a feudal system. Land was owned by the Emperor, who granted tenure subject to feudal obligations. Tenure forms known as *gult* and *rist* were practised.[10] Communal ownership of land was generally denoted by the term *rist* and an individual was entitled to *rist* rights in a commune if he or she could prove some blood relation to the founding patriarch of the commune. A person who held *rist* rights was called *ristegna*. The usufruct rights conferred by *rist* were generally valid for a lifetime and extended over many generations (Dessalegn Rahmato 1984). However, since any 'legitimate' member's claims were always honoured, frequent redistribution was necessary to accommodate all claims. Often *rist* rights were challenged by others on the grounds of closer ties to an ancestor.

> 10. In the Amhara Region, *gult* and *rist* existed simultaneously. These terms did not imply ownership, but referred to the rights and the duties of the different holders of rights to the same piece of land (Heinrich 1984, cited in Ludi 1997).

As Hoben (1973; p.13) put it 'there were always more legitimate descendants of an ancestral first holder than there are [people] who hold fields in the land tract'. Therefore, the potential of being challenged was always there and so the incentive to improve ones *rist* holding was diminished.

The gult was not distinctively different from *rist*, since it often applied to the same area of land. The difference between the two was in the nature of the tenure, as *gult* was linked with the legal and political status of the receiver in the grant of tenure. A *gultegna* was responsible for partial administration and justice at the local level in maintaining law and order and at the same time collecting taxes levied on land, which formed the greatest part of his income. *Gultegnas* could collect payment from *ristegnas* in the form of tributes, taxes or labour. Under the *gult*, as a rule, tax was 20% of the total crop production.

Comparing Amhara with other regions of the country, BoA (1997), in its review of the pre-1975 land tenure system, argued that there was a difference in the perception of peasants towards the system. Peasants in Amhara enjoyed more hereditary land-use rights by virtue of their membership in cognatic descent groups or residential communities. It is believed that the communal system that was practised in the northern parts of the country (Gojam, Gonder, North Shewa, Wello and Tigray) was more flexible and accommodating in that the chances for social mobility were greater. Furthermore, landlessness and tenancy were minimised, and, most importantly, peasants were assured security of tenure (Hoben 1975, cited in Dessalegn Rahmato 1984). Empirical evidence is, however, lacking.

Upon overthrow of the monarch, the military government (also known as the Derg) in its land reform proclamation of March 1975, declared land as the collective property of the people, redistributed land to farmers, and abolished the system of tenancy and elite rule. Under this new system, all customary and other pre-existing land rights were abolished and land was declared public property. Large holdings that existed under the *gult* system and under control of the church were confiscated. The maximum holding allowed per household was set at 10 ha, but in practice was usually less than 3 ha due to scarcity of land and population pressure (BoA 1997).

Selling, buying, leasing and mortgaging land were legally forbidden. Hiring of labour was also forbidden to destabilise the feudal system. Local administration, known as the Peasant Association (PA, today's *kebele* administration) was created and charged with the responsibility of distributing and managing common resources, subject to equitable distribution and to accommodate new claimants. Redistribution of cultivated fields to meet the increasing demand by new households led to further fragmentation of farmland holdings and limited

farmers' incentive to invest in the land. The PA set common grazing and browsing areas. If a farmer wanted to make use of trees, the PA executive committee had to approve the cutting of trees, even if the trees were on the farmer's homestead. This restriction and others discouraged investment in private tree-planting activities. Later, however, special areas were set aside for community tree-planting activities (woodlots), with seedlings and labour compensation provided by the government and food-for-work assisted programmes. Natural resource conservation activities such as terracing, pond construction and tree planting were planned at the top and handed down for implementation through mass mobilisation.

11. In principle, females and males were entitled to farmland when they reached the ages of 18 and 21 years, respectively.

The 1975 land reform proclamation also created state farms and producer co-operatives, to form the basis for development and food self-sufficiency. Therefore, most of the good quality and fertile land, including that with high irrigation potential, was set aside for co-operatives. Occasionally, individual farms were confiscated for this purpose.

Today, based on the new 1995 constitution, land is the state's property and redistribution is the sole mechanism through which land transfer, to accommodate new claimants, is effected. The differences between the present and previous Derg land policy are that the present land policy allows rural households to hire labour to work on their fields, while land leasing, sharecropping and lending of land are again legal and widely practised. However, buying, selling, and mortgaging land are still prohibited. The last land redistribution in the region was declared and undertaken in February 1997. In that reallocation, as in previous ones, landless and resource poor farmers gained access to farmland, and in some areas (e.g. in parts of North Shewa zone) new landowners were issued some form of document, which stated the name, address, quality of land, and degree or nature of the land fertility. While some farmers felt this was a symbol of ownership, others did not think so and felt that it was only a form of proof to be utilised in case of disputes in the future, as most of the land redistributed had belonged to migrants (abandoned land) and previous Derg officials. When asked if their sense of ownership affected the manner in which they cultivated their land, they responded in the negative. They reasoned that the new landowners were poor and, thus, did not have the resources and ability to exploit the land any differently. Although they did not anticipate any future redistribution, some of the farmers felt that the document represented the completion of the process of 'ownership'. However, those without the document were not pushing for similar documents and had adopted a 'don't ask' perspective, since they felt an equal sense of ownership.

In discussions in Meket *wereda*, as part of a field trip undertaken for this phase of the project, farmers expressed the view that buying and selling of land is 'bad' because of the false sense of security it brings from temporary relief through selling land to satisfy short-term problems. When asked about the unrestricted movement of resources that buying and selling brings, they think it is not an issue, since getting land is not difficult for migrants, even if non-residents are not entitled to 'own' land. Residents of Gubalafto *wereda* share similar views. They think buying and selling of land would lead to bad decision making. People, especially men, would sell their land and go elsewhere to squander the proceeds while their family members starve to death. Besides, they think that migration is not a good omen, as everybody wants to reside in their place of birth.

The regional government has been looking to implement a land-use policy that will reduce, if not eliminate, the inefficiencies (e.g. low productivity and over grazing) surrounding current land use practices. The Regional Conservation Strategy (BoA 1997), as a basis for formulating a regional strategic land use plan, identifies the need for undertaking a regional survey of the major categories of existing land uses and users. Objectives, guiding principles, and strategies to be followed are also presented in the strategy document.

The Regional Conservation Strategy document, under the rural land and natural resource tenure and access rights provision, includes the following objectives (BoA 1997):

- To provide security of tenure for land and natural resource users by clearly defining and strengthening land and other natural resource tenure rights and responsibilities, so as to support sustainable agricultural, pastoral, forestry and fisheries production and sustainable urban development.
- To undertake as a matter of urgency, studies, consultation and discussion into existing and potential mechanisms for the regulation and management of natural resources.
- To study the experience of other countries with similar socio-economic conditions with respect to the institutional structures, legal systems and any other interventions for the cost-effective administration of land tenure systems.
- As a basis for formulating regional strategic land use plans, to undertake a regional survey of the major categories of existing land users and uses: [for example] in smallholder agriculture; in communal lands of pastoralists; and among agropastoralists and shifting cultivators (pp. 16–17).

To solve the land-shortage problem and promote afforestation, a land directive was issued in 1998 to distribute degraded communal lands to landless individuals and groups for private development of forest, fruit and fodder. Under this directive (BoA 1998b), recipients are issued a formal contract and certificate that specifies the land area, location (in terms of adjoining holdings), and percentage and type of current vegetation cover. Recipients also agree to develop the land according to set guidelines subject to approval of the *kebele* administration and agricultural office, usually over a 15-year period for forest and 10 years for fruit crops. Identifying degraded common lands and beneficiaries is the sole responsibility of the *kebele* administration.

The Bureau of Agriculture, through its Landuse Planning and Regulatory Team, has prepared a draft land use policy that has been submitted to the regional council for endorsement. Major components of the draft (BoA 1999d) include provisions for:

- agricultural development to be based on the land use policy (e.g. set land care obligations for land users; undertake road, dam and other infrastructure development within land use and land care objectives etc.)
- long-term ownership security and use right (e.g. carry out land mapping and issue land certificates)
- settlement and resettlement (e.g. such programmes should be based on farmers' willingness and initiative)
- land transfer and consolidation/fragmentation (e.g. carry out land quality categories and encourage or advise farmers to consolidate their plots through exchanges)
- establishment of a land administration unit and legal entity to deal with land use studies and administer all land related issues
- rules, regulations and laws against land abuse
- formal and informal customary institutions (e.g. recognition of customary institutions by strengthening them to make positive contribution to proper land use)
- research on land use and impact monitoring (e.g. research on use of alternative household energy sources and organic fertilisers).

6.2.4 Local institutions and organisations[12]

Institutional and organisational development may have a major impact on land management.[13] The nature and evolution of local rules and norms (institutional development) and the organisations established to make decisions about, or to enforce such rules (organisational development) set the context and constraints within which land management decisions are

made. For example, most of the people of Amhara are Orthodox Christian, and subject to the norms and rules of the Ethiopian Orthodox Church. Among the most important of these norms, from the standpoint of land management, is the large number of religious holidays during which manual labour is prohibited. This obviously affects the availability and cost of labour during the rest of the year and, hence, the ability of farmers to make labour-intensive investments in land improvement or to adopt labour-intensive practices such as mulching or composting and other agricultural activities in general.

12. Following other social scientists, we define 'institutions' as 'complexes of norms and behaviours that persist over time by serving collectively valued purposes' and distinguish them from 'organisations', which are defined as 'structures of recognised and accepted roles' (Uphoff 1986). This definition differs from common use of the terms, which often confounds the two terms.
13. Based on the definition of institutions given in the preceding footnote, institutional development includes market development as well as changes in land tenure relationships. In this subsection, we focus on other aspects of institutional development.

Local rules also have important bearing on the management of common lands. In recent years, many *kebeles* and *gots* have established area enclosures,[14] where grazing is restricted to allow natural vegetation to recover, and community woodlots. Although leadership in establishing these areas has been provided by the Bureau of Agriculture and other organisations, decisions about whether to establish such areas and how to manage them are the responsibility of the local *kebele* administration. However, it seems that local communities do not have any sense of ownership of such common resources and are unclear about what their rights and responsibilities are with regard to management and use of such areas. For example, in one of the *kebeles* we visited in Tarma Ber *wereda*, only one got, of the four that comprise the *kebele*, had benefited from trees grown in the *kebele's* four woodlots; tree products had been used for house construction and repair for got flood victims in 1999. Perhaps in part because such confusion has limited the benefits farmers have received from the enclosures, as well as the near-term costs caused by loss of access to enclosed areas, some farmers do not favour the concept of enclosed areas. For example, common grazing areas and community woodlots in some *kebeles* in Meket *wereda* have been distributed for individual management and use following disagreements about collective management and use.

14. A *kebele*, which is made up of several *gots* or villages, forms the basic administrative unit in the region.

With regard to organisational development, Amhara Region is divided into 11 administrative zones (with Bahir Dar the capital forming a special zone),[15] 105 *weredas* of which 7 are classified as urban, and 3051 *kebeles*, formerly known as PAs. The *kebele* administration plays a decisive role in terms of local governance. This role includes: identifying problems; designing areas of intervention and for community action; developing regulations related to resource use; identifying target groups for food aid, food for work, rehabilitation schemes and credit; regulating tax collection and credit repayments; ensuring security; and resolving other minor legal issues. The current administrative set-up is the result of a reorganisation that started in 1995 to reduce the number of *weredas* and *kebeles*. This reorganisation may have affected the ability of local governments to reach and implement agreements. Thus, research on the impacts of the reorganisation on local decision making could yield useful insights.

15. The other 10 zones are Awi, East and West Gojam, North and South Gonder, North Shewa, North and South Wello, Oromia and Wag Hemra.

Other important organisations at the local level include churches, service co-operatives, schools, informal credit groups, and various social and religious groups. The church plays an important role in the economic and social (and of course religious) life of the people. For

example, the Ethiopian Orthodox Church, Ethiopian Evangelical Church (Mekane Yesus) and Baptist Mission Ethiopia have ongoing agricultural development projects in about 62 *kebeles*. The projects include integrated rural development, food security, and soil and water conservation (see Annex 3 for details). The roles of such and other organisations are discussed later under non-governmental programmes.

6.2.5 Farmers' perceptions and attitudes

In the region, different types of soil and water conservation measures (both biological and physical) are practised; however, site suitability of measures has not been assessed. Knowledge of farmers' perceptions and attitudes toward land degradation is an important first step to tackling the problem. Land degradation is not a new phenomenon in the region. It is often claimed that farmers do not fully understand the causes and consequences of land degradation. Nevertheless, farmers frequently undertake traditional methods of soil and water conservation such as simple diversion ditches across their fields to divert runoff and therefore prevent their land from becoming waterlogged.

In a recent study conducted in South Wello, Zealbowesen Asfaw (1998) found that 93% of the farmers were aware of the problem of soil erosion, though their perception of the occurrence of soil erosion, based on observation, was low (see Table 9). This may be because most of the erosion had occurred much earlier. However, in a UNECA (1996) study of the region, 88% of the farmers interviewed had observed declining soil depth since they started farming.

Table 9. *Farmers' perception of soil erosion in South Wello.*

Indicators of soil erosion	Percentage (%) of farmers aware	
	Maybar *kebele*	Atarymesk *kebele*
Decreasing of soil depth observed when plowing	21	30
Deposition of sediments below the edge of plots	25	30
Visible rills on cultivated plots after rains	25	27
Observed colour change after run off leaving the plots	27	30
Source: Adapted from Zealbowesen Asfaw (1998).		

In the UNECA (1996) study, farmers were asked to rank their perceptions on the causes of soil erosion. Thirty-one per cent perceived the steepness of the farmland as the major cause of soil erosion while equal percentages of farmers (both 22%) thought that improper cultivation methods and deforestation were the primary causes (Table 10). Zealbowesen Asfaw (1998) found that 66% of farmers thought that soil erosion was severe while 16% thought that soil erosion was not a problem. However, virtually all (98%) of the farmers highlighted the importance of soil conservation for their farming activities, as means of reducing the problem of soil erosion. They undertook soil conservation work during the dry season and maintained this work during the wet season; depending on the slope, mainly contour bunds (stone bunds) were constructed, but the extent of investment was not investigated by the study. In the UNECA (1996) study, however, about 30% of the households did nothing to combat erosion problems, while 40% undertook terracing, 24% planted trees and 10% built check dams to combat soil erosion.

Table 10. *Farmers' perception on the causes of soil erosion on cultivated land in Amhara Region.*

	Percentage (%) of farmers rankings[1]				

Causes of erosion	1	2	3	4	5
Overgrazing	17.3	25.3	21.9	22.3	8.6
Deforestation	21.7	30.0	24.2	11.4	9.1
Improper cultivation methods	21.7	21.8	26.8	23.8	6.5
Cultivation on steep slope	31.3	18.1	20.0	25.4	17.7
Other	8.0	4.8	7.0	7.1	58.1
Total percentage of respondent households[2]	81.2	65.0	48.0	28.0	9.3

1. 1, 2, 3, 4 and 5 represent the first, second, third, fourth and fifth most important cause of erosion, respectively.
2. Total percentage of households out of 2000 that were interviewed.
Source: UNECA (1996).

Concerning declining soil fertility, UNECA (1996) found that 12% and 24% of households thought that it was caused by erosion and intensive cultivation for many years, respectively, while 58% thought that it was caused by both erosion and intensive cultivation. Furthermore, while only 5% thought that their land was fertile, 44% and 51% thought that their land was moderately fertile and not fertile, respectively, compared with when they started farming.

Concluding from the evidence presented in this section, it seems that most farmers are aware of land degradation and many are aware of their own management practices as a cause or possible response to the problem.

6.3 Government policies, strategies and programmes

Policies, strategies and programmes of government play a critical role in affecting farmers' decisions with respect to land management. They influence most of the factors discussed above in crucial ways, as well as having other direct effects on land management. We consider now the past and current policy strategies as they have been implemented in Amhara, and their possible impacts on land management. First, we consider the broad development strategy, and then specific policies and programmes implemented within those strategies relating to agricultural research, extension, inputs, credit, irrigation, marketing, infrastructure and farmers' organisations. In addition, we take a look at non-governmental organisation (NGO) involvement in the region.

6.3.1 Agricultural development policies and strategies

In an effort to bring about economic growth and development, various agriculturalsector development strategies have been undertaken by the government of the day. The strategies have evolved from Comprehensive Package Programmes (CPPs) of the mid1960s and early 1970s and Minimum Package Programmes (MPPs) of the late 1970s and early 1980s to the Peasant Agricultural Development Programmes (PADEPs) of the late 1980s and early 1990s.

The present federal government has developed the Agricultural Development Led Industrialisation (ADLI) strategy to improve the productivity of the agricultural sector, with the primary objective of transforming the economy in such a way that the relative contributions of agriculture, industry and services to economic growth would change significantly in favour of the latter two over time. With more than 90% of the population employed in farming and living in rural areas, there is debate on whether agricultural development will trigger urban and industrial development or, contrarily, urbanisation will trigger agricultural development.

The agricultural development policies and strategies for the Amhara Region are based on the national strategy to follow a conservation-based and agricultural development led

industrialisation in such a way that accounts for the region's resources and constraints. The major objectives of the five-year development plan, set up in 1996, include:

- Development of the economic and social sectors of the region in order to produce sufficient food and improve general employment opportunities for the fast growing population.
- Setting up a better economic management system to withstand droughts and other natural disasters.
- Laying the foundation for sustainable development in all areas of the region. Among others, the strategies of the plan in achieving the objectives include:
    - promotion of agricultural development led industrialisation along with conservation of the natural resources
    - intensification of agricultural production in high rainfall areas through higher use of inputs, credit and extension service
    - increased agricultural production in drought-prone areas through: the promotion of traditional and small-scale irrigation; wider use of drought resistant seeds, fertiliser, credit and extension services; enhanced conservation practices of natural resources and reforestation efforts; and creation of income-generating activities.

Though specific strategies are outlined for different sectors, it seems that the focus is on crop production, with limited attention to the economic potential of livestock and tree products. In addition, implementation and distribution of benefits have been constrained by a host of problems that were not adequately addressed. These include (i) untimely supply of inputs and insufficient quantities; (ii) shortage of farm credit; (iii) the present land tenure system that provides inadequate incentives for farmers to invest in their land; and (iv) inadequate capacity of research and extension systems to effectively generate and disseminate new and improved technologies (CEDEP 1999).

For the 48 drought-prone, most degraded and chronically food-insecure *weredas* of the region, a spatial development approach has been adopted in the design of the Integrated Food Security Programme for 1998 to 2002 to benefit about 2.5 million people living in these *weredas* (IFSP 1998). The main purpose of the programme is to increase income and food availability of the rural population at the household level.

- Proposed to start in 1998, several activities were planned in all, or a subset of the areas involved, among others these include:
- livestock production and health (forage development, breeding, apiculture development)
- land use (formulation of land use guidelines, training etc.)
- soil and water conservation (construction of structures, training etc.)
- agroforestry (nurseries, training, promoting indigenous species etc.)
- forestry (nurseries, extension, monitoring and evaluation, promoting indigenous species).

Table 11 shows the number of *weredas* and beneficiaries, i.e. the number of people affected frequently by food shortage. Areas affected severely are the Wag Hemra, North and South Wello and Oromia zones, as they include all their respective *weredas*.

Table 11. *Integrated Food Security Programme* weredas *and beneficiaries.*[1]

Zone	Number of *weredas*	Number of beneficiaries
Wag Hemra	3	230,000
North Wello	8	561,000
South Wello	15	499,192

Oromia	3	81,000
North Shewa	4	349,800
North Gonder	7	273,500
South Gonder	5	410,750
East Gojam	3	50,000
Total	48	2,455,242

1. Programme *weredas* are those unable to produce adequate food, have low population carrying capacity, and have more than 10% of the population dependent on relief food since 1993.
Source: IFSP (1998).

In discussions with some programme officials in June 1999, we learned that the programme actually started in 1999 with capacity building. Road construction is next and is expected to start in 2000. At the time, the major constraints were finance and capacity to monitor and evaluate projects.

6.3.2 Agricultural research policies and strategies

A thorough review of agricultural research (both national and regional) is given in the Regional Research Master Plan (CEDEP 1999). Until 1994, agricultural research in the region took place under a national umbrella and was guided by the Institute of Agricultural Research. Three research centres located at Sheno, Adet and Sirinka, one subcentre at Kobo, and a number of trial sites were set up in the region. The Sheno Research Center, which first started operation in 1968 as a testing site of the Holetta Research Center, focused on highland crops such as barley, wheat and faba bean. Adet Research Center was established in 1986 to cover development activities in the mid to high altitude agro-ecological zones (AEZs), while Sirinka Research Center, established in 1987, covered the tepid to cool moist, mid to high altitude AEZs. At the national level, the federal government had made a number of efforts to develop national agricultural research policies and guidelines. However, it was not until after the National Science and Technology Policy of 1993 identified agriculture and natural resources as priority sectors that the National Agricultural Research Policy and Strategy was adopted (October 1994), with the objective of improving the country's agricultural research capacity.

A Research Extension Liaison Committee (RELC), established to enhance research–extension–farmer linkages, has been in operation at the regional and zonal levels for over 10 years. CEDEP (1999) concludes that the committee has not been successful because there has been lack of strong, well-co-ordinated and institutionalised research–extension–farmer linkages, as research is not demand driven. This is because farmers' participation in setting research and extension agendas, and in technology development, has been minimal. Furthermore, the system is not oriented to generate adequate and relevant technologies and to make them available to resource-poor farmers. Thus, although it has been over 10 years since the establishment of the research centres, research is still not well focused and prioritised and does not produce adequate results. In addition, there is inadequate transfer and utilisation of available technologies.

In 1994, there was decentralisation and the three research centres located at Adet, Sheno and Sirinka, one subcentre at Kobo, and a number of trial sites were transferred to the regional government. In addition, three SCRP stations at Maybar, Andit Tid and Anjeni were decentralised in 1996, after 15 years of operation at the national level. A fourth research station is scheduled to start operation soon at Sekota, which represents the drier parts of the region. The three SCRP research stations have similar organisational set-ups, which are comprised of seven to eight research divisions and an administrative support unit. The

research programmes cover crop science, animal science, soil and water management, agroforestry, agricultural machinery and implements, agricultural economics, and farming systems and research–extension linkages.

Despite recognition by the regional government of its importance for making headway in enhancing technology-based agricultural development, until the Regional Research Master Plan was developed in 1999, the Amhara National Regional State (ANRS) did not have its own agricultural research policies and strategies. It thus appears that the regional agriculture research system is constrained by lack of policies to generate and disseminate relevant and affordable technologies to smallholder farmers. CEDEP (1999) summarises the deficiencies of the regional agricultural research system as the:

- limited agro-ecological coverage
- lack of policy for production and dissemination of technology
- inadequate research organisation structure and management
- lack of agricultural research policy.

Given the level of land degradation and its impact on productivity, the Regional Research Master Plan (RRMP) proposes that the research focus should be conservation based, which in turn needs to be watershed based. Consequently, highest priority is to be given to research on biological/vegetation and indigenous soil and water conservation practices. The next priority is research on physical soil and water conservation and water harvesting and moisture conservation practices, while low priority is given to research on socio-economic and soil and water conservation incentive systems, and erosion, runoff and modelling. On soil fertility and plant nutrition, the plan proposes fertiliser recommendations to be based on agro-ecology and soil tests vis-à-vis organic matter (manure etc.). On forestry, because of the lack of information on management and economics of forestry, it is suggested that the Gonder Fuelwood/Pole Projects have useful data on costs and benefits of growing plantations on both marginal land and croplands that should be exploited for research.

Presently, a board leads the research system with a co-ordinating unit attached to the Bureau of Agriculture. According to the RRMP (CEDEP 1999), separation of the research centres from the federal body has negatively affected the operations of the research centres in the sense that it has reduced the opportunities for technical leadership, peer reviews, consultation and co-ordination of support, especially related to external sources. Furthermore, it has led to inadequacies in the documentation and information services.

6.3.3 Resource conservation

In an effort to combat degradation and rehabilitate resources, soil and water conservation and forestry activities have been ongoing and have progressed substantially, especially since 1992. For example, only 9000 ha of land was terraced in 1992/93 compared with 219,214 by 1999 (BoA 1991 Ethiopian calendar). These achievements have been made possible through community labour mobilisation and food-for-work programmes. It is estimated that 3.7 million people participated with 34.8 million man-days. Table 12 shows soil and water conservation efforts and other natural resource management practices undertaken in the region from 1992 to 1998.

Table 12. *Soil and water conservation activities through mass mobilisation in Amhara, 1992–93 to 1997–98.*

Activities	1992–93	1993–94	1994–95	1995–96	1996–97	1997–98
Construction of terraces (ha)	9,604	17,686	39,321	80,565	137,726	176,419
Maintenance of terraces (ha)	1,494	2,601	4,852	10,209	26,163	44,289
Construction of microbasin ($\times 10^3$)	675	730	1,007	789	1,271	n.a.

Construction of check dams (km)	194	509	861	1,169	1,520	1,580
Maintenance of check dams (km)	n.a.	65	n.a.	478	543	746
Construction of cutoff drains (km)	199	290	964	979	1,312	1,655
Artificial water ways (km)	10	55	129	339	621	793
Grass strips (ha)	15	17	59	155	277	1,278
Tree planting (ha)	23,038	7,936	23,858	25,990	n.a.	n.a.
Area closure (ha)	6,749	10,122	15,342	10,565	n.a.	11,944
Farmers training (number)	573	13,991	20,587	57,046	96,572	n.a.
The figures are year specific and not cumulative. n.a. = data not available. Source: BoA (1998a).						

Soil and water conservation practices require a huge amount of labour. Thus, the rate of adoption by farmers has been poor. Physical soil and water conservation activities in the eastern and moisture-stressed areas of the region, compared with the western high rainfall areas, are better maintained and cared for by farmers due to the double advantage of improving soil moisture and soil conservation. In the past, the bulk of soil and water conservation activities were targeted to the eastern and northern parts of the region where erosion and degradation have severely reduced the agricultural potential. The western parts of the region, i.e. the relatively high agricultural potential areas, have not attracted attention. Some people have expressed concern that this could be a mistake, since today's degraded and low-potential areas were once fertile and high-potential areas. However, evidence from SCRP sites shows low (even negative) returns to soil and water conservation investments in higher-rainfall areas (Herweg 1993) because they reduce crop area, harbour pests and cause waterlogging. The majority of planned and implemented activities within the regional soil conservation programme are physical measures such as construction and maintenance of soil and stone bunds, which in aggregate are known as terracing (Lakew Desta 1998; CEDEP 1999). Construction and maintenance of check dams, waterways and cutoff drains are also undertaken, but these are less common, as they are more costly. In the high rainfall areas, proper alignment of terraces with respect to the flow of runoff is a challenge, as there is rarely any integration with drainage structures such as water-ways and cutoff drains. Based on research advice for stone-free and deeper soils in the high rainfall areas of the region, there is a need to shift from conventional soil bunds to *fanya juu* types of terrace (BoA 1998a). In the planning of soil and water conservation measures, there is progressively increasing support for *fanya juu* (BoA 1991 Ethiopian calendar). This can be seen by visits to one of the SCRP sites at Anjeni, where *fanya juu* types of terrace perform and stabilise soil better than conventional soil bunds. The evidence presented in Table 6, however, suggests that grass strips may be better than both soil bund and *fanya juu* terraces.

Most of the soil and water conservation activities in the region are undertaken from the perspective of individuals and communities and not from a watershed perspective. The regional government is in the process of setting a directive to follow watershed approaches, with pilot schemes in four sites. Detailed surveys and project designs have been completed in two of the sites situated in Gubalafto and Sekota *weredas* in the North Wello and Wag Hemra zones, respectively (BoA 1999b; BoA 1999f). The key challenge of the watershed approach is to be able to address problems of collective action, especially where multiple communities and stakeholders are involved.

Soil conservation measures that are currently being promoted (e.g. soil bunds) have been emphasised to the neglect of indigenous practices and biological ones, and without consideration of the variability of soil, rainfall and slope conditions. There is untapped indigenous knowledge of farmers in areas of land resource management that offers a good

base for enhancing conservation. While about 38 different types of indigenous practices in soil and water conservation have been identified at the national level, since 1996, 27 types of practices have been identified in the Amhara Region alone (Lakew Desta 1998). Further evaluation under on-farm conditions is suggested (see Annex 2 for a summary of the different types of indigenous soil and water conservation practices in the region and their respective effectiveness and constraints).

In the forestry extension activities, the number of tree nurseries and seedlings produced is increasing; moreover, the seedling survival rate is also increasing and was reported to be 72% in 1999. In 1999, 2302 existing and 1005 new nurseries supplied 297 million seedlings, which were distributed to farmers (BoA 1991 Ethiopian calendar). About 30 of the existing nurseries are grass/legume multiplication centres with agroforestry practices. Improved seedling distribution to individuals, compared with communal plantings, may have contributed to the higher survival rates. There is more room for improvement, although seed shortage and lack of forestry research support are major constraints.

In an effort to rehabilitate degraded areas, a directive was passed by the regional government to distribute wasteland on hillsides to individuals and groups for private tree planting and agroforestry. Such tree-planting activities started in January 1999. The plan was to distribute 14,871 ha in 1999. As of June 1999, 9600 ha (or 65% of the planned acreage) had been distributed, benefiting 47,000 individuals (BoA 1999e). The absence of immediate return from conservation and tree-planting activities, in view of the short-term planning horizon of poor farmers, is a major concern for suitable natural resource conservation. However, low opportunity costs of degraded hillside lands and scarcity of wood can lead to high returns from and strong interest in private tree planting in such areas, as has already been observed in parts of Tigray (Fitsum Hagos et al. 1999) and Amhara. Still, for the directive to be successful, the tenure security of farmers undertaking long-term investments has to be assured.

Currently, trees are mostly planted in homesteads. On a field trip for this phase of the project, residents of Gubalafto *wereda* revealed that during the Derg regime, it was forbidden to plant trees on farmlands, since it interfered with the government's policy of land redistribution. Then, in addition to losing their trees, violators were fined 10 Ethiopian birr (EB; US$ 1 = EB 2.07 in 1990). Although it is not current policy, many farmers still believe that planting trees on farmland is banned by the government, especially planting of eucalyptus trees, which is believed to have a negative soil-moisture impact on neighbouring fields and also renders the particular field unsuitable for future crop production (Jagger and Pender 2000). While between 30 and 40 farmers in one of the *kebeles* planted eucalyptus on croplands in the past, no one plants currently, although some farmers expressed interest in planting. The view on tree planting is entirely different in one *kebele* of Dessie Zuria *wereda*, where farmers said they have experienced the negative impact of shading by eucalyptus. Furthermore, they asked 'what shall we eat if we plant trees?' It seems that the idea of food self-sufficiency at the household level has overshadowed the goal of increasing farm incomes. Perhaps the concern of farmers in Dessie Zuria arises because the *kebele* is in a more remote area where farmers cannot easily sell their tree products to buy food; from this *kebele*, it takes almost an hour and a half to reach the nearest urban market on foot.

Individual vs. community management of natural resources also poses an interesting topic. People interviewed in Gubalafto and Tarma Ber *weredas* prefer community management (e.g. community woodlots and grazing areas), since their land resources are so small that reallocating them for individual management and use, would lead to very small plots and they would not know where to keep their animals during the day. This view suggests that communal resources encourage farmers to keep a large stock of animals, since most of the farmers expressed that they would be forced to reduce their herds if grazing areas were managed privately, as they could not afford to pay for grazing. Conversely, farmers in Meket *wereda* preferred individual management and use of resources, especially since they did not

have any sense of ownership of communal resources, such as woodlots, because they were hardly allowed to use them. In addition, they felt that even those who were not involved in managing the resources shared in the rare benefits. Common grazing land and woodlots have consequently been distributed in some *kebeles* for individual management and use.

Conservation policy and strategy

The national and regional policies on natural resources and the environment have objectives to promote improved land husbandry practices and maintain land productivity for sustainable development of agriculture in general, and biomass and productivity in particular. The strategy for natural resource conservation and sustainable land management, among others, focuses on the following:

- securing land ownership
- preparing and implementing rural land use policy
- applying population control policy through an effective rural family planning scheme
- promoting appropriate water-harvesting technologies for drought-prone areas
- reducing the cow dung and crop residue share that goes to household energy consumption by promoting fuelwood plantation and conservation of biomass energy resources
- following watershed-based conservation approaches
- promoting individual tree plantation
- promoting changes in livestock production management that will limit the need for free grazing.

The draft land use policy, for soil and water conservation purposes, proposes that any land with a slope of 55% or more should not be used for cropping. It also emphasises the needs for reducing livestock stocking rates and improving feed sources. Unfortunately, detailed strategies to achieve the above are not outlined clearly.

Implementation of policy strategies and extension

Nearly three decades ago when the soil conservation programme was started, as a response to the drought episode of 1974, it mobilised affected farmers to construct physical soil and water conservation structures through food-for-work programmes. A lot of emphasis then was paid to level structures as a means of water harvesting. Recently, the emphasis has shifted to the development of appropriate mechanical techniques. Without any socio-economic and socio-cultural assessments, effort and resources were channelled to watershed and sub-watershed planning and implementation approaches that emphasised technical solutions and top–down mobilisation campaigns, heavily supported by food-for-work programmes. Through these programmes, large areas of watershed and sub-watershed systems (between 30,000 and 40,000 ha) were involved. After further reevaluation, the watershed and sub-watershed level approaches were abandoned, and a minimum planning scheme, later developed into the Local Level Participatory Planning Approach (LLPPA), was established.

LLPPA is a planning approach where the natural and physical problems are assessed and socio-economic problems prioritised. Between 1993 and 1995, over 400 LLPPAs were prepared in the region. Unfortunately, due to the merging of the two bureaus (BoA and Bureau of Natural Resources Conservation and Environmental Protection) in late 1995 and consequent reorganisation of staff and their responsibilities, implementation of the LLPPAs has been stymied severely.

In addition to LLPPA, several other methodological tools have been and are being tried in the region at various places. For example, Participatory Agricultural Demonstration Extension and Training Systems (PADETES), another methodological tool, is an approach where soil and

water conservation and forestry activities are considered as part of extension packages that are used by Sasakawa-Global 2000 (SG-2000). There are a number of NGOs operating in the region and using different participatory methodologies. For example, the Swedish International Development Agency (SIDA) encourages Community Empowerment Programmes (CEPs) and gives a lot of attention to traditional institutions and neglects externally established institutions. The Finnish International Development Agency (FINNIDA) endorses participatory rural appraisal (PRA), which is a good approach for quick problem identification, analysis and planning, but lacks implementation approaches; however, it is appropriate for participatory planning. Another approach is the participatory land use planning and implementation (PLUPI), which is currently used in Meket *wereda* (North Wello) by SOS-Sahel. Based on thesis research in the dry *weina dega* agro-ecology of North Shewa zone, Azene Bekele (1998) has developed a participatory agroforestry approach (PAA); further research is needed to determine its suitability for other agro-ecologies. Generally, however, it seems that there are a lot of methodological tools to choose from. The positive thing about these tools is that they are meant to be participatory and, therefore, involve farmers in development, planning and implementation of technologies in soil and water conservation, forestry, land use etc. However, the extent of farmers' participation and the impact of these approaches on land management are not apparent. Thus, in addition to investigating the impact on land management, research is needed to assess the methodologies to establish, individually or jointly, their suitability for the different agro-ecologies to enhance sustainable land management.

6.3.4 Agricultural extension

Agricultural extension is the process whereby ideas, techniques and materials are communicated to the farming community, and the problems, experiences, needs and priorities of the latter are communicated back to researchers and policy makers. This feedback is a critical missing link in the farmer–extension–research system and cannot be overemphasised. The capability to learn from farmers and to transfer appropriate technologies to users is a critical factor in the development of agriculture.

Agricultural extension has a long history in Ethiopia and in the Amhara Region. In 1971, fertiliser trials commenced, complemented by small supervised credit schemes. Concerning this, the Comprehensive Package Programme (CPP) was introduced with the idea of removing selected barriers to production and to promote agricultural development by concentrating inputs and activities in geographically limited areas. Since this technique required a large work force to implement, it was difficult to implement it all over the country. Accordingly, the Minimum Package Programme (MPP) was initiated in 1976 and the Extension and Implementation Development (EIPD) was established under the Ministry of Agriculture (MoA), with the aim of increasing peasant production by implementing these MPPs. The idea of MPP is that the farmer is given an integrated support service, which includes extension advice, fertiliser, improved seeds, farm credits, better tools and implements, and improved storage conditions. However, the programme did not benefit farmers located further from all-weather roads. In addition, it focused only on crop improvement to the neglect of the livestock subsector, as the livestock programme lacked appropriate technologies and support facilities.

Peasant Agricultural Development succeeded the MPPs and was implemented in surplus-producing areas. This development strategy, which is based on a modified training and visit extension system, recommended by a team of experts in 1983, was first launched as a pilot programme. It was fully implemented in the country in 1989. The effectiveness of the system was criticised because of the large number of farmers to be served by a development agent (with about 1 or 2 development agents to 300 farmers), the short duration of each visit and lack of transport facilities. In addition, the professional competence of the agents was low. This is because the time allocated to train development agents and other extension personnel was

often short, too general and had involved little or no practical training on how to approach farmers.

A key issue seems to be whether extension should follow an intensive strategy in a few areas or extensive strategy in many areas. Given the limited resources, the criticisms of the extensive approach are predictable, but the question is how can the system reach a large number of farmers without limiting support to each farmer?

To alleviate the shortcomings of the previous systems and programmes, the ANRS launched the Participatory Agricultural Demonstration Extension and Training System (PADETES) in 1997. This system is an integrated approach to crop, livestock, natural resources (e.g. agroforestry, soil and water conservation, and forestry) and post harvest technology. PADETES is supposed to be participatory, compared with previous approaches in the sense that demonstrations are carried out on farmers' farms, which are managed by the farmers themselves. The system embraces poor smallholders, has a credit component, involves landless people and rural women, and is meant to fit the complex farming system. However, with the heavy emphasis on fertilisers, it does not seem well suited to drought prone areas unless accompanied by irrigation schemes.

The aim of PADETES is to increase food crop and livestock production through an aggressive agricultural extension campaign programme. Farmers who participate in the system receive technical training and the necessary inputs for at least 2 years. Although there is no anticipated end date, it is expected that most farmers will graduate from the system within 2 years and be able to replicate the programme by themselves. Although the programme is an improvement over previous ones, it still has problems. Extension workers have to upgrade their scientific knowledge periodically and have to be able to offer better and current information. The regional and zonal experts are themselves not well equipped to offer technical backstopping to the *wereda* experts. In addition, facilities and materials, such as improved seeds and seedlings with acceptable quality, are not always available. Demonstrations of full packages attract many farmers, but it has been difficult to satisfy the demand. Despite much effort to incorporate system and participatory approach, the top–down technology development (research) and transfer (extension) paradigm is still in operation, and is believed to have resulted in poor institutional performance of both research and extension services (CEDEP 1999).

Research on the impact of the new system would yield useful insights to several questions raised in this characterisation phase of the project. Some of the questions include: How well adapted to drought-prone areas is the approach? How much learning from farmers takes place? How well integrated are conservation and productivity enhancements? How much emphasis is placed on profitable approaches, including adoption of new products? How well are problems and potential of livestock and tree products incorporated?

6.3.5 Local market development: Purchased inputs, rural credit and output

The nature and development of markets for factors of production (e.g. land, labour, draft animals and credit), inputs and outputs can play a major role in determining patterns of land use and land management. Where markets are well developed and competitive, farmers can be expected to respond largely to the profitability of alternative land uses and management options; the outcomes are likely to be relatively efficient, though not necessarily equitable or resource conserving. Where some markets are poorly developed or missing, however, farmers' production decisions cannot be separated from their consumption preferences and endowments (Singh et al. 1986; de Janvry et al. 1991). For example, where credit is unavailable, poorer farmers may not be able to use purchased fertiliser although it may be highly profitable to do so. Where hired labour is a poor substitute for family labour and labour

markets are undeveloped, households with more family labour available relative to land will be more likely to adopt labour-intensive practices or make labour-intensive land improvements. Where high transportation costs cause households to produce cereals for subsistence purposes, farmers' response to changing cereal prices at the national level may be negligible.

Purchased inputs

The low density of roads in the region causes serious transportation constraints, which limit commercial production of crops and, therefore, the potential for using purchased inputs (fertiliser and seeds) and credit for the majority of farmers, who depend on traditional means of transportation.

Use of low-yielding technologies is one of the factors contributing to low productivity of the agricultural sector. Traditional farming systems are not only low yielding, but they also enhance the mining of major plant nutrients because of lack of replenishment of soil nutrients. At the national level, a new extension system, which is a technology package approach with credit for agricultural inputs, is in effect. The ANRS is one of the regions widely implementing this system with slight modifications. In this system, agricultural inputs such as fertiliser, improved seeds, chemicals and improved livestock are distributed to farmers. The bulk of the inputs are distributed on credit, where inputs are provided in kind to minimise the risk of loan diversion for other purposes. Farmers repay their loans in cash.

Development agents assessed the input demand of the farmers based on the number of farmers in the extension programme, anticipated area of cultivation to improved seeds and recommended application rates. The development agents forward the demand information to the *wereda* agricultural office. After compilation, the *wereda* agricultural office will submit it to the *wereda* Input Co-ordination Committee (ICC)[16] and from there, it is sent to the zonal agricultural office. The zonal office approves and forwards it to the Bureau of Agriculture (BoA) through the zonal ICC. The Bureau compiles the respective zonal demands and then sends it to the regional council for credit approval through micro-financial institutions, such as the Amhara Credit and Savings Institution (ACSI) and service co-operatives. The allocation of the approved credit follows the above procedure in reverse order.

16. ICC is a government body organised to assess the demand for inputs, screen farmers for credit and then follow up credit repayments.

There are two private (Ambassel and Ethiopian Amalgamated (EAL)) and one public (Agricultural Input Supply Enterprise; AISE) sector agencies supplying fertilisers in the region. During the 1998–99 cropping season, Ambassel, AISE and EAL had market shares of 77%, 15% and 6%, respectively. Due to capacity constraints, each supplier operates in only a few zones. In some zones, only one supplier operates. As there is hardly any competition among the suppliers, some remote areas do not get fertilisers on time and farmers do not fully benefit from the credit scheme. Whenever there is more than one supplier, rather than undertaking promotional activities, non-price competition and other means to attract customers are used. For example, EAL and AISE alleged that local authorities intervene in the market in favour of Ambassel by coercing farmers to purchase their fertiliser from Ambassel.

Between 1988 and 1991, fertiliser consumption in Amhara Region averaged 20–23 thousand tonnes (Larsen et al. 1996). However, since the new extension system began in 1997, the consumption rate of fertiliser has tended to increase, despite a decrease in consumption rate in the 1997/98 cropping year due to supply constraints and unfavourable rainfall conditions (Table 13). Although there is an increasing trend in the absolute amount of fertiliser used, the overall consumption per hectare in the region is still low and only about 25–35% of smallholder farmers are using fertiliser (Larsen et al. 1996).

Table 13. *Consumption of fertiliser in Amhara.*

Crop year	Consumption in quintals		
	DAP[1]	Urea	Total
1994–95	398,075	53,490	451,565
1995–96	450,230	86,023	536,253
1996–97	503,159	113,917	617,076
1997–98	441,014	116,186	557,200
1998–99	483,921	237,928	721,849
1999–2000	475,788	264,682	740,470
Total	2,752,187	872,226	3,624,413

1. DAP = diammonium phosphate.
Source: BoA (1999c).

Table 14 shows average consumption of fertiliser per hectare of land under cereal cultivation and total cultivated land. This table needs to be interpreted with caution, since fertiliser is recommended for improved seed varieties; however, most of the cultivated land is under traditional crop varieties. Therefore, the application rates (kg/ha) for improved seeds are higher than shown.

Table 14. *Fertiliser application rate (kg/ha) for cultivated land in Amhara.*

Crop year	DAP[1]		Urea		DAP + urea	
	Cereals	Total cultivated land	Cereals	Total cultivated land	Cereals	Total cultivated land
1994–95	13.3	9.8	1.8	1.3	15.1	11.1
1995–96	14.5	10.8	2.8	2.1	17.3	12.9
1996–97	15.9	11.8	3.6	2.7	19.4	14.4
1997–98	13.9	10.3	3.7	2.7	17.8	13.1
1998–99	14.4	10.9	7.5	5.3	21.5	16.2
1999–2000	13.6	10.3	7.5	5.7	21.1	16.1

1. DAP = diammonium phosphate.
Source: BoA (1999c).

Consumption of fertiliser is constrained by untimely supply, absence of supply in remote areas, lack of competitor suppliers and distributors, unequal access to credit by farmers, packaging problems, crop failure, low levels of infrastructure, high and increasing fertiliser prices, and low farm prices. For example, 22%, 20%, and 40% of households interviewed in a recent survey in the region cited adequacy, availability and high prices, respectively, as the major constraints to using fertiliser (UNECA 1996). With respect to packaging, the fertiliser is packed in 50 kg sacks only, which is quite heavy for farmers who live in inaccessible and remote areas and do not have pack animals. The 50 kg package is also too much for farmers with small land holdings and limited demand for fertiliser, especially those in the north-eastern part of the region. In general, fertiliser marketing and distribution within the region is characterised by delays, shortages and high prices (USAID 1995).

Improved seed is transported and distributed by agricultural offices at various levels. There is no private seed distributor in the region. At the national level, the seed sources are Ethiopian Seed Enterprise (ESE), which is state owned, and Pioneer Seed Company, which is privately owned. There are also a government seed multiplication centre and SIDA support programme

that supply seeds. Farmers themselves also save a portion of their harvest for seed. To narrow the gap between demand and supply, agricultural offices multiply seeds on a contract basis on farmers' fields. This programme is financed by the World Bank and co-ordinated by the national seed agency. In addition, the SIDA support programme produces seed in East Gojam and South Wello zones. Wheat, maize and teff are the dominant crops for which improved seeds are used. In general, the demand for and use of improved seeds is increasing rapidly (Table 15). ANRS is third among regions of Ethiopia in the volume of improved seed consumption. Improved seed use per hectare of cultivated land is low, but it increased by about 400% between the 1994/95 and 1998/99 cropping seasons (Table 15).

Table 15. *Improved seed utilisation in Amhara.*

Crop year	Quintals	Cultivated land (kg/ha)
1994–95	5,618	n.a.
1995–96	14,060	0.42
1996–97	32,909	0.90
1997–98	25,920	1.67
1998–99	28,000	2.08
Total	106,507	–

n.a. = data not available.
Source: BoA (1999a).

Lack of availability and high and rising prices have contributed to the low levels of improved seed utilisation. For example, in a survey of households in the region, 67% and 18% cited limited availability and high prices, respectively, as major constraints to using improved seeds (UNECA 1996). However, use of improved seeds is increasing rapidly (Table 15), suggesting that availability and/or lack of awareness may have been constraints before. It seems that market liberalisation and removal of subsidies are having positive impacts. Benefits may have been constrained by poor infrastructure, lack of bargaining power of farmers and credit institutions demanding that farmers settle their debts immediately following harvest when farm prices are at their lowest.[17] Grain merchants take advantage of the latter by buying at very low farm-gate prices and then selling grain at very high prices in the cities, and even back to the farmers during the lean season. One has to be careful of the implications here since having more grain merchants (and hence more competition) may be a solution, it is not always the lesson drawn from this.

17. Post-harvest repayment of credit is a problem associated with most agricultural loans.

Rural credit

Extension advice through field visits, demonstrations and discussions alone are not sufficient for the farmer to adopt new and improved technologies. Farmers in the region face a multitude of problems. Of these, the major ones include lack of capital and purchasing power due to chronic crop failure, especially in the Wello area. The lack of credit reduces farmers' ability to finance purchase of fertiliser and other productive inputs. Currently, to mitigate this and other constraints, the regional government is providing both regular and revolving credit to farmers involved in the extension programme.[18] Occasionally, however, credit is directed to farmers who are not participating in the extension programme. The revolving credit is given usually for 1 year for livestock activities such as improved dairy, sheep and poultry production, and for coffee cultivation. Its main purpose is to diversify the rural economy to enable farmers to generate additional income and be able to cope better in times of drought and crop failure.

18. Regular credit is money borrowed from the bank by the regional government on behalf of

farmers and on a short-term basis for agricultural input (e.g. seeds, fertiliser and chemicals) purchases and is handled by the Amhara Credit and Savings Institution (ACSI) and service co-operatives. The regional government thus provides the collateral that the farmers cannot otherwise provide. Revolving credit is money allocated from the regional government budget and obtained from NGOs for long-term loan purposes.

Credit provided by the government is managed by the Amhara Credit and Saving Institution (ACSI), service co-operatives, and agricultural offices at various levels. The credit is extended to the farmers in-kind via a coupon system. Depending on the type of enterprises to be assisted financially, credit is given to the farmers on a group or individual basis without physical collateral. Peer social pressure is used as a collateral substitute, as the group is responsible for any member that defaults. Although credit is obtained on a voluntary basis and the farmers themselves form the groups, there is intensive screening of members by the *kebele* administration. Depending on the capacity of individual farmers, farmers receive credit with a down payment of 0–25% of the total cost of inputs.

Since the commencement of the new extension system, the amount of credit delivered to the farmers has been increasing annually. The major proportion of the loan, which is more than 90% of the total disbursed, is allocated for fertiliser. The loan recovery rate has been encouraging and, on average, it is greater than 95% (Table 16).

Table 16. *Credit (in the form of fertiliser, improved seeds and chemicals) utilised by farmers in Amhara.*

Year	Amount used by farmers ('000 Ethiopian birr)	Repayments (expressed as a % of credit)
1994	22,235.4	96.0
1995	54,120.0	96.6
1996	73,605.5	98.0
1997	123,156.3	98.0
1998	108,752.0	90.7[1]

1. This recovery rate is expected to increase as debt collection is still underway.
Source: BoA (1999a).

Although the recovery rate is high, a substantial share of loans is not repaid on the due date. For example, during 1997/98 and 1998/99 cropping years, over EB 5 and 13 million (US$ 1 = EB 7.12 in 1998), respectively, were not paid on the due date. The interest rates charged are 12.5% for credit (inputs) distributed by ACSI and service co-operatives and 10% for those distributed by the agricultural offices using revolving funds. The interest rate that the bank extended to the government is 8%. The difference of 4.5% is subsidised to cover administrative and operating expenses. For example, branches and sub-branches are provided rent-free offices (Hailu Wondafrash et al. 1998). In addition to managing credit obtained by the government for farmers, ACSI provides its own credit and saving services for people in both rural and urban areas at an interest rate of 12.5% for credit and 6.1% for savings. In 1998, ACSI was operating in all zones and 78 *weredas* (Hailu Wondafrash et al. 1998). Annex I shows financial service operators in the region, their capacity, and constraints. Most banks operate in a few urban areas only with limited patronage because of their stringent collateral requirements, risk avoidance and lack of experience with rural development.

The Bureau of Trade and Industry (BOTI) and the Development Bank of Ethiopia (DBE) are jointly engaged in a micro-enterprise development lending programme, which has 11,186 members in 21 market towns in the region and has so far distributed EB 26.9 million (US$ 1 = EB 7.12 in 1998) (Hailu Wondafrash et al. 1998).[19] Although some government bureaus and

offices are engaged in microcredit services, they are of the view that it is outside their mandate. For example, BoA is seeking to scale down its involvement in credit administration and has transferred its inputs and credit programme to ACSI and service co-operatives and is only handling non-crop farming extension packages in connection with the revolving credit for long-term projects (Hailu Wondafrash et al. 1998). Besides ACSI and agricultural service co-operatives, women's associations have the potential to help breach the gap between the demand for, and supply of rural credit. Given the limited membership in agricultural co-operatives, women's associations can provide credit to women for both on-farm (draft oxen, fertiliser and seeds) and off-farm (petty trading and handicrafts) production activities. With regards to credit utilisation and repayment, it is noted that women clients of ACSI have demonstrated better performance compared with their male counterparts. The regional administration is currently preparing a legal frame-work for women's associations that will soon be operative when its capacity has been built to a satisfactory level.

19. Even though BOTI, DBE, BoA and service co-operatives are engaged in microcredit services, ACSI is the only formal microcredit institution in the region.

Grain and livestock marketing

The quantity of grain traded in the market is extremely difficult to estimate and varies considerably from season to season depending on the production output in different areas. Comparing production level in surplus-producing areas with food requirements, it is likely that only 25–30% of the total grain produced in the region is traded (Larsen et al. 1996). This reflects a high level of subsistence agriculture in the region and/or that the grain market is poorly developed. The former suggests that farmers are not fully oriented to modern farming methods and inputs. However, even when farmers produce surpluses for the market, the transactions costs for participating in the market are too high. Evidence on the share of limited market participation due to low marketable surplus and market access constraints in the region is not clear. For example, Mesfin Wolde-Mariam (1991) showed that 96% of farm households interviewed in South Wello and North Shewa zones said they produce primarily for their own consumption, while the remaining 4% produced primarily for the market. However, farmers generally paid more for farm products than they received for the same items that they sold immediately following harvest. For example they paid 17–75% more than they received for selling grain (teff, barley, sorghum and maize) and 13–25% more for livestock. The extent to which this unfavourable trade is a cause of subsistence agriculture is unclear. Nevertheless, it seems that a combination of subsistence agriculture and limited access to credit, input and produce markets results in low use of fertiliser and other high-yielding and land-improving technologies. Trade in grain seems to be highly affected by the prices, which are greatly influenced by the prevailing prices in the Addis Ababa grain market. Unexpected quantities demanded as a result of interventions by government and aid organisations also cause fluctuations in grain demand and prices in the region. Drought announcements, signalling shortages due to the underlying weather conditions, have also contributed to substantial price fluctuations as farmers hold back their stock and are reluctant to sell (Larsen et al. 1996).

Livestock markets, compared with grain markets, are relatively more developed in the region, and particularly so for small ruminants as farmers frequently sell them to purchase household consumer goods and farm inputs, especially at the beginning of the cropping season. However, due to the combination of the free-grazing system and poorly functioning livestock markets especially in remote areas, livestock are kept beyond their optimum productive levels (in terms of producing milk, meat and draft power) where there is no value added from feeding and grazing. The result is overstocking and, consequently, overgrazing.

6.3.6 Irrigation

Smallholder irrigation schemes allow higher cropping intensity, reduce crop failure rates, and

increase level of profits. They also provide increased sources of income and food security during dry seasons. With gravity flow, pump and open furrow technology, large areas of rainfed lands could be converted to small-scale irrigation in sub-Saharan Africa (Haddad 1997).

Irrigated agriculture can play an important role in areas ranging from arid to subhumid, by guaranteeing one or two cropping season during the rains and, possibly, introducing another in the dry season. The region is endowed with large river basins of the Abay (the Blue Nile), Tekeze, Awash and Afar. The total annual discharge is estimated at 35 billion cubic metres, of which less than 2% is utilised for irrigation. The irrigation potential of the Abay and Tekeze river basins is estimated at 195,440 ha (BoA 1997). Table 17 shows a breakdown of large-scale irrigation potential in the region.

Table 17. *Estimated large-scale irrigation potential in the region.*

Zone/area	Irrigable land (ha)
Lake Tana irrigation[1]	58,990
South Gonder	45,190
East Gojam	30,950
North Gonder	29,910
West Gojam	16,400
South Wello	6,000
North Shewa	5,000
North Wello	3,000
Total	195,440

1. Lake Tana, which is about 2412 km^2 (BoPED 1999b) is bordered by North and South Gonder and West Gojam zones.
Source: Adapted from BoA (1997).

Irrigation data are scant, as most of the irrigation schemes are traditional small-scale systems involving streams and rainfall runoff. Presently, the total area under irrigation is about 69,433 ha, which is about 14% of the region's potential (considering potential for small-scale as well as large-scale irrigation) (BoA 1999a). The majority of this constitutes traditional small-scale irrigation practices. All irrigation currently being practised is surface irrigation, notably, flooding. These methods result in high loss of water and possible health risks such as an increased incidence of malaria. The average yield of irrigated crops is estimated at only 1.4 times that of rainfed cultivated crops, suggesting potential for improvement. Major crops under irrigation are maize, sorghum and vegetables.

Established in 1995, the Commission for Sustainable Agriculture and Environmental Rehabilitation in Amhara (CoSAERAR) is mandated for irrigation development in the region. The main objective of the commission is promotion and development of smallscale irrigated agriculture to improve food production in more than 40 moisture stressed *weredas* of the region that are susceptible to drought. By 1998, the commission had completed 24 irrigation water development projects consisting of river diversions, earth dams and pumps. The total command area and beneficiaries of these projects are estimated at 3647 ha and 10,270 households, respectively (CoSAERAR 1999). Since then, there has been a progressive increase in area planned to be irrigated. Feasibility studies of the Kobo-Girana Valley Development Project in the North Wello zone indicate that four reservoirs, two groundwater wells and two diversion weir projects have been identified to irrigate a total area of 10,500 ha (CoSAERAR 1997). When CoSAERAR was established, an ambitious plan was set to create 540 small-scale irrigation schemes (mostly earth dams) in order to irrigate 62,100 ha over a 10-year period; however, this target has subsequently been revised downwards.

Siltation is a common and frequently occurring problem that affects dams. This is evident at Borkena and Angereb of South Wello and North Gonder, respectively. Siltation and the limited experience in dam construction and irrigation water management have resulted in some failures. This has also been noticed in the Tigray Region (Fitsum Hagos et al. 1999). The absence of catchment treatment before construction is one of the major reasons for the silting up of dams. After completing the construction of a dam, CoSAERAR hands it over to the community (*kebele* administration) for management, with advice from BoA. Perhaps joint supervision and management from the outset may reduce the incidence of siltation.

With increased yields from irrigation, come problems associated with marketing (storage and transportation), as farmers have no improved storage facilities and often face poor market access. High transport cost and poor market outlets resulting in low farm prices may discourage farmers from practising irrigation, or from adopting higher-value crops and more intensive practices.

6.3.7 Livestock development

Livestock production is a major component of the economy of the region. Its contribution to agricultural output in value terms is estimated at 20–30% (CEDEP 1999). In the mixed crop–livestock farming system, animals provide food, fibre, finance, employment, draft power,[20] manure and means of transport. They also act as a major source of income and security for most households. As in other parts of the country, livestock ownership determines status and prestige in the society.

20. Oxen provide over 95% of the power required.

The population of livestock by type in 1995/96 is shown in Table 18, implying a stocking rate of 0.7 tropical livestock units (TLU)/ha of total land area. Compared with other regions, Amhara stands first in the number of goats, second in cattle, sheep, asses, horses and poultry, and fifth in camels (CSA 1998a).

Table 18. *Population of livestock in Amhara, 1995/96.*

Livestock	Population	TLU
Cattle	10,589,934	8,471,947.2
Sheep	5,722,315	509,286.0
Goats[1]	4,169,133	291,839.3
Pack animals[2]	2,109,028	1,327,584.9
Poultry	9,548,466	–
Total	32,138,876	10,600,657.4

1. Goat population is dominant in the lowland parts of the region.
2. Mules, horses, donkeys and camels.
Source: BoPED (1999b).

Cattle are the most important types of livestock in terms of income, followed by sheep and goats. In a farm survey conducted in the late 1980s in the Gojam area, even though sheep and goats represented less than 10% of the farm capital invested in livestock, they accounted for about 40% of the cash income (CEDEP 1999). Five sheep breeds/strains[21] are found mainly in the highland zones of 2500–3400 m.a.s.l. Among these, the Menz breed is the most suitable to produce wool for the carpet industry. Currently, there are two breeding ranches in Debre Birhan and Amed Guya (North Shewa). There is a plan to establish one more in Gubalafto *wereda* to improve the Tucur breed (IFSP 1998). Constraints to increased sheep production include: feed shortage; absence of an organised marketing structure; high

incidence of disease; lack of data on sheep productivity (especially of local breeds); keeping of large flocks for social prestige; and lack of improved breeds or training in improved management techniques (IFSP 1998).

21. The breeds/strains are Menz, Tucur, Simien, Washera and Horro.

Next to coffee, skins and hides are second in the nation's foreign exchange earnings (Zewdu 1999, cited in CEDEP 1999). The Amhara Region produces 38,580 hides and 4.7 million skins annually (BoA 1991 Ethiopian calendar). Livestock in the region provide about 16.4 million tonnes of manure annually, equivalent to 114 thousand tonnes of nitrogen, which is being used primarily for fuel rather than manure (CEDEP 1999).

In addition to its livestock resource, Ethiopia has the largest bee population in Africa, which is estimated at more than 5 million colonies. This is attributable to the plant diversity and climatic conditions. In 1994/95, there were about 611 thousand traditional, intermediate and improved beehives (CSA 1995). Annual honey and beeswax production are estimated at about 3000 and 300 t, respectively (CEDEP 1999). Unfortunately, apiculture has been on the decline. The total number of beehives declined by 9% from about 691,400 in 1997/98 to 623,000 in 1998/99 (CSA 1998a; CSA 1999). This may be due to deforestation and the elimination of suitable trees for maintaining high quality beehives (CEDEP 1999).

The major livestock constraint in the region and the nation in general is feed shortage. The current stock of animals is undernourished, consequently animals show poor growth, low body weights, poor fertility and high mortality rates due to the prevalence of diseases; feed shortages also limit the potential for adopting improved varieties. Feed deficiency in the region ranges from 28% to 40% (BoA 1991 Ethiopian calendar). For the region's 10.6 million TLUs, it is estimated that 22.4 million tonnes of feed is needed for maintenance; however, the supply of dry matter from grazing lands and crop residues can satisfy only 15.8 million tonnes. Feed shortage severely affects the performance of draft animals at the time that they are needed for land preparation and cultivation (BoA 1991 Ethiopian calendar; CEDEP 1999).

The major feed sources are traditional communal grazing on natural pastures, crop residues, fallow land and stubble. These sources are generally of poor productivity and quality. They are reportedly low in digestible energy and protein content and do not meet the nutrient requirement for maintenance. The causes of feed shortage are a decrease in grazing land due to expansion of cropland and poor management of grazing land. Grazing is concentrated on slopes and marginal areas where excessive vegetation removal occurs and exposes the soil to erosion. Free grazing on cultivated land after harvest and on fallow land result in soil compaction, low moisture retention, high runoff and, consequently, reductions in crop yields. Feed scarcity is most critical in North Wello zone, where 90% of the feed is derived from crop residues.

The incidence of various types of animal diseases is high in the region and the development of veterinary services is poor. Common animal diseases are anthrax, black leg, pasteurellosis, sheep pox, respiratory diseases, streptothricosis and contagious bovine pleuropneumonia (CBPP). Currently, there are 2 laboratories and 429 veterinary clinics in the region; animal health services (especially treatment of diseases) have generally been increasing since 1993/94 (Table 19).

Table 19. *Animal vaccination and treatment coverage in Amhara Region.*

Service	1993–94	1994–95	1995–96	1996–97	1997–98
Vaccination (number)	4,001,028	4,657,810	4,727,800	4,083,900	4,090,900
Treatment (number)	1,408,579	1,769,950	1,525,500	2,163,900	3,134,300

Source: BoPED (1997–98, 1999b).

The livestock development strategy of the region's five-year development plan focuses mainly on solving three inter-linked problems of animal husbandry: feed constraints, health constraints and genetic improvement. The strategy is to:

- enhance the quality and quantity of feed by allocation of sites for grazing, provision of improved animal feed, and improvement of extension services to farmers
- increase livestock health service coverage to 62% and improve vaccination sources
- improve productivity of local cows by artificial insemination but also to preserve and improve indigenous breeds.

The Regional Research Master Plan (RRMP) on the livestock subsector suggested that a diagnostic survey should be undertaken on the productivity and quality of feed resources, soil and vegetation conditions, number and kinds of animal grazing systems, carrying capacities and problems of feed sources (CEDEP 1999).

6.3.8 Infrastructure and urban development

Lack of enough roads and the poor state of roads in the region constitute major constraints to development. The density of roads is low, standing at 35 km/1000 km^2 area and 0.37 km/1000 population (BoPED 1999b). Although the road network in Ethiopia is less developed than in other African countries (Ahmed and Donovan 1992), that of the Amhara Region is more developed than that in the Tigray (12.9 km/1000 km^2) and the Oromia (24 km/1000 km^2) regions. Two highways, one each in the east and west, cross the region from north to south and one links the west and east between the Gonder and Wello zones. Feeder roads are few and most of the rural population depends on traditional means of transport, such as pack animals and animal-drawn carts. However, as Table 20 shows, there was a marked improvement in road development and maintenance between 1993 and 1998. For example, routine maintenance of roads increased more than 10 times from 13.8 to 150 km in this period. Table 20 also indicates that education and health services have improved, although there is still much room for improvement.

Table 20. *Infrastructure development in Amhara Region.*

Infrastructure	1993/94	1997/98
Education		
Primary schools	2655	2737
Secondary schools	73	83
Health		
Hospitals and health centres, stations and posts	1067	851
Hospital and health centre beds	1123	1736
Pharmacies, drug stores and rural drug vendors	94	340
Road		
Routine maintenance of roads (km)	13.8	150
Distance of asphalt, all weather and dry weather (km)	n.a.	5629

n.a. = data not available.
Source: BoPED (1997–98; 1999b).

Urbanisation and urban development have been slow. There are 206 towns in the region. Of these, 118 (57%) do not have any development plan (BoPED 1999b). In a study by the

Bureau of Trade and Industry (Ashagrie Mulufird 1998) on 217 market towns, 16 do not have any roads while 41 have only dry-weather roads existing in the town. A large proportion of towns do not have a post office or agent, telephone service, electricity or a bank (43%, 47%, 54% and 85%, respectively). These services are limited to major towns along the major roads.

6.3.9 Development of local participation and farmer organisations

Under the Derg, agricultural co-operatives were considered the best means to channel basic socio-economic services to the rural communities, and to mobilise local resources and initiatives to promote social welfare at the grassroots level. Based on this rationale, rural co-operatives were established widely in Ethiopia in the 1970s. Most agricultural co-operatives have been engaged in consumer goods retailing, agricultural goods marketing, grain milling services, oxen credit and fertiliser credit. A few, however, have been involved in sheep rearing and fattening, hides and skins trading, provision of bull stations and veterinary services. At the time of the change of government in 1990, there were 1272 such co-operatives operating (Hailu Wondafrash et al. 1998). In 1997/98, there were 944 co-operatives with almost 1.3 million members (only 10% were women) and an operating capital of EB 37.2 million (US$ 1 = EB 7.12 in 1998) (BoPED 1999b). A new proclamation (Proclamation 85/94) to regulate and license co-operatives replaced the old Proclamation 138/78, based on which co-operatives acquired legal status.

Generally, most co-operatives do not possess the institutional capacity to effectively provide financial services to their members. This shortfall has been recognised by the regional government which has, in response, created an independent Agricultural Co-operative Affairs Office (ACAO) under the new Proclamation 85/94, charged with restructuring and revitalising weak co-operatives that have been abandoned by corrupt executives. So far, 92 co-operatives have been targeted for restructuring to provide financial services to their members (Hailu Wondafrash et al. 1998).

6.3.10 Non-governmental programmes

Non-governmental organisations complement government policies and programmes by undertaking various development projects. Currently, there are about 26 NGOs implementing various agricultural development projects in the region. Annex III shows a description of the implementing NGOs, the specific projects, area coverage, number of beneficiaries, project duration, total budgets and the major objectives and activities being undertaken. The various programmes are being implemented in 468 *kebeles* and benefit over 1.8 million individuals and households. Among the major implementers in terms of number of *kebeles* covered are World Vision (80 *kebeles*), Organisation for Rehabilitation and Development in Amhara (at least 54 *kebeles*), Water Action (40 *kebeles*), SOS-Sahel (35 *kebeles*), Redd Barna (34 *kebeles*) and Food for the Hungry International (32 *kebeles*).

In the project sites, many activities are being organised, such as small-scale irrigation, soil and water conservation, tree planting, forage development, credit, extension and capacity building, nurseries and integrated pest management. About 42% of the NGOs are directly involved in soil and water conservation activities, 58% in afforestation, tree planting, and nursery development activities, while 39% are directly involved in forage and improved grazing development.[22] However, the general and common underlying objectives seem to be to increase agricultural production and productivity, to raise disposable income and to improve micronutrient intake and health. While the need for such development projects cannot be overemphasised, there is also a need to assess whether or not they are having positive and sustainable impacts on the livelihoods of the beneficiaries. It is feared that some development activities, especially those organised on a food-for-work basis and of the type employed in mass mobilisation in constructing terraces, and other soil and water conservation structures,

may make beneficiaries dependent on the incentives and leave them worse-off when the project is over.

22. The actual percentages may be higher since activities undertaken by some of the NGOs were not available (see Annex IIIC).

7 Development pathways: Opportunities for sustainable development[23]

Considering the nature and causes of land degradation as discussed in the previous sections, we seek in our research programme to identify policy, institutional and technological strategies for more sustainable, productive and poverty-reducing development in the highlands of Amhara Region.[24] Given the complexity of factors that influence land degradation and the diversity of situations existing in Amhara, we do not expect that a 'one-size-fits-all' strategy will suffice in every situation. However, there will be common elements to all successful strategies. These include physical security, economic stability, a competitive market environment, land tenure security and investments in physical, human, natural and social capital. Much of what distinguishes different strategies in different situations will be difference in the portfolio of such investments.

23. The remainder of this document draws heavily from an analysis developed originally by Pender et al. (1999a) and is similar to the analysis in the characterisation of Tigray by Fitsum Hagos et al. (1999).

24. Sustainable development is a big issue and as such there are many alternative definitions of sustainability and sustainable development (e.g. Pezzey 1992, cited in Hazell and Lutz 1998). Following Hazell and Lutz (1998), and focusing on development pathways for sustainable land management, we define a pathway as sustainable if the amount of income that is extracted for consumption each period can be maintained over time, and that the value of the capital stock (natural, human and man-made) is not depleted over time

In this section, we take some initial steps towards identifying such strategies, based on the limited information available and hypotheses about the key constraints and opportunities for development, in the different types of situations in the highlands of Amhara Region. Our principal hypothesis is that the strategies for sustainable development in any given situation depend largely on the comparative advantage of alternative livelihood strategies in that situation.[25] For example, in areas where commercial crop production is feasible and economic, the potential to address soil nutrient depletion using large inputs of inorganic fertiliser will be much greater than where subsistence production of food crops is likely to remain the dominant activity. A corollary to our principal hypothesis is that the strategy to promote more sustainable development must be based on the comparative advantages that exist or that may be developed in different locations, with the proviso that local and external conditions can change comparative advantage.

25. Support for this hypothesis is provided by similar IFPRI research conducted in Honduras (Pender et al. 1999b). Support for this hypothesis is provided by similar IFPRI research conducted in Honduras (Pender et al. 1999b).

Many factors determine comparative advantage and the appropriate response to it. We will focus on three factors that reflect much of what distinguishes the opportunities for agricultural

development: agricultural potential, access to markets and population pressure.

Agricultural potential is an abstraction of many factors-including rainfall, altitude, soil type and depth, topography, presence of pests and diseases, and others-that influence the absolute (as opposed to comparative) advantage of producing particular agricultural commodities in a particular place. Of course, potential varies depending upon which commodities are being considered. Furthermore, agricultural potential is not a static concept but changes over time in response to changing natural conditions (such as climate change) as well as human-induced conditions (such as land degradation). For simplicity of exposition, however, we will discuss agricultural potential as though it was a one-dimensional and fixed concept. In reality, the multidimensional and dynamic nature of agricultural potential should be considered when developing more specific strategies of development than will be possible in this paper.

Access to markets is critical for determining the comparative advantage of a particular location, given its agricultural potential. For example, a community with an absolute advantage in producing perishable vegetables (i.e. total factor productivity in vegetable production is higher there than anywhere else) may have little or no comparative advantage (low profitability) in vegetable production if it is far from roads and urban markets. As with agricultural potential, market access is also a multidimensional and dynamic concept (e.g. distance to roads, condition of roads, distance to urban centres, degree of competition, access to transport facilities etc. may change over time), but we will treat it as a single predetermined variable (though subject to change through investments in roads, for example).

Population pressure affects the labour intensity of agriculture by affecting the land:labour ratio, and may induce innovations in technology, markets and institutions, or investments in infrastructure (Boserup 1965; Ruthenberg 1980; Hayami and Ruttan 1985; Binswanger and McIntire 1987). Population pressure thus affects the comparative advantage of labour-intensive strategies of development, and returns to various types of investments.

Agricultural potential, access to markets and population density interact with each other in complex ways. Population density tends to be higher where there is greater agricultural potential or greater market access, since people move to such areas in search of better opportunities. However, population pressure may have contributed to land degradation in many cases, reducing agricultural potential from what it once was. Market access tends to be better where there is a higher population density, since the per capita costs of building roads are lower and the benefits higher in such circumstances. Market access also tends to be better, where agricultural potential is higher, since the returns to developing infrastructure are greater. Despite these interrelationships, it appears that there is still substantial independent variation of these factors in the highlands of Amhara Region. Given such variations, and the fact that these factors change relatively slowly over time, it is useful to consider how different combinations of these factors influence possible development pathways.

We can classify the situations of the highlands of Amhara into a maximum of eight major types, considering two levels of each dimension (agricultural potential, market access and population density). We recognise that there is an unavoidable element of arbitrariness in defining these categories. Agricultural potential is based on the Disaster Preparedness and Prevention Committee's (DPPC's) classification of the region into drought-prone and non-drought-prone areas, which is based on the historical incidence of drought and dependence on relief food. Thus, 'high agricultural potential' areas are the relatively higher-rainfall areas in the western and south-eastern parts of Amhara, while 'low agricultural potential' areas lie to the east. 'High market access' areas are those whose capital or major market towns have access to all-weather roads and transport facilities. These areas are those lying on or close to the triangular Addis Ababa–Bahir Dar–Woldiya–Addis Ababa main roads and around Gonder. Otherwise, they are classified as 'low market access' areas. Although relative to other parts of Africa, population density is high in all of the Ethiopian highlands, we consider 'high'

population density to mean more than 100 persons/km^2. Other areas are viewed as 'low' population density. Unlike in Tigray, where irrigation was used as a factor in characterising agricultural potential (due to the limited precipitation), many parts of Amhara have relatively reliable rainfall and so irrigation is considered separately. Thus, we have two subcategories of irrigated high and low agricultural potentials.

The eight major categories are presented in Figure 4. For each category, we present hypotheses about what opportunities exist for various pathways of development (see Table 21). The pathways we consider include:

- Intensification of cereal production using relatively high levels of external inputs, such as improved seeds and fertiliser (the approach being promoted by the extension programme of the Bureau of Agriculture).[26]
- Intensification of cereal production using labour intensive investments and organic sources of soil fertility in combination with limited use of external inputs.
- Commercial production of perishable cash crops, such as fruits and vegetables.
- Commercial production of non-perishable perennial cash crops, such as nuts, coffee or chat.
- Commercial production of dairy cattle or other intensive livestock, such as poultry.
- Improved and intensified livestock production through increased forage and fodder production, use of improved breeds, disease prevention and health services etc.
- Bee keeping.
- Fishing.
- Planting and management of woodlots for timber, poles or other purposes (e.g. agroforestry).
- Non-farm development, such as through development of agricultural processing, mining, manufacturing or other industries.
- Migration to areas with greater economic opportunities.

26. Intensification means increasing the amount of labour, capital and information per unit of land area (Kaimowitz et al. 1998). Therefore, intensification is not limited to increased use of purchased inputs, but also non-traded inputs such as manure and family labour.

As will be evident in the following exposition, we hypothesise that most of the variation in comparative advantage in Amhara is due to variation in agricultural potential and market access, with irrigation and population density as important factors conditioning some of the opportunities that are determined primarily by these other factors. We, thus, discuss the four possible categories of agricultural potential and market access under major headings, and discuss how variations in irrigation and population density are hypothesised to condition the opportunities within these major categories.

Lowland weredas are those with more than 50% of their total land area classified as *kolla*, which is traditionally estimated at 500–1500 m a.s.l. Source of area data: BOA (1999a).
Agricultural potential is based on Disaster Prevention and Preparedness Committee's (DPPC) classification of the region into drought-prone vs. non-drought-prone *weredas*. *High agricultural potential* (HAP) refers to non-drought-prone and *low agricultural potential* (LAP) refers to drought-prone.
Market access is defined by the condition of the road (all weather vs. dry weather) that passes through and links *wereda* towns. *High market access* (HMA) implies all weather road and *low market access* (LMA) implies dry or seasonal weather road. Source of road condition data: EMA (1994).
Population density is defined by the 1994 rural population/km^2 of total land area. *High population density* (HPD) is greater than 100 persons/km^2 and low population density (LPD) is less than or equal to 100 persons/km^2.
Source of data: BoPED (1997–98).
Map produced by Land Use and Regulatory Team, Bureau of Agriculture, Bahir Dar.

Figure 4. *Classification of the highlands of Amhara Region.*

Table 21. *Opportunities for sustainable land management in the highlands of Amhara Region.*

Agricultural potential	Market access	Population density	
		High	Low
High	High	• High input cereals • Perishable cash crops	• High input cereals • Perishable cash crops

		• Dairy, intensive livestock • Non-perishable cash crops • Rural non-farm development • Fishery (23; 647)[1]	• Dairy, intensive livestock • Livestock and grazing improvement • Non-perishable cash crops • Woodlots • Rural non-farm development • Fishery (12; 405)
	Low	• High input cereals • Non-perishable cash crops • Bee keeping (3; 102)	• High input cereals • Non-perishable cash crops • Livestock and grazing improvement • Bee keeping (4; 71)
Low	High	• Low input cereals • Rural non-farm development (14; 354)	• Low input cereals • Livestock and grazing improvement • Woodlots • Rural non-farm development (8; 256)
	Low	• Low input cereals • Limited livestock intensification • Bee keeping • Migration (2; 65)	• Low input cereals • Livestock and grazing improvement • Bee keeping • Migration (9; 238)

1. The figures in parentheses are the number of rural *weredas* and rural *kebeles*, respectively, that fall in each category.

7.1 High agricultural potential with high market access

Areas with high agricultural potential and high market access—such as areas near the two main roads linking Dejen and Bahir Dar, and around Gonder Zuria and Debre Birhan–represent the greatest potential for agricultural development. Most agricultural strategies are feasible in such circumstances, but the more commercial strategies linked to high-value products, such as production of perishable cash crops and dairy production, likely offer the greatest economic potential in the long run.

In the near term, intensification of cereal production using high levels of external inputs is a high priority to farmers in such areas. This will allow rapid improvement in food security and incomes, and will facilitate their ability to invest in production of riskier, but more profitable perishable commodities. This is particularly the case in high population density settings where markets are not yet well developed, since land scarcity may limit farmers' willingness to devote significant portions of their land to even very profitable commercial crops. Increased cereal productivity can also facilitate intensified livestock production by increasing the supply of crop residues available for feeding and freeing up land for fodder or forage production. Conversely, production of cash crops can facilitate increased food crop and livestock production, by providing significant income from a small amount of land (and during the dry season when dry

season irrigation is available). This income can be used to finance purchase of external inputs or purchase of improved livestock breeds.

In lower population density settings (as in the far western part of the region; see Figure 4), the potential to saturate local markets with increased food grain production will be greater than in higher population density settings (as in the south-western and south-eastern parts of the region). This will remain the case, at least until development of regional and national infrastructure and grain marketing systems facilitate increased trade of local surplus production. Opportunities for improved livestock production by improving management of communal grazing lands are likely to exist. Taking advantage of such opportunities will require effective collective action at the community level to protect and improve management of grazing areas and area enclosures. There are also likely opportunities for profitable production of timber, poles and other tree products in woodlots or natural forests in such areas.

Fishing in Lake Tana and associated rivers, and other non-farm development opportunities are also likely to exist in high-potential, high access areas (both low and high population density), particularly through growth linkages to commercial farming activities. For example, employment in input supply, agricultural trading and processing industries will be stimulated by development of commercial farming. Growing demand for construction, financial services and other non-farm sectors will also stimulate non-farm growth linked to growing commercial agricultural activity.

7.2 High agricultural potential with low market access

In areas with high agricultural potential that are more remote from the main roads and market centres (such as in parts of central, e.g. Estie and Sekela *weredas*, and northern Amhara), opportunities for commercial agricultural development are more limited, at least until substantial improvements in road and transport infrastructure are made. Travel to these parts during the main rainy season is very limited. Commercial agricultural production may need to emphasise non-perishable high-value (relative to volume) crops, livestock (particularly small ruminants that can be readily transported to market) and/or bee keeping. There may also be good opportunities to reduce the perishability and increase the value:volume ratio of some commodities through local processing, such as by drying fruits or meats. In the near term, such processing efforts will probably need to focus on activities that require little capital (but may be labour-intensive) and that do not involve large economies of scale (otherwise such activities are more economical in larger urban processing facilities).

Opportunities for selling surplus cereal production from such areas are likely to be limited by high transport costs relative to the value of the products. A similar argument applies to importing cereals and suggests that farmers will seek to be self-sufficient in food production in such remote areas. Intensifying cereal production using external inputs is likely to be important in achieving this objective (particularly in high population density areas), since using imported inputs is likely to be cheaper than importing food in high-potential remote areas. For example, one study estimated that one quintal of fertiliser produces three to seven quintals of additional cereals in high-potential areas of the Ethiopian highlands (Mulat Demeke et al. 1997, cited in Fistum Hagos et al. 1999).

Without improvement in the productivity of food crop production, farmers' ability to take advantage of profitable opportunities to produce cash crops or livestock may be constrained by the need to allocate scarce land to producing food crops, particularly in high population density settings.[27] However, high transport costs and low incomes may limit farmers' ability to improve food crop productivity by use of purchased inputs, suggesting that credit and possibly near-term subsidies on transport costs of inputs may be critical in enabling farmers to escape the poverty trap that they are facing. However, there are inherent problems in administering

such dual pricing policy that need to be considered. For example, who (farmers vs. input traders) should get the subsidy and when should the subsidy be removed, are some of the issues that need to be dealt with appropriately.

27. For example, the Technical Committee for Agroforestry in Ethiopia (1990) reported that forest coffee production was declining in high-potential areas of Ethiopia as a result of population pressure and expanded food crop production.

Bee keeping is less affected by land and cash constraints and thus may be a good opportunity even in densely populated and low-income areas. The major constraints limiting bee keeping in Amhara may be lack of improved beehives, and farmers' lack of familiarity with bee keeping and use of improved technology. The yield from traditional honey production per hive per season is very small when compared with the yield from improved hives (IFSP 1998). In less densely populated areas, improved management of grazing areas and livestock may be a good opportunity to generate increased incomes and increase the sustainability of resource use.

7.3 Low agricultural potential with high market access

In lower potential areas with high market access, such as areas close to the Debre Birhan–Woldiya main road, adoption of more input-intensive cereal production is still very limited. It is likely to remain so, due to moisture stress, except where irrigation investments are being made, such as in Tuhuledere and Gubalafto *weredas*. Farmers can take more advantage of the soil and water conservation investments that exist in these areas by increasing targeted use of fertiliser and improved seeds to the parts of the fields where soil moisture is greatest. Although there is evidence from Berhanu Gebremedhin (1998) in Tigray and from the Soil Conservation Research Project (SCRP) that yields are increased significantly due to the soil moisture retention caused by conservation structures, such a limited and adaptive approach is not being pursued widely at present. Some farmers in Gubalafto *wereda* told us that they do not use fertiliser because of inadequate rainfall and also because there is residual fertiliser in the soil from previous applications. For this approach to be economically feasible and widely practised, sources of income to finance input purchases and on-farm demonstrations are needed.

Limited use of purchased inputs will be most feasible closer to urban areas where off farm sources of income are available, where industries such as poultry or manufacturing are developing, or where seasonal migration (or remittances from permanent migrants) is common and extension services are already in place. Despite opportunities for some agricultural improvement, however, non-farm development is likely to be the driving force for development in such areas, provided sufficient investments in infrastructure, education and training are made. Rainfed areas close to the major towns of Woldiya, Kombolcha and Dessie are examples of such a situation.

In low-potential areas with good market access and low population density, expansion of livestock production may be a good opportunity. Achieving this potential may require the strengthening of collective action institutions to encourage investments in improvements of grazing lands, perhaps by planting and managing fodder grasses and trees in area enclosures. Tree-planting activities in degraded lands may also provide opportunities for significant incomes and welfare improvement where market access is relatively good.

7.4 Low agricultural potential with low market access

The most difficult cases for which to identify development opportunities are areas with low agricultural potential, which are without irrigation and are far from roads and markets,[28] particularly where there is high population density and no significant off-farm sources of

income. In some cases, particularly close to forests, bee keeping presents an important economic activity. For example, compared with other areas, Wogera *wereda* has a high number of beehives, although its honey production is among the lowest, reflecting marketing and/or production constraints. Small ruminants can be efficient users of available fodder resources, and can be transported long distances to market, though intensification of their use will be limited by grazing resources (especially in high population density settings). Tree planting on degraded lands, as mentioned previously, and continued investment in soil and water conservation structures (particularly given relatively low opportunity costs of labour and the greater benefits of such technologies in drier areas) may also have significant potential to improve land productivity. However, high risk may act as a disincentive to invest in conservation even if opportunity cost of labour is low and potential returns are high. Tree planting has been encouraged in the region, with emphasis on eucalyptus. However, efforts should be made to include other species, especially indigenous trees that are suitable for high altitude and cold areas where eucalyptus trees may take a longer time to mature. Thus, despite the existence of opportunities, these strategies seem unlikely to solve the long-term poverty problem facing such communities, unless in high population pressure areas where road development can reduce the risks and enhance production increasing and conservation technologies. Migration (seasonal or permanent) is likely to be an important element of the people's livelihood strategies in these areas.

28. For example, most of Gishe *wereda* is not accessible by road.

In summary, despite the many constraints facing agricultural development in the highlands of Amhara Region, there appear to be many opportunities to achieve more productive and sustainable agriculture. Nevertheless, there is a continuing need to develop the non-farm sector as well, and pay particular attention to labour supply constraints imposed by cultural and religious practices, as they may pose a major problem for any kind of intervention. This is because intensive use of labour is common to all the strategies. In the long term, such balanced development of both the farm and non-farm sectors will be the key to achieving more sustainable use of the land, economic growth and elimination of poverty.

8 Strategies for sustainable development

Having developed hypotheses about pathways of development that may be economically feasible in different types of circumstances in the highlands of Amhara Region, we now develop hypotheses about the policy, and institutional and technological strategies needed to exploit these comparative advantages. We must be clear at the outset that we are only suggesting hypotheses at this point. Development of recommendations for actual strategies must await further policy research at the community and household levels. First, to identify whether the pathways of development that we have hypothesised are actually feasible and desirable in the circumstances suggested. Secondly, to illuminate the constraints and opportunities to achieving more sustainable, productive and poverty reducing development through the development pathways considered above.

8.1 High external input intensification of cereals

The first requirement of this strategy is the availability of food crop varieties that will respond well to fertiliser and other inputs under the conditions of the highlands of Amhara. The initial success of the Sasakawa-Global 2000 (SG-2000) programme and the government extension programme in higher potential areas of Ethiopia (SG-2000 1996; Quinones et al. 1997), demonstrate the availability of such varieties, especially for maize. However, potential yield increases from such varieties are likely to be more limited in the moisture-stressed conditions existing in the drought-prone and low agricultural potential areas.

To have the broadest and most sustainable economic impact, promotion of such technologies should account for local potentials and economic conditions as much as possible. As discussed previously, small farm sizes and uncertain rainfall (especially in moisture-stressed areas) can make allocation of half-hectare plots to new technologies a very risky strategy. This is less of a concern where rainfall is relatively assured or irrigation exists, but many farmers even in these circumstances may still prefer to adopt a more gradual or diversified approach, which may be precluded by a fixed-package approach. In addition, adaptive and participatory research is needed to develop more targeted recommendations for integrated nutrient management practices. Recommendations need to take into account available sources of organic matter, local sources of soil nutrients and potential for leguminous crops or trees (Quinones et al. 1997; Sanchez et al. 1997). The priority for such research in the near term should be high-potential areas where this strategy is most feasible. For the longer term, continued basic research is needed to develop varieties that are suitable for use under lower potential conditions, such as in moisture-stressed and drought-prone environments.

Even without targeted nutrient management recommendations based on adaptive research,

agricultural extension programmes can improve the usefulness of their efforts by allowing a more flexible approach and learning from farmers. The fixed extension package being promoted by the Bureau of Agriculture (BoA) has demonstrated some impressive results. However, results that are even more impressive might be possible if farmers are given more opportunity to experiment with alternative mixes of inputs, and the results of such experiments are used to inform the development of more site-specific recommendations.

The availability of inputs (especially seeds and fertiliser) must also be assured. Although distribution of inputs by the extension programme is attractive as a way of demonstrating the benefits of using such inputs, this is something that can be as or more effectively provided by competitive input markets, at least to places with good market access. The longer-term goal should be to promote development of such markets. This is largely a matter of removing obstacles to such development, such as eliminating foreign exchange and import restrictions, deregulating prices and avoiding interventions by local authorities in private marketing of inputs. Mulat Demeke et al. (1997, cited in Fistum Hagos et al. 1999) estimated that improvements in the competitiveness of the input marketing system in Ethiopia resulting from such changes, could reduce the average farm level price for fertiliser (relative to unsubsidised prices) by nearly EB 20 (US$ 1 = EB 6.71 in 1997) per quintal or 100 kg (a decrease in price of about 8%). Other positive efforts that can help develop such competitive markets include investments in road construction, and improvement and facilitation of the availability of credit to private wholesalers and retailers. Credit can be used to finance purchase of storage and marketing facilities, and working capital stocks.

In remote areas where substantial improvements in market access are not likely in the near future, consideration of the most effective means to address poverty and food security should include consideration of subsidising the cost of transporting inputs to these areas (perhaps by continuing government provision to these areas). Since 1 t of fertiliser can yield 3–7 t of additional grain in higher potential areas (Mulat Demeke et al. 1997, cited in Fistum et al. 1999), it is much cheaper to subsidise fertiliser imports than grain imports (through food aid) to such areas as a means of addressing food deficits. The longer-term solution for such areas is to invest in improved infrastructure and education, but people still must be able to feed themselves in the near term.

Of course, exporting substantial quantities of grains from remote areas is not likely to be economical due to high transportation costs, and should not be promoted through subsidies. For example, it may require a two-day round trip for a farmer to take a quintal of grain by donkey to the nearest market from remote areas in Amhara. The opportunity cost of this trip (including the farmer's time and additional feed) could easily be EB 20 (US$ 1 = EB 6.71 in 1997), approaching 10% of the value of the grain sold. Probably more important, most farmers in remote areas may simply be unable to sell substantial amounts of grain, even if they produced a surplus, due to limited ownership of pack animals and carts. Thus, it is not a good idea to subsidise fertiliser imports to remote areas that already produce sufficient food for local consumption, since the impact will be to produce a local surplus and depress local prices.

These considerations suggest that the priority for a transport cost subsidy for inputs, if it is used, should be remote areas that are food deficit with relatively high potential to use the inputs profitably. An example of such a situation might be in areas where production of non-perishable tree crops may be profitable, but may be limited by the need to produce food crops. In this situation, subsidised inputs for a limited period may enable farmers to intensify production of food crops and invest in increased perennial crop production. Eventually farmers may be able to sustain use of inputs without subsidies through sales of high-value products. In the near term, a subsidy on the transport costs of inputs may not be sufficient to overcome the subsistence constraint if incomes are very low, given the time lags in earning returns from producing high-value perennials. In such cases, longer-term credit or a subsidy on the cost of the inputs (not only on transport costs) may be necessary in the near term, until farmers are able to meet food needs and earn sufficient income to buy such inputs, or until substantial improvement in market access occurs.

In areas with high-potential and good market access, subsidies for inputs should be avoided. Such areas are likely capable of producing and marketing sufficient surplus production to pay for inputs purchased without subsidies. The major constraints to increased input use in such areas are likely to

be limited access to credit and perhaps limited information, where farmers have not yet participated in the extension programme.

In moisture-stressed areas with otherwise suitable soil conditions (particularly areas close to roads and markets), high priority should be given to irrigation investments where irrigation potential exists. The drought-prone areas close to the Woldiya–Debre Birhan main road, where the Commission for Sustainable Agriculture and Environment Rehabilitation for Amhara Region (CoSAERAR) has established irrigation projects, are examples of such a situation. In more remote areas with irrigation potential, priority should be given to investments in roads as well as irrigation, since marketing constraints may otherwise undermine the ability to reap the full benefit of irrigation investments. In low-potential remote areas, the returns to fertiliser and other inputs may be too low or risky for farmers to use substantial amounts of them. Thus, food aid may still be needed in the near term to address food deficits in such areas. In the longer term, alternative sources of income are needed.

In all areas where a high external input strategy is pursued, development of rural credit institutions is critical to the long-term sustainability of the effort. Efforts to develop credit institutions, especially microcredit, should focus on areas where there is good potential for a high input strategy. The greatest immediate need is of course for short-term credit, simply to finance the input purchases. However, where surplus production and trade is possible, marketing credit to allow farmers to store and market grain during the dry season is also very important. Related to that, credit to finance investment in grain storage and facilities is needed where inadequate capacity exists. Adequate regulation of private grain warehouses, for example through licensing and bonding, is also needed to assure quality and reliability of the grain stored. Given such regulation, private warehouse receipts can serve as collateral for marketing loans or other kinds of loans. Consumption credit can also be very helpful in promoting increased input use, since it can act as a form of insurance. In areas with sufficiently large production and good market access to support grain milling, credit or equity to finance such investments will also be helpful. The development of equity markets in Ethiopia may be helpful in this regard, as is maintaining a policy environment favourable to domestic and foreign investment in industry.

The high external input strategy may facilitate more sustainable land management. Investments in soil and water conservation may be more attractive to private farmers since the value of land and the need to minimise losses of valuable inputs through erosion and runoff will be increased. In addition to direct benefits where such intensification occurs, indirect benefits in other areas can also result. Increased supplies of biomass reduce pressure on forests and grazing areas, and increased incomes provide alternatives to expansion of production onto marginal lands.

The impacts of this strategy on sustainable land management, however, are not assured. Soil fertility can be restored through increased use of fertiliser together with greater production of organic material. However, a net increase in soil mining may occur even with greater use of fertiliser, because of increased losses through erosion, leaching and quantities harvested. For example, estimates from western Kenya showed greater nutrient mining on farms where there was more commercial orientation in food crop production (de Jager et al. 1998). Less nutrient depletion was found in cash crop production (e.g. in coffee and tea), suggesting that the profitability of using fertilisers in food crops may be insufficient to prevent such depletion. High negative nutrient balances in commercial annual food crop production have also been found recently in central Uganda (Wortmann and Kaizzi 1998). In contrast, less negative and even positive nutrient balances have been found in a study of eight farms in Kindo Koisha, southern Ethiopia (Elias et al. 1998). Further research is needed on this issue in the Ethiopian context.

In summary, to fully realise the potential benefits of a high external input strategy of increasing food production, adequate attention must be paid to factors affecting the feasibility and profitability of input use. These factors include infrastructure, extension, input availability, credit and marketing facilities. In some cases where persistent food insecurity exists, subsidies on the costs of using inputs should be considered as a lower cost alternative to food aid, until these other constraints can be overcome (IFPRI 1995).

8.2 Low external input intensification of cereals

In lower potential areas without irrigation, the return to using external inputs, particularly fertiliser, is likely to be much more limited. The strategy for intensifying food crop production therefore must rely on a low (not zero) external input approach. In moisture stressed areas, a critical need is to conserve and use the available soil moisture as efficiently as possible, in combination with integrated use of limited amounts of inorganic fertiliser with organic nutrient sources.

In moisture stressed areas, investments in soil and water conservation structures such as stone bunds and terraces may have relatively high returns by conserving soil moisture (Herweg 1993; Berhanu Gebremedhin 1998). In addition, there may be good potential to increase production through better management of nutrients where these structures exist. For example, it might be possible to significantly increase production with limited risk by targeting use of fertiliser and manure to the vicinity of conservation structures, where soil moisture is greater. However, the fixed-package approach of the current extension programme has not encouraged such site-specific experimentation. In addition, little adaptive research has been conducted to explore the potential of such integrated approaches to conservation and productivity improvement.

Research is also needed to better understand the potential for improving soil productivity through integrated use of organic and inorganic fertilisers in different settings (Palm et al. 1997). Organic sources vary greatly in terms of their biomass productivity and nutrient content, their interactions with soil moisture and inorganic sources of nutrients, and their impacts on productivity; moreover, these issues are not yet well understood in sub-Saharan Africa (Palm et al. 1997). For example, application of organic materials may reduce nutrient availability to crops by immobilising nitrogen or increase nutrient availability by reducing phosphorus fixation. It is also important to recognise that many organic 'sources' of nutrients (such as crop residues or manure produced from grazing crop residues) only recycle nutrients within the farming system, and do not add to the stock of nutrients in the system. As important as such recycling is, to help slow the rate of nutrient depletion, it cannot restore soil fertility. Biological nitrogen fixation by leguminous plants, uptake by trees of nutrients that are unavailable to crops, and transfer of biomass from outside the farm do increase the stock of nutrients available to the farming system, and can be very important components of a low external input strategy. However, these strategies cannot adequately restore phosphorus where it is depleted (Sanchez et al. 1997). Thus, some use of inorganic fertiliser is an essential component of strategies to restore soil fertility and increase agricultural productivity, especially where phosphorus depletion is a major problem as in South Wello due to the practice of *guie*, soil burning, to release phosphorus.

A critical constraint to increased use of organic material in low-potential areas is the shortage of such material and high demand to use it for other purposes (particularly in high population density areas), such as burning of dung and grazing of crop residues. It is thus difficult to address the soil fertility problem in such areas without addressing the larger problem of a shortage of biomass. One way to address this issue is to make better use of degraded lands and communal grazing areas to produce biomass. With the directive to distribute wasteland or degraded hillsides for tree-planting activities, which started in April 1999, there is substantial potential to increase production of trees, helping to relieve local shortages of wood for fuel and construction materials, as well as generating substantial income and wealth. The key to success seems to be to provide the right set of incentives. The community approach to planting woodlots has yielded limited benefits in Ethiopia, whereas allowing individuals to receive private benefits from tree planting (with secure tenure) shows promise of achieving impressive results.

For example, leaders of one village in eastern Tigray Region decided to allow private tree planting on a degraded hillside beginning in 1992 (Fitsum Hagos et al. 1999). Very small plots were allocated to each household in the village, and the households were expected to plant trees and to provide good management. In contrast to management of community woodlots, private management has been highly intensive, with large labour investments in clearing rocks and constructing stone bunds around the plots, and even hand irrigation of the seedlings during critical dry periods. As a result, the survival rate of seedlings on the private plots has averaged about 80%, according to village residents. The village has continued to allocate parts of the unused hillside almost every year since 1992. A similar initiative was started in the Wello areas in 1997. The success of these experiences led the regional government of Amhara to adopt a new directive in January 1999, allowing all rural communities to allocate unused hillside wastelands for private tree planting and other conservation

uses.

The impact of the new directive to distribute degraded land to landless households, and individuals promoting private tree planting and other conserving uses should be investigated. If it does result in a substantial increase in tree planting and harvesting from wastelands, more manure and crop residues can be recycled into crop production, as fuelwood becomes more available. As the general biomass shortage is reduced, the need for the most rapidly growing species (generally eucalyptus) will decline and it may become more attractive to plant other kinds of trees, such as fruit trees, legumes and fodder producing trees. This will increase opportunities for improving soil fertility and intensifying livestock production, and for generating income directly from tree products.

Improved management of pasture and grazing areas could also yield substantial benefits. For example, area enclosures are showing good results in terms of regeneration of natural vegetation, but there are common complaints from farmers that they are not benefiting from the biomass being produced (where cut-and-carry, or controlled grazing systems have not been established). In addition, enclosures tend to increase pressure on other unprotected areas, so the net impact on resource degradation is not necessarily positive. To help ensure that positive benefits are achieved and felt by farmers, more intensive management of grazing areas, such as planting and managing improved grasses and trees, is needed. This could be approached by allocating such lands for private grazing use or through better collective management of enclosures.

Because of economies of scale in protecting grazing areas and risk spreading advantages of using them collectively, privatisation of such lands may not be optimal (Baland and Platteau 1996). Adverse distributional impacts of privatisation on poorer households may also cause collective ownership to be preferred. However, attaining the benefits of collective management requires effective institutions at the local level. Such institutions do not necessarily arise spontaneously, even when the net benefits of effective collective action are large (Baland and Platteau 1996). Government or other external intervention can help to catalyse the development of such institutions, though this requires a cautious approach that respects local autonomy and concerns. Heavy-handed intervention from external agents can undermine the development of such institutions, causing increased dependency on the regulatory role of such external agents, and possibly increased conflicts in the community (Pender and Scherr 1999). Research is needed to understand better the conditions under which effective institutions for managing grazing lands arise and become sustainable in the Ethiopian highlands, and how the government and nongovernmental organisations (NGOs) can help to promote rather than undermine this development. Where it is possible to establish effective institutions to manage grazing lands, intensified livestock production, improved soil fertility management and increased incomes will also likely occur.

Another approach that could combine the advantages of private management while retaining the advantages of community control over common grazing lands or area enclosures, would be to provide the rights to manage such areas to an individual or group of individuals within the community. This right (essentially a franchise to manage the grazing land) could be assigned by lottery, through an auction, provided to landless members of the community or through some other procedure acceptable to the community. The individual or group attaining this franchise would then be responsible to invest in improvements in the grazing area or enclosure, enforce restrictions on use of the area, sell fodder and other materials cut from the area, and/or provide grazing services on behalf of livestock owners. Fees for these services could be established by the community as a whole or through negotiations between livestock owners and the grazing area managers. The *kebele* administration could retain regulatory authority over the management of such areas, ensuring that the managers do not overcharge for what could become a monopoly service, but do take necessary measures and make suitable investments to preserve and improve the quality of the resource. If the performance of the managers were not adequate, the *kebele* could take the franchise away from the current managers. Such an approach could be pilot tested in a few *kebeles* before any decisions are made to adopt it more broadly.

Organic sources of fodder and crop nutrients can also be generated on cropland. Many practices have been developed for this purpose, such as hedgerow inter-cropping, improved fallows, green manures, composting and planting of fodder or multi-purpose trees (Cooper et al. 1996). High

population density and remoteness from markets favours more labour-intensive practices (such as hedgerow inter-cropping or composting) since opportunity costs of labour are lower in such circumstances (Ehui et al. 1990; Cooper et al. 1996). However, the potential of such approaches is limited by the scarcity of water in the low agricultural potential highlands. High population density and small farm sizes will limit more extensive practices, such as improved longer-term fallows. In land scarce settings, planting of trees may be most feasible in particular niches, such as in the homestead plot, on bunds and on plot boundaries. However, planting on boundaries and bunds can also create problems by competing with crops for water and light on the owner's as well as neighbours' fields (Ehui et al. 1990; Cooper et al. 1996).[29] There are also possibilities of temporal niches, such as improved fallows during the short rainy season.

29. These problems are particularly acute for eucalyptus, which has led the Government of Amhara to discourage planting of eucalyptus trees on farmland.

Despite these possibilities, the potential for increasing flows of organic nutrients into food crop production from such sources is probably lower than the potential offered by better management of grazing lands and wastelands, at least in lower population density settings. In very high population density, low-potential (non-irrigated) areas, the options for increased organic matter production are probably relatively limited. In such cases, development of woodlots, even on farmland, may be a better option for sustainable land use and reduction of poverty (particularly where market access is relatively good and farmers have access to off-farm sources of income). However, discouraging planting of eucalyptus trees on farmland may eliminate this as a feasible option, since eucalyptus is by far the preferred tree because of its ability to grow rapidly, produce valuable products and regenerate even in very dry conditions.

Tenure insecurity on farmland may also undermine investments in tree planting, manuring, soil and water conservation structures, and other land improvements. This issue appears to be more of concern in Amhara and other regions of Ethiopia where land redistributions are still a threat, compared with Tigray. Though farmers in most of Amhara now have registration certificates to their land, the sense of tenure security is mixed. Those without registration certificates do not feel any less secure. Surprisingly, some of the farmers with certificates, especially those with large holdings, feel less secure. They reason that their endowment is now known and, therefore, it is easier for the government to carry out redistribution. Thus, many of those without certificates are not asking for them. Restrictions on long-term leasing may also reduce such investments where leasing is common. Land fragmentation, as is common throughout much of the highlands, is likely a major constraint to investment in manuring, mulching or other approaches requiring transport of bulky materials to distant fields. Fragmentation may also prevent investments in land improvements such as planting fruit trees or constructing soil bunds, since these may be subject to theft or damage by neighbours if not easily supervised. For example, Olson (1995, cited in Fistum Hagos et al. 1999) reported cases of farmers in the Kabale District of south-western Uganda surreptitiously undermining terraces on plots of their upstream neighbours, thus 'harvesting' some of the fertile soil that had accumulated in the terrace. Restrictions on land sales and leasing may contribute to the land fragmentation problem. However, the example from Uganda, where such restrictions do not exist, suggests that change of land policies would not necessarily solve it. Nevertheless, a more flexible and dynamic approach to land policy, more secure tenure and access to land will have to be adopted under the umbrella of the constitution. Only when farmers know what their rights are, or even what rights they do and do not have can they make objective decisions. Thus, transparency is required for any policy on land. For example, due to the smallness of current land holdings, further land redistribution is unlikely in the near term. However, while this may be reassuring, many farmers may not be aware of it. Furthermore, the problems of fragmented farmlands and landlessness still need to be dealt with. The prohibition of land sales might limit the ability of farmers to consolidate fragmented land holdings, or the ability of landless people to acquire land, unless land lease markets or other methods of land acquisition work well. Lack of ability to pledge land as collateral may inhibit development of credit markets unless suitable alternative forms of collateral or alternatives to collateral are available.

Livestock grazing practices can also have a significant impact on the feasibility of some kinds of land improving investments. For example, free grazing on farmland after the harvest is common in

the highlands of Amhara Region. This likely limits the ability of farmers to invest in planting many kinds of plants as biological measures to control erosion and restore soil fertility, since such plants may be destroyed by grazing or trampling. It may also limit the potential of minimum tillage due to soil compaction by grazing animals. Thus, improvements in management of farmlands may depend upon changes in the grazing system and improvements in the management of grazing areas. With regard to minimum tillage, free grazing seems to discriminate against poorer households who lack oxen, both because they receive less benefit from free grazing and because it reduces their options to try minimum tillage. Perhaps policy makers and local leaders should consider allowing households the right to prevent grazing on their cropland even after harvest, or to charge others for the grazing services. However, free grazing does benefit oxless households through animal droppings. Thus, cost–benefit analysis is needed to advise on this issue.

Other issues such as fertiliser and credit supply are less important where a low external input strategy is pursued than where a high input strategy is pursued, since such areas will have lower demand for these inputs. Nevertheless, these areas should not be neglected in this regard, since the small amounts of inputs and credit they use may be very important. Other kinds of credit, particularly credit for productive non-agricultural purposes (such as petty trading) and for consumption purposes may also be very important in addressing problems of poverty and food insecurity. Development of road infrastructure, storage facilities and the output marketing system will be less important to such areas as suppliers of food, but will be critical to them as net importers of food.

8.3 Commercial production of perishable cash crops

Where there is very good access to markets and irrigation, or sufficiently reliable rainfall, intensive commercial production of perishable fruits and vegetables can be very profitable. The ability to pursue this strategy will likely depend first upon the success of increased productivity of cereal production. Risk-averse farmers with very little land are usually reluctant to gamble on new and highly risky crops, however potentially profitable, unless their food security is assured (von Braun et al. 1991). Such assurance need not depend only on local food production though. For example, small farmers in western Kenya are adopting vegetable crops and importing maize from Uganda. Open trade policies, thus, can be very helpful in allowing such commercialisation to occur. Non-farm income can also provide sufficient food security to allow commercialisation to occur (von Braun et al. 1991). In cases where a potential comparative advantage in cereal production exists, realising that potential can be an important first step towards enabling farmers to diversify into higher-value products. Thus, the requisites of high external input intensification of cereals are also likely to help to promote intensive production of perishable cash crops in such cases. At the same time, income earned from such cash crop production can help farmers intensify food crop production, by enabling them to purchase more inputs. Thus, increased cash crop production and increased food crop production may be mutually reinforcing strategies.

One important constraint may be lack of knowledge about such products, especially about their market potential. Technical assistance, emphasising market opportunities for different crops as well as crop management, can be very important. With fresh horticultural products, local markets can quickly become saturated, causing dramatic price declines. Farmers must be aware of the potentials and problems of alternative crops, so that they can diversify their production. Information on prices in local markets, announced over the radio, could also be helpful.

Such technical assistance, however, need not come only from government extension agents. Elsewhere in the world, farmers often obtain advice from other farmers, input suppliers or traders. As the input marketing system develops, local suppliers will become more knowledgeable and able to provide advice to farmers. Providing training to both suppliers and farmers could help this process. For some things, however, technical assistance must be provided (or at least financed) by governments, due to incentives facing private suppliers. For example, integrated pest management and organic farming methods may not be adequately promoted (relative to their potential benefit) by private input suppliers, since these methods may reduce sales of agrochemicals. Training is also needed on proper use and disposal of pesticides, which are likely to be used much more widely where there is horticultural development. Taxes on pesticides, so that their private cost reflects their social cost, accounting for negative externalities, would help to promote safer and more efficient use

of pesticides, while generating revenue for governments.

Where irrigation is used in production of cash crops, conflicts may arise over access to water and management of irrigation systems. Well-functioning institutions are needed to allocate use rights and enforce responsibilities. As with institutions to manage grazing lands (discussed below), such effective institutions may not arise spontaneously, but may be catalysed by appropriate interventions by external agents (Baland and Platteau 1996). However, external intervention may undermine the effectiveness of local management and increase the potential for conflict (Baland and Platteau 1996). Thus, a careful approach to promoting development of such institutions is warranted, taking full account of local conditions and concerns before investing in irrigation schemes or identifying the strategy to address issues of rights and responsibilities. For example, allocation of land in the command area that fails to take account of farmers who have lost access to land as a result of microdam construction could lead to conflicts that undermine confidence in the overall effort, which otherwise appears to be achieving impressive results. Proper planning and involvement of local community councils (*kebele* administrations) in decision making, from the outset, will likely result in broad support for the effort.

Available input supply and credit to finance input purchases are of course important for producers of horticultural crops, as they are for high input production of cereals. Given the high expected returns to such inputs, linking future credit to repayment of past loans can provide a strong incentive to repay. However, since such crops are highly risky (particularly price risk), lenders may be reluctant to lend as much as farmers desire where collateral is limited. This problem is exacerbated by the prohibition on land mortgaging in Ethiopia. However, even when farmers have adequate collateral, they may be reluctant to borrow due to the risk involved, even if the expected profits are high. Alternative institutional arrangements, such as share cropping and contract farming, can be used as a means of reducing risks and obtaining access to short-term capital such as fertiliser and seed.[30]

30. The use of these arrangements to obtain capital and reduce risks has been observed in Honduras (Bergeron et al. 1996, cited in Fistum Hagos et al. 1999; Pender et al. 1999b).

Tenure insecurity, restrictions on leasing and land fragmentation may limit commercialisation of perishable cash crops for the same reasons cited earlier in discussing factors affecting investments in land improvement. These factors are particularly important with respect to planting fruit trees, which of course requires long-term tenure security, and protection against theft or being cut for fuelwood. Where such security is lacking, investments in fruit trees are likely to be limited to plots near the homestead.

Where there is potential for selling processed products and/or export of cash crops, the availability of cold storage, processing and transport facilities may be critical constraints. The availability of electricity is one key constraint affecting the development of such facilities. Commercial credit or equity capital also will be needed. Provision of infrastructure and lines of credit for such purposes, and maintenance of a policy environment that facilitates private investment are, thus, likely to be very important in achieving this potential. Development of processing can also promote contract farming or co-operatives, since processors will seek to assure themselves a reliable supply.

There is good potential for more sustainable land management where horticultural production is occurring, but there are also risks. Such high-value, labour-intensive production may reduce pressure on marginal lands by providing farmers' sufficient income on a smaller area of land. It can contribute to agrobiodiversity and help to reduce pest problems if used in rotations with primary staple crops (Pingali and Rosegrant 1995). Horticultural production can encourage investment in soil conservation by increasing returns to such investments. For example, Tiffen et al. (1994) found a strong association between adoption of horticultural crops and construction of bench terraces in the Machakos District of Kenya. The cash income generated by horticultural production also provides incentive and ability to purchase fertilisers, which may restore soil fertility. However, this effect is not assured, since multiple cropping of horticultural crops can rapidly deplete soil nutrients even when fertiliser application is increased. Education and extension efforts can help to address such problems, though farmers may simply find it too risky or costly to apply sufficient amounts of fertiliser to avoid this problem. Production of horticultural (especially annual) crops on steep slopes can also be highly erosive, unless sufficient investments are made in soil conservation. Other potential

problems include contamination of soil and water and human health risks caused by agrochemicals, and increased conflicts over water. Applied research and extension related to integrated pest management, integrated nutrient management and water management are critical to minimise such risks and attain the greatest possible benefits from this development strategy.

8.4 High-value non-perishable perennial crops

Given the time lags required to receive the benefits of investment, expansion of production of high-value perennial crops such as nuts, coffee and chat where land is scarce depends upon first assuring food security. Since areas with a comparative advantage in such non-perishable crops will tend to be further from markets than dairy or horticultural areas, reliance on imported food is likely to be more costly than local production. Increased food production therefore must be high priority for such areas, with the goals being elimination of local food deficits and freeing up of scarce land for the production of higher-value crops. The policy and institutional requisites, thus, include those discussed earlier to achieve high-input intensification of cereal production, including consideration of subsidies on the transport cost of fertiliser in the near term until food deficits are eliminated and income from perennial crop production is growing.

Many of the requirements for other commercial strategies mentioned earlier are also important for high-value perennials. Investment in roads, land tenure security and land transactions (to reduce fragmentation) are critical. Research and extension to promote use of improved varieties and improved management are needed. Promotion of private nurseries (for example, through availability of credit) can be helpful. Credit to finance inputs and purchase of tree seedlings can also be helpful. Development of processing facilities and assurance of adequate capacity utilisation of such facilities is important, especially for tea, due to its relative perishability (von Braun et al. 1991). The need to assure a sufficient quantity and reliability of supply to make such facilities profitable contributed to the attractiveness of large plantations established by colonial settlers in Kenya. Improvement of alternative institutional arrangements more appropriate to smallholder production, such as co-operatives or contract farming, can help to achieve the same goals.[31] Large processing facilities are less necessary for coffee than tea if coffee is sold in the unwashed form, but the value added in the local economy is reduced. To be able to tap this potential, substantial investments in coffee washing facilities are now occurring in coffee-producing areas of Ethiopia. Maintaining a policy environment conducive to efficient operation of co-operatives and such investments in processing are key to attaining the potential of this strategy.

> 31. While agricultural co-operatives were established widely in Amhara Region in the 1970s, many of them are not functional, as they have been plagued by corruption. Currently, the Agricultural Co-operative Affairs Office (ACAO) has been charged with restructuring and revitalising weak co-operatives.

The benefits of development of high-value perennial crops for the sustainability of land use can be substantial. As with annual horticultural crops, the income generated can help reduce pressure to continue producing or expanding onto marginal lands and allow greater use of inorganic fertilisers, while the increase in land values encourages investments in land improvements.[32] In contrast to annual cash crops, high-value perennials are a less erosive land use. Where coffee is grown in shaded conditions, there is good potential to plant other kinds of trees for soil fertility management, fodder and/ or fruit production, increasing the benefits for land management and farm incomes. There is evidence from western Kenya that soil fertility depletion is lower where perennial cash crops, such as coffee and tea, are grown than where annual food crops are grown for commercial purposes (de Jager et al. 1998). As with horticultural crops, however, increased use of agrochemicals poses risks in the production of such crops. Thus, extension and training will play an important role in promoting appropriate practices of integrated soil nutrient management and integrated pest management.

> 32. For example, coffee has played a key role along with horticultural crops in promoting more profitable and sustainable land use in the Machakos District of Kenya (Tiffen et al. 1994).

8.5 Intensification of livestock production

The most widespread technical constraint to intensified livestock production in sub-Saharan Africa is the availability of feed (McIntire et al. 1992; Winrock International 1992). In the densely populated highlands, the prospects for relaxing this constraint through increased forage production in farmlands are limited (except where high-value dairy production exists), given the scarcity of land and food (McIntire et al. 1992). Except in less densely populated parts of the highlands, the potential for increased fodder production in communal grazing areas and wastelands is also limited, as discussed above. Imported feed and feed concentrates are likely to be of limited use, except in very commercialised systems such as urban and peri-urban dairy production. Thus, the prospects for livestock intensification (especially in mixed crop–livestock systems which are common in Amhara) may depend significantly upon the success of intensification of cereal production, which can greatly increase the quantity and quality of crop residues available as a feed source, as well as freeing-up land to be used for increased forage production. This implies that the policy and institutional requisites of cereal crop intensification discussed above are also critical to livestock intensification.

Other important constraints to intensified livestock production in the Ethiopian highlands include animal diseases, limited stock of improved breeds, limited availability of veterinary services and other inputs, poor infrastructure, and limited market and institutional development (Winrock International 1992). While it is desirable to address all of these constraints wherever they are binding, priority should be given in the near term to places where there is substantial commercial potential and where the feed constraint is not binding. For example, improved dairy breeds are not likely to be used where adequate feed cannot be assured or only limited commercial potential exists, given their cost and greater demand for feed. Returns to investment in veterinary services, infrastructure and marketing facilities will be much greater where commercial potential exists and feed is adequate than elsewhere. Thus, such efforts should be targeted in the near term to areas close to urban markets, particularly where dairy potential exists, since the returns to this activity are relatively high (Jahnke 1982; McIntire et al. 1992).

Development of dairy co-operatives may be a critical component of a strategy to develop dairy production in areas of high market access. Because of the bulky, highly perishable and easily contaminated nature of liquid milk, the transactions costs and risks involved in marketing milk are very high (Staal et al. 1997). Dairy co-operatives help to reduce risks and transactions costs facing individual producers by pooling risk, reducing unit costs due to economies of scale in collection and transport, making inputs available and enhancing their bargaining power. They reduce costs faced by processors by reducing milk acquisition costs and assuring the quality and reliability of the supply. In addition, dairy co-operatives may contribute to the development of social capital; for example, by investing in education and health facilities.

Dairy co-operatives are not yet common in Ethiopia. For example, almost all milk is marketed through informal channels in the Addis Ababa milkshed; only 12% is sold to the parastatal Dairy Development Enterprise (DDE) (Staal et al. 1997). As a result, substantial differences exist in prices received by different producers and paid by different buyers. Large producers receive higher prices than smaller producers do, urban producers higher than peri-urban and all producers are willing to accept lower prices if selling to larger and more reliable customers (Staal et al. 1997). Controlling for these differences, farmers with more capital are able to obtain higher prices than poorer ones. These findings suggest that development of co-operatives could help promote smallholder dairy development in Ethiopia, by helping to reduce transactions costs and achieving economies of scale. The Smallholder Dairy Development Project, funded by Finnish International Development Agency (FINNIDA), has begun to promote development of milk groups for processing and marketing in peri-urban areas of Ethiopia.[33] Preliminary results from a recent survey of such groups suggest that there are substantial variations in their performance and viability, influenced by many factors (Nicholson et al. 1998). One factor that appears to be particularly important is economies of scale; the largest group studied obtained the highest prices for dairy products and was the most profitable (Staal et al. 1997). Thus, changes in farmers' attitudes towards participation in co-operatives are likely to be an important determinant of their success in Ethiopia. Removal of bureaucratic obstacles to co-operative development and availability of credit could help facilitate co-operative development.[34] Availability of crossbred cattle also must be assured. Government provision of information about market opportunities, and prices and capacity building in co-operative

management could also be very helpful.

33. Perhaps because of the negative impression farmers have of co-operatives from the politicisation of service co-operatives under the Derg, dairy co-operatives are called ‘milk groups’ in Ethiopia.
34. For example, government agencies in Ethiopia are reported to have claimed ownership of dairy processing equipment purchased by groups of producers under dairy development projects (Nicholson et al. 1998).

Development of other intensive commercial livestock enterprises such as beef fattening, and poultry and pork production is constrained mainly by the need for low-cost feed, though religion also plays a strong role with regard to pork consumption. Where domestic feed supplies are limited, avoiding restrictions on imported feed concentrates could help such enterprises to develop. Once demand for such concentrates becomes sufficiently developed, and domestic production of cereals increases sufficiently, local production of feed concentrates may become profitable. Ensuring a policy environment attractive to foreign and domestic investors could be an important element in facilitating such development. However, keeping of livestock for other purposes and, therefore, beyond their optimum productive levels (for milk, meat and traction) is not likely to make feed concentrates profitable. In the near term, therefore, educating and providing livestock producers with other stores of wealth (e.g. savings) will help to build the basis to achieve those long-term goals.

Development of such commercial intensive livestock industries would greatly enhance the availability of manure. Given the high cost of transporting manure, the direct impacts on soil fertility would be limited mainly to areas close to the urban markets where these industries develop. However, the increase in supply of such organic material might be used to develop domestic industries supplying more concentrated fertiliser or fuel, which could have a significant impact even in areas further from the urban market. An attractive policy environment (also for growth in demand for such products) could also help facilitate investment in this type of venture.

In more remote areas, fodder production is not likely to occur without improved livestock markets. Therefore, in higher population density areas, opportunities exist for development of small ruminant production and increasing flow of nutrients between crop and livestock (crop residues as feed and manure as fertiliser). In lower population density settings, there will be opportunities for improved grazing land and area enclosure management (discussed previously). There may be market opportunities for increased wool production in the highlands, given investments in suitable varieties of sheep, and in processing and marketing. Public measures to control or eliminate animal diseases are justified in remote areas as well as commercial areas for both efficiency reasons (due to the 'public good' nature of the investment) and to address rural poverty and food insecurity.

8.6 Bee keeping

The primary constraints to expanded bee keeping in Amhara Region are the lack of improved beehives, deforestation and lack of suitable trees, farmers' knowledge and training in this activity, and the availability of infrastructure and facilities for marketing the honey. Given the limited availability of forests, expansion of bee keeping could be linked to establishment and management of area enclosures and to private tree planting efforts on degraded lands, increasing the benefits achieved by such efforts. The policy and institutional requirements for increased bee keeping, thus, include the same requisites as those to promote improved management of area enclosures and tree planting in degraded areas (discussed previously).

Other requisites include training and technical assistance in bee keeping and honey marketing, and facilities for canning, storing, transporting and marketing honey. A step in the right direction, is the Integrated Food Security Programme (IFSP) plan to establish in the region one bee-keeping training, material producing and research centre, which will train 500 farmers and 50 development agents annually (IFSP 1998).

8.7 Fishing

In areas surrounding Lake Tana, and areas lying along the Nile and other major rivers, fishing

activities can be an important source of employment and income. Potential annual fish production from lakes in the region is 16–20 thousand tonnes; however, harvest is less than 1.5 thousand tonnes per year (IFSP 1998). To use fishery resources effectively, it is important to improve traditional methods of fishing to increase fishing capacity as well as transportation services to markets. For fishing areas far from major urban towns, improved methods of preservation (e.g. smoking and drying) are necessary. In general, the strategy is to organise and strengthen fishers so as to ensure sustainable market opportunities, and expand the transportation and distribution network. Other requirements include training programmes to upgrade fishing skills, and access to and availability of necessary fishing gear.

8.8 Rural non-farm development

In areas close to roads and markets, rural non-farm activities are usually an important source of employment and income (von Braun et al. 1991; Delgado et al. 1994). Where commercial agricultural production is expanding, linkages to agricultural input supply, processing and trading are particularly important. For example, off-farm income exceeds half of total income for farmers in western Kenya (the proportion is higher for lower income farmers), and much of this comes from small enterprises engaged in such agriculturally related activities (Crowley et al. 1996, cited in Fistum et al. 1999). Thus, many of the requisites for this strategy are the same as those discussed previously for the commercial agricultural development strategies.[35]

> 35. Other kinds of rural non-farm development may be related to developments in mining, tourism, manufacturing (e.g. textiles and leather goods) and construction (related to development in other sectors). These types of development have some of their own requirements, which will not be discussed here in detail.

Beyond development of commercial agriculture, the key requirements for this strategy include development of infrastructure (especially roads and electricity) and transportation facilities, education and vocational training, availability of credit and savings to help finance small start-up enterprises and equity capital for medium and larger enterprises (access to credit is usually not a problem for larger enterprises). It is important to maintain an environment conducive to investment; for example, by reducing delays in licensing procedures, facilitating purchase or long-term leasing of land and buildings by enterprises in urban and peri-urban areas, reducing taxes and broadening the tax base. Restrictions on labour mobility caused by restrictions on land sales, or leasing or tenure insecurity in rural areas can also be an important constraint inhibiting migration of workers to areas where employment demand is high. However, shortage of skilled workers resulting from low education and inadequate training facilities is probably a more critical constraint. High priority should be given to improved education in all areas and to establishment of training facilities where potential for non-farm development exists.

The impacts of non-farm development for sustainable land management are less direct than the effects of the agricultural development strategies, but may be larger and more profound in the long run. Non-farm income enables households to save and to overcome capital market imperfections that may otherwise cause households to discount the future heavily, limiting their ability to invest in commercial crop production, inputs or land improvements (Reardon et al. 1996; Pender and Kerr 1998). Such development can provide farmers an alternative to continuing depletion of soil, forests and other resources (Pinstrup-Andersen and Pandya-Lorch 1995). However, non-farm development may reduce farmers' incentive to invest in land improvement, by increasing the opportunity cost of their time (Pender and Kerr 1998). It is thus important to promote less labor-intensive strategies of land management (such as planting trees rather than annual crops and hand-built terraces) in areas where non-farm employment opportunities are increasing the value of labour. Land policies that limit farmers' ability to plant trees—such as the periodic land redistributions, restrictions on land sales and leasing (limiting ability to reduce fragmentation) and discouraging planting of eucalyptus trees on farmland in Amhara—may thus have a particularly onerous impact where rapid non-farm development is occurring, by limiting the ability of farmers to adopt this less labour-intensive form of land management and, thus, their ability to take advantage of non-farm employment opportunities.

8.9 Migration

Related to non-farm development is the strategy of migration, both seasonal and permanent. Areas with low agricultural potential and low market access are likely to be particularly large sources of migrants, though migration from all areas of the rural highlands is likely given the high population density and small farm sizes. The feasibility of this strategy depends largely upon commercial agricultural development and non-farm development; thus the requisites of the strategy include the requisites of those strategies. Note that restrictions such as those during the Derg regime on labour movements across regions would make this strategy infeasible. These restrictions have been relaxed and we encountered seasonal migration in some of the areas we visited. For example, some farmers from Meket *wereda* used to go to Mekelle in Tigray Region between December and June to weave, while others from Gubalafto *wereda* go to the Afar Region to engage in house construction. There is likely potential for seasonal rural–rural migration within the highlands, from low-potential areas to higher-potential or irrigated areas during the dry season, and in some cases there may be potential for permanent rural–rural migration to reduce disparities across locations (though generally high population density throughout the highlands makes this difficult). Permanent rural to rural migration is already taking place in the region, but the extent at the regional level is not fully known. There has been some migration from Meket *wereda* to neighbouring Bugna *wereda*, which is less densely populated. From one *kebele* alone, we were told that about 20 and 30 people in 1998 and 1999, respectively, were involved. Table 22 shows the distribution of migrants in the region by zone between 1992 and 1995, among 2000 sampled households.

Table 22. *Migration in Amhara Region by zone, 1992–95.*

	East Gojam	West Gojam	North Gonder	South Gonder	North Wello	South Wello	North Shewa	Oromia	Wag Hemra	Awi
Total number	35	26	54	41	16	40	92	1	13	45
Rural–rural (%)										
in *wereda*	42.9	46.2	50.0	63.4	50.0	35.0	60.9	100	53.8	68.9
in zone	11.4	23.1	16.7	0	6.3	10.0	7.6	0	7.7	15.6
out zone	0	3.8	0	2.4	0	2.5	1.1	0	0	0
out region	0	7.7	3.7	2.4	18.8	22.5	4.3	0	23.1	0
Sub total	54.3	80.8	70.4	68.2	75.1	70.0	73.9	100	84.6	84.5
Rural–urban (%)										
in wereda	5.7	0	9.3	12.2	6.3	0	6.5	0	7.7	8.9
in zone	8.6	11.5	5.6	2.4	0	7.5	2.2	0	0	4.4
out zone	2.9	3.8	0	4.9	0	5.0	1.1	0	0	0
out region	25.7	0	7.4	9.8	12.5	15.0	15.2	0	7.7	2.2
Sub total	42.9	15.3	22.3	29.3	18.8	27.5	25.0	0	15.4	15.5
Other (%)										
out country	0	0	5.6	0	6.3	2.5	0	0	0	0
unknown	2.9	3.8	1.9	2.4	0	0	1.1	0	0	0
Sub total	2.9	3.8	7.5	2.4	6.3	2.5	1.1	0	0	0

Note that the percentages do not add up exactly to 100% due to round-off error.
Source: Adapted from UNECA (1996).

Rural to rural migration accounted for most of the migration. Most of the migrants, about 57%, went in search of a job or left due to land shortage or drought, while the remaining left to live with their families, to be closer to school or due to divorce (UNECA 1996). Mobility can provide farmers with sufficient income for survival, but also enables them to leave their marginal lands fallow for short periods. However, the high probability of losing land when a person is not present at the time of

redistribution, acts as a disincentive to migration.

The need for education and training for people in areas of migration should be emphasised. Land tenure is also a key issue affecting migration. People without secure tenure are unlikely to risk losing their land by taking jobs in the city. The scope for permanent rural–rural migration is affected by host area tenure policies affecting opportunities for land leasing. This will be less important with regard to seasonal migration, although availability of land to establish housing for seasonal immigrants is important. Education policies can also affect possibilities for inter-regional migration. For example, different languages are now being taught in different regions of Ethiopia, which will likely increase barriers to inter-regional migration.

9 Summary and conclusions

In this paper, we have examined the available evidence regarding land degradation in the highlands of Amhara Region and its causes; moreover, we have suggested hypotheses about opportunities for various pathways of development in Amhara and strategies to achieve more productive, sustainable and poverty reducing development via such development pathways. Although the evidence on land degradation and its causes is limited in Amhara, it appears that the interrelated problems of soil erosion, soil nutrient depletion, deforestation and limited soil moisture are the most critical land management problems facing the region, and are inflicting substantial costs in the region.

The proximate causes of these problems are relatively well known, and include natural factors such as the rugged topography, thin soils, and low and uncertain rainfall (subject to highly erosive rainfall events) in many parts of the highlands of Amhara. In addition, farmers' decisions regarding land management, including land use, crop choice, adoption of soil and water conservation measures, soil fertility management practices, grazing practices, use of agricultural inputs etc. have contributed to the problem. Underlying these decisions of farmers are many socio-economic and institutional factors; among the most important appear to be population pressure, poverty, land tenure, local market development, local institutional and organisational development, and farmers' perceptions and attitudes. Affecting many of these socio-economic and institutional factors (and often affecting farmers' decisions directly) are many government policies and programmes, particularly policies affecting distribution and leasing of land, agricultural research and extension, input marketing, credit, irrigation development, road and other infrastructure development, development of farmers' organisations and local institutions, and soil and water conservation programmes. Clearly, soil and water conservation programmes, though important, are not the only, nor necessarily the most important, policy factor affecting whether land is managed in a sustainable manner. Further research is needed to determine the impact of these other policy areas (and the impact of conservation programmes) and to identify policy strategies to promote more sustainable and productive development.

To identify effective policy strategies, we have argued that it is useful to start by considering the comparative advantage of various potential pathways of development under the different types of situations existing in Amhara Region. In areas with relatively high agricultural potential and good market access, there is strong potential for commercially oriented agricultural development strategies, such as intensified production of cereals using high levels of external inputs, commercial production of perishable cash crops such as fruits and vegetables, and/or intensive production of commercial livestock products such as dairy and poultry products. There is also strong potential for rural non-farm development linked to agricultural development in such areas. We have argued that in these areas, the priority initially should be on intensified cereal production, since the need for food security is likely to constrain farmers' ability to expand production of other (perhaps more profitable) products until cereal production is adequate. In the longer term, increased production of higher-value commercial products is likely to bring greater incomes and development in these areas. Development of credit, and input and output marketing systems will be critical to the success of these pathways.

In areas with high agricultural potential that are more remote from markets, the comparative advantage is likely to be greater in production of high-value (relative to volume) non-perishable cash crops such as nuts, coffee, tea or chat, and/or intensified production of easily transportable livestock such as small ruminants. Even more than in areas of good market access, farmers' ability to produce sufficient food is likely to constrain their ability to expand

production of such products. Thus, we have argued that high priority should be given to increased cereal production in such areas with food deficits through the use of imported inputs (particularly seeds and fertiliser). This may require subsidising the cost of transporting inputs in the near term, as well as medium- or long-term credit to allow farmers to finance investments in perennial crops. In the longer term, investments in transportation infrastructure and increases in farm income will make transport cost subsidies unnecessary.

In areas with low agricultural potential but good market access, development opportunities are likely to be related to: investment in irrigation where feasible and profitable; intensification of cereal production using limited amounts of inputs integrated with soil and water conservation, and organic fertility management measures; intensification of livestock production through improved management of grazing lands (especially in lower population density settings); development of private woodlots (especially in lower population density settings); and rural non-farm development. Increased cereal production using limited inputs is likely feasible in such areas, though there needs to be more flexibility and adaptation of the extension approach to farmers' situations. Development of the capacities of local *kebele* administrations to manage common lands (including grazing areas, area enclosures, and degraded and sloping areas) more profitably will also be critical in these areas. These areas are likely to remain deficit producers of food and food aid may be needed in the near term in many such areas, until the development potentials are more fully realised.

In areas with low agricultural potential and poor market access, the opportunities for agricultural or rural non-farm development are even more limited. Irrigation development, although of low priority in these areas, may be a driving force for development where large potential exists, as in the Tekeze and Afar river basins, as generally the returns to such development may be much lower than in areas of higher market access. Development of woodlots may also be limited by lack of market access. Intensified cereal production using limited amounts of inputs integrated with soil and water conservation practices and intensified livestock production is likely to be important. Bee keeping may also be an attractive option in some areas and could be linked to vegetative regeneration in area enclosures (especially in lower population density settings). Despite the opportunities that still exist for agricultural development in such areas, food aid and migration are likely to be essential to the livelihoods of people in these circumstances. Thus, policies with respect to food aid, agricultural extension, education and training in non-farm activities, and land tenure will be of particular importance for these areas.

The opportunities for addressing land degradation, while achieving more productive and poverty reducing development, will differ depending upon which pathways of development are pursued. Where commercial agriculture is feasible and profitable, there is strong potential to increase incomes and sustainability through use of high levels of inputs integrated with organic soil fertility management practices and conservation investments. Where commercial agriculture is less feasible, improved soil and water management will depend greatly on development and adoption of integrated resource management practices, linking tree planting, improved grazing land management, and integrated use of soil and water conservation, and organic fertility management measures with limited use of inputs. The success of these efforts likely will depend greatly on adoption of a more integrated, flexible and responsive approach to agricultural extension, and soil and water conservation.

Consideration of the key constraints likely to be binding in these different situations discussed suggests a number of hypotheses about where public policy and investment priorities should be placed:

1. The highest priority for road development should be areas relatively close to urban markets where there is high agricultural potential or high irrigation potential. The highest priority for irrigation development is also in these areas, particularly drier areas, although

supplemental irrigation in higher-rainfall areas can also be very valuable. Such development could enable intensive production of food crops, high-value perishable cash crops and dairy products. Where irrigation investment is occurring, adequate attention must be given to institutional issues, such as how water will be allocated and how losers will be compensated, before physical construction.

2. Where such commercial potential exists, food security is a key to allowing farmers to exploit the opportunities available. Where farmers have substantial off-farm income, they may be willing and able to specialise in cash crop production. However, where such opportunities are more limited (or for more limited income farmers), the risks associated with cash crop production may require increases in food productivity to enable greater cash crop production. Increased cash crop production may also help to promote increased food crop production (by enabling purchase of inputs), so that both food and cash crop production may increase for some time before greater specialisation occurs. Similarly, complementary growth of food crop and dairy production may occur in the early phases of development. Research and extension programmes should recognise and exploit such complementary activities.
3. Assuring adequate provision of inputs and credit, and development of the marketing system are critical to all commercial strategies. Development of processing facilities and marketing institutions (such as co-operatives and contract farming), facilitated by a supportive policy environment, are needed. Research and extension programmes will need to take a broader focus, emphasising market opportunities for new commodities, management of animal health, integrated pest management and integrated soil nutrient management.
4. Second priority for road development should be high-potential areas further from markets, especially where population density is high. There is good potential for intensified production of high-value perennial crops in these areas if roads are adequate. However, achieving this potential first requires assurance of food security, which is likely to be most economical by increasing productivity in food crop production. For the near-term, subsidies on the cost of transporting fertiliser and other inputs to such areas (if they are food deficit) should be considered as a lower cost alternative to food aid. As food deficits are eliminated and increased, and income from perennial crops generated, such subsidies should be eliminated. A further high priority for such areas is land registration and avoidance of restrictions on long-term land leasing, to reduce problems of tenure insecurity and land fragmentation.
5. For low-potential areas without good potential for irrigation (especially with lower population density), priority should be placed on promoting increased productivity of all land, including grazing lands and wastelands. Cautious efforts by governments and non-governmental organisations (NGOs) to catalyse development of local institutions to better manage grazing lands are needed. Contingent upon improved grazing land management, some intensification of livestock production is possible. Increased production of small ruminants may be a particularly profitable strategy. Private allocation of wastelands and sloping lands for tree planting has potential to substantially reduce the biomass shortage in some areas, as well as to increase household wealth and incomes, though the potential for income generation is greater closer to markets. In the near term, food aid may be needed in such areas, though priority should be given to developing alternative sources of income as well as increasing land productivity.
6. For low-potential areas with good market access, good opportunities for rural non-farm development may exist, though these may depend upon non-agricultural activities, such as manufacturing and mining, given low agricultural potential. Priority should be on investment in infrastructure (especially electricity), availability of credit to finance start-up enterprises, and education and training of the labour force.
7. For low-potential areas with poor market access (especially with high population density), migration should be facilitated. High priority should be placed on education and training. Allowing long-term land leasing could also help to facilitate migration and less

intensive use of the land.

These are only hypotheses, based upon theoretical considerations and a very limited amount of empirical evidence. Furthermore, there is certainly substantial variation within the types of situations discussed, and across households with access to different resource endowments. Addressing problems of poverty, low agricultural productivity and resource degradation will therefore require strategies that address the needs of the poor as well as those of the more well endowed. Nevertheless, identifying the broad strategies of development that are feasible can help to identify more targeted strategies for more specific situations. Much research is needed to validate the development pathways and associated strategies that have been hypothesised, or to identify other appropriate strategies. Implementation of this research is the objective of the International Food Policy Research Institute–International Livestock Research Institute–Amhara National Region Bureau of Agriculture and Natural Resources (IFPRI–ILRI–ANRBANR) research programme that is being conducted in Amhara Region, building upon the hypotheses developed in this paper.

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Annex I. Financial services operators in Amhara Region, Ethiopia

Service operator	Status indicator				
	Outreach	Collateral requirement	Institutional capacity[1]	Experience[1]	Policy and legal constraints
Commercial Bank of Ethiopia	Branches in 32 urban centres	Collateral Project proposal Legal personality License etc.	Limited capacity to organise and follow clients Banking at counter only	Limited experience with loans in tens of thousands No experience in microloans and rural areas	Reluctant to handle small loans Does not handle non-collateral loans Accepts license and government undertaking for co-operatives and associations
Development Bank of Ethiopia (DBE)	Branches in 4 urban centres	Collateral Project proposal Legal personality License etc.	Limited capacity to organise and follow clients Banking at counter only	Serves as financing agent for the International Development Agency (IDA)-financed schemes Works in partnership with the Bureau of Trade and Industry (BOTI), who organises borrowers and follows loan utilisation and repayments	Reluctant to use own fund for microcredit Avoids organisation and follow-ups associated with microcredit Accepts license and government undertaking for co-operatives and associations
Business and Construction Bank	4 branches	Collateral Project proposal Legal personality License etc.	Limited capacity to organise and follow clients Banking at counter only	No experience in microfinance	Reluctant to handle small loans
Dashen Bank	2 branches	Collateral Project proposal Legal personality License etc.	Limited capacity Banking at counter only	No experience in rural microfinance	Reluctant to handle small loans
Wugagan Bank	Only 1 branch at Bahir Dar	Collateral Project proposal Legal personality License etc.	Limited capacity to organise and follow clients Banking at counter only	No experience in microfinance in the region	Reservation in handling microcredit
Bureau of Trade and Industry (BOTI)	Uses Development Bank of Ethiopia (DBE) as financing agent and organises clients	No collateral Adopts solidarity group-based collateral	Zonal departments have section for microcredit follow-up Limited capacity to meet growing demand for credit	Good experience in organising microcredit groups and follow-up of loan utilisation and repayment	Requires policy decision on future operations

Bureau of Agriculture	Adequate outreach through its *wereda* offices	No collateral	Capacity to deliver inputs and credit	No professional capacity to manage microfinance business Specialised agency for agriculture	Tendency to concentrate on technical support and facilitation rather than managing credit
Agricultural Co-operative Societies	Have capacity to serve farmers	No collateral	Few have capacity to handle financial service Need revitalisation and capacity building Need seed capital Require sensitisation of members in co-operative concepts and principles	Experience in providing agricultural inputs and oxen credits to their members in the past	Has no legal and policy inhibition Amhara National Regional State (ANRS) has taken legal and policy measures to revitalise them Almost all have legal personality
Women's Associations	Have affiliated associations in each *kebele*	No operational modality yet	No institutional capacity Need institutional capacity building	No experience in microfinance, even informally	Has no legal personality
Non-governmental organisations (NGO)	Operationally limited in their impact areas	Often, no collateral	Subsidised operations Often face hand-over problems Unsustainable institutional strength	Influenced by humanitarian and donor attitudes Generally lack professional touch in administration of microfinance	Has no license to deliver microfinance services Operational life is limited to project life
Amhara Credit and Savings Institution (ACSI)	Extensive outreach in 78 *wereda*s Has 70,000 clients with target of 0.5 million by the year 2000	Adopts solidarity group-based collateral	503 office and field staff trained in microfinance Adequate financial and operational system for group solidarity-based microfinance Shortage of loanable funds to meet growing credit demand Yet to reach financial self-sufficiency	4 years experience in rural microfinance Has shared the poverty-lending experiences of institutions like Grameen Bank of Bangladesh	Lending maximum is EB 5000 (US$ 1 = EB 8.4 at 20 December 2000) Confines operation to the region Target is mainly the rural poor

1. Capacity and experience to deliver rural microfinance services at the grassroots level. Source: Adapted from Hailu Wondafrash et al. (1998).

Annex II. Indigenous soil and water conservation measures in Amhara Region, Ethiopia

Measures	Local name	Objective (relative effectiveness)	Constraints
Physical			
Stone bund	*Kab*, and *anjet, hulet anjet, ywejed kab*	Soil/moisture conservation Less land taken as compared with soil bund or grass strip Strong defence No waterlogging above the bund	Skill and high labour Rodents in highland low temperature areas Topsoil is overburdened if too much weight U-turn is difficult for oxen Crumbles under free livestock movement
Scattered stone bunds	n.a.	Checks soil erosion at only necessary spots	Less permanent
Traditional ditch	*Fessess boy*	Good drainage Less waterlogging Less seed and fertiliser wash	Skill in contour alignment Requires outlet structures Not permanent
Traditional cutoff drain	*Trass boy*	Diverts runoff	High labour and skill in alignment and design Needs vegetative stabilisation and maintenance Requires crossing and outlet structures
Traditional waterway	n.a.	Collects runoff from cutoff drain and graded structure	Takes up land Stone paving/vegetative stabilisation Frequent maintenance Skill in design and high labour
Check dam	n.a.	Gully rehabilitation	High labour and construction material
Bench terracing	n.a.	Harvest runoff and silt	Gradual development High labour
Trashlines	*Sircho*	Barrier to runoff and filter sediment Improves soil moisture and organic matter	Sorghum stalk needed (competition with fuel, feed and construction material needs)
Flood-water harvesting	*Melle*	Harvests, diverts and spreads runoff for surface irrigation	High labour at flood peak times Frequent maintenance of canals/structures for high silt load
Raised bed	*Diridaro*, *shurube*	Prevents waterlogging Soil aeration Sequence cropping	High labour
Vegetative			
Euphorbia tirucalli	*Kinchib*	Deep rooted, drought resistant, feed for camels	

Arundinaria alpina	*Kerkeha*	Shelterbelt, gully reclamation, handicraft, basketry	
Arundinaria donax	*Shembeko*	Gully rehabilitation along watercourse, basketry	
Adhatoda shimperiana	*Sensel, smifa*	Stabilise structures (cutoff drains, waterways) and for house construction (roof, wall etc.)	As long as they are applied in their respective agro-ecologies and soil requirements, there are no disadvantages
Eragrostis	*Guassa, chima*	Good on degraded soils, as soil cover	
Rumex	*Embuacho*	Bund and boundary stabilisation	
Aloe species	*Ret, kacha*	Bund stabilisation and gradual build up into terraces	
Unploughed grass strip	*Dib, dinber*	Less labour as it needs to be developed gradually Harvest grass in cropping seasons	Takes up land Weed and rodents
Ley cropping	*Gibto*	Improves the soil (since leguminous)	Localised to Gojam and South Gonder zones
Lupinus lupin	n.a.	Economic value for brewing local beverages	Not eaten by livestock
Other			
Weed heap	*Gulit/gul*	Complements weeding practices	High labour
Soil (organic matter) burning	*Gay/guie*	Nutrient (potassium and phosphorus) release	Burning of organic matter Loss of nitrogen Long fallow required to replenish soil nutrients
Fallowing	*Edari*	Improve soil fertility and structure	Shortage of feed (crop residues)
Stone mulching	n.a.	Reduces impact of raindrop Moisture conservation	Reduces area for crops High labour
Temporary kraal	*Hura, chichet*	Manuring by allowing cattle to stay for a number of days	Only for small areas as livestock numbers are limited
Cow dung manuring	*Maklez*	Improves soil fertility	Competition with fuel needs and high labour
Soil trampling	*Beray, tiktako*	Seedbed preparation Reduces puddling	High livestock requirement Compaction reduces infiltration

n.a. = Not applicable
Source: Lakew Desta (1998).

Annex IIIA. Non-governmental organisation (NGO) agricultural development projects/programmes in Amhara Region, Ethiopia

Serial no.	Implementing agency (NGO)	Project/programme title	Project area		
			Zone	*Wereda*	No. of peasant association (PAs) covered
1.1	World Vision International/Ethiopia	Mehal Meda Area Development Program	North Shewa	Gera Key	27
1.2	World Vision International/Ethiopia	Anstokiana Gemza Area Development Program	North Shewa	Antsokiana Gemza	13
1.3	World Vision International/Ethiopia	Kemissie Area Development Program	Oromia	Dawa Chefa	11
1.4	World Vision International/Ethiopia	Adjibar Area Development Program	South Wello	Tenta	29
2.1	Agri-Service Ethiopia	Lalo Mama Medir Integrated Rural Development Program	North Shewa	Lalo Mama Medir	10
2.2	Agri-Service Ethiopia	Misrak Gojam Integrated Rural Development Program	East Gojam	Debay Tilat Gin	9
3	Plan International Ethiopia	Community-Based Rural Development Project	North Wello	Bugena	5
4	Care International/Ethiopia	Zegie Community Development Project	West Gojam	Bahir Dar Zuria	2
5	Jerusalem Association Children's Home	Integrated Community-Based Rural Development Program	West Gojam	Bahir Dar Zuria	2
6	Menschen für Menschen Foundation	Merha Bete Integrated Rural Development Program	North Shewa	Merha Bete	21
7.1	Ethiopian Orthodox Church	Sekota-Dehana Integrated Rural Development Program	Wag Hemra	Sekota and Dehana*	4
7.2	Ethiopian Orthodox Church	Mekdela-Wadla Food Security Project	South and North Wello	Mekdela and Wadla	11
8	SOS-Kinderdorf International	SOS Children's Village & associated projects	West Gojam	Bahir Dar Zuria	1
9.1	Canadian Physicians for Aid and Relief	Lai Gayint Healthy Community Program	South Wello	Lai Gayint	26
9.2	Canadian Physicians for Aid and Relief	Macronutrient & Health Initiative Project	South Wello	Lai Gayint	
9.3	Canadian Physicians for Aid and Relief	Damot Area Self-Help Sheep Fattening Project	South Wello	Lai Gayint	
10.1	Food for the Hungry Int./ Ethiopia	Simada Integrated Food Security Program	South Gonder	Simada	8
10.2	Food for the Hungry Int./ Ethiopia	Simada Integrated Food Security Program	South Gonder	Lai Gayint	13
10.3	Food for the Hungry Int./ Ethiopia	Simada Integrated Food Security Program	South Gonder	Tach Gayint	11
11	Water Action	Minjarna Shenkora Integrated Watershed Development Project	North Shewa	Minjarna Shenkora	40

12.1	Organisation for Rehabilitation and Development in Amhara	Ebinat-Belessa Integrated Food Security Program	South and North Gonder	Ebinat and Belessa	14
12.2	Organisation for Rehabilitation and Development in Amhara	Sekota Integrated Rural Development Program	Wag Hemra	Sekota	33
12.3	Organisation for Rehabilitation and Development in Amhara	Tach Gayint Integrated Food Security Program	South Gonder	Tach Gayint	n.a.
12.4	Organisation for Rehabilitation and Development in Amhara	Gidan Integrated Food Security Program	North Wello	Gidan	n.a.
12.5	Organisation for Rehabilitation and Development in Amhara	Wadla Integrated Food Security Program	North Wello	Wadla	7
13.1	SOS-Sahel	Meket *wereda* Development Program	North Wello	Meket	35
13.2	SOS-Sahel	Food Security Initiative in Meket *wereda*	North Wello	Meket	
14	Redd Barna Ethiopia	Child-Centerd Rural Development Project	North Gonder	Alefatakusa	34
15.1	Ethiopian Evangelical Church Mekane-Yesus	Soil and Water Conservation Project	North Wello	Bugena, Habru and Kobo	4
15.2	Ethiopian Evangelical Church Mekane-Yesus	Armachiho Rural Development Project	North Gonder	Lai Armachiho and Tegede Armachiho	12
15.3	Ethiopian Evangelical Church Mekane-Yesus	Washera Community Development Project	South Wello	Legambo and Tenta	13
15.4	Ethiopian Evangelical Church Mekane-Yesus	Community Development Component for Soil and Water Conservation	North Wello	Habru	n.a.
15.5	Ethiopian Evangelical Church Mekane-Yesus	Soil and Water Conservation Project: Phase II	North Wello	Habru and Kobo	n.a.
15.6	Ethiopian Evangelical Church Mekane-Yesus	North Shewa Integrated Rural Development Project	North Shewa	Basona Worena	n.a.
16	Baptist Mission Ethiopia	Asagrit Community Development Project	North Shewa	Angolela Asagrit	18
17	Bahir Dar Medhanealem O.D.S.T.C.	Training and job creation for destitute families	West Gojam	Bahir Dar Zuria	1
18.1	Save the Children Fund–UK	Livestock Development Project	North Wello and Wag Hemra	Gidan, Bugena, Meket and Sekota	20
18.2	Save the Children Fund–UK	Farmer-Led Extension and Research Project	North Wello and Wag Hemra	Gidan, Bugena, Meket and Sekota	
18.3	Save the Children Fund–UK	Integrated Pest Management Project	North Wello and Wag Hemra	Gidan, Bugena, Meket and Sekota	
19	Alternative Relief-Rehabilitation Management Scheme	Assistance to Support and Promote Poverty Alleviation Project	South Wello	Tehuledere and Kalu	6
20.1	Oxfam–Great Britain	Delanta-Dawnt Integrated Food Security Project	North Wello	Delanta Dawnt	8
20.2	Oxfam–Great Britain	Delanta Rehabilitation Project	North Wello	Delanta Dawnt	
21	Concern World-Wide	Support to Local Food Security	South Wello	Kalu	5

		Initiative			
22	Amhara Women's Development Association	Provision of credit services to women in three *weredas*	North Shewa	Ankober1	3
23	Swedish Philadelphia Church Mission	Kundi Development Project	South Wello	Kutaber	8
24	Agency for Assisting Refugees	Rehabilitation of displaced persons	North Shewa	Debre Berhan	n.a.
25	Society of International Missionaries	Sim Forestry Study	Awi	n.a.	n.a.
26.1	Women Support Organization	Bette Valley Integrated Community Development	Oromia	Artuma Jele	3
26.2	Women Support Organization	Bette Valley Integrated Community Development	North Shewa	Efratana Gidem	1
Total					468

n.a. = data not available.
1. Data on other two *weredas* are not available.
* The four PAs are from Dehana *wereda*. The number of PAs from Sekota *wereda* is not known.
Source: BoA (1999g).

Annex IIIB. Non-governmental organisation (NGO) agricultural development projects/programmes in Amhara Region, Ethiopia

Serial No.	No. of beneficiaries	Programme duration	Planning project/programme cost (Ethiopian birr)							
			Fiscal year 1997	Fiscal year 1998	Fiscal year 1999	Fiscal year 2000	Fiscal year 2001	Fiscal year 2002	Fiscal year 2003	Total
1.1	124,547	Oct 1997–Sept 2002	–	1,519,791	1,842,659	1,877,309	1,235,283	683,529	–	7,158,571
1.2	75,277	Oct 1997–Sept 2002	–	2,980,187	2,403,233	2,237,445	1,366,736	1,064,301	–	10,051,902
1.3	64,013	Oct 1997–Sept 2002	–	3,496,969	3,019,037	1,915,585	1,390,690	887,180	–	10,709,461
1.4	108,734	Oct 1997–Sept 2002	–	1,242,220	1,527,106	1,073,366	1,036,882	1,336,559	–	6,216,133
2.1	30,528	Jan 1998–Sept 2002	–	1,274,462	1,688,515	1,851,156	1,206,355	1,000,203	–	7,020,691
2.2	44,525	Jan 1997–Dec 1999	1,750,097	1,008,061	1,238,622	–	–	–	–	3,996,780
3	22,130	Sept 1997–Aug 2002	65,000	245,812	1,500,000	2,000,000	2,000,000	–	–	5,810,812
4	7,235	Mar 1997–Aug 2002	–	1,256,157	1,250,284	941,206	964,859	993,475	–	5,405,981
5	6,407	Sept 1997–Aug 2002	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	–	1,260,604
6	104,000	Jan 1997–Dec 2001	5,546,177	7,969,479	7,314,448	6,246,556	5,561,584	–	–	32,638,244
7.1	29,000	June 1998–May 2001	–	204,183	229,590	179,925	–	–	–	613,698
7.2	48,044	Oct 1997–Sept 2003	–	3,565,550	7,004,727	10,409,252	7,566,055	3,523,184	2,052,070	34,120,838
8	120	May 1998–Apr 2001	–	450,000	550,000	800,000	n.a.	?	?	1,800,000
9.1	63,765	June 1997–May 2000	–	356,088	397,632	410,244	–	–	–	1,163,964
9.2	35,646	July 1998–	–	765,867	475,586	–	–	–	–	1,241,453

		June 1999							
9.3	3,565	July 1998–Sept 2000	–	n.a.	n.a.	n.a.	–	–	–	73,000
10.1	83,385	Oct 1998–Sept 2001	–	–	2,535,768	2,404,293	2,587,173	–	–	7,527,234
10.2	89,950	Oct 1998–Sept 2001	–	–	3,190,545	2,512,323	2,773,236	–	–	8,476,104
10.3	73,906	Oct 1998–Sept 2002	–	–	2,607,396	2,306,980	2,585,933	–	–	7,500,309
11	81,594	Aug 1996–July 2000	641,130	735,720	443,610	437,700	–	–	–	2,258,160
12.1	25,000	Feb 1997–Dec 2000	n.a.	n.a.	n.a.	n.a.	–	–	–	15,588,000
12.2	32,560	Jan 1997–Dec 1999	658,535	776,857	748,257	–	–	–	–	2,183,649
12.3[1]	n.a.	Feb 1999–Jan 2000	–	–	–	n.a.	–	–	–	2,773,366
12.4[1]	n.a.	Feb 1999–Jan 2000	–	–	–	n.a.	–	–	–	2,545,530
12.5[1]	n.a.	Feb 1999–Jan 2000	–	–	–	n.a.	–	–	–	2,898,322
13.1	44,142	Jan 1998–Dec 2000	–	5,094,992	4,557,059	4,216,980	–	–	–	13,869,031
13.2	20,000	Feb 1999–Jan 2001	–	–	n.a.	n.a.	n.a.	–	–	2,622,472
14	76,704	Jan 1995–Dec 2000	1,367,000	1,316,000	1,315,000	998,000	–	–	–	4,996,000
15.1	2,753	Jan 1997–Dec 1999	3,970,043	4,485,285	2,482,333	–	–	–	–	10,937,661
15.2	41,248	Jan 1998–Dec 1999	–	544,978	507,400	–	–	–	–	1,052,378
15.3	12,000	Jan 1998–Dec 2000	–	n.a.	n.a.	n.a.	–	–	–	1,200,000
15.4	n.a.	Jan 1999–Dec 2002	–	–	n.a.	n.a.	–	–	–	846,038
15.5	n.a.	Jan 1999–May 2001	–	–	n.a.	n.a.	–	–	–	10,280,734

15.6	26,212	Oct 1999–Sept 2002	–	–	–	n.a.	n.a.	n.a.	–	2,430,446
16.0	22,237	June 1998–July 1999	–	–	192,388	–	–	–	–	192,388
17	190	Dec 1996–Nov 1999	n.a.	n.a.	n.a.	–	–	–	–	1,144,625
18.1	80,000	Jan 1999–Dec 2001	–	–	1,874,172	1,188,533	996,157	–	–	4,058,862
18.2	2,000	Jan 1999–Dec 1999	–	–	1,195,117	–	–	–	–	1,195,117
18.3	30,000	Jan 1999–Dec 1999	–	–	1,827,499	–	–	–	–	1,827,499
19	414	Apr 1999–Dec 2002	–	–	569,996	460,698	628,061	377,055	–	2,035,810
20.1	48,876	Dec 1998–Nov 1999	–	–	n.a.	–	–	–	–	3,013,957
20.2	n.a.	May 1999–Apr 2000	–	–	n.a.	n.a.	–	–	–	5,990,799
21	236,263	Dec 1998–Sept 1999	–	–	n.a.	–	–	–	–	2,248,133
22	750	July 1999–June 2003	–	–	n.a.	n.a.	n.a.	n.a.	n.a.	497,200
23	12,906	Apr 1999–Mar 2000	–	–	n.a.	n.a.	–	–	–	477,881
24	n.a.	Aug 1999–July 2003	–	–	n.a.	n.a.	n.a.	n.a.	n.a.	990,777
25	n.a.	Sept 1999–Feb 2001	–	–	n.a.	n.a.	n.a.	–	–	121,080
26.1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	384,312
26.2	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	262,280
Total	1,810,626									253,708,286

n.a. = data not available.
– = indicates that value is outside project years and so budget allocated is zero.
1. In addition to the Ethiopian birr amount, 1015, 1094 and 702 t of food is planned for projects 12.3, 12.4 and 12.5, respectively. (US$ 1 = EB 6.71 in 1997).
Source: BoA (1999g).

Annex IIIC. Non-governmental organisation (NGO) agricultural development projects/programmes in Amhara Region, Ethiopia

Serial no.	Major project/programme objectives	Major project/programme activities
1.1	To increase agricultural production. To increase the level of household income. To enhance local leadership and technical capacity.	Small-scale irrigation development. Veterinary clinic/post construction. Natural resource conservation. Agricultural extension support. Pest and disease control. Community and government staff capacity building (training).
1.2	To increase crop production.	Irrigation development. Flood protection. Tractor operation. Veterinary clinic construction. Capacity building (training). Horticulture demonstration. Natural resource conservation. Support extension service. Support early warning system. Pest and disease control.
1.3	To increase crop production. To enhance the capacity of stakeholders. To enhance socio-economic infrastructure development.	Irrigation development. Farmers and line-offices staff training. Material support to government partner office. Provision of veterinary facilities.
1.4	To increase crop production. To increase household income. To enhance the efficiency of management and leadership capacity of stakeholders.	Irrigation development. Provision of credit for the purchase of agricultural inputs. Provision of capacity building training for the community, government and World Vision-Ethiopia staff.
2.1	To increase agricultural production and productivity. To increase livestock production and productivity.	Vegetable production. Local level seed production. Promotion of organic farming. Backyard livestock production. Forage seed production and development. Provision of local veterinary service. Sheep production. Forestry, soil and water conservation.
2.2	To improve crop production and productivity. To enhance livestock productivity. To conserve and develop natural resources.	Provision of awareness training for the community. Vegetable production. Local level seed production. Promotion of organic farming. Forage development. Poultry production. Bee-keeping improvement. Provision of veterinary service.
3	To increase disposable household income of families.	Soil and water conservation. Reforestation. Small-scale irrigation development. Support agricultural extension. Support veterinary services. Support pest control.
4	To enable target households to obtain improved access to income generating schemes. To enable target households to adopt recommended agricultural inputs, practices and techniques on their individual holdings.	Promotion of coffee and other horticultural production. Promotion of fishery. Provision of assistance to women.
5	To increase crop production/productivity. To improve animal husbandry. To promote income generating activities.	Provision of credit for agricultural inputs. River diversion for irrigation. Forage development. Improvement of dairy production. Provision of veterinary services. Improvement of bee keeping.
6	To strengthen agricultural extension and environmental rehabilitation programmes. To guarantee food self-sufficiency.	Soil conservation. Afforestation. Support crop production/extension. Support livestock development. Small-scale irrigation development.
7.1	To increase major agricultural crops and livestock. To rehabilitate the environmental resource base of the target area. To increase the levels of household income of landless women and youth.	Provision of better extension service. Provision of irrigation facilities and other farm inputs. Improvement of fodder production. Improvement of environmental protection awareness and knowledge of the direct beneficiaries. Support self-employment through skills training and facilitating credit.
7.2	To increase agricultural production. To maintain natural resource base. To increase household income. To enhance emergency response capacity. To improve health status.	Diversification of crops and application of fertiliser. Provision of farm oxen for oxless households on credit basis. Development of agro-forestry. Improvement of irrigation development. Training of farmers in appropriate agricultural practices. Improvement of livestock development
8	To support agricultural development of the surrounding peasant community. To provide a better farming environment for SOS community.	Introduction of improved small-scale dairy farming, poultry farming, bee keeping, fruit orchards, seedling production and vegetable production.
9.1	To improve the health and sustainability of the biophysical environment in selected areas. To increase the capacity of poor/vulnerable communities to meet their basic needs in a sustainable manner by enhancing the productivity of natural resource base.	Building of the capacity of community development committees and extension volunteers to lead resource development and protection efforts. Promotion and support of community forestry, soil and water conservation, fodder feeding of livestock and closure of degraded lands. Increasing the diversity and availability of appropriate crop seeds. Promotion of crop diversification and support for sustainable agriculture.

9.2	To improve the micronutrient and health status of mothers and children through cost effective and sustainable intervention and to build local capacity for the delivery of these interventions.	Promotion of vegetable and fruit production. Provision of training for communities and line-office staff. Conducting of seminars/workshops to line-offices/departments concerned.
9.3	n.a.	n.a.
10.1	To increase the number of hectares of community grazing lands that are covered. To increase the production of non-cereal crops by local farmers. To increase the area of community fodder production that is protected by soil conservation measures and/or managed with the cut and carry system. To increase the annual cereal and non-cereal crops production of beneficiary households.	Community fodder production. Homestead fodder production. Training of farmers in use and application of fertiliser and improved seeds, the control of pre- and post harvest losses, and the maintenance of the natural resource base. Demonstration of improved farming practices on 'lead' farmers' plots. Provision of basic farm inputs for poor farmers through co-operatives. Improvement of existing small-scale irrigation scheme.
10.2	Same as 10.1	Same as 10.1
10.3	Same as 10.1	Same as 10.1
11	To enable targeted households to adopt conservation-based agricultural practices including use of agro-forestry on their farmlands. To enable target households to establish private forestry and homestead plantation.	Promotion of small-scale irrigation schemes. Implementation of physical and biological soil and water conservation measures. Introduction and implementation of agro-forestry and tree plantation. Introduction of grazing land improvement measures. Promotion of gully treatment. Development of awareness through training.
12.1	To secure the survival of parts of the population who are unable to feed themselves, due to poor harvests or insufficient own production capacities. To rehabilitate the natural resources as a pre-condition for the population to regain their capacity for self-reliance. To enhance the population's potential for self-help and food security initiatives through appropriate measures in different agricultural and off-farm spheres.	Promotion of afforestation. Application of soil and water conservation measures. Development of small-scale irrigation practices. Promotion of sustainable agronomic practices. Development of forage development strategies. Identification of suitable strategies for livestock development. Provision of improved veterinary extension services. Provision of training for the target farmers, development agents etc. in various activities.
12.2	To increase agricultural productivity through improved agricultural practices. To improve animal husbandry practices. To improve health condition of livestock and genetic make-up of local breeds.	Upgrading the existing nurseries. Undertaking plantation. Carrying out physical, biological and agronomic measures of soil conservation. Protection of crops from crop pests, diseases and weeds. Promotion of community seed bank. Support for vegetable production. Promotion of small livestock production including poultry and apiculture. Support for the provision of veterinary services. Provision of training for selected farmers and Peasant Associations (PAs) mainly in crop production, animal husbandry etc.
12.3	n.a.	n.a.
12.4	n.a.	n.a.
12.5	n.a.	n.a.
13.1	To enable the people of Meket *wereda* to find sustainable solutions to environmental, social and economic problems through their own endeavours. To promote the transfer of successful methodologies for community-based, self-reliant development from Meket Development Programme (MDP) to other *weredas* in North Wello through active dissemination of lessons learnt from other organisations (governmental and non-governmental organisations).	Refining methodologies for an appropriate farmer-led extension programme relevant to the constraints of Meket. Exposing farmers to seed production techniques. Construction of veterinary clinics. Enabling communities and individuals to establish private woodlots. Strengthening a participatory approach. Introduction and development of agro-foresty practices. Equipping the Ministry of Agriculture (MoA) to ensure adequate supply of forage. Training and equipping MoA supervisors.
13.2	To develop practical mechanisms for local government to promote and support community initiatives through a programme of accountable and effective employment schemes, and community-managed grain banks.	Establishment of Employment Generating Scheme (EGS) fund. Animation of communities for grain bank initiation. Construction of grain banks. Training of community management committees. On-going training of local partners.
14	To offer a variety of crops with high nutritional values to 20% of children in the target area.	Conducting crop husbandry training. Promotion of compost preparation as biological fertiliser. Establishment of nursery site and satellite sites. Raising fruit-bearing and multi-purpose trees. Identification of target families for improved livestock production. Conducting animal husbandry training. Conducting biological water conservation training. Construction of veterinary posts and livestock crushes.
15.1	To ensure the proper and sustainable access of all intended beneficiary households to the irrigated areas. To implement soil conservation and erosion control measures. To help farmers improve farming methods and inputs.	Discussion among project participants to increase awareness and motivation. Integration of methods of ensuring equal benefits to women. Conducting physical and biological soil conservation measures, and afforestation. Maximisation of local agricultural production and livestock raising methods. Assist households and line bureaus to capitalise on the project benefits and sustainability.
15.2	To rehabilitate and develop degraded farms and grazing	Natural resources conservation and development. Provision of credit and

	lands. To build the capacity of the rural community, particularly rural women.	saving services. Support vegetable production. Training of farmers in information communication and in nursery practices/management. Conduct workshops. Organising study tour for the project and staff of line-offices.
15.3	n.a.	Soil and water conservation. Afforestation. Animal husbandry and development. Crop production and protection. Introduction of appropriate technology (wood processing, soap making, mud technology etc.). Support extension service. Training of farmers and staff.
15.4	n.a.	n.a.
15.5	n.a.	n.a.
15.6	n.a.	n.a.
16	To continue management of tree nurseries. To continue follow-up visits to afforestation and horticulture contact farmers. To continue training and providing extension services.	Afforestation. Support horticultural production. Assisting livestock production. Provision of training for the target farmers in nursery management, garden management, vegetable production and improved forage production.
17	To improve the productive capacity of the beneficiaries. To enable destitute families to generate recommendable income. To develop the awareness of destitute families through the provision of training.	Provision of training for the target group in vegetable production and fishing. Provision of credit facilities for the beneficiaries. Conducting of research and preparation of projects, which can help generate income to the beneficiaries.
18.1	To ensure the provision of reliable, affordable and sustainable veterinary services in the project areas. To improve the availability and management of forage and forage resources in the project area. To identify and implement opportunities for diversifying and increasing household income through re-stocking programmes. To promote poultry production and bee keeping.	Operation of veterinary drugs revolving fund scheme. Strengthening animal health subclinics. Support community-based animal health service provision. Introduction of improved forage and fodder. Provision of credit for women heads of households for poultry production, bee keeping etc.
18.2	To initiate a process of demand-driven agricultural research for marginal and drought-prone areas. To equip North Wello and Wag Hemra Departments of Agriculture with proven working methodologies for effective farmer-led extension. To allow a programme of scaling-up to be initiated.	Provision of training for farmers, development agents (DAs), MoA experts etc. Extension package demonstration. Selecting and training of farmer extensionists. Credit and input supply to overcome constraints of the existing credit system. Implementation of research activities.
18.3	To improve the household food security situation of vulnerable farmers in North Wello and Wag Hemra zones by reducing crop losses due to pests.	Development of integrated pest management technologies and methodologies. Training of DAs. Spraying chemical pesticides. Establishment/strengthening of revolving funds. Institutional support.
19	To assist and build capacity of target groups. To improve incomes by provision of external inputs. To improve nutritional value of food for project target group.	Empowerment of rural women participating in the project by provision of training related to planning, management etc. of their daily activities. Income generation through vegetable production. Improvement of nutritional quality and quantity of food available to project participants and their dependants. Improvement of traditional methods of fishing and provision of training to women on fishing to increase quantity and quality of fish caught. Improvement of transportation of fish to markets. Purchase and provision of female goats and ewes to project participants.
20.1	To increase and improve agricultural production of the peasant farming households. To conserve natural resources. To strengthen the organisational and technical capacity of the local government institutions and the community at the grassroots level.	Support crop production by carrying out an integrated pest and disease management survey, providing training to contact farmers and providing pesticides on revolving credit basis. Promotion of livestock production through the provision of clinical equipment and other supplies, and by carrying out an animal disease survey. Support horticultural production by conducting training and providing vegetable seeds.
	To improve the nutritional cover of the food insecure and vulnerable section of the community.	Support afforestation through the provision of tree seeds for the establishment of private tree nurseries. Assist soil and water conservation through the construction of check dams.
20.2	Same as 20.1	Same as 20.1
21	To strengthen the capacities of community and government so as to improve long-term food security while addressing short-term food security problems.	Construction of veterinary clinic. Training of farmers and government staff. Support community and government microprojects.
22	To improve the living conditions of women in the target areas. To create awareness of women's rights and to empower women so that they can participate equally with men in economic, political and social activities. To improve women's capabilities and skills by engaging them in diversified activities and by giving them skills training.	Mobilisation of beneficiaries for loan disbursement and to encourage savings. Collection of loan repayments. Training in financial transactions and in keeping accounting records.
23	To rehabilitate degraded lands through afforestation and associated soil and water conservation methods. To produce pole, timber, fuelwood and fodder as well as fruits. To	Establishment of main and local nurseries. Providing households with tree seedlings for homestead planting. Planting seedlings on farm and grazing boundaries and scattered trees on farms. Planting trees along riverbanks,

	generate cash income from these products.	steep hills and roadsides.
24	n.a.	n.a.
25	n.a.	n.a
26.1	n.a.	n.a.
26.2	n.a.	n.a.
n.a. = data not available. Source: BoA (1999g).		

Annex IV. Description of secondary data collected and used in writing this report

This annex lists some of the secondary data that were collected and analysed in the process of preparing this document. The data listed below are available upon request from the authors.

- Land use type in hectares by *wereda*, 1996
- Altitude (m above sea level) and distribution of area by agro-ecology and by *wereda* (%)
- Composition of forests in hectares by *wereda*, 1993–99
- Population by gender and by *wereda*, 1994 and 1999
- Amount of land cultivated (in ha) and output (in quintals) by *wereda*, 1997–99
- Population of livestock by *wereda*, 1996
- Number of milking cows and milk production by *wereda*, 1996
- Number and percentage distribution of farmers by ownership of draft oxen by *wereda*, 1996
- Traditional and modern beehives (number) and honey production (quintals) by *wereda*, 1996
- Farmers' producers co-operatives by zone, 1996–97 and 1997–98
- Animal health service by *wereda*, 1993–96
- Distribution of population by type of employment (%) by *wereda*, 1996
- Composition of average annual income of farm households (in Ethiopian birr) by *wereda*, 1996
- Number of *kebeles* in each *wereda*
- Market, postal agents, banks, electricity power sources and telephone services existing in markets towns, 1999
- Construction of stone bunds and terraces by government and community action (in hectares) by *wereda*, 1993–96
- CoSAERAR (Commission for Sustainable Agriculture and Environmental Rehabilitation for Amhara Region) accomplished irrigation projects in Amhara Region
- Government, non-governmental, co-operative and private nurseries by *wereda*, 1996
- Non-government agricultural development projects/programmes in Amhara Region
- Financial services operators in Amhara Region: capacity and constraints, 1998
- Number of population affected by drought by *wereda*, 1994–99; and
- Regional food balance (in quintal wheat equivalent), 1993/94 to 1997/98.

Annex V. Abbreviations and acronyms

ACAO	Agricultural Co-operative Affairs Office
ACSI	Amhara Credit and Savings Institution
ADLI	Agriculture development led industrialisation
AEZ	Agro-ecological zone
AFAP	Amhara Forestry Action Programme
AISE	Agricultural Inputs Supply Enterprise
ANRBANR	Amhara National Region Bureau of Agriculture and Natural Resources
ANRS	Amhara National Regional State
BoA	Bureau of Agriculture
BoPED	Bureau of Planning and Economic Development
BOTI	Bureau of Trade and Industry
CEDEP	Consultants for Economic and Environmental Protection
CEP	Community Empowerment Programme
CoSAERAR	Commission for Sustainable Agriculture and Environmental Rehabilitation for Amhara Region
CPP	Comprehensive Package Programme
CSA	Central Statistics Authority
DAP	Diammonium phosphate
DBE	Development Bank of Ethiopia
DDE	Dairy Development Enterprise
DPPC	Disaster Prevention and Preparedness Commission
EAL	Ethiopian Amalgamated
EGS	Employment Generating Scheme
EHRS	Ethiopian Highlands Reclamation Study
EIPD	Extension and implementation development
ESE	Ethiopian Seed Enterprise
FEC	French Engineering Consultants
FINNIDA	Finnish International Development Agency
ICC	Input Co-ordination Committee
IDA	International Development Agency
IFPRI	International Food Policy Research Institute
IFSP	Integrated Food Security Programme
ILRI	International Livestock Research Institute
LLPPA	Local level participatory planning approach
MDP	Meket Development Programme
MNREP	Ministry of Natural Resources and Environmental Protection
MoA	Ministry of Agriculture
MPP	Minimum Package Programme
NEC	Netherlands Engineering Consultants
NGO	Non-governmental organisation

PA	Peasant Association
PAA	Participatory agroforestry approach
PADEP	Peasant Agricultural Development Programme
PADETES	Participatory Agricultural Demonstration Extension and Training System
PLUPI	Participatory land use planning and implementation
PRA	Participatory rural appraisal
RELC	Research Extension Liaison Committee
RRMP	Regional Research Master Plan
SCRP	Soil Conservation Research Project
SG-2000	Sasakawa-Global 2000
SIDA	Swedish International Development Agency
TLU	Tropical livestock units
UNECA	United Nations Economic Commission for Africa
USAID	United States Agency for International Development
USLE	Universal soil loss equation