Federal Democratic Republic of Ethiopia
Ministry of Economic Development and Cooperation

Environmental and Social Analysis
Food Security Project

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# ABBREVIATIONS & ACRONYMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACSI</td>
<td>Amhara Credit and Saving Institution</td>
</tr>
<tr>
<td>ADLI</td>
<td>Agricultural Development Led Industrialization</td>
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<tr>
<td>ADP</td>
<td>Area Development Program</td>
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<tr>
<td>AISCO</td>
<td>Agricultural Inputs Supply Corporation</td>
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<tr>
<td>ANRS</td>
<td>Amhara National Regional State</td>
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<tr>
<td>BOA</td>
<td>Bureau of Agriculture (Woreda Level)</td>
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<td>BOH</td>
<td>Bureau of Health (Woreda Level)</td>
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<tr>
<td>CBD</td>
<td>Community Based Development</td>
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<tr>
<td>CBGs</td>
<td>Community Based Organizations</td>
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<tr>
<td>CBP</td>
<td>Contagious Bovine Pleuropneumonia</td>
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<td>CBR</td>
<td>Crude Birth Rate</td>
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<td>CCP</td>
<td>Contagious Caprine Pleuropneumonia</td>
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<tr>
<td>CFSSC</td>
<td>Central Food Security Steering Committee</td>
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<tr>
<td>CPB</td>
<td>Cooperatives Promotion Bureau</td>
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<tr>
<td>CRDA</td>
<td>Christian Relief and Development Association</td>
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<td>CRDA</td>
<td>Community Road Development Agent</td>
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<td>CSA</td>
<td>Central Statistical Authority</td>
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<td>CSE</td>
<td>Conservation Strategy of Ethiopia</td>
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<tr>
<td>DA</td>
<td>Development Agent (Agricultural Extension)</td>
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<tr>
<td>DAP</td>
<td>Diammonium Phosphate</td>
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<tr>
<td>DPPC</td>
<td>Disaster Prevention and Preparedness Commission</td>
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<tr>
<td>EACRO</td>
<td>Ethiopian Agricultural Research Organization</td>
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<td>E.C.</td>
<td>Ethiopian Calendar</td>
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<td>EGS</td>
<td>Employment Generation Scheme</td>
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<td>EIA</td>
<td>Environmental Impact Analysis</td>
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<td>ERA</td>
<td>Ethiopian Road Authority</td>
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<tr>
<td>ESA</td>
<td>Environmental and Social Analysis</td>
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<tr>
<td>ETB</td>
<td>Ethiopian Birr</td>
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<tr>
<td>FA</td>
<td>Farmers' Association</td>
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<td>FMD</td>
<td>Foot and Mouth Disease</td>
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<td>FSP</td>
<td>Food Security Project</td>
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<tr>
<td>GNP</td>
<td>Gross National Product</td>
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<tr>
<td>GO</td>
<td>Government Organization</td>
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<tr>
<td>Ha</td>
<td>Hectare</td>
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<tr>
<td>HH</td>
<td>Household</td>
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<tr>
<td>IC</td>
<td>Irrigation Cooperative</td>
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<td>IDA</td>
<td>International Development Association</td>
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<tr>
<td>IMCI</td>
<td>Integrated Management of Childhood Illness</td>
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<tr>
<td>ITCZ</td>
<td>Inter-Tropical Convergence Zone</td>
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<tr>
<td>KAC</td>
<td>Kebele Agricultural Committee</td>
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<td>KDC</td>
<td>Kebele Development Committee</td>
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<tr>
<td>KRC</td>
<td>Kebele Road Committee</td>
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<tr>
<td>Kg</td>
<td>Kilogram</td>
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<tr>
<td>Km</td>
<td>Kilometre</td>
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<tr>
<td>LGP</td>
<td>Length of Growing Period</td>
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<tr>
<td>Masi</td>
<td>Metres above sea level</td>
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<tr>
<td>MCE</td>
<td>Metaferia Consulting Engineers</td>
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<tr>
<td>MEDaC</td>
<td>Ministry of Economic Development and Cooperation</td>
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<tr>
<td>MoIC</td>
<td>Ministry of Information and Culture</td>
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<tr>
<td>Mt</td>
<td>Metric Ton</td>
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<tr>
<td>NGO</td>
<td>Non-Governmental Organization</td>
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<tr>
<td>OIDA</td>
<td>Oromiya Irrigation Development Authority</td>
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<tr>
<td>ONRS</td>
<td>Oromiya National Regional State</td>
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<td>ORDA</td>
<td>Oromiya Relief &amp; Development Association</td>
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</table>
PA – Peasant Association
PEC – Primary Environmental Care
PRA – Participatory Rural Appraisal
Qt – Quintal (1 Qt = 100 kg)
RECC – Regional Environmental Coordination Committee
REMSEDA – Regional Medium and Small-Scale Enterprise Development Agency
REST – Relief Society of Tigray
RFSCO – Regional Food Security Coordination Office
RRA – Rapid Rural Appraisal
RRA – Regional Roads Authority
RRA-REMB – Regional Roads Authority–Regional Environmental Management Branch
SAERAR – Society for Agricultural and Environmental Rehabilitation in Amhara Region
SMS – Subject Matter Specialist
SNNP – Southern Nations, Nationalities, and Peoples
SSI – Small- Scale Irrigation
SWC – Soil and Water Conservation
TNRS – Tigray National Regional State
USD – United States Dollar (1 USD = 8.5 ETB)
WDA – Women Development Agent
WFP – World Food Programme
WID – Women in Development
WUA – Water User Association
WUC – Water User Committee
WVE – World Vision Ethiopia
TABLE OF CONTENTS

1. INTRODUCTION .................................................................................................................. 1

2. DESCRIPTION OF THE PROPOSED PROJECT ................................................................ 2
   2.1 BACKGROUND .................................................................................................................. 2
   2.2 THE FOOD SECURITY PROJECT (FSP) ........................................................................ 3

3. DESCRIPTION OF THE TARGET AREAS ........................................................................... 5
   3.1 AMHARA REGIONAL STATE ......................................................................................... 5
      3.1.1 Location and Topography ...................................................................................... 5
      3.1.2 Population and Settlement ................................................................................... 5
      3.1.3 Climate and Agro-ecology .................................................................................... 6
      3.1.4 Soils and Soil Erosion .......................................................................................... 6
      3.1.5 Land Use and Cover ............................................................................................ 6
      3.1.6 Water Resources ................................................................................................ 7
      3.1.7 Forest Resources .................................................................................................. 7
      3.1.8 Energy .................................................................................................................. 7
      3.1.9 Wildlife ................................................................................................................ 7
      3.1.10 Farming System and Crop Production ................................................................. 8
      3.1.11 Health Services .................................................................................................. 8
      3.1.12 Water Supply .................................................................................................... 8
      3.1.13 Education .......................................................................................................... 8
      3.1.14 Access Roads ..................................................................................................... 9
      3.1.15 Cultural Heritage ............................................................................................... 9
      3.1.16 Income .............................................................................................................. 9
   3.2 SOUTHERN NATIONS AND NATIONALITIES PEOPLES REGIONAL STATE .......... 9
      3.2.1 Location and Topography ...................................................................................... 9
      3.2.2 Population and Settlement ................................................................................... 10
      3.2.3 Climate and Agro-ecology .................................................................................... 10
      3.2.4 Farming System and Crop Production ................................................................. 10
      3.2.5 Health Services .................................................................................................. 11
      3.2.6 Access Roads ..................................................................................................... 11
   3.3 TIGRAY REGIONAL STATE ............................................................................................. 12
      3.3.1 Location and Topography ...................................................................................... 12
      3.3.2 Population and Settlement ................................................................................... 12
      3.3.3 Climate and Agro-ecology .................................................................................... 13
      3.3.4 Soil and Water Conservation ............................................................................... 13
      3.3.5 Land Use Land Cover .......................................................................................... 14
      3.3.6 Water Resources ................................................................................................ 14
      3.3.7 Forest Resources .................................................................................................. 14
      3.3.8 Farming System and Production ......................................................................... 15
      3.3.9 Health Services .................................................................................................. 15
      3.3.10 Water Supply .................................................................................................... 15
      3.3.11 Education .......................................................................................................... 16
      3.3.12 Access Roads ..................................................................................................... 16
      3.3.13 Cultural Heritage ............................................................................................... 16
   3.4 OROMIA NATIONAL REGIONAL STATE ........................................................................ 16
      3.4.1 Location and Topography ...................................................................................... 16
      3.4.2 Population and Settlement ................................................................................... 17
      3.4.3 Climate and Agro-ecology .................................................................................... 17
      3.4.4 Geology and Soils ................................................................................................ 17
      3.4.5 Land Use/Cover ................................................................................................... 18
      3.4.6 Forest Resources ................................................................................................ 18
      3.4.7 Wildlife .............................................................................................................. 18
      3.4.8 Farming System and Crop Production ................................................................. 18
      3.4.9 Health Services .................................................................................................. 19
6. ENVIRONMENTAL AND SOCIAL ANALYSIS OF INTERVENTIONS IN FOOD INSECURE PEASANT ASSOCIATIONS

6.1 PROJECTS IN AMHARA REGION
6.1.1 Small-Scale Irrigation in Bati Woreda
6.1.2 Off-farm activities
6.1.3 Roads in Bati Woreda
6.1.4 Market places
6.1.5 Input use in Bati Woreda
6.1.6 Small scale irrigation in Tenta Woreda
6.1.7 Off-farm activities in Tenta Woreda
6.1.8 Road in Tenta Woreda
6.1.9 Market places
6.1.10 Input use in Tenta Woreda
6.2 PROJECTS IN OROMIA REGION
6.2.1 Small Scale Irrigation
6.2.2 Soil and Water Conservation
6.2.3 Existing & Ongoing Interventions in Chiro Woreda
6.3 PROJECTS IN SNPPR
6.3.1 Irrigation Projects
6.3.2 Road Projects
6.3.3 Crop Production and Input Use Interventions
6.4 PROJECTS IN TIGRAI REGION
6.4.1 Environmental Impacts
6.4.2 Socioeconomic Impacts

7. ANALYSIS OF ALTERNATIVES AND SUSTAINABLE RURAL LIVELIHOOD

7.1 ANALYSIS OF ALTERNATIVES IN BATI WOREDA (AMHARA REGION)
7.2 ANALYSIS OF ALTERNATIVES IN TENTA WOREDA (AMHARA REGION)
7.3 DEVELOPMENT ALTERNATIVES FOR THE SELECTED FOOD INSECURE PAS IN OROMIA
7.4 DEVELOPMENT ALTERNATIVES FOR THE SAMPLE WOREDAS IN SNPPR
7.5 ANALYSIS OF ALTERNATIVES FOR TIGRAI REGION
8. REHABILITATION AND POTENTIAL DEVELOPMENT INTERVENTIONS ........................................... 120

8.1 IRRIGATION SCHEMES ........................................................................................................... 120
  8.1.1 Rehabilitating Existing Irrigation Schemes .................................................................... 120
  8.1.2 Potential Irrigation Development/Interventions ............................................................ 121
8.2 ROAD CONSTRUCTION .......................................................................................................... 123
  8.2.1 Rehabilitation ................................................................................................................. 123
  8.2.2 Potential Projects ............................................................................................................ 124
8.3 PROVISION OF INPUTS ........................................................................................................ 124
  8.3.1 Rehabilitation .................................................................................................................... 124
  8.3.2 Potential Projects ............................................................................................................. 125
8.4 SOIL AND WATER CONSERVATION (SWC) ....................................................................... 126
  8.4.1 Rehabilitation .................................................................................................................... 126

9. PROPOSED INSTITUTIONAL FRAMEWORK ........................................................................... 127

9.1 EXISTING INSTITUTIONS .................................................................................................... 127
9.2 PROPOSED INSTITUTIONAL FRAMEWORK ...................................................................... 129

10. MITIGATION MEASURES AND COST ESTIMATES ............................................................. 134

11. MONITORING PLAN AND MONITORING INDICATORS .................................................. 142
  11.1 MONITORING AND EVALUATION .................................................................................. 142
  11.2 MONITORING TEAM AND RESPONSIBLE GROUPS ...................................................... 142
  11.3 FACILITIES REQUIRED IN MONITORING .................................................................... 142
  11.4 METHODOLOGY ENVISAGED IN MONITORING ......................................................... 143
  11.5 MONITORING INDICATORS ............................................................................................ 143

12. RECOMMENDATIONS AND CONCLUSIONS .................................................................... 147
  12.1 AMHARA REGION .............................................................................................................. 147
  12.2 OROMIA REGION ............................................................................................................. 150
  12.3 SOUTHERN NATIONS NATIONALITIES PEOPLES REGION .......................................... 151
  12.4 TIGRAI REGION ............................................................................................................... 154

13. REFERENCES .......................................................................................................................... 156
LIST OF TABLES

Table 1 - Land Use Pattern of Bati Woreda ................................................................. 20
Table 2 - Cultivated land, Crops and Yield (Bati) ........................................................... 21
Table 3 - Land Use Pattern of Tenta Woreda ................................................................. 22
Table 4 - Cultivated Land, Crops and Yield (Tenta) ......................................................... 23
Table 5 - Land Use of Goro Gutu Woreda for the Production Year 1999-2000 .............. 25
Table 6 - Major Crops Grown in Goro Gutu Woreda .................................................... 25
Table 7 - Projected Population (year 2000) of the Two Sample PAs ............................ 26
Table 8 - Livestock Population of Goro Gutu Woreda ..................................................... 26
Table 9 - Number of Health Institutions and Manpower in Goro Gutu Woreda .......... 28
Table 10 - Required logistics to improve health services in the Goro Gutu Woreda ...... 28
Table 11 - Top Ten Diseases in Goro Gutu Health Center ............................................. 29
Table 12 - Existing land use of the Chiro Woreda for the production year 1999/2000 .... 30
Table 13 - Major type of crops and their respective yield & price per quintal in 2000 ...... 30
Table 14 - Projected Population (2000) of Chiro Woreda by sex .................................. 31
Table 15 - Livestock Population of Chiro Woreda ......................................................... 31
Table 16 - Major Tree Species of Chiro Woreda ............................................................ 32
Table 17 - Health Infrastructures and Manpower Distribution in Chiro Woreda ............ 33
Table 18 - Ten Top Diseases in Chiro Woreda (Year-1999) ............................................ 34
Table 19 - Ten Top Diseases in Chiro Woreda (Year-2000) .......................................... 34
Table 20 - Ten Top Diseases in Chiro Woreda (Year-2001) .......................................... 34
Table 21 - Fertilizer Distribution in Bolos Sore & Damot Gale Woredas (1990-93 E.C.) .. 37
Table 22 - Human Population, Crop Production and Livestock Population of the Target Woredas ................................................................. 38
Table 23 - Prices of Major Crops in the two Sampled Woredas (1990-93 E.C.) ............. 38
Table 24 - Major Crop Production of Sample Woredas (1986–92 E.C) ....................... 39
Table 25 - Areas Under Major Crops for the two Sample Woredas (1986–1992 E.C) .. 39
Table 26 - Livestock Prices at Major Markets in Bolos Sore & Damot Gale from (1990–93 E.C) ................................................................. 40
Table 27 - Number of Storage, Capacities and Location in the Woredas ....................... 40
Table 28 - Food Insecurity Mitigating Institutions Working in the Target Woredas ........ 41
Table 29 - Land Use Pattern of Wokro Woreda ............................................................ 42
Table 30 - Crop Production and Yields (qt/ha) 1988/1991 E.C ....................................... 43
Table 31 - Percentage of Sex Composition of Students by Class (2000) ....................... 48
Table 32 - Livestock Type and Population in the Woreda ............................................. 50
Table 33 - Classification of Food Insecure Households in Ethiopia .............................. 70
Table 34 - Crop Average Yield/ha ................................................................................. 80
Table 35 - Price Trends of Crops for Two Production Years (1998/99 and 1999/00) .... 80
Table 36 - Availability of Farm Oxen by ....................................................................... 81
Table 37 - Prices for Agricultural Inputs for year 2001 (Bati Woreda) ......................... 84
Table 38 - Crop Yield/ha (1997 to 2000) ..................................................................... 86
Table 39 - Price Trends of Agricultural Crops (1996 to 2000) ....................................... 86
Table 40 - Availability of Farm Oxen ............................................................................. 87
Table 41 - Environmental and Social Impacts of Existing and Ongoing Food Security Interventions In Goro Gutu Woreda and Proposed Mitigation Measure .......... 93
Table 42 - Features of Irrigation Schemes in Boloso Sore Woreda ................................. 95
Table 43 - Potential Rivers in the Woreda .................................................................... 111
Table 44 - Potential Rivers in the Woreda .................................................. 115
Table 45 - Proposed Institutional Framework for the FSP .................................................. 132
Table 46 - Mitigation Table for Small-Scale Irrigation Schemes ........................................ 135
Table 47 - Mitigation Table for Community Access Road (CAR) ....................................... 137
Table 48 - Mitigation Table for Agro-Inputs, SWC and Afforestation ................................ 139
Table 49 - Interventions, Monitoring Indicators, Methods, Frequency and Responsibilities 145
1. INTRODUCTION

This Environmental and Social Analysis (ESA) is the Final Report prepared and submitted by Metaferia Consulting Engineers (MCE). The International Development Association (IDA) of the World Bank is to allocate funds for a proposed Food Security Project in selected ‘chronically food deficit’ Woredas of the Regional states of Amhara, Oromiya, Tigrai and Southern Nations and Nationalities. IDA requires an Environmental and Social Analysis prior to the consideration of the project.

The contract agreement for the study was signed on June 13, 2001 between the Ministry of Economic Development and Cooperation (MEDaC) and the Consultant (MCE). The study was carried out between June 29 and August 10, 2001 covering two sample Woredas from each of the four Regional States of Amhara, Tigrai, Oromiya and Southern Nations and Nationalities. The Draft Final Report was submitted to the Client and was duly commented upon.

This Final Report incorporates the comments, suggestions and corrections given by the Client. The report provides the Environmental and Social Analysis of the Food Security Project based on data derived from selected Woredas in the respective Regions. The report embraces analysis of the natural resource base, the socio-economic situations, the production systems and activities and the health and nutrition status of the sample Woredas, followed by ESA of envisaged interventions under the project.

The report is organized as follows. The essence of the proposed Food Security Project, is described in chapter two. Chapter three describes the target areas in terms of bio-physical characteristics including topography, altitude, climate, agro-ecology, land use/land cover, the resource base, population, settlement pattern, major occupations and production activities of the communities. Policies, legal, regulatory and administrative frameworks related to the project are reviewed in chapter four.

Chapter five describes the methods and techniques used in assessing and analyzing the impacts of the various projects. The environmental and social impact analyses of the interventions (current and future) and analyses of alternatives are presented in detail in chapters six and seven, respectively. Chapter eight deals with potential development interventions.

The institutional framework for environmental and social management is treated in chapter nine. Mitigation measures with cost estimates, and a monitoring plan and monitoring indicators for the interventions are presented in chapters ten and eleven, respectively.

Finally, conclusions and recommendations are given in chapter twelve and a list of institutions, community groups and individuals contacted during the course of the study is presented in the appendices. Checklists and focus group discussion
questionnaires used for the survey and other relevant data are annexed to this report.

2. DESCRIPTION OF THE PROPOSED PROJECT

2.1 Background

Ethiopia is one of the poorest countries in the world with a per capita GNP of about US$ 120. The country has been chronically food deficit during the last two and half decades and has suffered two major famines in this period, one in 1973 and the second in 1984. In both cases, the loss of human lives was very large. The root causes include recurrent droughts; erratic nature of the rainfall; severe soil erosion, land degradation, population growth, and diminishing farm size; lack of tenure security; poor agricultural management; poor infrastructure development; and shortage of cash to buy inputs (draught animals, fertilizers, etc.).

Food security is defined as access by all people at all times to enough food of good quality for an active and healthy life. The essential elements of food security are the availability of food, the ability to acquire it and its utilization. Food insecurity can be either chronic where inadequate diet results from the lack of resources (land, draught power) to produce or acquire food, or transitory where a temporary decline in a household’s access to enough food occurs due to drought and displacement of people.

The majority of the rural population of the country is characterized by subsistence production, low productivity and vulnerability. Data from various surveys show that about 45% of the country’s population are chronically food insecure, living below the food poverty line set at a minimum food consumption of 2,100 kcalories per adult equivalent/day. Although there is a growing problem of food insecurity in urban areas, the great majority of the food insecure areas are located in the rural areas. The severity of food poverty is highest in Tigrai and Amhara Regional States where 65 and 57 percent of the respective populations are affected.

The seriousness of poverty and food insecurity is manifested by the high level of under nutrition observed amongst the affected population, particularly in children under six years of age. A nutritional survey made in 1992 revealed that 64 percent of children who are under 5 years of age showed stunted growth. This figure increased to over 68 percent by 1996. Moreover, the surveys also revealed seasonal weight loss in both children and adults during the four months of the year prior to planting of the new crop.

Another dimension of food insecurity emanates from the poor development of feeder roads and market outlets. The country’s average road density is estimated to be about 21 km per 1,000km$^2$ of land. The proportion of farm villages and market centers that can be reached by all-weather roads is very low. Farmers carry their produce (by pack animals or humans) long distances to market places. This impairs
distribution of food (food transfer from surplus to deficit areas) and increases costs of inputs and produce.

The Government of Ethiopia has identified 156 Woredas as ‘chronic food deficit’ areas in the Regional States of Amhara, Oromiya, Tigrai and Southern Nations and Nationalities (SNNP). The total population of these Woredas (47 in Amhara, 58 in Oromiya, 16 in Tigrai and 32 in SNNP) was estimated at 17.4 million in 1994, and is more than 21 million today. Of this total population, about 5.3 million persons or close to 25% of the inhabitants are chronically affected by food shortage. (Refer to appendices for the location of the Regions and food insecure Woredas).

The livelihood of the population of these Woredas is significantly dependent on agriculture, mainly crop production and livestock husbandry. However, these areas are characterized by high population density, severe environmental degradation, frequent drought and lack of appropriate farming techniques. The small and fragmented land size coupled by the poor farming practices barely produces enough to cover the basic food requirements of the household (4-5 persons/household). The proposed Food Security Project is, therefore, a long-term intervention envisaged to reduce vulnerability and ensure sustainable food access in target areas.

2.2 The Food Security Project (FSP)

The Food Security Project has been conceived under the food security strategy that the Government of Ethiopia presented to the international community in December 1996. The Government emphasizes that the keys to food security in ‘chronic food deficit areas’ are:

  i) building the resource base of poorer households;
  ii) increasing opportunities for employment;
  iii) raising the level of income of households;
  iv) lowering the real costs of food; and
  v) improving the nutritional status of children, pregnant and lactating women.

One of the strategies to increase food security at household level is to increase agricultural production and incomes through the development of (i) small-scale irrigation, (ii) improvement in rainfed agriculture, (iii) promotion of improved seeds and fertilizer use, (iv) soil and water conservation practices, (v) construction of roads and market places and (vi) development of off-farm enterprises. With regard to these, IDA considers that the key features of the project would be establishing financing mechanisms to allow funds to flow to vulnerable communities and households and scaling up promising innovations and initiatives that have already proven their worth in addressing the problems of vulnerable rural communities.
IDA proposes the allocation of funds to be provided through four ‘windows’. These include:

- grants to Kebeles/Communities, which is the major portion;
- capacity building grants to Woredas, Regions and Federal Ministries for specific, project related activities;
- investments undertaken at the Federal and Regional levels in initiatives and policies to lower costs of food marketing and distribution throughout the country; and
- a small portion of investments in impact evaluation and administration of the flow of funds.

Four types of grants that would be provided to Kebeles/communities are considered. These are capacity building, production, entitlement and emergency. Capacity building deals with the assistance provided to the communities to prepare a plan of action for using other grants. The production type of grant, which is the primary and predominant grant, envisages an acceptable proposal (from the community) for asset-building activities in the community. The concept of entitlement is a grant that is designed to help households with no assets to develop a supporting environment for productive investments. The emergency grant type would be used to provide a risk management mechanism and a means of safeguarding asset gains made by using production and entitlement grants from being lost during disasters or economically adverse events. Details of the grant mechanisms are being worked out.

The criteria for the selection of eligible Woredas have also been established. These criteria include:

- degree of food security;
- presence of a critical mass of technical expertise in Government and NGOs;
- ongoing initiatives to build health services including Integrated Management of Childhood Illnesses (IMCI) or comparable activities, either by Government or NGOs, with support by other donors;
- located in a ‘cluster’ with other selected Woredas;
- complementary with other programs, especially long term soil improvement efforts; and
availability of agricultural technologies proven for the agro-
ecological zone.

3. DESCRIPTION OF THE TARGET AREAS

3.1 Amhara Regional State

3.1.1 Location and Topography

The Amhara National regional state extends from 9 to 13°45’N and 36 to 40°3’E. It is bounded by Benshangul and the Sudan in the West, Oromia in the South, Afar in the East and Tigray in the North. The region covers a surface area of 170,152 km$^2$ and occupies 1/6 of the country’s total landmass.

The Amhara Region constitutes ten administrative zones (North Shewa, East Gojam, West Gojam, North Gonder, South Gonder, North Wollo, South Wollo, Oromia (Kemissie), Awi and Wag Hamra Zones) and 105 Woredas. Of the total Woredas about 48 are earmarked as food deficit Woredas.

The region is affected by severe land and soil degradation, recurring drought, fragmented farm plots, (0.7 ha/HH,) high population, low literacy, and with poor delivery of research technology and extension support.

The central highlands of Ethiopia, of which Amhara Region is the major part, underwent several crucial deformations during the tertiary period. This resulted in the appearance of large openings e.g. fissures, rents and the production of prominent plateau, hills and mountains. Those diversified geological formations produced complex and mosaic landscapes which made the region a center of diversity and variability for various biological life and physical structures. The Amhara Region, which is between the two major massifs, Tekeze Gorge in the north and Abay Gorge to the south and the Rift valley escarpment in the east, are important watershed and sources of major national and international rivers.

3.1.2 Population and Settlement

According to the 1994 census the population of the region is estimated at 14.4 million people (7.4 million male and 7 million female). About 88% of the population live in rural areas. Regional population density ranges from 136.4 persons (East Gojam) to 41.5 persons /km$^2$ (North Gondar). The average is about 82.5 persons/km$^2$.

The census has also indicated that the proportion of the population under the age of 15 is 49.3%, which is attributed to high fertility rate and declining infant mortality
rate. The high proportion of the younger population combined with the aged (4.8%) poses a very high degree of dependency.

More than 85% of the total population live in the highlands where the climate is mild, the soils are productive and human and livestock pests and diseases are relatively absent. The majority is rural with only 12% of the population residing in urban areas.

3.1.3 Climate and Agro-ecology

The Region exhibits wide altitudinal ranges, from 600m at Metema (Sudan border) to 4620masl, the peak of Ras Dashen. The amount of rainfall per annum varies from 200mm at Qobbo to 2,000mm at Awi (Banja, and Guang Woredas). The single growing period in the eastern and southern parts of the Region is respectively 45-90 and 60-120 days long. The Belg growing highlands’ length of growing period (LGP) is 120 days at Wag Hamera and 200 days at Awi (Banja).

The Amhara Region has ten major and fairly homogenous agro-ecological zones (AEZs). The major part of the region (37%) lies within the tepid to moist zone. This agro-ecological zone is predominantly located in the central part, where there is high potential for crop production. Moisture deficit areas are found in the hot to warm arid or hot to warm sub-moist agro-ecological zones (Wollo and Gondar zones).

3.1.4 Soils and Soil Erosion

There are about twelve distinct soil types in the region. Depressions and flat plains are mainly covered by black clay soils (Vertisols). Undulating to gently rolling areas are characterized by dark reddish to brown colored deep soils (Luvisols, Nitosols and Acrisols). The mountainous and degraded landscapes of most parts of Wollo and North Gondar are dominated by shallow and stony soils. The major alluvial plains in the east are predominantly Fluvisols and Vertisols with some saline and sodic traces. The highlands of Amhara suffer from severe soil erosion and degradation.

3.1.5 Land Use and Cover

There is no updated data on land use/cover of the region. Climate, topography and population are the main influencing factors both for land use and cover types of the region. There are twenty-four mapped land use/land cover types derived from eleven major classes. From the available data, about 53.5% of the total regional area is under cultivation, 40% is covered by bushes/shrubs and open grass lands, 0.8% is open woodlands; 0.4% swamps; 0.8% Afro-alpine vegetation; 2.2 % rocky and shrubs & grasses; the riparian vegetation occupies 0.2% and the remaining are water bodies and bare lands.
3.1.6 Water Resources

About 70% of the Region suffers from high water erosion. Most of the rivers cut deep gorges and many of them are seasonal. Abay, Tekeze and Awash tributaries are mainly from the Amhara highlands. Of all the rivers, only Abay is used to generate hydropower at several natural falls. The regional survey indicated that about 250,800ha is suitable for irrigation and 120,000ha can be developed by microdams and river diversions. At present 15.5% (40,000 ha) has been brought under irrigation, 97% of these by traditional means.

Prominent friable red and brown clay soils on relatively flat land in Gojam and Awi are potential crop farming zones and are considered as food self-sufficient areas. The bottom wetlands like Woreta/ Fogera plains, Chefa-Borkena and Qobbo Valley are crossed by several rivers and are considered as potential irrigable and rice production areas.

Potable safe water distribution is an unresolved development problem and closely related to gender issues. Only 10.3% of the population receive clean water and substantial numbers of people walk 5-7 km to fetch water.

3.1.7 Forest Resources

There are four major types of forests including natural forests, plantations, farm forests and Acacia woodlands. The Region has an estimated 80,000ha of natural forest, 73,000ha-plantation forest; 25,000 ha farm forest and more than 600,000ha of Acacia woodland (mostly incense, gums and A. Abyssinica, A.Nilotica, etc.). A report on forest ownership in the region indicates that 94%, 3% and 3% is owned by state, community and private farms, respectively.

3.1.8 Energy

Biomass from wood, coal, cow dung and crop residues are the main energy sources, accounting for 99% of the total fuel needed for domestic use. Alternative energy sources like wind, solar, earth-coal and methane (bio-gas) gas are under study.

3.1.9 Wildlife

There are many endemic mammals and birds in the Region. The Semen Mountain National park is known for a number of rare wildlife including Walya Ibex, Abyssinian Wolf, Chelada Baboon, Minelik bush buck, Serine birds, etc. Low land animals are widely distributed at Metema and Quara areas and some in Bati and Woredas bordering the Afar Region. Lake Tana, L.Hayik, Ardibo, May Bara and Gulbo are some of the lakes (water bodies) that inhabit fish and other aquatic life.
3.1.10 Farming System and Crop Production

The dominant farming system in the region includes cereal growing, oxen cultivation, and mixed farming where livestock production is undertaken complimentary to crop production. Crop production is mainly rainfed, which in some places entails uncertainty due to the erratic nature of the rainfall. The major crop types include cereals, pulses, oil-crops and tubers. Barley, wheat, tef, maize, sorghum, millet, faba bean, peas, chickpeas, vetch, lentils, linseed, noug, sesame and oats (wild type) are widely grown in the different agro-ecological zones of the region.

Cattle constitute 70% of the livestock population, and many of them are highland and 'senga' types. The Fogera types, around Lake Tana, are potential milk yielder breeds. Sheep (highland sheep with fur) at Debre Birhan; Amhed Guya and the Menz and Awassi types are potential wool type breeds in the Region. Equines (horses, mules, sinar donkeys from Metema and camels) are commonly found in the Region.

Hides and skins are mostly used at home, with only small amounts reaching the market. Moreover, there is no processing plant in the region. Veterinary service is poor in the highlands. Due to limitations in accessibility, periodic vaccination for epidemics and sporadic diseases is greatly hampered.

3.1.11 Health Services

Health service in the region is very low, especially in the rural areas. Facilities are inadequate and there is an acute shortage of health personnel as related to the large population of the region. Currently, there are ten hospitals, 41 health centers and 446 clinics covering about 30% of the population needs. The population suffers from various diseases such as malaria, tuberculosis, intestinal parasites, skin and eye diseases, diarrhea, etc. In recent years, malaria has become a major cause of morbidity and socio-economic problem. It is estimated that about 75% of the region is prone to malaria, affecting more than 64% of the region's population. Women and children are among the most vulnerable groups of the population.

3.1.12 Water Supply

Only 10.3% of the total population of the region have access to safe water from properly constructed facilities. Safe water coverage in rural areas is in much worse condition. Over 97% of the rural population have no access to potable water. Women are responsible for fetching water to the household. In many cases they travel long distances (5-7km) in search of water.

3.1.13 Education

Regional reports indicate that between 40 and 50% of the total population can not read and write. Only 13% of the estimated school age children attend schools. There
are 2,506 primary schools, 228 junior and 76 senior secondary schools. The primary schools enroll about half a million students, which account for about 18% of the total primary school age children. The junior and senior secondary schools enroll only 8.3% and 5.4% of the total population (between 15 and 18 years of age), respectively.

Technical and vocational schools are few, three in number, with a capacity of 700 students at a time. These institutions train middle level manpower in the fields of mechanics, electricity and commerce. Community skill training is also given in 114 centers although many of these centers were ruined and looted during the transition period to the new Government, ten years ago.

There are also three teacher training and three higher training institutes in the region. However, all the schools and institutes lack adequate facilities, tools, equipment and qualified instructors.

3.1.14 Access Roads

Road access within the region is limited. In most cases pack animals and human porterage are the major forms of transport. The total length of all-weather road is about 4,339km. Of this total, only 590km (13.6%) is asphalt and the remaining is surfaced with gravel. There are also feeder roads constructed by the community and NGOs. In general, current data indicate that road/access density is about 8km/1,000km². Many of the roads lack periodic maintenance and upgrading.

3.1.15 Cultural Heritage

There are many historical and cultural sites in the Region that are tourist attractions. The Lalibela rock hewn churches, Gonder Castles, Mesela Mariam and Ankober Palaces, Tisesat Falsí and the islands in Lake Tana are the major cultural heritage sites. Limalimo and Tekeze gorges, Ras Dashen and Semien Park, Wofwash (birds), Gussa-ecology (Menez) and Dessie-Bati areas are also tourist attractions. None of these cultural heritage sites will be affected by the proposed project.

3.1.16 Income

Average annual income per household is Birr 1,500 (for a household of 4.3 persons) and per capita income is Birr 350. About 32% of the households are without oxen. The average land holding in the highlands and the lowlands is 0.70 ha and 1.75 ha, respectively.

3.2 Southern Nations and Nationalities Peoples Regional State

3.2.1 Location and Topography
The Southern Nations, Nationalities and Peoples Regional State (SNNPRS) is located in the Southern and Southwestern part of Ethiopia, bordering with Kenya in the South, Sudan in the Southwest, Gambella Region in the Northwest and Oromia Region in the North and East. The Region lies roughly at 4°27'-8°30' latitude N and 34°21'-39°11' longitude E. It is a region of immense ecological and cultural diversity. The SNNPR occupies about 113,539 km$^2$ and accounts for about 10% the total area of the country. There is a wide variation of altitude in the region, which ranges from about 380m at Lake Turkana to about 4,210m at Mount Guge in North Omo.

Administratively, the SNNPR is divided into 12 Zones and 77 Woredas. Seven of the Woredas are Special Woredas, which directly report to the regional government.

### 3.2.2 Population and Settlement

According to the 1994 Population and Housing Census of Ethiopia, the population of the region was 10,377,028, and it is estimated to reach 12,880,801, in the year 2001. About 92% of the population live in rural areas and the remaining 8% in urban areas. Eighty percent of the region's population live in the highland areas that account only for 40% of the regional total area. The remaining 20% are pastoralists and agro-pastoralists occupying the semi-arid and arid southern lowlands. The average population density of the region was about 97.5 persons per km$^2$, in 1997.

### 3.2.3 Climate and Agro-ecology

The rainfall intensity, duration and amount increase from south to northeast and northwest. The mean annual rainfall for the region ranges from 400mm to 2,200mm. Temperature is usually inversely related to altitude. As a result of this, it decreases from south to northeast. The mean annual temperature of the region, in general, ranges from 15°C to 30°C. Agro-climatically, the region can be classified as including Dega, Woina Dega and Kolla agro-climatic zones.

### 3.2.4 Farming System and Crop Production

The agricultural production of the region includes both food crops and cash crops. Root crops such as cassava, yam, taro, and sweet potato are predominantly found in the Woina Dega agro-climatic zone. Cash crops such as coffee, cotton, and spices occupy an important place of the region's economy.

The region has an estimated population of 7.7 million cattle, 2.2 million sheep, 2 million goats and 1.3 million equines, approximately 1.14 animals per person.

The Agricultural Bureau of the region has aims at increasing productivity per unit of land, while minimizing the dependency on rainfall by shifting towards water harvesting and irrigation development. It also focuses on the introduction of high yielding, disease and pest resistant crops.
3.2.5 Health Services

The major health problems of the region are various types of infectious diseases. As the morbidity statistics reported by hospitals and health centers in the region indicate, malaria is the leading cause of morbidity, accounting for about 11.3% of all outpatients in 1999/2000 (1992 E.C). Pneumonia, helminthiasis (intestinal parasites), upper respiratory tract infections, dysentery and infection of skin and subcutaneous tissue are among the main causes of outpatient visits. The majority of the health problems are water related diseases that are transmitted by drinking contaminated water, or due to lack of safe water for personal hygiene or through aquatic invertebrate insects that depend on water for their breeding. The top five causes of deaths (as recorded in 1999/2000) are malaria (19.5%), TB (15.0%) pneumonia (15.8%), accidents (5.2%) and tetanus (3.2%). Gastro-enteritis and colitis, meningitis, dysentery, chronic rheumatic heart disease, malnutrition and anemia are also among the causes of deaths in the region.

Malaria is by far the most important health problem in the region. It is well recorded that areas below 2,000m altitude are malarious, and short-lived transmission occurs even above 2,000m where the microclimate is favorable. Most parts of the 12 administrative zones and the 7 special Woredas of the region have endemic malaria transmission. Many Woredas of the region are also annually affected by epidemic of the disease. For example, about 146,100 people living in 101 Kebeles in 25 Woredas were affected by a malaria epidemic in 1999/2000. The entire 32 'Chronic food deficit' Woredas of the region are known to be endemic for malaria.

Public health infrastructure of the region includes 12 hospitals (10 governmental and 2 non-governmental), 95 health centers (91 governmental and 4 non-governmental), 366 clinics (310 governmental and 56 non-governmental), and 263 health posts. In addition, there are 109 private clinics and 91 other governmental clinics (other than the regional health bureau). Furthermore, there are 31 pharmacies, 43 drug shops and 478 rural drug vendors in the region.

In 1999/2000 there were 2,814 health personnel including 215 physicians, 792 nurses, 133 sanitarians, 10 pharmacists, 30 health officers, 1447 health assistants, 41 pharmacy technicians, 104 laboratory technicians, 6 biologists and 23 X-ray technicians.

3.2.6 Access Roads

Shortage of reliable road infrastructure is one of the major bottlenecks for socio-economic development in the region. In 1999, the total length of all weather roads in the region was about 4,949km. Of this, about 4,512 km was gravel, and the remaining 437km asphalt. All weather road density of the region is about 43.5km per 1000 km². The Regional Rural Road Authority has recruited a consulting firm to carry out a regional master plan study for road networking and prioritize future road construction and maintenance programs to effectively utilize the resources.
Of the 32 chronic food deficit Woredas considered in this study, 25 Woredas have all weather road network while the remaining 7 Woredas (Kemba, Zala, Ubamale, Dita Deramalo, Selamago, Maenit, Surma and Dizi) do not have reliable all weather roads. The Woredas located in Wolayita and Gamo Gofa zones have relatively good road networks.

### 3.3 Tigrai Regional State

#### 3.3.1 Location and Topography

The Regional State of Tigrai is situated in the northern part of the country with a total area of 50,230 km$^2$. It has a common boundary with Eriteria in the north, with the Sudan in the west, with Amhara Region in the south and with the Afar Region in the east. It extends from 12° 15' to 14° 50' North Latitude and from 36° 27' to 39° 59' East Longitude (TFAP, 1996). The region is divided into five administrative zones (Western, Central, Eastern, Mekele and Southern Zones). It has 35 Woredas, 603 development centers (Tabias) and 2,272 kushets. Tabias are the main development centers, which are the basic units of the administrative structure.

Tigrai exhibits three distinct topographical zones; the central highlands, the northwestern lowlands and the eastern lowlands. The central highlands are an extension of the central highlands of the country with an elevation of between 1,500 and 3,200masl, the highest peak being 3,900masl. As this ecological zone is safe from malaria and most other diseases, population density is very high, which through time led to degradation of the natural resources. The northwestern lowlands are sparsely populated and have soils that are less eroded and exploited. Close to the Sudanese border, elevation is as low as 500masl. Malaria and livestock diseases are more prevalent in this zone. The eastern escarpment falls steeply from the plateau of 2,900masl to the depressions in the Afar Region.

#### 3.3.2 Population and Settlement

The total population of the region in 1994 was 3.13 million (about 3.85 million in 2001), of which 1.54 million were males and 1.59 million females. The urban population was 468,478. The average household size was 4.3 persons. The proportion of children under the age of 15 was about 44.8%, the age group of 15-64 51.2%, and the population aged 65 years and over about 4%. The literacy rates for urban and rural areas were 57% and 14%, respectively (TGSA, 1996/97).

Seventy eight percent of the population of the 15-64 age groups is economically active and 1,226,970 persons are employed in various sectors of the economy. The rate of unemployment for the total population of the region, by sex, is 1.5% and 1.7% for males and females, respectively. Fertility rate is 5.4% for the region. Estimated infant mortality rate is 123/1000 births and life expectancy is 49 years.
The larger proportion of the population is concentrated in the highlands mainly in the eastern part. The western lowlands are sparsely populated. The settlement pattern is in scattered villages with a number of houses in each village. The pattern poses problems to provide services like health, schools, water supply, electricity and communications. There is also lack of well-developed rural centers, small and middle sized towns, which can perform necessary functions for the rural hinterland.

3.3.3 Climate and Agro-ecology

There is a marked variation in rainfall distribution from east to west. The mean annual rainfall in the region varies from less than 200mm in the extreme east, bordering the Danakil Depression, to over 1,900mm in the southwestern part of the region. The rainy season is mainly between June and September. However, just south of Mekele and southward along the eastern part of Tigrai highlands, the short rains prevail, which last 45 to 65 days. The mean annual rainfall and the length of the growing period increases considerably when one moves from lower to higher altitudes and from east to west. The length of the growing period varies from 120 days in the western part to 90 days along the Eastern Escarpments and eastern low lands (TRBIMPP, 1997/98).

The mean temperature in the lowlands of Tigrai is $25^\circ$C. In the eastern part, along the foot slopes of the great escarpment, separating the lowlands from the highlands, the temperature ranges from 25 to $28^\circ$C. Also, in the extreme western part of the region, where altitude falls below 1000masl and along the Tekeze River, mean temperature is about $25^\circ$C. Temperature of 15 to $18^\circ$C is restricted to the ridges of the highlands, which run west east from Inda Silassie to Adigrat, and the upper slopes of the escarpment.

According to TAFP's 1996 survey, there are four main agro-ecological zones identified in the region. These include:

- hot to warm arid lowlands (found mainly in the eastern part of the region below 1,400 masl);
- hot to warm semi-arid lowlands and plateau remnants (found on the extreme western of the region between 500-1600 masl);
- hot-to warm sub-moist lowland and plateau remnants (found in the south-western part of the region and along the western part of the eastern escarpment); and
- tepid to cool sub-moist low to high altitude, which occupies the central and north western part of the region with altitude varying from 1000 to 3000masl.

3.3.4 Soil and Water Conservation
Farmers in the region are aware of the environmental degradation, which takes place in their farmland and surroundings. Farmers are participating in problem identification, planning, implementation and evaluations of various types of soil and water conservation. They fully participate in SWC measures not only to get food aid, but because they have understood the long-term benefits of SWC measures on their farmland and surroundings.

Soil and water conservation activities have included planting trees around gullies to stabilize the check dams. The most significant biological conservation measures accomplished include the establishment of area closures. In the region, excluding the southern zone, about 143,016 hectares of uncultivated and overgrazed hillsides are enclosed (TFAP, 1996).

3.3.5 Land Use Land Cover

There is no recent information on land use/land cover of the region. However, previous studies indicate the following. Cultivated land (including commercial farms, intensively and moderately cultivated smallholdings) accounts for 64%. Disturbed high forest, dense and open woodlands occupy about 7%. Open bushes and grassland account for 17%. The remaining are water bodies and waste lands.

3.3.6 Water Resources

Major river basins include Tekeze and Mereb, which drain a combined catchment area of over 37,037km$^2$ within the region. The Mereb River basin alone drains most of northern part of the region. The Lailay Adiabo, Mereb-Leha, Medabay Zana and Enticho watersheds are included in this basin. The area coverage of this basin is about 5,899km$^2$. Lake Hashenge is a large water body in the Southern Zone with an area of 20km$^2$, is inhabited by fish and other aquatic life.

3.3.7 Forest Resources

The available information on the amount of forest resources in the region is very limited and inconclusive. The estimate made by the regional Agricultural Bureau puts the total forest land at approximately 0.3% of the regional area. An estimate made by SAERT (1994) indicates that about 154,000ha of land is covered by vegetation.

The long history of intense human settlement has left an extremely degraded landscape. Most of the climax vegetation, especially on the highlands, has been transformed to grass and shrubs vegetation. However, there is an indication from the remnant vegetation that the highland areas, above 2,000m, were covered by Podocarpus gracilior, Olea africana, Cordia africana and highland Acacia of various types. The lower valleys and the western lowlands were covered with deciduous woodlands and shrublands mostly dominated by species like Acacia spp., Boswellia spp., etc.
At present, severe fuel wood scarcity prevails in almost all areas of the region, more in the highlands than in the lowlands, and better in localities close to forest degraded wood lands compared to the predominantly clear agricultural landscapes.

3.3.8 Farming System and Production

The general farming system is single cropping, oxen cultivation, mixed farming where livestock husbandry is complemented by crop production. Crop production is mainly under rainfed conditions. The major types of crops produced in the region are cereals, pulses and oil crops. The main crops are teff, barley, wheat, millet, finger millet, sorghum, maize, chickpeas, broad beans, vetch, peas, linseed, lentils noog and sesame. The average yield of crop in the region is 5.3 quintal per ha. The average yield for cereals, pulses and oil crops is 6.9, 3.7 and 3.7 quintals/ha, respectively.

The region has a total livestock population of 2,533,047 TLU. Of the total livestock population, 3,040,712, 1,465,693 and 935,337 are cattle, goats and sheep, respectively. Equines are important pack animals in transporting input and output to rural and urban markets. They are also important in human transport (horses & mules). Among the equines, donkeys stand first in quantity with a total number of 303,405 followed by mules (10,417) and horses (5,110). There are also camels (13,661) and poultry (3,765,276). The region produces significant amounts of good quality honey from 164,580 colonies of beehives (ILCA 1990).

3.3.9 Health Services

There are two higher hospitals, four zonal hospitals, six zonal clinics, fifteen health centers, fifteen health stations and eighty health posts (TRBH 1999/2000). About 2,538 medical and management personnel of various levels of professions staff these establishments. Besides these health institutions, there is a nursing school in Mekele, with a capacity of graduating about 31 nurses each year. Other medical infrastructures such as pharmacies, drug shops and rural drug vendors (run by both government and the private sector) are also prevalent.

The main diseases in the region are malaria, acute respiratory infections, infections of skin, gastritis, helmintus and genito urinary system problems (TRBH 1999).

3.3.10 Water Supply

Only 13.9% of the region’s population have access to piped water supply. About 7.5% has access to protected sources. The remaining population use water from unprotected wells and rivers/ponds.
3.3.11 Education

According to the Bureau of Education (1999/2000), there were about 289,319 students from grade 1 to grade 6 in governmental and 9,503 students in non-governmental schools. In addition to this, there were about 27,131 students from grade 7 to 8 in government and 1,713 in non-governmental schools. Similarly, the number of students from grade 9 to grade 12 in governmental and non-governmental schools was 16,213 and 546, respectively. Moreover, there are about 7 colleges/universities in the region enrolling 1,663 students (BETR 1999). Besides this normal educational program, there is a program of literacy for the adult population. So far, 12 rounds of literacy campaigns have been undertaken and 136,587 males and 74,520 females have participated in these rounds (BETR 1999/2000).

3.3.12 Access Roads

The region has a network of 14,739km of access road that connect zones and Woredas. Of the total length, 741km is main road, 590km all-weather road and about 13,400 dry-weather roads.

3.3.13 Cultural Heritage

There are a number of cultural heritages that are very much impressive to both national and international visitors. These include, among others, the obelisks of Axum, the churches of Debre Damo and Abrha Woatsebha, and the historical mosque of Negash. None of the cultural heritage sites will be affected by the proposed project.

3.4 Oromia National Regional State

3.4.1 Location and Topography

The Regional State of Oromia extends from the southeastern border with Kenya across the center to the border of the Sudan. Its estimated area is about 35,3690 km². Oromia constitutes about 32% of the total area of the country. It has physical contacts with all the Regional States of the country except Tigrai.

Oromia is bordered on the North by Afar, Amhara and Benishangul-Gumuz National Regional States, on the South by Kenya, on the East by Somali Regional State and on the West by Sudan and Benishangul-Gumuz Regional states. In the south, it borders the National Regional States of Southern Nations and Nationalities and Gambela.

The topography of Oromia includes high and rugged mountain ranges, undulating and rolling plateaus, panoramic gorges and deep incised river valleys and rolling
plains. The altitude ranges from about 500 masl in the Rift Valley to about 4,200 masl at Batu Mountain, the highest peak in the region. Over three fourths (75.9%) of the region lies between 1,000 and 2,500 masl.; 17 % below 1000 masl. and the remaining 7.1 % fall in altitudes above 2,500 masl.

Thirty percent of the land of the region is estimated to have a slope gradient of below 0.5%, which includes the low plains, river and rift valley floors. Five percent of the landmass of the region, having slope gradient of above 15%, is characterized by severe erosion risks. About 65% of the region is potentially utilizable from the viewpoint of good surface drainage and low risks to soil erosion.

3.4.2 Population and Settlement

According to the 1994 census report of the Central Statistics Authority (CSA), the total population of Oromia Regional State, in July 2000 was projected to 22.3 million. Out of this population about 89 % are living in rural areas and the remaining 11 % in urban areas. Of the economically active population 92.2% are engaged in agriculture, 1.3 % in manufacturing and construction, and 6.5 % in service and related sectors. Sixty percent of the GDP is from agriculture.

3.4.3 Climate and Agro-ecology

As already mentioned, having varied ranges in elevation, the region is characterized by diverse climatic conditions, ranging from hot tropical low lands to warm and cool temperate highlands. Mean annual temperature for the region is about 19.3°C, with mean annual maximum of over 30°C in the lowlands to less than 10°C in the cool highlands. Areas of extreme temperature include the lowlands of Borena and Hararghe (above 30°C) and Bale massifs (less than 10°C).

Highland Oromia attracts heavy precipitation particularly in the summer from moisture-laden southwest tropical monsoon winds that cross the Atlantic Ocean. Over a quarter of the region receives 800-1200mm of rainfall (mean annual), while its arid lowlands and wet highlands receive mean annual of less than 800mm and over 1,600mm, respectively. In these areas, especially in the arid and semi arid portion of the region, rainfall variability is so high that it seriously affects crop production. Late onset and early cessation of rains causes heavy damages on crop and livestock production. It is estimated that, in the high lands, rainfall can reduce production by 50% while in the lowlands the reduction could be as high as 70 to 90 percent of the normal average.

3.4.4 Geology and Soils

The geology of the region is characterized by the existence of considerable crystalline basement, basalts and sediments and sedimentary rocks. Rocks of the crystalline basement complex cover about 21.3% of the region. Almost half of the
regional surface cover is Cenozoic basalts and sediments, while 28.8% is of old Mesozoic sedimentary rock cover.

Soils of volcanic origin dominate the central high plateau of the region. The soils include Cambisols, Phaeozems, Luvisols and Vertisols. Except the Vertisols, which are constrained by poor drainage, the others are mostly utilized for cropping. Other major soil units of significant coverage include Acrisols and Nitosols, both of which characterize the western section of the western sub region and the northern Borena area. Soils of arid climate, gypsic soils, occur in the rift valley system and the lowlands of eastern sub region.

3.4.5 Land Use/Cover

The land use/cover of the region is 14% cultivated area; forests, bush and woodlands constitute 25% and grazing areas occupy about 32% of the total area. The remaining areas include infrastructure and settlements, water bodies, mountains and steep slopes and wastelands.

3.4.6 Forest Resources

Oromia is endowed with vast areas of forest resources. The total forest area of the region is estimated at 29,000km². Of this total area, about 50% is natural high forest, 2.3% plantations and the remaining are other types (woodlands, bushes, etc.).

3.4.7 Wildlife

The region is home for various types of wildlife. There are a number of national parks (Awash, Bale Mountains and Abjata Shala), sanctuaries (Babile and Yavelo), game reserves (Bale and Awash West) and controlled hunting areas (Borena, Bale, Chercher/Arba Gugu, Segen and Awash West) covering some 97,667km².

3.4.8 Farming System and Crop Production

Agriculture is the main stay of the regional economy. It accounts for the larger portion of the regional GDP and 92.2% of employment. Small holder producers contribute over 95% of the total agricultural production. Though the agricultural potential of the region is considered significant, its performance is low because of land fragmentation, population pressure, low level of technological advancement in the sector, poor infrastructure development, pure dependence on rainfall and environmental degradation including serious soil erosion, deforestation, desertification and loss of soil fertility.
3.4.9 Health Services

Health coverage of Oromia region is about 46%. This means that the majority of the population has no access to modern health services of any kind. Infant mortality is as high as 118 per 1000 live births. The coverage of vaccination in the region is about 66%. The health coverage of drought prone areas is even lower because of shortage of infrastructure and other socio-economic problems.

Water born and water related diseases are the major health problems of the region. Among these, malaria, helminthiasis and diarrhea dominate. Malaria is the most prevalent health problem of the region. It occurs in all the areas below 2000 masl, and was the first amongst the top ten diseases registered in several health centers of the region, in the year 2000. The major types of malaria parasites commonly found in Oromia regional state are Plasmodium vivax and Plasmodium falciparum.

Other intestinal parasites are the ones mainly associated with poor quality of drinking water, unsanitary living environment and poor personal hygiene, which are common in the region. The major intestinal parasites frequently encountered are Amoebae, Ascaris, Gardia & tapeworm. Upper respiratory tract infections, Pneumonia, Subcutaneous tissue infections and skin infections are also common in the region.

3.4.10 Water Supply

In the year 2000 about 24.8% of the rural and 83% of the urban population has got access to clean potable water. This makes a total of 30.1% of the population with access to potable water in the region.

3.4.11 Education

Though education services are improving in the last six years, still most of the population has no access to education facilities. Enrollment rates in primary schools (1-8) are only 52% and only 22.4% of the population are able to read and write.

3.4.12 Road infrastructure

Poor road net work and transport facilities are one of the factors for food insecurity. The average road density in Oromia is estimated to be 25.8 km per thousand sq km of land and 0.48 km per thousand population (1996), but much lower in drought prone food insecure areas. For example the road density per thousand population for East and West Hararge, North Shewa and Arsi is 0.24, 0.23, 0.4 and 0.42, respectively. The existing road net work is mostly concentrated in the more productive zones of the central and Western parts of the region, which are assumed to be areas of high economic importance. This poor network in drought prone areas makes delivery of food aid extremely difficult and farmers obliged to carry their
produce to market places by pack animals or humans. This severely constrains the total farm production that can be marketed and adds substantially to the cost of farm inputs and prices of other consumption goods.

3.5 Description of the Sample Woredas

3.5.1 Bati Woreda (Amhara Region)

Physical features

The climate of the Woreda can be generally categorized into dry Woinadega (19%) and kola areas (81%). The topography of the area is rugged comprising mainly hilly (70%), mountainous (20%) and flat area (10%). The altitude ranges between 1200 to 2300 masl. Bati Woreda has the following land use pattern.

Table 1 - Land Use Pattern of Bati Woreda

<table>
<thead>
<tr>
<th>Land use pattern</th>
<th>% of total area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivated land</td>
<td>9</td>
</tr>
<tr>
<td>Forest and bush land</td>
<td>50</td>
</tr>
<tr>
<td>Grazing land</td>
<td>15</td>
</tr>
<tr>
<td>Area allotted for construction and other purposes</td>
<td>26</td>
</tr>
</tbody>
</table>

Source: Woreda Agriculture Office, 2001

Demographic Features

The projected total population of Bati Woreda for the year 2001 is estimated at 108,931 (54,747 male and 54,184 female). The population density of the Woreda is in the order of 72 persons per square kilometer. The Woreda population is dominantly agrarian, which accounts for 83% of the total population.

Economic Activity

The rural population of the Woreda is mainly engaged in mixed agricultural activities and its livelihood is dependent on agriculture (93.5%), non-farm activities (4%), and wage and remittance (2.5%). The average land holding size per household is estimated to be 0.5 hectare.
Table 2- Cultivated land, Crops and Yield (Bati)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cultivated Land</td>
<td>Yield</td>
<td>Cultivated Land</td>
<td>Yield</td>
<td>Cultivated Land</td>
</tr>
<tr>
<td>Sorghum</td>
<td>9265</td>
<td>1E+05</td>
<td>11</td>
<td>9935</td>
<td>12390</td>
</tr>
<tr>
<td>Maize</td>
<td>45</td>
<td>534</td>
<td>11.86</td>
<td>25</td>
<td>65</td>
</tr>
<tr>
<td>Barley</td>
<td>10</td>
<td>51</td>
<td>5.1</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>Teff</td>
<td>1450</td>
<td>9237</td>
<td>6.37</td>
<td>596</td>
<td>893</td>
</tr>
<tr>
<td>Pulse Crops</td>
<td>150</td>
<td>750</td>
<td>5</td>
<td>55</td>
<td>125</td>
</tr>
<tr>
<td>Oil Crops</td>
<td>741</td>
<td>2964</td>
<td>4</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Woreda Agriculture Office
Social and Economic Services

Social Services

Bati town is inhabited by 16,000 people. The township has social services including health stations and schools up to senior high school level.

Economic services

The town has a commercial bank and an automatic telephone service. Moreover, Bati town is famous for its Monday market hosting several people coming from within and out of Bati Woreda. In the market, a variety of commodities are displayed coming from adjacent Woredas and Afar Region, mainly agricultural commodities such as livestock and cereals. The main road connecting the town to Kombolcha passes through Bati town leading to Mille, in the Afar Region.

3.5.2 Tenta Woreda (Amhara Region)

Physical features

The climate of the Woreda can generally be categorized into Wurch (0.16%), Dega (40.15%), Woina Dega (26.18%), and Kola (33.51%). The topography of the area is mainly mountainous. The altitude ranges between 1,500 to 3,350masl. The Woreda's land use pattern is as follows.

Table 3 - Land Use Pattern of Tenta Woreda

<table>
<thead>
<tr>
<th>Land use</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural land</td>
<td>35279.56</td>
</tr>
<tr>
<td>Grazing land</td>
<td>11548.3</td>
</tr>
<tr>
<td>Forest and bush lands</td>
<td>11564.84</td>
</tr>
<tr>
<td>Land used for construction purposes</td>
<td>7620.91</td>
</tr>
<tr>
<td>Unusable land</td>
<td>7462.84</td>
</tr>
<tr>
<td><strong>Total area</strong></td>
<td><strong>73476.45</strong></td>
</tr>
</tbody>
</table>

Source: Woreda Agriculture Office, 2001

Demographic Features

The projected total population of Tenta Woreda, for the year 2001, is estimated at 167,112 (82,742 male and 84,370 female). The Woreda population is dominantly agrarian (95.2%).

Economic Activity

The rural population of the Woreda is mainly engaged in mixed agricultural and petty trade activities. The livelihood of the rural population is dependent upon crop production (70%), livestock husbandry (25%), petty trade (3%), small-scale enterprise (1%) and other sources (1-%). The average land holding size per household is about 0.62 hectare.
### Production and Productivity

Table 4 - Cultivated Land, Crops and Yield (Tenta)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tef</td>
<td>3245</td>
<td>1367</td>
<td>2.37</td>
<td>34877</td>
<td>8502</td>
<td>4.1</td>
<td>8508</td>
<td>66343</td>
<td>10140</td>
<td>6.54</td>
</tr>
<tr>
<td></td>
<td>Barley</td>
<td>17493</td>
<td>2261</td>
<td>7.73</td>
<td>19052</td>
<td>2210</td>
<td>6.62</td>
<td>25200</td>
<td>8502</td>
<td>2167</td>
<td>9.09</td>
</tr>
<tr>
<td></td>
<td>Wheat</td>
<td>11124</td>
<td>1824</td>
<td>4.09</td>
<td>12225</td>
<td>2532</td>
<td>4.82</td>
<td>15216</td>
<td>1902</td>
<td>37552</td>
<td>10.26</td>
</tr>
<tr>
<td></td>
<td>Sorghum</td>
<td>31944</td>
<td>4741</td>
<td>6.69</td>
<td>1711</td>
<td>275</td>
<td>6.22</td>
<td>53966</td>
<td>11</td>
<td>33260</td>
<td>11.5</td>
</tr>
<tr>
<td></td>
<td>Beans</td>
<td>9960</td>
<td>2047</td>
<td>4.86</td>
<td>5441</td>
<td>900</td>
<td>6.04</td>
<td>9888</td>
<td>8</td>
<td>37185</td>
<td>6.79</td>
</tr>
<tr>
<td></td>
<td>Peas</td>
<td>6097</td>
<td>1040</td>
<td>5.86</td>
<td>4237</td>
<td>827</td>
<td>5.12</td>
<td>4305</td>
<td>615</td>
<td>12361</td>
<td>8.03</td>
</tr>
<tr>
<td></td>
<td>Lentils</td>
<td>4254</td>
<td>849</td>
<td>5.01</td>
<td>3552</td>
<td>742</td>
<td>4.78</td>
<td>9822</td>
<td>1637</td>
<td>6162</td>
<td>10.27</td>
</tr>
<tr>
<td></td>
<td>Vetch</td>
<td>4302</td>
<td>280</td>
<td>15.36</td>
<td>1638</td>
<td>304</td>
<td>5.38</td>
<td>1800</td>
<td>300</td>
<td>4548</td>
<td>7.58</td>
</tr>
<tr>
<td></td>
<td>Chickpeas</td>
<td>345</td>
<td>307</td>
<td>1.12</td>
<td>2489</td>
<td>397</td>
<td>6.26</td>
<td>1350</td>
<td>225</td>
<td>8492</td>
<td>7.68</td>
</tr>
</tbody>
</table>

Source: Woreda Agricultural Office
Social and Economic services

Social Services

The town of Ajbar is the center of Tenta Woreda, inhabited by 2,500 people. The township has social services including health stations and schools up to senior high schools. Social services coverage of the Woreda is health 27.4%, potable water supply 6%, and education coverage 29%.

Economic services

The town has access to bank services (from Tenta town about 12 kilometers away from Ajbar town) and automatic telephone service. Ajbar town is situated about 120 kilometers away from Dessie town (Zone center of South Wollo), and it is connected by all weather road. The communities of the Woreda have access to market places including Dessie, Ajbar, Tenta, Feto, Masha, and Yrema. The Woreda has road access of (very rough) 82km RR10 standard and electricity service for 5hrs a day.

3.6.3 Goro Gutu Woreda (Oromia)

Location

Goro Gutu Woreda is located at the western end of Eastern Hararghe Zone of Oromia National Regional State. The Woreda has a total area of about 53,123 ha. The main town, Karamile, is situated at about 406 km away from Addis Ababa on the road to Harar and 119 km from the zonal capital, Harar.

Topography and climate

The topography of the Woreda is mainly hilly and mountainous. Its altitude varies from 1,450 to 2,650m a.s.l. About 60% of the total area of the Woreda is between 15% and 30% slope while 18% of the area has a slope of 30% and above. The rest of the area (12%) has below 15% slope.

Agroclimatically, the Woreda is divided into 3 local climatic classification zones. These are Kola (low land) Woinadega (mid-highland) and Dega (highland). About 48% and 29% of the total area fall under the Kola and Woinadega agroclimatic zones, respectively. The remaining 23% of the total area falls under highland agroclimate zone.

There are two rainy seasons in the area. The shorter rainy season is from March to May and the main rainy season is from June to September. The mean annual rainfall of the Woreda is estimated at about 650 mm. The temperature of the Woreda varies from 16°c to 31°c depending on the altitude and season.

Land use
As indicated earlier the total surface area of the Woreda is about 53,123 ha. From this area, the major portion (48.58%) is under cultivation. The remaining area is under forest, bush, grass and settlement. The landuse of the Woreda for the year 1999-2000 production year is presented in Table-5.

**Table 5 - Land Use of Goro Gutu Woreda for the Production Year 1999-2000**

<table>
<thead>
<tr>
<th>Land Use type</th>
<th>Area covered (ha)</th>
<th>% of the total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivated Land</td>
<td>25807.5</td>
<td>48.58</td>
</tr>
<tr>
<td>Forest</td>
<td>6284.45</td>
<td>11.83</td>
</tr>
<tr>
<td>Bush and grass land</td>
<td>8515.6</td>
<td>16.03</td>
</tr>
<tr>
<td>Settlement area and others</td>
<td>12515.8</td>
<td>23.56</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>53123</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

*Source: Compiled from data obtained from Goro Gutu Woreda Agriculture Office*

**Major Crops Grown in the Woreda**

Major crops grown in Goro Gutu Woreda are maize and sorghum. Barley, wheat, beans, lentil, peas and flax are also grown relatively in small amount. Root crops such as potato and sugar beet are also grown to some extent. The major cash crop is chat. Table-6 shows the types of crops grown in the Woreda and their respective yield per unit area.

**Table 6 - Major Crops Grown in Goro Gutu Woreda**

<table>
<thead>
<tr>
<th>Type of crop</th>
<th>Area covered in ha</th>
<th>Total yield in quintals/yr.</th>
<th>Yield in quintals per ha</th>
<th>Price per quintal in 2000/01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>4809</td>
<td>53080</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Sorghum</td>
<td>6055</td>
<td>37231</td>
<td>12.9</td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>2891</td>
<td>20502</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Barley</td>
<td>2092</td>
<td>12704</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Teff</td>
<td>36</td>
<td>144</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Horse Beans</td>
<td>712</td>
<td>3139.4</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>Field peas</td>
<td>711</td>
<td>2516.3</td>
<td>3.54</td>
<td></td>
</tr>
<tr>
<td>Lentils</td>
<td>55</td>
<td>11.1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Haricot bean</td>
<td>6529</td>
<td>26320</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Flax</td>
<td>41</td>
<td>123</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Compiled from data obtained from Goro Gutu Woreda Agriculture Office*

**Population of Goro Gutu Woreda**

According to the 1994 population census, the projected total population of the Woreda in year 2000 is estimated at 124,317 (63,509 males and 60,818 females). Only 5,744 people live in urban centers.
About 34,804 people are needy or highly food insecure. At present, Catholic Church Aid is supplying food for 10,187 food insecure people (80% on food for work basis and the remaining 20% are getting free food aid). Free food aid is provided for the aged and disabled people. The population of the two sample PAs is shown in Table 7.

Table 7 - Projected Population (year 2000) of the Two Sample PAs

<table>
<thead>
<tr>
<th>Name of PA</th>
<th>Male</th>
<th>Female</th>
<th>Total Population</th>
<th>Total No. of Families</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meda Woltea</td>
<td>2963</td>
<td>2857</td>
<td>5823</td>
<td>1134</td>
</tr>
<tr>
<td>Erer Mude Inchine</td>
<td>2547</td>
<td>2473</td>
<td>5020</td>
<td>1052</td>
</tr>
</tbody>
</table>

Source: Compiled from data obtained from Goro Gutu Woreda Agriculture Office

Livestock Population

Table 8 shows the list of types and population livestock of the Woreda.

Table 8 - Livestock Population of Goro Gutu Woreda

<table>
<thead>
<tr>
<th>Type of domestic animals</th>
<th>Number of each type</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxen</td>
<td>22,654</td>
<td>10.44</td>
</tr>
<tr>
<td>Cow</td>
<td>15,955</td>
<td>7.35</td>
</tr>
<tr>
<td>Goat</td>
<td>37,235</td>
<td>17.16</td>
</tr>
<tr>
<td>Sheep</td>
<td>37,641</td>
<td>17.34</td>
</tr>
<tr>
<td>Donkey</td>
<td>9193</td>
<td>4.24</td>
</tr>
<tr>
<td>Camel</td>
<td>292</td>
<td>0.13</td>
</tr>
<tr>
<td>Horse</td>
<td>107</td>
<td>0.05</td>
</tr>
<tr>
<td>Mule</td>
<td>76</td>
<td>0.035</td>
</tr>
<tr>
<td>Poultry</td>
<td>18016</td>
<td>8.30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>217013</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: Compiled from data obtained from Goro Gutu Woreda Agriculture Office

Flora

The land cover of the Woreda is highly degraded. Remnants of natural forests are observed in very small areas, where the terrain is very steep and difficult to cultivate. The most endangered indigenous tree species found in these areas is Podocarpus spp. It is mainly confined to the high land portion of the area. Other commonly observed tree species are Olea africana, different species of Acacia, Junipers procera, Cupressus lusitanica, Croton macrostachyus, Vernonia amygdalina and different species of Eucalyptus. Among bush species Carissa edulis, Phytolacca...
dodecandra, Dodonaea angustifolia and Euphorbia tirucallli are the major types, which were encountered during the field observation.

**Fauna**

As there is no undisturbed natural forest to harbor wild life resources, the number and diversity of wildlife species in the study area is very limited. According to the information obtained from the Agriculture Office of the Woreda, there are few species of wild life such as Hyena, Bush buck, Midaqua and common Fox. So far there is no known endemic or endangered species in the Woreda.

**Socio-Economic Infrastructures in Goro Gutu Woreda**

**Market**

The marketing system helps to stabilize prices in surplus as well as in food deficit areas. The presence of market facilities in the drought prone food insecure areas is very important. A poor marketing system is one of the contributing factors to food insecurity.

In Goro Gutu Woreda there are two market places, each having two market days in a week. The market places are about 18 km apart and are located on the main road from Addis Ababa to Dire Dawa.

**Road infrastructure**

From the road point of view Goro Gutu Woreda has no problem. The main road from Addis Ababa to Dire Dawa passes through the Woreda center.

Most parts of the road leading from Addis Ababa to Dire Dawa through Karamile town is asphalt and the rest will be expected to be asphalt with in the coming two years time. When this road is completed, transporting surplus food to marketing places and food aid to drought prone areas will be easier.

There are also roads, which connect each PA with the Woreda center. Most of these feeder roads were constructed through community participation, with Government and NGO support. However the standard of these roads is so poor that it is difficult to reach the communities during the rainy season.

**Education**

There are 34 elementary and junior secondary schools in the Woreda, but no high school. Most of the students, after completing junior school, join farming, trade or daily labor in their villages. Recognizing the existing high school education problem, the Education Bureau has planned to construct a high school at the Woreda capital in the year 2002.
**Human Health**

There are 4 clinics, 2 health posts, and 1 newly constricted health center in the Woreda (Table-9). There are also five private pharmacies and one clinic. The health center is located at Karamile town and run by 5 health assistants, 3 nurses, 2 front line workers, a pharmacist and a lab technician. At the moment, there is one health assistant for each clinic and one front line worker for each health post.

The health facilities in the Woreda have several problems. The health center has no laboratory equipment including adult scales, delivery kits, vehicle for the day to day activities, syringes and medicines especially antibiotics. It is also poorly staffed. According to the head of the health center, a vehicle, solar microscope and 6 motor bicycles (one for each clinic and health post) are required to make the existing service better (Table-10).

A medical doctor and a health officer are required for the health center, and a nurse and a front line worker for each clinic in the Woreda and a guard for each health institutions. The other problems of the health facilities in the Woreda are absence of electric power, lack of refrigerator for storing medicines and lack of potable water supply.

<table>
<thead>
<tr>
<th>Location Name</th>
<th>Health Institution</th>
<th>Type and number of Health Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>H. Officer</td>
</tr>
<tr>
<td>Karamile</td>
<td>health center</td>
<td>-</td>
</tr>
<tr>
<td>Karamile</td>
<td>Clinic</td>
<td>-</td>
</tr>
<tr>
<td>Burkula ela</td>
<td>Clinic</td>
<td>-</td>
</tr>
<tr>
<td>Boroda</td>
<td>Clinic</td>
<td>-</td>
</tr>
<tr>
<td>Yeka watcha</td>
<td>Clinic</td>
<td>-</td>
</tr>
<tr>
<td>Wolta dankola</td>
<td>Health post</td>
<td>-</td>
</tr>
<tr>
<td>Safa Jalala</td>
<td>health post</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total man power</strong></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

**Source:** Compiled from data obtained from Goro Gutu Woreda Health Office

<table>
<thead>
<tr>
<th>No</th>
<th>Required item</th>
<th>Estimated price</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Double cabin pick up</td>
<td>280,000</td>
<td>for the health center</td>
</tr>
<tr>
<td>2</td>
<td>6 motor bicycles</td>
<td>30,000 each</td>
<td>1 for each clinics &amp; health post</td>
</tr>
<tr>
<td>3</td>
<td>1 solar microscope</td>
<td>10,000</td>
<td>for the health center</td>
</tr>
<tr>
<td>4</td>
<td>1 scale (balance)</td>
<td>2,000</td>
<td>&quot;</td>
</tr>
<tr>
<td>5</td>
<td>A delivery kit</td>
<td>5,000</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

**Source:** Compiled from data obtained from Goro Gutu Woreda Health Office
Health status of the Goro Gutu Woreda: The health condition of the Goro Gutu Woreda is aggravated by the existence of poverty. The top ten diseases prevailing in the Woreda are directly or indirectly related to malnutrition and food deficit situations of the area. The infection rate of the diseases increases when the people are starved and lose weight.

Out of the top ten diseases recorded in the Woreda’s health center, malaria is number one followed by Pneumonia, diarrhea, intestinal parasites and anemia. Other intestinal diseases, gastritis, eye disease and unidentified fevers are also among the top ten diseases prevailing in the area (Table-11).

Table 11 - Top Ten Diseases in Goro Gutu Health Center

<table>
<thead>
<tr>
<th>No</th>
<th>Type of diseases</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Malaria</td>
<td>672</td>
</tr>
<tr>
<td>2</td>
<td>Pneumonia</td>
<td>613</td>
</tr>
<tr>
<td>3</td>
<td>Diarrhea</td>
<td>431</td>
</tr>
<tr>
<td>4</td>
<td>Intestinal parasites</td>
<td>331</td>
</tr>
<tr>
<td>5</td>
<td>Anemia</td>
<td>192</td>
</tr>
<tr>
<td>6</td>
<td>Influenza</td>
<td>144</td>
</tr>
<tr>
<td>7</td>
<td>Other Gastro intestinal disease</td>
<td>116</td>
</tr>
<tr>
<td>8</td>
<td>Gastritis</td>
<td>109</td>
</tr>
<tr>
<td>9</td>
<td>Eye diseases</td>
<td>104</td>
</tr>
<tr>
<td>10</td>
<td>Unidentified fever</td>
<td>87</td>
</tr>
</tbody>
</table>

Source: Compiled from data obtained from Goro Gutu Woreda Health Office

Veterinary Services in Goro Gutu Woreda: There are about 22,654 oxen, 15,955 cows, 37,235 goats 37,641 sheep, 9,193 donkeys, 107 horses, 292 camels and 18,016 poultry in the Woreda. There are four veterinary clinics serving the livestock population. The major livestock diseases in the area are Anthrax, Black leg, Pastrolsis, foot and mouse diseases and external and internal parasites.

3.6.4 Chiro Woreda (Oromia)

Location

Chiro Woreda is located in Western Hararghe Zone, Oromia National Regional State. The Woreda has a total area of about 164,740 ha. The Woreda center, Asbe Teferi, is situated at 326Km away from Addis Ababa on the road to Harar. Asebe Tefari is also the Zonal capital for the Western Hararghe zone.
**Topography and climate**

The topography of the Woreda is hilly and mountainous. Altitude varies from less than 970 to above 1,410 masl. Agro climatically, the Woreda is divided into 3 climatic zones. These are lowland (Kola) mid-highland (Woiena Daga) and highland (Dega).

The mean annual minimum rainfall is 650mm and mean annual maximum rainfall is 950 mm. The mean annual temp varies from 20°c to 31°c.

**Land use in the Woreda**

The total surface area of the Woreda is 164,740 ha. The major portion (58,553 ha) is cultivated land. The rest of the area comprises forest/, rivers/gullies, residence and grazing land. Table-12 below shows the land use pattern of the Woreda.

**Table 12 - Existing land use of the Chiro Woreda for the production year 1999/2000**

<table>
<thead>
<tr>
<th>Land use type</th>
<th>Area in ha.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivated Land</td>
<td>58,553</td>
<td>36</td>
</tr>
<tr>
<td>Grazing</td>
<td>7,944</td>
<td>5</td>
</tr>
<tr>
<td>Forest and Other Vegetation</td>
<td>25434</td>
<td>15</td>
</tr>
<tr>
<td>Rivers and Gullies</td>
<td>30,560</td>
<td>19</td>
</tr>
<tr>
<td>Residence</td>
<td>18,372</td>
<td>11</td>
</tr>
<tr>
<td>Others</td>
<td>23,877</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>164,740</td>
<td>100</td>
</tr>
</tbody>
</table>

*Source: Compiled from data obtained from Chiro Woreda Agriculture office*

**Major Crops Grown in the Woreda**

The major types of crops grown in the Chiro Woreda are sorghum, maize, barley, teff, wheat, horsebean and fieldpeas. Table-13 shows the types of crops and their production performance.

**Table 13 - Major type of crops and their respective yield & price per quintal in 2000**

<table>
<thead>
<tr>
<th>Type of crop</th>
<th>Yield Q/ha</th>
<th>Rate Birr/Qt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorghum</td>
<td>13</td>
<td>90</td>
</tr>
<tr>
<td>Maize</td>
<td>11</td>
<td>100</td>
</tr>
<tr>
<td>Barley</td>
<td>9</td>
<td>100</td>
</tr>
<tr>
<td>Teff</td>
<td>5</td>
<td>180</td>
</tr>
<tr>
<td>Wheat</td>
<td>12</td>
<td>120</td>
</tr>
<tr>
<td>Horse bean</td>
<td>8</td>
<td>120</td>
</tr>
<tr>
<td>Field pea</td>
<td>6</td>
<td>150</td>
</tr>
</tbody>
</table>

*Source: Compiled from data obtained from Chiro Woreda Agriculture office*
Weeds are one of the major causes for poor performance of crop production. The main species of crop weeds in the Woreda are Partinum hystraphus, Digitaria abisinica, Cyndon spp. Major crop pests known in the Woreda are stock borer, aphids and armyworm. Major crop diseases include rust, smut and late blight.

**Population of Chiro Woreda**

According to the 1994 population census, the projected total population of the Woreda in year 2000 was 328,943 (187,641 male and 141,302 female). These are shown in Table-14.

<table>
<thead>
<tr>
<th>Total population</th>
<th>328,943</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>187,641</td>
</tr>
<tr>
<td>Female</td>
<td>141,302</td>
</tr>
<tr>
<td>House hold</td>
<td>66,055</td>
</tr>
</tbody>
</table>

*Source: Compiled from data obtained from Chiro Woreda Council*

**Livestock Population**

The total livestock population of the Woreda for the production year of 1999/2000 is presented in Table-15, below.

<table>
<thead>
<tr>
<th>Type of domestic animals</th>
<th>Number of each Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxen</td>
<td>76,449</td>
</tr>
<tr>
<td>Cow</td>
<td>73,561</td>
</tr>
<tr>
<td>Goat</td>
<td>41,933</td>
</tr>
<tr>
<td>Sheep</td>
<td>23,561</td>
</tr>
<tr>
<td>Donkey</td>
<td>20,048</td>
</tr>
<tr>
<td>Camel</td>
<td>1,476</td>
</tr>
<tr>
<td>Horse</td>
<td>305</td>
</tr>
<tr>
<td>Mule</td>
<td>367</td>
</tr>
<tr>
<td>Poultry</td>
<td>154,408</td>
</tr>
</tbody>
</table>

*Source: Compiled from data obtained from Chiro Woreda Agriculture office*

**Flora**

The land cover of the Woreda is highly depleted. The remnant of natural forests are found in areas where access is impossible and the terrain is rugged and steep. Common tree species observed in the Woreda are listed below in Table-16.
Table 16 - Major Tree Species of Chiro Woreda

<table>
<thead>
<tr>
<th>Amharic Name</th>
<th>Scientific Name</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tid</td>
<td>Juniperus procera</td>
<td>Indigenous</td>
</tr>
<tr>
<td>Wanza</td>
<td>Cordia africana</td>
<td>&quot;</td>
</tr>
<tr>
<td>Zigba</td>
<td>Podocarpus falcata</td>
<td>Indigenous &amp; endangered</td>
</tr>
<tr>
<td>Weira</td>
<td>Olea africana</td>
<td></td>
</tr>
<tr>
<td>Yeferenji tid</td>
<td>Cupressus lusitanica</td>
<td></td>
</tr>
<tr>
<td>Nech bahir zaf</td>
<td>Eucalyptus globulus</td>
<td></td>
</tr>
<tr>
<td>Key bahi zaf</td>
<td>Eucalyptus camaldulensis</td>
<td></td>
</tr>
<tr>
<td>Bisana</td>
<td>Croton macrostachyus</td>
<td></td>
</tr>
<tr>
<td>Game</td>
<td>Ehretia cymosa</td>
<td></td>
</tr>
</tbody>
</table>

Source: Compiled from data obtained from Chiro Woreda Agriculture office

Fauna

The number and diversity of wild life species in the area is very limited due to scant vegetation for shelter and feed. According to the information obtained from the Agriculture office of the Woreda, few species of wild life such as hyena, Midaqua, bushbuck, fox and monkeys inhabit the area. There are no endemic or endangered species that can be affected by any form of development activities in this area.

Socio-Economic Infrastructure in Chiro Woreda

Markets

There are several market places where buyers and sellers meet. The Woreda center, Asebe Teferi, is the biggest market place in the Woreda. Most of the market days in the Woreda are Saturdays, Mondays and Thursdays.

Education

There are eleven schools in the Woreda, seven elementary, three junior secondary, and one high school. The high school is in Asebe Teferi town. The schools were established by Government, communities and NGOs.

Human Health

Health infrastructures: The health infrastructure in Chiro Woreda is relatively good as compared to other Woredas in the Western Hararghe Zone. There are 7 clinics, 2 health posts and a zonal hospital. The seven clinics and the two health posts in Chrio Woreda are run by 18 health assistants (Table-17).
Table 17 - Health Infrastructures and Manpower Distribution in Chiro Woreda

<table>
<thead>
<tr>
<th>No</th>
<th>Location</th>
<th>Health Infrastructure</th>
<th>M.D</th>
<th>Nurse</th>
<th>Health Assistant</th>
<th>Pharmacist</th>
<th>Lab. technician</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Balea</td>
<td>Clinic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Ejafara</td>
<td>Clinic</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Y/shambako</td>
<td>Health post</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Kuni</td>
<td>Clinic</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Sire Gudo</td>
<td>Health post</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Sogido</td>
<td>Clinic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Kasenifa</td>
<td>Clinic</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Gawgalo</td>
<td>Clinic</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Fidimo</td>
<td>Clinic</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Compiled from data obtained from Chiro Woreda Health office

Health status of the Chiro Woreda: As in Goru Gotu Woreda, the top ten diseases prevailing in Chiro are directly or indirectly related to malnutrition. Out of the top ten diseases registered in the Woreda, pneumonia is the most common followed by intestinal parasites, diarrhea and gastritis (Tables-18,19,20).
### Table 18 - Ten Top Diseases in Chiro Woreda (Year-1999)

<table>
<thead>
<tr>
<th>Remark</th>
<th>Type of disease</th>
<th>No of Patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pneumonia</td>
<td>4772</td>
<td>17.2</td>
</tr>
<tr>
<td>2</td>
<td>Intentional parasites</td>
<td>4023</td>
<td>14.4</td>
</tr>
<tr>
<td>3</td>
<td>Diarrhea</td>
<td>3682</td>
<td>13.2</td>
</tr>
<tr>
<td>4</td>
<td>Dermatitis</td>
<td>3359</td>
<td>12.1</td>
</tr>
<tr>
<td>5</td>
<td>Gastritis</td>
<td>3348</td>
<td>12.0</td>
</tr>
<tr>
<td>6</td>
<td>Anemia</td>
<td>1882</td>
<td>6.85</td>
</tr>
<tr>
<td>7</td>
<td>Influenza</td>
<td>1860</td>
<td>6.6</td>
</tr>
<tr>
<td>8</td>
<td>Malaria</td>
<td>1770</td>
<td>6.3</td>
</tr>
<tr>
<td>9</td>
<td>Other Skin</td>
<td>1740</td>
<td>6.2</td>
</tr>
<tr>
<td>10</td>
<td>Malnutrition</td>
<td>1450</td>
<td>5.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>27866</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: Compiled from data obtained from Chiro Woreda Health office

### Table 19 - Ten Top Diseases in Chiro Woreda (Year-2000)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Type of diseases</th>
<th>Number of patient</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pneumonia</td>
<td>4267</td>
<td>18.9</td>
</tr>
<tr>
<td>2</td>
<td>Intestinal parasites</td>
<td>3966</td>
<td>17.6</td>
</tr>
<tr>
<td>3</td>
<td>Diarrhea</td>
<td>3904</td>
<td>17.3</td>
</tr>
<tr>
<td>4</td>
<td>Gastritis</td>
<td>2084</td>
<td>9.2</td>
</tr>
<tr>
<td>5</td>
<td>Dermatitis</td>
<td>1700</td>
<td>7.5</td>
</tr>
<tr>
<td>6</td>
<td>Influenza</td>
<td>1550</td>
<td>6.8</td>
</tr>
<tr>
<td>7</td>
<td>Malnutrition</td>
<td>1460</td>
<td>6.5</td>
</tr>
<tr>
<td>8</td>
<td>Anemia</td>
<td>1350</td>
<td>6.0</td>
</tr>
<tr>
<td>9</td>
<td>eye disease</td>
<td>1255</td>
<td>5.6</td>
</tr>
<tr>
<td>10</td>
<td>Other skin diseases</td>
<td>1050</td>
<td>4.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>22586</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: Compiled from data obtained from Chiro Woreda Health office

### Table 20 - Ten Top Diseases in Chiro Woreda (Year-2001)

<table>
<thead>
<tr>
<th>Type of diseases</th>
<th>Number of patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia</td>
<td>4728</td>
<td>20.0</td>
</tr>
<tr>
<td>Intestinal parasites</td>
<td>3678</td>
<td>15.5</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>3619</td>
<td>15.3</td>
</tr>
<tr>
<td>Gastritis</td>
<td>2802</td>
<td>11.8</td>
</tr>
<tr>
<td>Anemia</td>
<td>1831</td>
<td>7.8</td>
</tr>
<tr>
<td>Dermatitis</td>
<td>1544</td>
<td>6.5</td>
</tr>
<tr>
<td>Malnutrition</td>
<td>1469</td>
<td>6.2</td>
</tr>
<tr>
<td>Influenza</td>
<td>1442</td>
<td>6.1</td>
</tr>
<tr>
<td>Other skin disease</td>
<td>1303</td>
<td>5.5</td>
</tr>
<tr>
<td>Malaria</td>
<td>1222</td>
<td>5.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>23638</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Compiled from data obtained from Chiro Woreda Health office
Veterinary health

The major diseases attacking livestock resources of the Woreda are Anthrax, Black leg, Pastorallosis, Foot and Mouth Disease and external and internal parasites. There are 5 veterinary clinics in the Woreda, run by one veterinary doctor and 5 technicians.

NGOs and their Activities in Chiro Woreda

In Chiro Woreda, there are four NGOs, actively involved in development and humanitarian activities. These are Care Ethiopia, Farm Africa and the Lutheran and Hararghae Catholic Secretariat.

Care Ethiopia is mainly involved in construction of infrastructure such as small-scale irrigation, schools, health posts, spring development and relief programs. It is also supporting extension programs by training farmers of the area and the development agents. Currently, there are some 102,898 beneficiaries participating in Care Ethiopia’s activities. Care Ethiopia has nine-grain distribution centers in four Woredas of the Zone (Kuni, Chiro, Meiso and Duba). Wheat, edible oil and CSB are provided on the basis of Food for Work program.

Farm Africa has started working in the area since October 1999. Farm Africa provides dairy goats for female headed poorest members of the community. The main objective of the project is to assist the poorest and food insecure members of the community to increase milk and goat production for the family as well as for the market. The project provides:

- credit to buy goats without interest;
- improved goat breed;
- training for the beneficiaries in goat health care;
- breeding station for the supply of goats;
- training for the development agents and the extension staff;
- nurseries for growing seedlings and distributing sites for trees and vegetables;
- training in home economics including food preparation and better way to feed themselves through the home agents it has assigned in its intervention areas;
- basic education for the selected members from the beneficiary groups. The training is focused on how to handle the financial documents of the group.

So far, there are 58 groups established by Farm African program in the Western Hararghe zone. Each group contains 20-30 members. Every member of the group is provided with two goats. Before receiving the goats, however, the group has to establish an insurance system where each member has to deposit Birr 10 per person or Birr 5 per goat. The main objective of the insurance is to replace goats in case of
goat’s death. According to the coordinator of the project, the insurance system has made the project sustainable and attractive.

After having the goats, each member of the group is advised to deposit Birr 0.50 per month. For facilitating the savings the project office has opened a credit account for the group. In case of cash needs, the members can borrow from their association without any collateral.

The project is very important in changing the life of poor female-headed households of the community. It is very helpful in overcoming food insufficiency and malnutrition problem of the poor. Through this project, many women headed households are getting milk and milk products, which is very important towards the fulfillment of balanced diet.

The Lutheran World Federation is also one of the NGOs participating in development and relief activities in West Hararghe Zone. It is mainly involved in construction of small-scale irrigation and provision of farm extension services. Similarly, Hararghae Catholic Secretariat is actively involved in distributing improved seeds and agricultural tools in the area.

3.6.5 Bolsso and Damot Gale Woredas (SNNPR)

**Demographic Condition**

According to the Central Statistics Authority, the population of the two Woredas in 2000 is estimated to be about 56,3036 persons, accounting for about 15% of the total chronic food deficit Woredas. The total land area of the two Woredas is about 106,173 hectare with an average population density of 544 persons per square kilometer. The dominant ethnic group in the Woredas is Wolayta.

**Agro-ecological Division**

Agro-climatically, the Woredas exhibit the three traditional agro-ecological zones, Dega (2000-2900 masl), Woina Dega (1500-2000 masl) and Kolla (below 1500 masl). Damot Gale Woreda is wholly in Dega and Woina Dega agro-climatic zones.

**Economic Activities**

**Crop Production:** The major crops grown in the two Woredas are maize (about 31%), enset (18.3%), root crops (22.3%), coffee (10%), beans (11%) and other crops cover the remaining 15.7%.

**Land holdings and Draft Oxen:** The current landholding size per household in the two Woredas does not exceed 0.70 hectare. It is 0.9ha in Bolosso and 0.5ha in Damot Gale. According to the Woreda Agricultural Offices, the landless households are about 2,117 in Bolosso (3.4%) and 3,145 in Damot Gale (6.8%). Tables-22 to 28 depict the Woreda population, livestock, crop production, prices, storage facilities and institutions operating on food security activities.
More than sixty percent of the households (54,159) do not own draft oxen; while 30,051 (28.2%) households have only one ox and only 10,211 (9.6%) households have a pair of oxen. Those households having more than a pair of oxen are only 708 (0.66%).

**Fertilizer and Improved Seed Inputs:** Two types of commercial fertilizers, namely DAP and UREA are distributed in the Woredas. The quantities of the fertilizers distributed for the years 1990 to 1993 E.C. are depicted in the following table.

**Table 21 - Fertilizer Distribution in Bolos Sore & Damot Gale Woredas (1990-93 E.C.)**

<table>
<thead>
<tr>
<th>Woreda</th>
<th>Type of Fertilizer</th>
<th>Years of Distribution</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolos Sore</td>
<td>DAP</td>
<td>9981.25</td>
<td>8829.25</td>
</tr>
<tr>
<td></td>
<td>Urea</td>
<td>4619.50</td>
<td>6128.5</td>
</tr>
<tr>
<td>Damot Gale</td>
<td>DAP</td>
<td>NA</td>
<td>10016.50</td>
</tr>
<tr>
<td></td>
<td>Urea</td>
<td>NA</td>
<td>3292</td>
</tr>
</tbody>
</table>

Source: Woreda Agriculture Offices
Table 22 - Human Population, Crop Production and Livestock Population of the Target Woredas

<table>
<thead>
<tr>
<th></th>
<th>Boisso Sore</th>
<th>Damot Gale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household</td>
<td>301142</td>
<td>261894</td>
</tr>
<tr>
<td>Household size</td>
<td>62649</td>
<td>46022</td>
</tr>
<tr>
<td>Rural population</td>
<td>8</td>
<td>5.4</td>
</tr>
<tr>
<td>Urban population</td>
<td>277330</td>
<td>243678</td>
</tr>
<tr>
<td>Urban population</td>
<td>23812</td>
<td>18216</td>
</tr>
<tr>
<td>Marriage status in Percent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marriage to single wife</td>
<td>64</td>
<td>25</td>
</tr>
<tr>
<td>Marriage to two wife</td>
<td>20</td>
<td>62.5</td>
</tr>
<tr>
<td>Marriage to three and</td>
<td>16</td>
<td>12.5</td>
</tr>
<tr>
<td>above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persons per km²</td>
<td>476</td>
<td>611</td>
</tr>
<tr>
<td>GFR Morality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Put Under Crops</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total crops area</td>
<td>42670</td>
<td>29271.9</td>
</tr>
<tr>
<td>Food Crop</td>
<td>36694</td>
<td>28426.9</td>
</tr>
<tr>
<td>Cash Crop</td>
<td>5976</td>
<td>845</td>
</tr>
<tr>
<td>Total land mass area</td>
<td>63266</td>
<td>42709</td>
</tr>
<tr>
<td>Land Holdings in hectar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average holding</td>
<td>0.91</td>
<td>0.50</td>
</tr>
<tr>
<td>Landless households</td>
<td>2117</td>
<td>3145</td>
</tr>
<tr>
<td>Less than 0.5 (ha)</td>
<td>24212</td>
<td>12531</td>
</tr>
<tr>
<td>0.5-1.0 (ha)</td>
<td>30267</td>
<td>4850</td>
</tr>
<tr>
<td>1.0-1.5 (ha)</td>
<td>3632</td>
<td>24049</td>
</tr>
<tr>
<td>&gt; 1.5 (ha)</td>
<td>2421</td>
<td>1447</td>
</tr>
<tr>
<td>Livestock and Oxen Ownership</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Livestock</td>
<td>158326</td>
<td>179187</td>
</tr>
<tr>
<td>Number of Draft Owners</td>
<td>23104</td>
<td>18111</td>
</tr>
<tr>
<td>Single ox owners</td>
<td>13745</td>
<td>16306</td>
</tr>
<tr>
<td>Pair oxen owners</td>
<td>9085</td>
<td>1371</td>
</tr>
<tr>
<td>Three oxen owners</td>
<td>247</td>
<td>368</td>
</tr>
<tr>
<td>Four oxen owners</td>
<td>-</td>
<td>66</td>
</tr>
<tr>
<td>Non oxen owners</td>
<td>26003</td>
<td>28,156</td>
</tr>
</tbody>
</table>

Sources: Population from CSA 2000; Marriage status from sample PRA discussion group; others from Woreda Agricultural Offices.

Table 23 - Prices of Major Crops in the two Sampled Woredas (1990-93 E.C.)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Teff</td>
<td>-</td>
<td>210</td>
<td>237</td>
<td>187</td>
<td>207</td>
<td>250</td>
<td>254</td>
<td>222</td>
</tr>
<tr>
<td>Maize</td>
<td>-</td>
<td>125</td>
<td>135</td>
<td>58</td>
<td>83</td>
<td>102</td>
<td>124</td>
<td>72</td>
</tr>
<tr>
<td>Barley</td>
<td>-</td>
<td>200</td>
<td>200</td>
<td>135</td>
<td>150</td>
<td>150</td>
<td>160</td>
<td>111</td>
</tr>
<tr>
<td>Horse bean</td>
<td>-</td>
<td>150</td>
<td>100</td>
<td>129</td>
<td>130</td>
<td>135</td>
<td>123</td>
<td>86</td>
</tr>
<tr>
<td>Sweet potato</td>
<td>-</td>
<td>-</td>
<td>45</td>
<td>19</td>
<td>65</td>
<td>91</td>
<td>92</td>
<td>51</td>
</tr>
<tr>
<td>Potato</td>
<td>-</td>
<td>80</td>
<td>50</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Compiled from respective Woreda Agricultural Offices.
Table 24 - Major Crop Production of Sample Woredas (1986–92 E.C)

<table>
<thead>
<tr>
<th>Year</th>
<th>Bolasso Peas</th>
<th>Maize</th>
<th>Barley</th>
<th>Teff</th>
<th>H.Bean</th>
<th>Wheat</th>
<th>Damot Gale Maize</th>
<th>Barley</th>
<th>Teff</th>
<th>S. Potato</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>4666</td>
<td>33348</td>
<td>791</td>
<td>6312</td>
<td>6596</td>
<td>3467</td>
<td>72320</td>
<td>22083</td>
<td>41250</td>
<td>833000</td>
</tr>
<tr>
<td>1987</td>
<td>4508</td>
<td>40910</td>
<td>3493</td>
<td>10612</td>
<td>14390</td>
<td>3910</td>
<td>178900</td>
<td>24056</td>
<td>36066</td>
<td>900000</td>
</tr>
<tr>
<td>1988</td>
<td>5200</td>
<td>94760</td>
<td>3360</td>
<td>13310</td>
<td>22600</td>
<td>2670</td>
<td>261343</td>
<td>38900</td>
<td>93625</td>
<td>1030000</td>
</tr>
<tr>
<td>1989</td>
<td>472</td>
<td>52034</td>
<td>1332</td>
<td>4935</td>
<td>14960</td>
<td>575</td>
<td>85000</td>
<td>32292</td>
<td>43810</td>
<td>756951</td>
</tr>
<tr>
<td>1990</td>
<td>5040</td>
<td>574112</td>
<td>4341</td>
<td>48926</td>
<td>22765</td>
<td>3585</td>
<td>267400</td>
<td>43384</td>
<td>86566</td>
<td>740000</td>
</tr>
<tr>
<td>1991</td>
<td>1428</td>
<td>265008</td>
<td>1426</td>
<td>18290</td>
<td>33222</td>
<td>3414</td>
<td>209480</td>
<td>37753</td>
<td>68626</td>
<td>396625</td>
</tr>
<tr>
<td>1992</td>
<td>1070</td>
<td>158655</td>
<td>1148</td>
<td>20129</td>
<td>11747</td>
<td>11576</td>
<td>181758</td>
<td>26952</td>
<td>37700</td>
<td>313000</td>
</tr>
<tr>
<td>1993</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Source: Compiled from the Agricultural Offices of the Respective Woredas

* The production for Demote Gale includes two seasons' productions (Belg and Meher Seasons)

Table 25 - Areas Under Major Crops for the two Sample Woredas (1986–1992 E.C)

<table>
<thead>
<tr>
<th>Year</th>
<th>Bolasso Sore</th>
<th>Damot Gale</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Area</td>
<td>Yield</td>
</tr>
<tr>
<td>1986</td>
<td>9042.48</td>
<td>5.8</td>
</tr>
<tr>
<td>1987</td>
<td>11648.70</td>
<td>6.9</td>
</tr>
<tr>
<td>1988</td>
<td>13020.00</td>
<td>11.2</td>
</tr>
<tr>
<td>1989</td>
<td>12453.50</td>
<td>6.1</td>
</tr>
<tr>
<td>1990</td>
<td>19855.00</td>
<td>3.3</td>
</tr>
<tr>
<td>1991</td>
<td>17740.00</td>
<td>18.3</td>
</tr>
<tr>
<td>1992</td>
<td>16477.19</td>
<td>12.9</td>
</tr>
<tr>
<td>Average for 7 years</td>
<td>14,319.60</td>
<td>9.2</td>
</tr>
</tbody>
</table>

Source: Compiled from the information obtained from Agricultural Offices of the two respective Woredas.

When we compare the two Woredas the yield per unit of land for Damot Gale is higher than Bolosso; for Damot Gale the area under potatoes and as well as yield are estimated, whereas the area and yield was not available for Bolosso.
Table 26 - Livestock Prices at Major Markets in Bolsso Sore & Damot Gale from (1990–93 E.C)

<table>
<thead>
<tr>
<th>Livestock</th>
<th>Bolsso Sore Price in Birr</th>
<th>Damot Gale Price in Birr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draft oxen</td>
<td>700</td>
<td>600</td>
</tr>
<tr>
<td>Bull</td>
<td>351</td>
<td>325</td>
</tr>
<tr>
<td>Milk cow</td>
<td>554</td>
<td>466</td>
</tr>
<tr>
<td>Heifer</td>
<td>315</td>
<td>261</td>
</tr>
<tr>
<td>Sheep</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mukit</td>
<td>226</td>
<td>253</td>
</tr>
<tr>
<td>Watete</td>
<td>135</td>
<td>114</td>
</tr>
<tr>
<td>Enat</td>
<td>77</td>
<td>75</td>
</tr>
<tr>
<td>Goat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mukit</td>
<td>222</td>
<td>250</td>
</tr>
<tr>
<td>Watete</td>
<td>130</td>
<td>114</td>
</tr>
<tr>
<td>Enat</td>
<td>144</td>
<td>113</td>
</tr>
<tr>
<td>Keb</td>
<td>77</td>
<td>79</td>
</tr>
<tr>
<td>Equine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horse</td>
<td>586</td>
<td>639</td>
</tr>
<tr>
<td>Mule</td>
<td>680</td>
<td>708</td>
</tr>
<tr>
<td>Ass</td>
<td>298</td>
<td>262</td>
</tr>
</tbody>
</table>

Source: Woreda Agricultural Offices

Table 27 - Number of Storage, Capacities and Location in the Woredas

<table>
<thead>
<tr>
<th>Bolsso Qt</th>
<th>PA location</th>
<th>D. Gale Qt</th>
<th>PA location</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>15000 Areka</td>
<td>-</td>
<td>5000 Bodeti</td>
</tr>
<tr>
<td>-</td>
<td>5000 Anchucu</td>
<td>-</td>
<td>5000 Wolara</td>
</tr>
<tr>
<td>-</td>
<td>4300 Hembecho</td>
<td>-</td>
<td>5000 Jege</td>
</tr>
<tr>
<td>-</td>
<td>5000 Woyebo</td>
<td>-</td>
<td>5000 Wolbira</td>
</tr>
<tr>
<td>-</td>
<td>5000 Tafama bancha</td>
<td>-</td>
<td>5000 Shento</td>
</tr>
<tr>
<td>-</td>
<td>12000 Dangara madalcho</td>
<td>-</td>
<td>5000 Lera</td>
</tr>
<tr>
<td>-</td>
<td>Duboo -</td>
<td>8000 Harto</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>51,300</td>
<td>47,000</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Agricultural Offices.
### Table 28 - Food Insecurity Mitigating Institutions Working in the Target Woredas

<table>
<thead>
<tr>
<th>Institution</th>
<th>Cooperatives</th>
<th>Microfinance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afamo Banja</td>
<td>128 M, 34 F</td>
<td>Boditi</td>
</tr>
<tr>
<td>Bombay</td>
<td>539 M, 160 F</td>
<td>Bibiso</td>
</tr>
<tr>
<td>Anchuchs</td>
<td>1906 M, 59 F</td>
<td>Tige</td>
</tr>
<tr>
<td>Garagudo</td>
<td>186 M, 65 F</td>
<td>suke</td>
</tr>
<tr>
<td>Woyebo</td>
<td>184 M, 46 F</td>
<td>Shonto</td>
</tr>
<tr>
<td>Hembecho</td>
<td></td>
<td>Lera</td>
</tr>
<tr>
<td>Areka</td>
<td></td>
<td>Bodeti</td>
</tr>
<tr>
<td>Woyebo</td>
<td></td>
<td>Artu</td>
</tr>
<tr>
<td>Hombba</td>
<td></td>
<td>Babisso</td>
</tr>
<tr>
<td>Yokera</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wormamo</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Credit obtained from cooperatives and Omo micro finance:** The Cooperative Office dispersed credit for different purposes and Omo Micro Finance among the above-mentioned PAs and members. A total amount of Birr 1,028,100 was dispersed. The credit was given:

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Credit Obtained</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>For buying draft oxen</td>
<td>551800</td>
<td>53.7%</td>
</tr>
<tr>
<td>For petty trading</td>
<td>168300</td>
<td>16.4%</td>
</tr>
<tr>
<td>For women development</td>
<td>25000</td>
<td>2.4%</td>
</tr>
<tr>
<td>For fattening</td>
<td>27000</td>
<td>2.6%</td>
</tr>
<tr>
<td>For fertilizer and other inputs</td>
<td>80000</td>
<td>7.8%</td>
</tr>
<tr>
<td>For grain purchase</td>
<td>176000</td>
<td>17.1%</td>
</tr>
</tbody>
</table>

**Source:** Woreda agriculture Offices

### 3.6.6 Wokro Woreda (Tigray Region)

Wokro is one of the chronic food insecure Woredas of the Eastern Zone bordering with Atsbi-Wombera and Hawzen Woredas in the North, Afar Region in the East, Enderta Woreda in the South and Dega-Tembien Woreda in the West (see map). Wokro town is the capital for the Woreda, located at a distance of 50km to the north of Regional Capital, Mekelle.

### Population

The total population of the Woreda is about 101,901 of which 22% (22,418) is urban and 78% (79,483) are rural. The population density of the Woreda is 286 persons per km² and has a population growth rate of 2.3%, per annum. The average
household size is 5 persons. Administratively, the population of the Woreda is organized under 15 peasant associations and 4 cooperatives (NRST-IFSP 1998).

**Climate**

The altitude of the Woreda ranges from 1600-2500 masl. The Woreda is classified under the traditional three agro-ecological zones: 16% Dega, 81% Woina Dega and 3% Kolla. It exhibits cool and warm climate with temperatures ranging from 15-20°C.

The Woreda is a drought prone area with a characteristic of erratic pattern. July and August are the main rainy months the short rainy season occurs March and April. The mean annual rainfall is about 550mm.

**Land Use Pattern**

The total area of the Woreda is 97,000ha. The land use pattern is not clearly known, nevertheless, the following land use types (Table-29) are estimated by the Woreda Agriculture Office.

<table>
<thead>
<tr>
<th>Land use type</th>
<th>Area (in Ha)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivated</td>
<td>24,702</td>
<td>25.5</td>
</tr>
<tr>
<td>Grazing</td>
<td>4,106</td>
<td>4.2</td>
</tr>
<tr>
<td>Shrubs and Bushes</td>
<td>6,200</td>
<td>6.4</td>
</tr>
<tr>
<td>Closed area (enclosed)</td>
<td>9,153</td>
<td>9.4</td>
</tr>
<tr>
<td>Miscellaneous (Road Construction)</td>
<td>52,838</td>
<td>54.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>96,999</strong></td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Woreda Agriculture Office

**Major Economic Activities**

The main economic activities of the Woreda are crop production (70%), livestock production (28%) and off-farm activities (2%). The major crops grown in the Woreda (according zonal ANRD, 1996) are barley, wheat, teff, sorghum, maize, linseed, pea, bean chick pea, lentil and grain pea, covering an area of 3,601, 5,003, 13,600, 4,380, 1,470, 300, 237, 261, 254, 244 and 254 ha, respectively. Crop production is mainly rainfed. The table below shows the types of crops and yields for the years 1988 to 1991 E.C.
### Table 30 - Crop Production and Yields (qt/ha) 1988/1991 E.C.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area</td>
<td>Production</td>
<td>Yield</td>
<td>Area</td>
</tr>
<tr>
<td>Barley</td>
<td>5603</td>
<td>31068</td>
<td>5.5</td>
<td>3620</td>
</tr>
<tr>
<td>Wheat</td>
<td>4818</td>
<td>26728</td>
<td>3.4</td>
<td>5002</td>
</tr>
<tr>
<td>Teff</td>
<td>612</td>
<td>2053</td>
<td>5.7</td>
<td>1360</td>
</tr>
<tr>
<td>Pea</td>
<td>149</td>
<td>850</td>
<td>4.0</td>
<td>237</td>
</tr>
<tr>
<td>Flax</td>
<td>144</td>
<td>577</td>
<td>9.7</td>
<td>330</td>
</tr>
<tr>
<td>Millet</td>
<td>274</td>
<td>2660</td>
<td>11.8</td>
<td>1260</td>
</tr>
<tr>
<td>Maize</td>
<td>148</td>
<td>1743</td>
<td>2.12</td>
<td>1753</td>
</tr>
<tr>
<td>F/Millet</td>
<td>216</td>
<td>1458</td>
<td></td>
<td>832</td>
</tr>
<tr>
<td>Bean</td>
<td>-</td>
<td>-</td>
<td></td>
<td>2672</td>
</tr>
<tr>
<td>Noug</td>
<td>-</td>
<td>-</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Lentil</td>
<td>-</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Abesh</td>
<td>-</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

The average yield per hectare of all crop types is extremely low in all years (1988 to 1991). As shown in the table above, the crop mix is varied and can be advantageous to the farmers. Moreover, gullies are planted with Sudan grass, alfalfa, lucinea, and Sesbania-sesban which is used for sheds and feed for cattle and goats. In some areas, vegetables, fruits and root crops are grown as cash crops. Cactus stands are used to feed the animals in the dry seasons by chopping to pieces.

**Small-scale irrigation**: one of the major problems of agriculture in the Woreda is the inadequate and unreliable rainfall, which limits crop growth. There is suitable land and adequate water resources (Geneffe and Messano Rivers) to develop irrigated agriculture. Currently, two small-scale irrigation schemes have been established in these rivers. The Geneffe scheme, with an area of 22ha and 112 beneficiary households, grows cereals and cash crops. The scheme has the potential for expansion of about 50ha and to support 224 additional households.

In the Messano scheme 60ha of land has been developed benefiting some 400 households. This area could also be expanded to about 100 ha.

There are also potentials for other small-scale irrigation schemes using dams, springs and ponds. Two dams at Korier and Lalay Wokro have already been constructed. Korir, with a potential of irrigating 100 ha, is currently irrigating 66 hectares, benefiting 242 households. There are two springs at Debretson and Tsegreda Tabias. Tsegreda is used only for cattle while the Debretson can be used for irrigation, but its potential of irrigable area is not studied and identified. The development of ponds for irrigation purpose is sited at three Tabias, Abreha Wo Astbeha, Mahibre Woine and around Messano. Currently, 4 ponds are under construction.

**Livestock potential**: The Woreda is endowed with high livestock population but with poor productivity. There are cattle, sheep, goats, donkeys, horses, mules, camels and poultry with a population size of 48870, 30228, 23061, 7993, 31, 685, 64, 34,824, respectively. The main problems for low productivity of livestock and livestock products include shortage of livestock feed/grazing land, watering points and prevalent diseases. Anthrax, FMD, Pastoroloyis, Blackleg and tick borne as well as intestinal helmenthic parasites are the most important diseases.

**Off-farm enterprises/activities**: The main off-farm income generating activities are petty trading of cattle and salt, wage labor- mainly in big urban centers, Mekelle and Adigrat. Women involve themselves in better income generating opportunities including backyard vegetable production, poultry and egg production, pottery making and fuel wood selling.
**Afforestation Activities:** The Woreda afforestation program activities is mainly focused on area closures and plantations. The most successful afforestation activity is area closure, which allows the rehabilitation of an area with its indigenous tree species through prevention and control of human and animal interference. Plantation programs have shown little success due to moisture stress. Species planted in this program include Eucalyptus, Dodoniar, Acacia spp. and Oliana africana.

**Roads and Markets**

The main Addis Ababa-Zalanebessa road passes through the Woreda and the main town, Wokro. According to the TRS-IFSP's five-year report of 1996, the Woreda's internal road system is said to be poor. But the Woreda is in a better condition in road net connection to adjacent Woredas. It is connected to Woredas of Atsebe Wonberta and Hawzen with two alternative all weather roads. Furthermore, it is also connected to Messano, Agula, Tsegeda, Negash, Tsebet, Kelesh-emeni, Hadinat Tabias in the Woreda.

There are major markets within and outside the Woreda boundaries in which the urban and the rural people exchange goods and services. The Woredas has a wide access to sell the product and buy other industrial goods. Since the Woreda is near and with very good road access it has great opportunity of marketing to Mekelle, Adigrat and Hawzen. There are five major markets, where the rural population sell their surplus products of any type and buy household utilities. These markets are Wokro, Negash, Abreha Wo Astbeha, Agula and Tsegreda.

The Wokro market is modern, with separate centers for fuel-wood, cattle, sheep and goat, crop production and other industrial goods.

**Access to Credit (Support) Service**

Currently two local organizations are facilitating and delivering rural credit to the population of the Woreda. These institutions/organizations are REST and Dedebit Micro Finance Institutions. Different development packages and loans are supplied by these two rural credit institutions. The main production packages are delivering input such as fertilizer and certified crop seeds. The other packages are to increase the productivity of agriculture and livestock sectors. Loans are given to some rural farmers to be involved in honey and bees wax production, fattening of cattle, sheep and goats, dairy production using cross bred cows of Barka and poultry production.

The money loan is administered and facilitated by respective agricultural office through farmers associations. The farmers association is responsible for the money to be given to individual households. The candidate households are selected through the administrators of the farmers associations.
Health

The health infrastructures of the Woreda include a hospital (in Wokro town), two health centers (in Agula and Wokro) five clinics and five health posts. The major diseases prevalent in the Woreda include the following (current year data):

- Upper respiratory infection 4,786 (28%)
- Intestinal parasites 2,207 (13%)
- Malaria 2,080 (12%)
- Skin diseases 1,819 (10.6%)
- Gastro enteritis 1,420 (6.6%)
- Eye -infection 1,635 (9.5%)
- Gastric 1,224 (7%)
- Urinary tract infection 334 (1.9%)
- Other wounds 952 (5.5%)

In addition to these bacterial and viral infectious diseases, disease caused by malnutrition is also very important. According to information from the Wokro Health Center, malnutrition diseases such as marasmus, kwashiorkor and marsmikwash affected 2,729, 1,144 and 323 people, respectively (current data).

There are about 325 medical professionals in the Woreda. The number and level of professionals are as follows:

1. Medical Doctor 2
2. Nurses 23
3. Health Assistant 50
4. Junior H/Assistant 6
5. Mid Wife 1
6. Junior MDW 8
7. Saniterials 3
8. A/Technician 4
9. Ppharmatical/ Technician 5
10. Primary Health workers 8
11. Community health agents 105
12. Traditional health attendants 112

However, the Woreda’s health activities are constrained by a number of problems including:

- Lack of transport facilities for patients;
- Lack of access to buy drugs due to expensiveness of the drugs in relation to income;
• Lack of multipurpose skills in health post workers so they can be involved in multipurpose treatments;

• Lack of experienced manpower in health centers due to lack of standard living facilities (houses and the like);

• Lack of transportation facilities for health workers (for emergency cases and other routine treatments).

**Potable Water Supply**

According to the data obtained from NRST-IFSP, 1996, the Woreda is endowed with potential of ground water for both domestic and irrigation purposes. There are, however, only 20 water wells and 18 springs that are protected and safe enough for 17% of the Woreda population. The remaining population derives its water from unprotected and unsafe sources consisting of 71 springs, 87 ponds and 90 wells.

The water supply sources for the rural population of the Woreda is from rivers, wells (elas), springs and traditional ponds. The rural water development schemes are carried out by government and Non Governmental Organizations. It is reported that the rural water coverage of the Woreda is 62.3%.

**Education**

According to the Woreda Education Office, there are 31 schools in the Woreda, including 8 complete elementary schools (1-8 grade), 1 secondary school (9-12) and 22 incomplete elementary schools (1-4, 1-5, 1-6 or 1-7 grades). Additionally, there are 3 schools run by NGOs of which 2 are incomplete elementary and 1 is a comprehensive high school, which gives technical training on trade, business, commerce and agriculture such as bee keeping, crop production, livestock husbandry for grade 12th completed students. Other skills are also given including pottery making, computer skills, metal and wood works for the surrounding communities.

The number of school age boys and girls (7-14 years age) were about 21,013, and out of this total school age 90.1% (18,945) were enrolled in the Woreda schools (year 2000). The sex composition of students is dominated by males except in grades 1-4 (Table-31).
Table 31 - Percentage of Sex Composition of Students by Class (2000)

<table>
<thead>
<tr>
<th>Class Range</th>
<th>% Female</th>
<th>% Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>50.49</td>
<td>49.51</td>
</tr>
<tr>
<td>5-8</td>
<td>46.54</td>
<td>53.46</td>
</tr>
<tr>
<td>1-8</td>
<td>49.0</td>
<td>51.0</td>
</tr>
<tr>
<td>9-12</td>
<td>31.9</td>
<td>68.1</td>
</tr>
<tr>
<td>1-12</td>
<td>46.1</td>
<td>53.9</td>
</tr>
</tbody>
</table>

The following main important problems were raised during the discussions with the Woreda authorities:

- Shortage of teachers both in quantity and quality;
- Educational materials, budget constraints for school maintenance works;
- Shortage of teachers' residences which contributes to the shortage of teachers;
- Weak management and follow up of the literacy program and lack of post-literacy reading materials to support and sustain the literacy program.

3.6.6 Tanqua Abergella Woreda (Tigrai Region)

Location and Topography

The Tanqua Abergella Woreda is located in the Central Zone of Tigrai, southwest of the Zonal capital, Axum, at a distance of 160km. The Woreda capital, Yechilla, is at 125 km from Mekelle. The Woreda lies between latitudes 13°14'00" & 13°42'00" N and longitudes 38°38'00" & 39°02'00" E. The topography of the Woreda is dominantly flat to rolling with few hilly areas and few river valleys.

Altitude and Climate

The altitude of the Woreda varies between 1,000 to 2,000 masl. and agro-ecologically it could be classified as Woina Dega. The rainfall is erratic and unreliable. The average annual rainfall is 539 mm and evapo-transpiration is very high.

Vegetation

The vegetation in the area includes those species used as source of fuel wood, construction material, farm implements, fodder and other commercial purposes in the area. These include Acacia etabacia, Acacia amythophyla/seyal, Combretum spp. Commiphora africana, Boscia anqustitolia, Malkuza, Ziziphus spina-christ, Mimusa laurifolia, Boswellia papyrfera, etc.
Water Resources

The Woreda has very scanty water resources. Shortage of water is more critical than food in the Woreda. The non-availability of water causes serious stress and burden to the women, who fetch water from quite distant areas from their homes. REST has made substantial effort to alleviate the problem for about 23,900 people through 19 boreholes, 20 hand dug wells, 1 motorized pump and 8 spring developments. At present, 6 boreholes & 10 hand dug wells are under construction and additional 8,000 people are anticipated to benefit.

Potential water sources for the future developments include use of ground water (boreholes and hand dug wells) and investigation of the possible use of Giba River and Agbe springs.

Socio-Economic Environment

Population and Area

The total population of the Woreda as projected for the year 1998 (CSA) is 62,180 (31,763 male and 30,417 female). The total area of the Woreda is 141,500 ha; with an average population density of 44 persons per km².

Occupation of the People

The principal occupation of the majority of Tanqua Abergelle Woreda is agriculture/crop production and livestock husbandry. The farming system is subsistence depending on the erratic rainfall and some traditional irrigation practices. Farmland holdings per household are small and fragmented. The total cultivable area is only 29,702 ha.

Size of Land Holding

Of the total area of the Woreda, only 13,076ha (21%) is cultivated land. On the basis of the total households in the Woreda, the average cultivable land holding size seems exaggerated, 2.3ha/household. However, large areas of farmlands remain fallow due to shortage of rainfall.

Crop Production

Crops grown in the Woreda include sorghum, maize, teff, finger millet, sesame, barley and other pulse crops. Crop production in the area is generally subsistence and the agronomic practices are based on the age-old tradition. According to a baseline survey conducted by REST in 1995, the total average crop yield of the Woreda is 5.08 quintals per household and the average crop yield per hectare is 2.75 quintals.
Livestock Husbandry

Farmers in the Tanqua Abergelle Woreda practice mixed farming (crop and livestock). The types of livestock in the Woreda are cattle, goats, sheep, equines, camels, poultry and bee colonies. The Woreda has a relatively high population of livestock as compared to the other Woredas in the Central Zone of Tigrai. The number of livestock by type is shown in the table below.

Table 32 - Livestock Type and Population in the Woreda

<table>
<thead>
<tr>
<th>Livestock Type</th>
<th>Number</th>
<th>Percent Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>61,057</td>
<td>27.67</td>
</tr>
<tr>
<td>Sheep</td>
<td>20,446</td>
<td>9.27</td>
</tr>
<tr>
<td>Goat</td>
<td>67,661</td>
<td>30.66</td>
</tr>
<tr>
<td>Equines</td>
<td>4,150</td>
<td>1.88</td>
</tr>
<tr>
<td>Camel</td>
<td>56</td>
<td>0.03</td>
</tr>
<tr>
<td>Poultry</td>
<td>63,217</td>
<td>28.65</td>
</tr>
<tr>
<td>Bee Colonies</td>
<td>4,066</td>
<td>1.84</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>220,635</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: Woreda Agriculture Office

During the years of famine, the population of the livestock was substantially affected because of the drought (shortage of water). Endemic and epidemic animal diseases are also common. Rinderpest, Anthrax, Blackleg, CBPD, CCPP, facioliasis, and tryponsomasis are the major livestock diseases in the area.

Rural Marketing

Most of the crops produced in the Woreda are sold at Abi Adi Sekota market centers. The centers are far away, and most people travel on foot. The livestock markets are at Yechilla, Agbe, Abi Adi, Jijika, Samre, Sekota, Fiyel Wuha, Mekelle, Hagera Selam and Gijet.

Health

Currently there are 1 health station, 4 clinics and 2 health posts in the Woreda. There are critical health problems in the Woreda and the top most diseases include malaria, parasites, TB, diarrhea, malnutrition, eye infection, skin infection and common cold.

Problems in the health sector of the Woreda include:

1. There is insufficient skilled manpower (there are, for example, 6 nurses for the population of the Woreda). Others are reluctant to work in the Woreda without having appropriate residence in the harsh climate of the area;
2. The required equipment is not adequate; 
3. The health station has no generator; and 
4. There is a high maternity problem in the Woreda.

**Education**

The total number of schools in the Woreda is 16. Twelve are primary and 4 are junior high schools (1- 8 grades). The total number of school age children is about 14,552 and only 6,382 (3,927 males & 2,455 females) are currently enrolled. The enrollment rate by gender shows that 68.35% for male and 31.65% female students. Some of the reasons for low enrollment are:

1. Awareness of the people about education is low;  
2. Gender disparity (early marriage of girls); and  
3. High rate of dropouts due to several reasons.

**Rural Road Network**

Of the drought-prone areas, the Tanqua Abergelle ranks the fifth inaccessible Woreda by road. This has, therefore, hindered the economic interaction of the people, the supply of agricultural inputs and produce and access to social services. Except the main road from Abi Adi to Sekota, which passes through Yechilla, there are few roads that connect the other parts of the Woreda.

**Credit Services**

Credit is taken for the purchase of seed & other agricultural inputs as well as for family consumption. Credit is facilitated through the Bureau of Agriculture and Natural Resources of Tigrai for the purchase of agricultural inputs. Relief Society of Tigrai (REST) provides also credit & saving for resource-poor farmers.
4. DESCRIPTION OF THE LEGAL, REGULATORY & ADMINISTRATIVE FRAMEWORKS

4.1 Environment

4.1.1 Introduction

This section defines food security, reviews the environmental policies and strategies and environment related international agreements to which Ethiopia is party, and comments on how they are related to food security. Food security, as defined at the World Food Summit (i.e. the Rome Declaration of World Food Security and Plan of Action) is achieved when all people at all times have physical and economic access to sufficient, safe and nutritious food for an active and healthy life. In general, food security is basically about production of and access to food.

4.1.2 Environmental Legal Instruments that are Supportive to Food Security

The Constitution

According to article 43 and 44 of the Constitution of the Federal Democratic of Ethiopia, all persons have the right to live in a healthy environment and to improvement of their living standard through sustainable development. Such a right can be meaningful and practicable only if adequate food can be made available to the people of Ethiopia in a sustainable manner. In this respect the constitution is strongly supportive of attaining food security in Ethiopia.

Conservation Strategy and Environment Policy

a) The Conservation Strategy of Ethiopia

The Conservation Strategy of Ethiopia (CSE) in 1989 was the first comprehensive document to lay down the basis for sustainable development policies and strategies for the country. The purpose of CSE was to assess the status and trends in the use and management of the resource base, formulate a policy and strategy framework, and develop an action plan and investment programs including legislative measures that will enhance sustainable development in various sectoral and cross-sectoral areas.

b) The Environmental Policy of Ethiopia

The Environmental Policy of Ethiopia (EPE) evolved from the conservation strategy. The overall objective of the environmental policy is to improve and
enhance the health and quality of life of all Ethiopians and to promote sustainable social and economic development through sound management and use of natural, human made and cultural resources and the environment as a whole, so as to meet the needs of the present generation without compromising the ability of future generations to meet their own needs. The Environment Policy of Ethiopia was adopted by the Government in April 1997.

The Environmental Policy advocates the need to improve the living standard of the Ethiopian people through sustainable development. The Policy also proposes use of the Polluter Pays Principle, and favors the introduction of economic instruments in environmental management, among them user and access fees, performance bonds, taxes, and subsidies. Both the strategy and the policy are important in terms of providing legal support to development efforts that are aimed to attain food security. The policy and strategy have also made it clear that the only way to secure food to the people of Ethiopia is through sustainable development.

**National Environmental Protection Authority**

A National Environmental Protection Authority was established as an autonomous public institution of the Federal Government in 1995. Its general objective is broadly defined as:

"... to ensure that all matters pertaining to the country's social and economic development activities are carried out in a manner that will protect the welfare of human beings as well as sustainably protect, develop and utilize the resource bases on which they depend for survival."

The mandate given to the Authority includes the following tasks:

- prepare and implement environmental policy and laws;
- institute a system for Environmental Assessment (EA);
- set environmental standards;
- combat desertification;
- take regulatory action to protect the environment;
- enhance environmental awareness;
- implement international treaties;
- provide support to the Regions.

An Environmental Protection Council provides oversight of the Authority. The Council comprises eight members, mostly ministers, who meet every six months. The EPA has a professional staff of about 35, organized in four teams: (i) Environmental Assessment, (ii) Environmental Pollution, (iii) Drought and
Desertification, and (iv) Ecosystems. The need to enhance staff training and acquire basic equipment is clearly recognized.

Among other things, the EPA encourages concerted efforts by interested Ministries to develop and promote Integrated Pest Management (IPM), a preferred method of controlling agricultural pests and diseases that minimizes the use of pesticides. In coordination with the EPA, the Department of Crop Production and Protection (Ministry of Agriculture) is responsible for drafting and/or upgrading pesticide regulations. A registration scheme to promote sound management of pesticides is overseen by an Advisory and Technical Committee whose membership includes the Ministries of Agriculture and Health, the EPA, the Ethiopian Agricultural Research Organization (EARO), and the Ethiopian Standardization Authority.

**Environmental Legislation**

An Environmental Proclamation (Bill) containing detailed legal provisions was formulated in 1999, and under debate during 2000. Once passed by Cabinet it will shape the legal basis for more detailed regulations regarding Environmental Assessments, the principles of environmental management, environmental standards, and compliance and enforcement, including specification of penalties for offences. Although it was expected that the Bill would be passed by mid-2000, it has not been agreed yet, and its current timetable is uncertain.

**Environmental Management of Roads**

The Ethiopian Roads Authority (ERA), in January 1998 established an Environmental Management Branch (EMB), with responsibility for setting and implementing ERA environmental guidelines in support of the national requirements for executing sustainable development practices among all line agencies. The EMB *Environmental Guidelines for the Road Sub-Sector* (1998), specifies the requirements and procedures for the conduct of an Environmental Impact Assessment (EIA) for road sector projects. The EMB Guidelines emphasize the preparation and use of contract specifications and conditions to ensure that environmental mitigation is both budgeted for and implemented by construction contractors (Ethiopian Roads Authority, 2001).

The EMB EIA process begins with environmental screening in order to identify those projects that require environmental analysis and what level of environmental analysis will be undertaken. Road projects are classified as Schedule I (requiring an EIA), and Schedule II (requiring a determination of whether or not an EIA is necessary – this determination is called an Initial EIA). In general, Schedule I projects comprise “major urban roads, rural road programmes and trans-regional and international highways.” Schedule II
projects include "upgrading/rehabilitation of major rural roads." The process involves preparing, in conjunction with a project scoping process, TORs that must be approved prior to conducting the work for an EIA.

Following EIA procedures, environmental monitoring is to be conducted during project implementation to confirm compliance with the requirements of the works in the contract. An Environmental Monitoring Report must be prepared to evaluate the accuracy of impact predictions and the effectiveness of mitigation measures. In addition, post-project evaluation during road operation is required.

**Regional Conservation Strategies**

In line with the general policy of decentralization in the country, regionalization of environmental management is underway. This entails the drafting of Regional Conservation Strategies (RCSs). By the middle of 2000, the Environmental Protection Council had approved only one (for Dire Dawa), while RCSs for Amhara, Tigray, Oromo and Southern Ethiopia Peoples’ Administrative Region were awaiting approval. Additional RCSs are being drafted in most other regions, but work in Afar, Gambela and Somali regions has not yet been initiated. Decentralization also means that the environmental regulation function is being delegated to the regions. In Addis Ababa, the City Administration has constituted an Environmental Protection Bureau. Other regions have appended environmental protection to Bureaus of Agriculture or similar organs of government. The Ethiopian Roads Authority is in the process of planning regional representations of its central Environmental Management Branch in the Regional Roads Authorities. EPA sees the strengthening of the regional units of all government agencies as a major and urgent priority.

**Conventions on Biological Diversity and Biosafety**

a) Convention on Biological Diversity

The objectives of this convention are to conserve genetic resources and sustainably use them. Ethiopia signed this convention on 10th June 1992.

b) Cartagena Protocol on Biosafety to the Convention on Biological Diversity

The objective of this protocol is to contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on conservation and sustainable use of biological diversity, taking also into
account risks to human health, and specifically focusing on transboundary movements. Ethiopia signed the protocol on the 24th May 2000.

Both the Biodiversity Convention and the protocol on Biosafety play important roles in achieving food security to the people of Ethiopia. The Biodiversity Convention aims to conserve genetic resources and promote sustainable agriculture through the use of pest resistant and drought resistant crops. On the other hand, the Biosafety protocol will help to boost crop yield through the use of biotechnology but in a safe manner. In this way both the convention and the protocol play an important role in the effort to secure food to the people of Ethiopia.

**Conventions on Desertification and Climate Change**

a) Convention to Combat Desertification

The objective of this Convention is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification. Ethiopia signed the convention on 15th October 1994 and ratified it on 27th June 1997. This Convention is very important to Ethiopia since it is very much affected by drought and desertification, which in turn contribute to food insecurity.

b) United Nations Framework Convention on Climate Change

The ultimate objective of this convention is to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Ethiopia ratified this convention on June 1997. Both the climate change and desertification conventions will have positive bearing on food security through their aims of mitigating drought and enhancing crop production.

**Environmental Assessment (EA)**

In order to maximize environmental enhancement and minimize environmental damage through sound mitigation, EA is used to identify, assess, evaluate alternatives and design, mitigate, manage and monitor the impacts of the proposed project on the environment. In the project cycle of identification, preparation, approval, implementation and post-project evaluation, ESA is an integral element of the project design and monitoring.

**Safeguard Policies**

The World Bank has a number of environmental and social safeguard policies. Its policies on Environmental Assessment (OP. 4.01 of October 1198) and Pest Management (OP. 4.09 of November 1998) are pertinent in the assessment of
the proposed Food Security Project. The safeguard policies and the applicable ones are herein outlined.

<table>
<thead>
<tr>
<th>Safeguard Policy</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Assessment</td>
<td>Applicable</td>
</tr>
<tr>
<td>Natural Habitats</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Forestry</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Pest Management</td>
<td>Applicable</td>
</tr>
<tr>
<td>Cultural Property</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Indigenous Peoples</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Involuntary Resettlement</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Safety of Dams</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Projects in International waters</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Projects in Disputed Areas</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

4.1.3 Related Previous Studies on Environment & Social Analysis in Ethiopia

A) Programmatic Environmental Assessment (PEA) on Small-Scale Irrigation

A report on “Programmatic Environmental Assessment of Small-Scale Irrigation in Ethiopia”, was prepared in September 1999, by Catholic Relief Services for the US Agency for International Development Bureau for Africa, and Bureau for Humanitarian Response. This report was prepared on behalf of several Cooperating Sponsors, who had identified small scale irrigation as a strategic intervention to address food security in Ethiopia, and were likely to draw upon USAID/Ethiopia provided Title II resources to finance such small scale irrigation. These Cooperating Sponsors included Catholic Relief Services, CARE, World Vision International, Food for the Hungry International, the Relief Society of Tigrai and the Ethiopian Orthodox Church.

The report is a Programmatic Environmental Assessment (PEA) of the environmental issues relating to small-scale irrigation. Its aims were to encourage identification and addressing of such issues early in the planning cycle, advance understanding of the principles of sustainability in small scale irrigation, build capabilities in designing and managing such sustainable systems, and helping the Cooperating Sponsors comply with US statutory regulations concerning use of Title II funds. The report examined small-scale irrigation as a generic class of actions, in order to learn lessons about any adverse environmental impacts and how to deal with them.

The report identified the following main environmental issues:
• Inefficient use of water because of leakage from irrigation structures, and over-watering in flood irrigation regimes, with the measures needed to improve design and management, and not allow this to happen.

• Possible leaching of plant nutrients from soils by irrigation water, and removal of nutrients from soils by intensified cropping under irrigation, with the improved management needed to avoid these.

• Possible build up of salinity in soil, and measures to counter this, such as better drainage, preventing leaks, and not applying excessive irrigation water.

• Possible soil erosion from irrigating on too steep slopes without supplementary measures such as bunding and terracing, as well as from leaving unprotected pits from which soil was excavated near dam sites.

• Possible water related disease hazards such as malaria, schistosomiasis, gastro-enteric diseases and parasites, and lymphatic filariasis, with measures to address them such as good environmental management and proactive planning.

• Possible displacement of people resulting from construction, and disruption of downstream water users' access to water resources.

The report proposed that Initial Environmental Examinations (IEEs) should be done in the field, and that field staff should also implement the proposed Environmental Planning Checklist that would be at the heart of future submissions of IEEs. The report also proposed that Cooperating Sponsors should step up their activities in support of developing a better database to assess water supply and availability. They should also ensure that Water User Associations reflect genuine community participation and not be structures imposed from the top. Cooperating Sponsors would be responsible for preparing IEEs, for justifying decisions about small scale irrigation based on the Environmental Checklist, for identifying situations where a higher level of Environmental Review was required, and for preparing a plan for monitoring the implementation of small-scale irrigation.

Situations where a higher level of Environmental Review was required could include:

• irrigation command areas greater than 200 ha,

• negative impacts on tropical forests or protected areas,
• activities adversely affected endangered species or biological diversity, groundwater pumping schemes,

• schemes with inordinately large construction activities,

• schemes involving displacement of large numbers of people or adversely affecting particular social groups (such as pastoralists),

• schemes needing large infrastructure (such as an access road),

• schemes that introduce exotic or industrial crop species, and

• schemes whose catchments are highly degraded with flooding and irregular water flows the norm.

B) Environmental and Social Aspects of Selected Other Projects

A Significant proportion of food security investments in Ethiopia have directly targeted improvements to the environment, through investments in soil and water conservation, improving catchment management, and afforestation. Lessons about those projects in which negative environmental impacts may have been anticipated that may have called for mitigation, can be learned from three World Bank financed projects – Ethiopia Social Rehabilitation and Development Fund (ESRDF), Fertilizer, and Seeds. These lessons are as follows:

(a) ESRDF - from the outset, it was agreed that sub-projects submitted for financing by the Development Fund would be reviewed at appraisal using environmental criteria contained in the Operational Manual for the project. Sub-projects with negative environmental impacts that could not be mitigated would not be funded. In the area of small-scale irrigation, potential problems related to soil quality, siltation and water-borne diseases are dealt with through special provisions in project design and implementation described in the project’s Small-scale Irrigation Handbook. Among other things, drinking water sources were to be separated from irrigation sources, proper maintenance of irrigation structures was required to avoid stagnant water, catchment treatments would prevent erosion, and beneficiaries would be trained in appropriate soils and water management practices.

In the social arena, the ESRDF also included an action plan for a gender impact assessment that included four components: (i) a Gender Checklist to screen project proposals for any possible negative impact on women; (ii) a policy to give special consideration to project proposals that emphasize benefits for women; (iii) efforts to recruit women staff into the ESRDF administration; and (iv) a management information system with special provisions to gather and report data on participation of women in the ESRDF, and the impacts of sub-projects on women.
(b) Fertilizer - the Fertilizer Project was designed to support training of farmers and extension agents in efficient and balanced use of nutrients in order to minimize losses of nutrients and other polluting elements into the environment. In addition, as proposed in the National Fertilizer Policy, the Government would maintain a database on the impact of fertilizers and other materials on the environment, and would establish monitoring and testing activities at strategic locations for environmental protection. The project also supported initiatives to develop indigenous nutrient resources, both organic and inorganic, biogas from animal wastes, and biofertilizers in the national microbiological laboratory for fixation of nitrogen by leguminous crops.

(c) Seeds - the main environmental issues related to pest management and management of pesticides in seed production and processing. At the time of project appraisal, the forthcoming National Pesticide Legislation was expected to introduce a pesticide registration scheme, which would set standards for pesticides importation, production and use in Ethiopia. Until that took place, the project included biocide guidelines and a negative list of pesticides, which were considered adequate to handle environmental risks.

In conclusion, the environmental legal instruments and the international environmental agreements indicated above provide legal support for enhancing food security through sustainable development. It is a recognized fact that environmental degradation leads to food insecurity and increased food production would only come through sustainable use of natural resources. To achieve food security for a particular community in a particular area, it is important that all development activities be carried out in an environmentally sustainable manner.

4.2 Food Security and Economic Policy

4.2.1 Introduction

An overall review of food security in Ethiopia requires one to briefly look into the economic policy and development strategy of the country and then assess the food security strategy and program in relation to the economic policy and development strategy. This approach will help to put the review of food security in its proper perspective.

Before reviewing the Economic Policy and Development Strategy, it is important to briefly assess the food security situation of Ethiopia. Ethiopia is the poorest country in the World. In 1999, Ethiopia's GNP per capita was only USD 100 while for Sub-Saharan Africa as a whole the figure was USD 500. If we use per capita
GNP for ranking, Ethiopia's rank is 206th out of 206 countries of the World. If one defines poverty as an income of One Dollar per day, nearly 31.5% or 20 million Ethiopians fall below the poverty line. If the definition of poverty is an income of Two USD per day, nearly 76.5% or 48 million Ethiopians fall below the poverty line. If we take malnutrition as the measure of food insecurity, the malnutrition of children under the age of five is 48 per cent, whereas the percentage for the rest of Africa is below 33 per cent.

According to official data sources, per capita food output of the country declined for 30 years, while the ability of the country to feed its 3 per cent growing population deteriorated from bad to worse. The output of foodgrains per capita in 1980/81 was 180kg, in 1989/90 150kg, and in 1993/94 139 kg. Output per capita declined 30kg from 1981 to 1990 and 11kg from 1990 to 1994. While there were some gains in the second half of the 1990s, food aid levels remain very high.

Leaving the food deficit situation aside, other indicators of development are also alarming. Infant and child mortality rates are the highest in Africa. Life expectancy at birth is the lowest in the World. The Human Development Index Ranking has worsened over the years. Only 26 per cent of the population has access to safe water and less than 8 per cent has access to sanitation. The comparable figure for Africa for both indicators is 48 per cent. Furthermore HIV/AIDS is complicating the matter.

Given the annual population growth of 3 percent, without strong measures poverty will worsen, the numbers that become food insecure will increase, and the number of Ethiopians living above the poverty line will decline.

4.2.2 Review of the Economic Policy as Related to Food Security

Ethiopia's new economic policy represented a change of the socialist economic policy to free market economic policy. The economic policy is divided into two major parts. The first part, which is a background to the policy, specifically analyzes the state of the economy, the major causes of economic crisis, the need for a new economic policy, and characteristics of the new economic policy. The analysis focused on the gloomy picture of the economic performance of the previous regime and highlighted the bright future awaiting the Ethiopian people. In its second part, the economic policy paper addressed sectoral policies in the area of agriculture, industry, trade, finance, transport and communication, mining and energy, urban development and construction and social affairs. In addition, the economic policy made provision for National Regional States Administration and other priority areas.
Even though the above broad areas of change and development make an indirect positive contribution to food security, the part of the economic policy that is directly linked with food security is the agricultural part. It is stated in the document that agriculture is the primary pillar of the Ethiopian economy, providing the country with employment, foreign exchange earning, a source of raw material for industry and sources of food for the population. For the purpose of this review the policy will be assessed under the topics of peasant agriculture, resettlement, modern large-scale farming and natural resource conservation and utilization.

**a) Peasant Agriculture Policy**

Peasant agriculture occupies the overwhelming majority of the country’s population and is the major source of agricultural output. The government’s agricultural policy rightly gives top priority to this sub-sector and has declared that the sub-sector needs unreserved effort and support for its development. The focus given to this sub-sector is proper. The production performance of the sub-sector for the last 10 years is not impressive due to natural and man-made problems.

One outstanding issue regarding peasant agriculture is the question of land ownership. In the agricultural policy, the government recognized the political and economic nature of land ownership but deferred dealing with it, stating that the question would be settled by a referendum that has not materialized till now. On the other hand, some argue that land is a factor of production like capital and it should be exchanged in the market. The notion of not subjecting land to be exchanged on the market goes against the logic of capitalism and is not supported by the history of agricultural development.

In a paper in April 2000, Allan Hoben argued that the way forward for food security was to give peasant farmers stronger and more individual use rights over land they currently hold, including the rights to mortgage, exchange, loan or sell their land use rights to other households. Others argue that land should remain under state and public ownership with guaranteed use right. These two lines of argument are not incompatible. Some proponents of state ownership fear that farmers by transferring their land will become landless. Other elements of this view are that the concentration of land in the hands of richer landholders will make the peasant poorer, and that businessmen and elites' buying land from farmers may lead to eviction, migration and political unrest, thus aggravating the food security problem.
An event that created controversy was the land re-distribution that took place in the Amhara National Regional State. The adjustment was called for to correct past discriminatory allocation of land. The distribution was politically motivated rather than based on economic and social considerations. Land distribution, though controversial, can be positive when considered from a food security point of view. The Amhara re-distribution awakened all landless peasants to the possibility of getting land but the government discontinued this program.

The strengthening and establishment of farmers’ service cooperatives on a voluntary basis is described in the agricultural policy as a measure that may improve the food security problem in rural society through employment.

**b) Resettlement Policy**

There is a long history of resettlement in Ethiopia, especially the spontaneous form of settlement, from the northern to the southern part of the country. Planned resettlement is recent and narrower in scope. The driving forces of resettlement, be it spontaneous or planned, are primarily economic, political, and environmental in nature. The economic policy document criticizes the resettlement program of the Derg regime from the point of view of the way it was implemented. In principle the present government believes that resettlement is one of the ways to achieve self-sufficiency in food production.

The policy stated that voluntary resettlement, which does not create conflicts between the settlers and local population, would have to be carried out to relieve shortage of land and relief population pressure. In reality no resettlement program has been carried out in the last 10 years except the small specific, one time resettlement scheme implemented in Dansha. Ethiopia is not a land hungry country. Less than half of the potentially arable land is cultivated with annual and perennial crops. This condition calls for a carefully planned resettlement program to increase agricultural output and reduce the food insecure population. The government’s second five year development, peace and democracy program states that before any settlement program is launched, Regional National States should identify and select areas suitable for settlement, and put in place basic physical and social infrastructure to make settlement sustainable. Whether this is going to be implemented or not is uncertain. In the long run, resettlement may increase food security in the country. Be that as it may, resettlement is not a part of the proposed Food Security Project.

c) **Modern Large-scale Farming**

In the agricultural policy, it is stated that the role of state farms will be reduced and the establishment of modern commercial private farms will be encouraged.
After making economic, financial and managerial analysis of what made them unprofitable the already established state farms will be disposed off in any of the following four ways:

- to farmers residing around the farms;
- to agricultural laborers employed on the farms provided the measure does not lead to conflict with the local community;
- to private investors on a concessionaire basis or to return the land to the local people after selling the assets on the farmland; and
- if necessary the state may operate on farms that are strategic to the economy jointly with domestic or foreign private capital.

The closure or abandonment of a significant number of the state farms did increase food insecure, as they were providing 4 per cent of agricultural output of the country. The closure of state farms also created a large number of jobless agricultural laborers.

The agricultural policy recognizes the decisive role of private capital for the development of large-scale modern farming. It is stated that the state will create enabling conditions to encourage both domestic and foreign private capital with no capital limitation. The policy states that the following four salient points will be addressed. First, the state will provide land in uninhabited area on a concessionaire basis either individually or on a joint venture basis. Second, the state will make land available to private investors after ascertaining that the provision will not result in eviction or affect the interests of the peasants, nomads and those practicing shifting cultivation. Third, the state will provide incentives in the form of access to bank credit, tax benefits, etc. to encourage the participation of private capital in modern large-scale farming. Fourth, the policy states that the state will create enabling mechanisms for the expansion of modern large-scale private farming by expanding physical and social infrastructure.

In reality, except for point number three, these goals are difficult to achieve. Specially point number two is difficult to achieve, as there is little land that does not touch the interests of peasants, shifting cultivators and nomads. The mechanism stated in point number four is very difficult to achieve, as they requires huge capital outlay. The achievements recorded in the last 10 years in establishing modern private large-scale farms in the country are insignificant and hence the opportunity to increase food security in the area of commercial farming is missed.
**d) Natural Resource Conservation and Utilization**

The agricultural policy drawn up in the economic policy states that policies regarding natural resource conservation and utilization will be formulated in the future. The question of natural resource conservation and rational utilization is the most urgent issue to be addressed. The policy specifically mentions three areas for which policy has to be formulated in the future. These include the conservation of soil, water and development of forest resources along with livestock resource development. These three are very important variables to increase food security in the country. One of the most food insecure segments of the society in Ethiopia are the nomads and there is an urgent need to have a livestock development policy and strategy.

In any case, the land ownership issue discussed earlier also puts limitations on individual farmers engaging in natural resource conservation and environmental protection. With proper policy and strategy, these areas will greatly promote the food security question in the medium and long-term time frame.

**4.2.3 Review of the Development Strategy as Related to Food Security**

The development strategy begins by describing the backwardness of the country and gives the reason as the political and economic forms of the past systems. The problems are deep-rooted and structural, and the solution lies in transforming the productivity of peasant agriculture and streamlining and reconstructing the manufacturing sector to make use of the extensive natural resources and manpower the country has. The name of the development strategy is known as Agricultural Development-Led Industrialization (ADLI). The strategy is to provide an all embracing framework for attaining the given objectives of development. The source of ADLI is the economic policy of the country, and it is organically linked to that policy.

It is stated in the development strategy paper that peasant Agriculture will be provided with special support and this special support is assumed to promote food self-sufficiency, raise the living standard of the people, generate foreign exchange, create employment, and increase availability of raw materials for industry. Any improvement in the above mentioned areas will of course increase food security. The special support envisaged to improve the lot of farmers and pastoralists includes expansion of the construction of rural roads, expansion of the distribution and use of fertilizers and improved seeds and expansion of extension services to farmers and pastoralists.

Agriculture has a key role to play in the economic development of the country. The priority given to the sector is consistent and appropriate with the existing
condition. The assessment made in the strategy document to award agriculture the top priority is impressive. The strategy proposed is broad enough to harness science, technology and extension to overcome the vagaries of nature and man. However ADLI claims that past strategies of development, especially the export-led strategy and import-substitution strategy was a failure. The claim is weak as it is not backed by strong reasoning, and the failures have been contributed to by the chronic and transitory challenges of recurrent drought, war and erratic weather conditions. ADLI, if consistently pursued, will increase the productivity of small holders.

According to the agricultural development strategy as formulated, three sequential phases of agricultural development strategy are viewed. In the 1st. phase the use of massive improved seed distribution is advocated to increase agricultural output. In the second phase small-scale irrigation development, expansion of agricultural infrastructure, the application of biotechnological/biochemical and technological inputs are called for to increase agricultural output. In the 3rd phase, the employment of the expanding rural labor force in non-agricultural activities is considered to improve the living standards of the rural population. All the three phases, if realized, will greatly improve the food security situation. So far no significant improvement has taken place as stipulated in the agriculture development strategy, when one takes into consideration the rate of population growth.

The strategy needs to analyze traditional agriculture, which is characterized by low yield and output, limited cultivated area, rain-fed agriculture, use of unimproved seeds, low level of production inputs, use of hand implements, traditional agro-forestry, overgrazing, land degradation, desertification and deficient nutrition. The transformation of peasant agriculture from traditional to improved practices will take place where agricultural research, extension and technology are strongly linked with an appropriate land tenure system, marketing, and good terms of trade. Food security calls for the constructive technological transformation of the society.

The priority setting of the economic development strategy of Ethiopia is quite in order. The investment programs and development priorities of the strategy is taken to be export-led growth in which agriculture, mining, industry and tourism sub-sectors play a leading role. Investment always entails employment that enhances food security.

Taken in its totality, the economic development strategy is comprehensive and appropriate. The priority settings are quite in order. If it is strictly adhered to and put into practices, it is a good instrument and guide to foster agricultural development in general and food security strategy in particular.
4.2.4 Food Security Strategy

The dimensions of food insecurity in Ethiopia are alarming. In the late 1980s domestic food production provided an average of 1,620 kcal per day per person. When one adds food imports into the calculation, 1,770 kcal per person per day is reached, which is 16 per cent below the acceptable minimum. Nearly 45 percent of the population in Ethiopia is food insecure and below the poverty line. Both chronic and transitory food insecurity situations are prevalent in both rural and urban areas. Per capita land holding and food production have markedly declined in the last two decades and has worsened the food security equation.

The numbers of Ethiopians being exposed to starvation and death are reinforced by recurrent drought, war, declining agricultural productivity, and disrupted ecological settings. These gloomy pictures are clearly stated in the Food Security Strategy. The strategy document lists the principal causes of food insecurity as inadequate and variable rainfall, soil fertility degradation, conflicts, transport and infrastructure problems, land tenure, geographic diversity, storage problems, poor nutrition and health, heavy work-load on women and the special problems of pastoralists.

The components of the food security strategy are outlined below.

**Components of the Food Security Strategy**

**I. Economic Growth and Employment**

a) maintain sound macro-economic policies and population policies;
b) give priority to rural development and focus on agriculture;
c) hold or lower real food prices through
   
   - increased production (short term: sustainable extension, inputs; medium term: research, credit, land policies)
   - lower-cost marketing (roads, transport, competition policies)

d) encourage rapid growth of small business enterprises that create jobs;
e) agricultural diversification and exports in support of food trade;
f) develop measures for regions with less reliable rainfall and pastoral areas.

**II. Additional Entitlement/Access and Targeted Programs (because growth is not enough)**
1. **Supplementary Employment/Income Schemes**

a) link with priorities for rural areas, agricultural production marketing, natural resource management, and nutrition/health focuses (i.e. roads, irrigation, soil conservation, water supply, sanitation);

b) link with lower real food prices (which support labor-intensive public works and job creation generally);

c) decentralize administration;

d) build on critical assessment of experience already available in Ethiopia;

e) develop sustainable financing plans (including donor assistance)

2. **Targeted Programs (for very poor and vulnerable groups)**

a) build on the successful Safety Net Program;

b) establish strong monitoring arrangements;

c) focus especially on women; and

d) plan graduation from targeted programs.

3. **Nutrition and Health Interventions**

a) children's immunization and diarrhea prevention;

b) nutrition education and family planning; and

c) better weaning foods, micronutrients, school feeding programs.

III. **Emergency Capabilities (to be maintained and strengthened)**

a) monitoring, surveillance, and early warning arrangements; and

b) food and relief distribution capabilities.

Classification of food insecure households in Ethiopia is presented in Table-33.
Table 33 - Classification of Food Insecure Households in Ethiopia

<table>
<thead>
<tr>
<th>Rural</th>
<th>Urban</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resource poor households</strong></td>
<td><strong>Low income households employed in the informal sector</strong></td>
<td><strong>Refugees</strong></td>
</tr>
<tr>
<td>- Land less peasants</td>
<td>- Groups outside the labor market</td>
<td>- Disabled people</td>
</tr>
<tr>
<td>- Oxen less peasants</td>
<td>- Elderly</td>
<td>- Ex-soldiers</td>
</tr>
<tr>
<td>- Poor pastoralists</td>
<td>- Disabled headed</td>
<td></td>
</tr>
<tr>
<td>- Female-Headed households</td>
<td>- Female-headed households</td>
<td></td>
</tr>
<tr>
<td>- Elderly persons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Disabled persons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Poor non-agricultural households</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Newly established settlers</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Transitory | | |
| **Resource poor households vulnerable to shocks** | **Urban poor vulnerable to economic shocks especially those causing food price rise.** | **Groups affected by temporary unrest** |
| - Farmers and others in drought prone areas | | |
| - Pastoralists with few animals | | |
| - Others vulnerable to economic shocks | | |
| - Low production area | | |

The classification is intended to underpin a better analytical understanding of the food insecure. The alternative to the above approach is to ask the person or the group to define their situation by themselves.

Past poverty alleviation oriented programs include the Emergency Recovery and Reconstruction Program, Ethiopian Social Rehabilitation Fund, Safety Net Program, intensified agricultural extension program, credit provision to the urban poor, food security program and the social sector programs.

According to Getahun Tafesse, the extent of absolute poverty levels, by reporting area, is shown below. The table shows the proportion of total population living below the poverty line, the extent to which the incomes of the poor lie below poverty line and the severity of poverty by giving more weight to the poverty of the poorest. Getahun's work provides a regional perspective that may strengthen the food security strategy for its better implementation.
### Absolute poverty levels by reporting areas

<table>
<thead>
<tr>
<th>Reporting Level</th>
<th>% age of poor people</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tigrai</td>
<td>57.9%</td>
</tr>
<tr>
<td>Afar</td>
<td>51.8%</td>
</tr>
<tr>
<td>North &amp; South Gonder</td>
<td>50.8%</td>
</tr>
<tr>
<td>East, West Gojam &amp; Agew Awi</td>
<td>64.5%</td>
</tr>
<tr>
<td>N. Wello &amp; Wag Hamra</td>
<td>60.0%</td>
</tr>
<tr>
<td>S. Wello, Oromiya &amp; N. Shewa</td>
<td>52.7%</td>
</tr>
<tr>
<td>East &amp; West Wellega</td>
<td>38.9%</td>
</tr>
<tr>
<td>ILLubabor &amp; Jimma</td>
<td>42.1%</td>
</tr>
<tr>
<td>North &amp; West Shewa</td>
<td>36.1%</td>
</tr>
<tr>
<td>E.Shewa, Arsi, Bale &amp; Borena</td>
<td>35.5%</td>
</tr>
<tr>
<td>East &amp; West Hararghe</td>
<td>22.1%</td>
</tr>
<tr>
<td>Somali</td>
<td>34.6%</td>
</tr>
<tr>
<td>Benshangul-Gimuz</td>
<td>47.6%</td>
</tr>
<tr>
<td>Yem, Keficho, Maji, Shekicho &amp; Bench</td>
<td>49.6%</td>
</tr>
<tr>
<td>N. &amp; S. Omo, Derashe &amp; Konso</td>
<td>77.4%</td>
</tr>
<tr>
<td>Hadiya, Kembata &amp; Gurage</td>
<td>52.2%</td>
</tr>
<tr>
<td>Sidama, Gedeo, Burji &amp; Amaro</td>
<td>41.8%</td>
</tr>
<tr>
<td>Gambella</td>
<td>41.8%</td>
</tr>
<tr>
<td>Harari</td>
<td>13.3%</td>
</tr>
<tr>
<td>Addis Ababa Rural</td>
<td>40.4%</td>
</tr>
<tr>
<td>Dire Dawa rural</td>
<td>36.6%</td>
</tr>
<tr>
<td>Mekele</td>
<td>46.5%</td>
</tr>
<tr>
<td>Bahir Dar</td>
<td>38.2%</td>
</tr>
<tr>
<td>Gonder</td>
<td>33.9%</td>
</tr>
<tr>
<td>Dessie</td>
<td>71.9%</td>
</tr>
<tr>
<td>Jimma</td>
<td>29.3%</td>
</tr>
<tr>
<td>Nazareth</td>
<td>29.3%</td>
</tr>
<tr>
<td>Debre-Zeit</td>
<td>44.2%</td>
</tr>
<tr>
<td>Harrar</td>
<td>29.1%</td>
</tr>
<tr>
<td>Addis Ababa urban</td>
<td>30.0%</td>
</tr>
<tr>
<td>Dire Dawa urban</td>
<td>24.6%</td>
</tr>
<tr>
<td>Other Urban</td>
<td>33.6%</td>
</tr>
<tr>
<td><strong>National</strong></td>
<td><strong>45.5%</strong></td>
</tr>
</tbody>
</table>

The food security strategy has also touched upon the key elements of economic growth and employment. The strategy articulates the relations between Macro-
Economic policies and population policies. It emphasizes and gives priority to agricultural and rural development and advocates agricultural production focusing on irrigation development and marketing infrastructure. It encourages rural enterprise formations as a result of increased agricultural output, export, and diversification. Livestock development in pastoralist areas will be given special consideration to improve food security through developing an early warning system, improvement of livestock feed, encouragement of cereal production, provision of better veterinary service, development of water supply, establishment of processing plants and encouragement of better livestock management.

The food security strategy does not touch on the role land ownership plays in improving food security. The strategy does not touch on resettlement as related to food insecurity. It does not also mention a word about how commercial farms can improve on the food security of the country. The strategy does not present the role natural resource conservation and utilization play to reduce food insecurity, though this aspect is dealt within the food security program.

4.2.5 Review of the Food Security Program of Ethiopia

Given the severity of food insecurity, a consensus was reached to formulate a national food security program, after the food security strategy was drawn up in December 1997 as presented under section 4.2, above. The food security strategy aims at increasing agricultural production and improving access/entitlement to food while managing food crises when they occur in a larger magnitude.

The national food security program's objective was to ensure access to food for vulnerable populations in the country and its expected outcome was that the large vulnerable population would be relieved from food insecurity. The criteria used in selecting 16 Woredas in Tigrai; 47 in Amhara; 59 Woredas in Oromia and 33 in Southern Nations Nationalities were environmental degradation, erratic rainfall, recurrent drought, deficit food production, poor infrastructure and poor access to safe water.

The major components proposed for the national program were eight in number: increased agricultural production (including livestock, fisheries and apiculture, small-scale irrigation); natural resource conservation management and use; infrastructural development (rural roads and marketing); credit service; health and education; water supply and finally capacity building (training, strengthening early warning, federal and regional food security efforts and data base).
The national food security program has so far not been taken up as the government envisaged. The proposed Food Security Project to be financed by IDA is designed to address many of the concerns of the national program, but in a selection from among the vulnerable Woredas identified for the national program, and using a different approach from that originally proposed, namely providing funds to Kebeles and local communities, with which the communities themselves will be able to select and implement their own programs, rather than having initiatives proposed for them from higher levels of government.

4.2.6 Review of Food Security Activities Undertaken in Ethiopia

The two main pillars of programs related to food security in Ethiopia over the past 15 years have been food aid to provide food directly to vulnerable groups, and agricultural development projects aimed at producing more food in the higher potential regions with more reliable rainfall and better soils. The proposed new Food Security Project does not involve food aid, and provides most of its funds for communities in the lower potential regions with less reliable rainfall that are especially vulnerable to food insecurity.

The total food aid delivered to Ethiopia in the years from 1985 to 2000 is estimated to be 11 million tons, valued conservatively at US$ 1.45 billion. For the period 1985 to 1994, about 27 percent was from USAID, 29 percent from the EEC and its individual member countries, 24 percent from the World Food Program, 7 percent from Canada, and 13 percent from all others. The Multi-Donor team in 1999 estimated that Food Security Assistance to Ethiopia planned and ongoing for the period 1998-2002 totaled about US$ 908 million equivalent. At least between 40 and 50 percent of that planned assistance is likely to be based on food aid, and a significant portion of the cash aid is aimed at investments in major roads, agricultural research and production in the higher potential regions, fertilizer supplies for the higher potential regions, building up emergency capabilities, and other targets not addressed by the new proposed Food Security Project, whose central concern is empowering communities with financial assistance with which they can make their own decisions about income and asset increasing initiatives that they have prioritized.

The mainstream food security initiatives undertaken in Ethiopia over the past 15 years have include:

(a) Large-scale distribution of relief and emergency food to vulnerable communities distressed by shocks related to drought and other calamities; the Disaster Prevention and Preparedness Commission (DPPC) of the Government has worked with most of the main NGOs to distribute food, which recent studies

2 Valuing this food aid at an average price for wheat of around US$130/ton in constant dollars of 1990.
show has not been distributed in an equitable way\(^3\), has left a substantial proportion of the vulnerable population with not enough food, and has made virtually no impact on the very serious problems of stunting suffered by children under 5 years of age in Ethiopia;

(b) Large scale, long term food-for-work programs in which food is exchanged for labor on terraces, bunds, catchment afforestation and other soil conservation and catchment protection measures; the best known is the long running World Food Program financed project 2488, “Rehabilitation and development of rural lands and infrastructure,” although other donors, notably the European Community, and a large number of NGOs working with food provided by the main bilateral donors, have implemented similar food for work schemes; the FAO “Assistance to Soil and Water Conservation Program,” for example, was closely linked with the WFP ETH/2488 food-for-work project, providing supporting technical assistance and training to government staff to carry out a soil and water conservation and afforestation campaign to arrest soil erosion, reduce sedimentation and halt the depletion of the country’s forest resources.

(c) Peasant Agricultural Development Programs (PADEPs) supported by several bilateral donors and the World Bank, comprising investments in the higher potential regions with more reliable rainfall and better soils, in support of improved agricultural extension and uptake of modern inputs, which together with other investments have achieved production increases in food grains.

(d) World Bank financed projects supporting agricultural research, fertilizer, and seeds, which complemented a comprehensive agricultural extension system with demonstration plots and input distribution, financed by Sasakawa-Global 2000 and the Government itself. These projects of the 1990s have financed initiatives that have had their major impact in the higher potential regions with more reliable rainfall and better soils. In conjunction with improved policies for food grain marketing adopted in the early 1990s, and better weather conditions in several years, especially in the second half of the 1990s, these projects have resulted in significant increases in production of food grains in the country.

(e) A World Bank financed Ethiopia Social Rehabilitation and Development Fund Project (ESRDF) under which grants are given to communities for projects of their choosing, mainly investments in rural water supply, small-scale irrigation, health and education infrastructure.

(f) Multi-donor financed programs to rehabilitate, repair, and construct major roads. These are now probably beginning to have some effect on slightly

lowering transport and marketing costs of food grains, thereby benefiting poorer consumers who spend a major proportion of their income on food grains.

4.2.7 Concluding Remarks of the Review

As it has been stated in the overall review, be it in per capita GNP or per capita food production or the social indicator variables, coupled with high rate of population growth, the country's food security situation has been declining at an alarming rate. The condition calls for an overall survival strategy.

The new economic policy of the country is dictated by the logic of free market economy, after the collapse of the socialist oriented economic policy of Ethiopia. In its content, the review presented the Federal, Sectoral, Regional and macro-economic profile of the economy as related to food security. The agricultural policy is reviewed from the point of peasant agriculture, large-scale farming, resettlement, natural resource conservation and utilization. Basic issues regarding land ownership, land tenure, land distribution and agrarian reforms are touched on but tangentially.

The development strategy, namely, Agriculture Development -Led Industrialization strategy (ADLI) was chosen among other alternative strategies. In this development strategy the agricultural policy that will accelerate self-sufficiency in food production is given top priority. Taken in its totality the economic development strategy and the priority settings are appropriate and are presented in an orderly manner.

The food security strategy, which is based on the economic policy and development strategy, calls for increased food production, increased employment and incomes, and the development of basic physical and social infrastructure. To challenge the food security problems in drought prone and degraded areas, a coordinated agricultural development program focusing on soil and water conservation, afforestation, and livestock resource development are envisaged. The improvement of land tenure including the selling and mortgaging of land is not considered in the strategy.

The national food security program document is well prepared and addresses drought prone, moisture deficit and degraded Woredas in Tigrai, Oromia, Amhara and Southern Ethiopian National Regional States. The reasons for omitting Afar, Somali, Gambela, Harari and Benshagul-Gumz Regional National States and urban areas from the list is not clear. Otherwise the economic policy, development strategy, the food security strategy and program are well linked together and logical. These logical and consistent linkages can be used to bring about improvements in the area of food security.
5. METHODS and TECHNIQUES used in ASSESSING and ANALYZING the IMPACTS

The Environmental and Social Impact Analysis included review of available documents, collection and collation of primary and secondary quantitative and qualitative data. Rapid field assessments have been carried out and focus group discussions held with the target communities. In each sample Woreda, two farmers associations (FAs/PAs) were chosen to conduct the focus group discussions. In each FA/PA two focus group discussions were held.

Selection of Sample Woredas

Two sample Woredas from each of the four Regions were selected based on the criteria set in the Terms of Reference (TOR) with the full participation and consent of the Food Security Units of the respective Regions. The criteria used include the following.

- The Woredas should be food insecure;
- The presence of a critical mass of technical expertise, in government services and NGOs;
- On going initiatives to build infrastructure, through food security and other programs;
- Located in a cluster with other selected food insecure Woredas;
- Complementary with other programs, especially long term soil and water improvement efforts such as those under the WFP, local level participatory planning (LLPP) projects, and
- Availability of a bank as near as possible (either at Woreda capital or at adjacent Woredas).

Based on these criteria, Bati and Tenta from Amhara; Chiro and Goro Gutu from Oromia; Bolsso Sore and Damot Gale from SNNP and Wokro and Tanqua Abergelle Woredas were selected. Similarly, from each Woreda two representative FAs/PAs were also selected for focus group discussions with the communities.

Rapid Field Assessment

Checklists/questionnaires were prepared to collect data from the project sites. The questionnaires were designed in such a way to cover the three food security components (availability, access and utilization components). The questionnaires
have also considered the physical, economical, and social dimensions of sustained development endeavors in view of the project interventions (small-scale irrigation, off-farm enterprises, construction of roads and market places).

**Participatory Rural Appraisal**

Group discussions were held with project beneficiaries and other concerned institutions that have a stake in the food security project especially in small-scale irrigation development, off-farm enterprises, construction of roads and market places, and provision of fertilizers. Two focus groups of project beneficiaries were consulted comprising male and female groups in each sample Woreda. The number of participants in each group ranged from 15 to 20.

Checklists were prepared to initiate discussions in light of the prime components of food security and project interventions that would be envisaged. The checklist used is presented in the appendices.

**Secondary Data Sources**

Secondary qualitative data sources including study documents in the area of food security were reviewed at Regional level. Baseline data were not available to accomplish impact assessment by intervention areas. In conducting impact assessments, the following approaches were considered to gain knowledge about previous, on-going, and future development areas.

- to differentiate the development endeavors of Government Institutions, Non-Government Organizations and the community;
- to conduct client satisfaction test by discussing their attitudes towards the development interventions;
- to conduct on-site environmental and social analysis;
- to review secondary time series agricultural production data to see if they reflect the interventions made in the sample Woredas; and
- to observe and appreciate the resources of the area.
6. ENVIRONMENTAL and SOCIAL ANALYSIS of INTERVENTIONS in FOOD INSECURE PEASANT ASSOCIATIONS

6.1 Projects in Amhara Region

6.1.1 Small-Scale Irrigation in Bati Woreda

The irrigation scheme in Bira Kebele was constructed during the Derg regime in response to the 1984 drought. The earth dam irrigation scheme can irrigate about 80 hectares of land. At present, however, only 25 hectares of land has been developed with a total number of 130 beneficiary households (0.19ha/hh). The majority of the farmers grow maize as their main crop, which has low market value.

The scheme was not initiated and developed with community based consultations. Moreover, the developed irrigated land was not divided amongst the users with active participation of the community. The residents of the Kebele believe that the underemployment or misuse of the scheme resulted from inefficient targeting of beneficiaries, in which some of them were from Bati town. Moreover, the cropping pattern and intensity does not consider factors including marketability of products and proximity to market places. Therefore, the irrigation scheme did not address the food insecurity problem of the area by utilizing its resources.

The productivity of the agricultural sector is very low. This can be substantiated by taking time series data (on average yield per hectare) ranging from year 1997 up to 2000. Average yield per hectare is generally decreasing. The total productive agricultural land is not sufficient to feed the increased number of mouths (Table-34). Price trends of agricultural produce are not encouraging and can not compensate the low productivity of the farmers (Table-35). Moreover, the productivity of the agricultural sector is affected by shortage of farm oxen, since only 58% of the households own farm oxen (Table-36).

Positive Impacts

Two irrigation sites were visited in Salmunae and Bira Kebeles of Bati Woreda. In Salmunae Kebele, a traditional irrigation scheme, developed by the community through the diversion of Salmunae River, has a command area of 40 ha. Currently, 15 ha of land has been brought under cultivation of a variety of horticultural crops. Forty-six households benefit out of this scheme with individual holdings of 0.32ha/hh. There is also another irrigation scheme in the same Kebele with a command area of about 6.5 ha and at present, only 3.5 ha is being cultivated by 9 household beneficiaries (0.38ha/hh).
Data and Information System: It was interesting to see basic and local data in handbooks at DAs offices, at Kebele Level (PA). Water Users Associations (WUA) also keep similar data books.

Negative impacts

Socioeconomic impacts

a) Community Consultation: The Rural Participatory Appraisal (RPA) techniques and tools are used to assess social benefits. But inadequacy of consultation and poor participation of the beneficiaries develop poor sense of ownership. Many of the interventions lack community consultation from the time of designing, planning and implementation.

b) Choice of Cropping Pattern: Crop selection should consider water use efficiency and market potential. Without these considerations, irrigation can not be an attractive business. The support of farm management and extension agents is vital to plan and organize annual calendars according to the agronomic features of crops and market demand.

c) Conflict on Water Use: There is always the potential for conflict between upper and lower stream irrigation users. This requires careful initial studies for equitable use of the resource. Establishment of an intermediation committee (between WUAs) together with extension agents will resolve the problem.

d) Extension Support: Number of DAs to beneficiary farmers is not satisfactory. Training, logistic support and follow-up (monitoring) activities are lacking.

Environmental Impacts

a) Leakage & Water logging: improper compaction of canals and earth dyke/dams resulted in leakage and water logging. Preventive maintenance and clearing the area are not periodically done as observed in Bira reservoir, northwest of Bati town.

b) Water borne vectors: flukes, mosquitoes and water borne diseases (malaria, Bilharizia, etc.) affect both humans and animals. Pesticides that are recommended to control these pests are sometimes not environmentally safe.

c) Minimum Water Flow/Inadequate Water Supply: minimum water flow for ecological balance in the upper and down stream of the rivers was not considered. The irrigation scheme in Salmanue Kebele cannot sufficiently provide water during the dry period, and as a result conflict occurs over resources between upper and lower stream users.

d) Change in land-use: many lower wetlands with various grass and herb species are converted to reservoir sites due expansion of irrigation schemes. Reservoir sites also diminish the scarce grazing areas.
e) **Soil Erosion:** all drought prone Woredas are severely degraded and soil erosion due to irrigation canals and drains is common.

f) **Flooding:** improper water shed management and poor catchment treatments with SWC structures damage schemes during flooding. In Bati Woreda at Salmanue PA annual flooding of the river is a problem heavily damaging mango, guava and papaya plantations.

h) **Afforestation:** a lot of effort and money have been expended on afforestation programs. However, survival rate of trees planted is very low (3.7% on communal lands and 17-20% on homesteads).

<table>
<thead>
<tr>
<th>Type of crops</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorghum</td>
<td>11</td>
<td>1</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Maize</td>
<td>12</td>
<td>3</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Barley</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Pulses</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Oil crops</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Teff</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

*Source: Woreda Agriculture Office, 2000*

<table>
<thead>
<tr>
<th>Type of crops</th>
<th>1998/99(Birr/qt)</th>
<th>1999/00(Birr/qt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tef</td>
<td>242.62</td>
<td>259.70</td>
</tr>
<tr>
<td>Barley</td>
<td>200.75</td>
<td>224.58</td>
</tr>
<tr>
<td>Wheat</td>
<td>225.58</td>
<td>185.83</td>
</tr>
<tr>
<td>Field peas</td>
<td>241.50</td>
<td>248.25</td>
</tr>
<tr>
<td>Horse bean</td>
<td>208.83</td>
<td>227.83</td>
</tr>
<tr>
<td>Chick bean</td>
<td>212.08</td>
<td>232.54</td>
</tr>
<tr>
<td>Lentil</td>
<td>337.83</td>
<td>333.00</td>
</tr>
<tr>
<td>Vetch</td>
<td>208.41</td>
<td>215.40</td>
</tr>
<tr>
<td>Maize</td>
<td>134.00</td>
<td>147.33</td>
</tr>
<tr>
<td>Sorghum</td>
<td>160.25</td>
<td>192.25</td>
</tr>
<tr>
<td>Finger millet</td>
<td>-</td>
<td>207.77</td>
</tr>
</tbody>
</table>

*Source: Woreda Agriculture Office, 2001*
Table 36 - Availability of Farm Oxen by Category of households by Number of farm oxen

<table>
<thead>
<tr>
<th>Category of households by Number of farm oxen</th>
<th>Number of households</th>
<th>% of total households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households without farm ox</td>
<td>6466</td>
<td>40.45</td>
</tr>
<tr>
<td>Households with one ox</td>
<td>8082</td>
<td>50.55</td>
</tr>
<tr>
<td>Households with two farm oxen</td>
<td>790</td>
<td>4.94</td>
</tr>
<tr>
<td>Households with three farm oxen</td>
<td>485</td>
<td>3.03</td>
</tr>
<tr>
<td>Households with more than three oxen</td>
<td>162</td>
<td>1.03</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15985</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: Woreda Agriculture Office, 2001

6.1.2 Off-farm activities in Bati Woreda

High population pressure coupled with land degradation problems has influenced the productivity of the agriculture sector. Rainfall intensity and distribution pattern, prevalent crop pests particularly beetles (tinziza) and diseases are the other factors that contribute to the low productivity of the agriculture sector of the area. Therefore, food security will be in jeopardy unless it is supported by on-farm and off-farm activities.

To provide relief to high population pressure and fragmented land in the rural community, off-farm activity schemes could be an alternative source of rural jobs and incomes. The off-farm activities mainly include petty trade, livestock fattening, metal and wood works, etc. They mainly constrained by factors including low market demand, ineffective credit and saving institutions, and lack of technical know-how (skill).

At present, limited numbers of the rural community are engaged in off-farm activities as a means of coping with adverse environmental impacts and/or generating additional income to offset the food insecurity gap created by the aforementioned prime factors.

The regional credit and saving institution is helping particularly women to undertake off-farm activities. The women have recognized the advantages of the credit and saving scheme in helping them to make enough profit from such activities to cover household expenses at least one month in a year. The coverage of credit and saving services is very limited, but could be expanded. Nevertheless, it is too early to think of positive and negative impacts of off-farm activities as there are no significant development interventions. The regional medium and small-scale enterprise development agency (REMSEDA), which is responsible for promoting the development of rural enterprises and off-farm activities, has been established recently, and it has not yet become operational at zonal and Woreda level.
6.1.3 Roads in Bati Woreda

Community accesses road situation

Bati Woreda borders Werebabo, Kalu, and Chefagelana Woredas and the Afar Region, and is linked to them via the main road crossing the Woreda center. As the Kebeles in Bati Woreda do not have all-weather access roads, they could not be effectively reached even using four-wheel drive vehicles. Dry weather access roads (trials) have been constructed with the participation of the community under employment generation scheme (EGS). Further, road development within the Woreda Kebeles is very important to improve access and mobility of the rural population to basic services.

Gaps

The community based road development program is below the standard level (RR 10 for example) to deliver the required services such as transportation of agricultural products and inputs, from and to Kebeles. Poor physical infrastructure particularly road development has aggravated the food insecurity status of the drought-affected Woredas of the region. Therefore, inter-and intra-woreda road networks that can improve access to marketing of agricultural products, provision of agricultural inputs, and transportation of agricultural produce from points of supply to points of demand are required.

Generally, Kebeles that are situated close to the main road have better access to markets and other social and economic services including health centers and banks. On the other hand, Kebeles that are away from the main road can not easily access available social and economic services present in the Woreda town. In order to improve physical access of the area, community self-help schemes should be encouraged beginning from the planning phase of development projects.

Positive impacts

Some of the community access roads interlink Kebeles in the dry season and in non-flooding months. However, priority should be given to link Woreda centers to zonal centers with special emphasis on drought affected Kebeles within the Woreda.

Negative impacts
a) *Soil erosion:* In many sites, the newly opened roads aggravated soil erosion and thus SWC measures, road side tree plantations, and grass strip coverage is needed.

*b) Farm Land Conflict:* The opening of community access roads through the scarce farm plots negatively affects poor farmers. Consultations are needed between the community’s road committee and the affected individuals. Possible alternative roads or compensation should be considered.

c) *Accidents:* Road safety and caution signs should be posted appropriate places to slow traffic and lower accidents.

6.1.4 Market places

The main market place of the Woreda is in Bati town. There are also several small market places in the Woreda Kebeles. For instance, the residents of Salmanae Kebele attend market places including Bati and other small markets in and out of their Kebeles such as Mohammed, Gerba, and Dega market places.

**Gaps**

Improving the road networks of the Woreda will greatly help the community’s market access to places in and out of the Woreda. The farmers of Bira and Salmanae Kebeles of Bati Woreda complained that market traders that come from different Kebeles of the Woreda dominantly bring similar commodities particularly livestock and therefore the price for livestock is low as compared to cereals, which are in short supply.

Nevertheless, there are no adequate access roads that link food deficit Woredas to food surplus producing areas/markets to lower food price at household level. Moreover, there are limited transport facilities in the area.

6.1.5 Input use in Bati Woreda

**Fertilizer**

*Positive Impact*

In *good rainy years*, proper fertilizer applications with improved seed varieties increase productivity/ha. In such a year, repayments are made on credits taken and food problems are alleviated at household level.
Negative Impact

The farmers of Bati Woreda generally do not favor fertilizer application as the rainfall pattern and intensity is not reliable. In many places, soils are sandy and some soils are salt affected. Repeated sowing and crop failures have been common in this area for the last five years. Additional production obtained from fertilizer use can not even cover the cost of fertilizer due to soil moisture stress. Moreover, the high price of the inputs is not affordable by the farmer (Table-37). Improved seed is hardly used, as the varieties are not drought tolerant and take longer time to mature.

Table 37 - Prices for Agricultural Inputs for year 2001 (Bati Woreda)

<table>
<thead>
<tr>
<th>Agricultural Inputs</th>
<th>Birr/qt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertilizer</td>
<td></td>
</tr>
<tr>
<td>-DAP</td>
<td>262</td>
</tr>
<tr>
<td>-Urea</td>
<td>158</td>
</tr>
<tr>
<td>Selected seeds</td>
<td></td>
</tr>
<tr>
<td>Maize A-511</td>
<td></td>
</tr>
<tr>
<td>- Katumani</td>
<td>268.54</td>
</tr>
<tr>
<td>- Tef</td>
<td>279.66</td>
</tr>
<tr>
<td>- Cr 37-Sorghum</td>
<td>426.50</td>
</tr>
<tr>
<td>- Beder</td>
<td>80</td>
</tr>
<tr>
<td>- Meko</td>
<td>268</td>
</tr>
<tr>
<td>- Gambela-1107</td>
<td></td>
</tr>
</tbody>
</table>

Source: Woreda Agriculture Office, 2001

6.1.6 Small scale irrigation in Tenta Woreda

As in Bati Woreda, productivity of agriculture in Tenta is very low. This can be substantiated by taking time series data of the crop yield performance from 1998 to 2000. Average yield per hectare is generally either constant or in a decreasing trend. Moreover, the total productive agricultural land developed is not sufficient to feed the increased number of people. Similarly, price trends of agricultural produce are not encouraging, and will not compensate the low productivity of the farmers. Moreover, the productivity of the agricultural sector is affected by shortage of farm oxen, since only 41% of the households have farm oxen (Tables-34, 35, 36).

Positive impacts

In Tenta Woreda, the cultivated area of land is estimated at 35,280 hectares of land, out of which 273 ha of land is under irrigation. Almost all crops grown under irrigation are cash crops including red pepper and other spices.
Two irrigation schemes are near completion by World Vision Ethiopia on Zaunat and Kurkur rivers, which have the capacity to develop 70 and 40ha of land, respectively. A total of 950 households (700 @ 0.1ha/hh in Zaunat; 250 @ 0.16ha/hh in Kurkur) will benefit from using these schemes. Moreover, an irrigation scheme on Meskel River has also been identified, and will be considered for implementation.

The irrigation projects intend to bring about impacts in improved capacity or efficiency to handle projects, improved community relation & participation, improved attitudinal change on adoption of new practices and establishment of community nurseries. But most of all the impact is on the incremental food crop production on household level.

**Negative impacts**

**Socioeconomic impacts**

a) **Diversification and poor planning**: Crop selection and diversification should be dictated by water availability and market demand. However, farmers lack advice on such matters. The farmers get low prices for their produce and have negative perceptions about irrigation development.

b) **Conflict on water use**: The down stream users and newly established irrigation schemes are affected by shortage of water. As a result conflicts occur frequently.

c) **Poor Design of Irrigation Infrastructures**: Low capacity of canals, poor compaction and infrastructural defects has impacts on efficient water use. Conflict among users occurs due to poor delivery of irrigation water.

d) **Community Consultation**: The inadequacy of consultation and poor participation of the beneficiaries develop poor sense of ownership.

e) **Research support**: There is little research support for irrigation agriculture to small-scale farmers.

**Environmental Impacts**

a) **Water borne vectors**: Tenta Woreda is situated over 3,000 masl, which makes the area relatively free from water borne/vector diseases. However, water vectors such as fluke require close monitoring.

b) **Insufficient Water Flow**: there is inadequate flow for down stream users and in most cases a minimum ecological balance water flow is not anticipated.

c) **Soil Erosion**: Overflow and scouring of irrigation water along diversion and main canals aggravate the already eroded and degraded soils due to improperly designed canals.
d) Flooding: Improper water shed management and catchment treatments with poor SWC structures induce risks of sudden flooding like the case of Krukur River irrigation diversion.

e) Afforestation and SWC:

SWC: The absence of manuals prepared in local languages is a constraint to implement SWC properly.

Nursery: Many of the nurseries grow mono-species (mainly eucalyptus), and therefore, there is low diversity in tree populations. There is no indigenous tree integrated plantation program.

Afforestation: A lot of effort and money have been expended by several aid and development agencies, but survival rate of trees planted is low (3.7% on communal and 17-20% on homestead).

Table 38 - Crop Yield- Qt/ha (1997 to 2000)

<table>
<thead>
<tr>
<th>Type of crops</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teff</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Barley</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Wheat</td>
<td>6</td>
<td>5</td>
<td>8.0</td>
<td>10</td>
</tr>
<tr>
<td>Sorghum</td>
<td>7</td>
<td>6</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Beans</td>
<td>5</td>
<td>6</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Peas</td>
<td>6</td>
<td>5</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Lentils</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Vetch</td>
<td>15</td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Chickpea</td>
<td>1</td>
<td>6</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: Woreda Agriculture Office, 2001

Table 39 - Price Trends of Agricultural Crops (Birr/Qt) (1996 to 2000)

<table>
<thead>
<tr>
<th>Type of crops</th>
<th>1996</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tef</td>
<td>252</td>
<td>263</td>
<td>213</td>
<td>244</td>
<td>252</td>
</tr>
<tr>
<td>Barley</td>
<td>192</td>
<td>159</td>
<td>158</td>
<td>204</td>
<td>214</td>
</tr>
<tr>
<td>Wheat</td>
<td>230</td>
<td>232</td>
<td>214</td>
<td>226</td>
<td>210</td>
</tr>
<tr>
<td>Field peas</td>
<td>210</td>
<td>209</td>
<td>189</td>
<td>201</td>
<td>205</td>
</tr>
<tr>
<td>Horse beans</td>
<td>202</td>
<td>192</td>
<td>179</td>
<td>191</td>
<td>169</td>
</tr>
<tr>
<td>Chick pea</td>
<td>194</td>
<td>185</td>
<td>167</td>
<td>180</td>
<td>169</td>
</tr>
<tr>
<td>Lentil</td>
<td>232</td>
<td>228</td>
<td>263</td>
<td>304</td>
<td>253</td>
</tr>
<tr>
<td>Vetch</td>
<td>196</td>
<td>163</td>
<td>128</td>
<td>154</td>
<td>136</td>
</tr>
<tr>
<td>Sorghum</td>
<td>182</td>
<td>167</td>
<td>236</td>
<td>214</td>
<td>258</td>
</tr>
</tbody>
</table>

Source: Woreda Agriculture Office, 2001
Table 40 - Availability of Farm Oxen

<table>
<thead>
<tr>
<th>Category of households by number of farm oxen</th>
<th>Number of households</th>
<th>% of total households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households without farm ox</td>
<td>21411</td>
<td>59.29</td>
</tr>
<tr>
<td>Households with one ox</td>
<td>9683</td>
<td>26.81</td>
</tr>
<tr>
<td>Households with two farm oxen</td>
<td>4635</td>
<td>12.83</td>
</tr>
<tr>
<td>Households with three farm oxen</td>
<td>381</td>
<td>1.07</td>
</tr>
<tr>
<td>Households with more than three oxen</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>36112</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: Woreda Agriculture Office, 2001

6.1.7 Off-farm activities in Tenta Woreda

General impression and implications

Tenta Woreda is a *Belg* (short-rains) and *Meher* (main season) growing area. Crops grown during the Belg period include barley, wheat, oats, flax and lentils. The Meher crops include barley, wheat, and faba beans.

High population pressure coupled with land degradation problem has negatively influenced the productivity of agriculture. Rainfall intensity and distribution pattern, prevalent crop pests and diseases, land shortage, shortage of farm oxen, limited grazing land and feed and lack of improved livestock breeds contribute to the low productivity of the agriculture sector of the area. Therefore, food security will be at risk unless it is supported by on-farm and off-farm activities. The off-farm activities include petty trade, livestock fattening, and metal works. The off-farm activities of the area are mainly constrained by low market demand, ineffective credit and saving institutions, and lack of technical know-how (skill).

The number of landless laborers is increasing, which adversely affects the food security status of the households. Off-farm activities are the prominent option to absorb the ever-increasing rural labor. Currently, a limited number of the rural community are engaged in off-farm activities as means of coping with adverse environmental impacts and/or generating additional income to offset the food insecurity gap created by the aforementioned prime factors. The Amhara Region micro-financing and Wisdom micro-financing institutions are providing the service to the community particularly to women to undertake off-farm activities. The women have recognized the advantages of credit and saving scheme. The profit generated from such activities can cover household expenses of one month in a year.
6.1.8 Roads in Tenta Woreda

Community accesses/road situation

Tenta Woreda borders North Wollo Zone, Ambasel, Legambo, Kutaber, Dessie Zuria and Mekdela Woredas. The Woreda center is situated about 128 kilometers away from Dessie town and access to the aforementioned adjacent Woredas is via the main road crossing the Woreda center.

Gaps

As the Kebeles of Tenta Woreda do not have all-weather access road, they could not be effectively reached using even four-wheel drive vehicles. There are, however, dry weather access roads (trials) constructed with the participation of community through Employment Generation Scheme (EGS). The community based road development programs need to be upgraded to a standardized level, say RR 10, to deliver required services such as transportation of agricultural products and inputs from and to Kebeles.

Positive impact

Generally, Kebeles that are situated close to the main road have better access to market and other social and economic services including health center, bank, and the like. At Regional level, priority is given to link Woreda centers to zonal centers with special emphasis on drought affected Woredas. On the other hand, road development within Woreda Kebeles is very important to improve access to services and mobility of the rural population.

Negative impact

Poor physical infrastructure, particularly road development, has aggravated the food insecurity status of the drought-affected Woredas of the Region. Therefore, inter-and intra-woreda road networks contribute a great deal to improve access to marketability of agricultural products, provision of agricultural inputs, transportation of agricultural produce from points of supply to points of demand, etc. On the other hand, Kebeles that are away from the main road can not easily access to available social and economic services present in the Woreda town. In order to improve physical access of the area, community self-help schemes should be encouraged.
6.1.9 Market places

The prime market place of the Woreda is located at Ajbar town, and Saturday is the market day. There are, however, a number of market places in and out of the Woreda premise, which include Dessie, Ajbar, Tenta, Feto, Masha, and Yrema.

Gaps

Improving the road networks of the Woreda will greatly improve the community market access to places in and out of the Woreda. The farmers of Meserbi and Ambamariam Keels of Tenta Woreda complained that markets attendants that come from different Keels of the Woreda dominantly bring similar commodities particularly livestock, and therefore lower the price for livestock in comparison with cereals which are in short supply.

Negative impact

Transportation cost from Tenta to Dessie is very high and discourages petty traders who are engaged in small retail business activities.

6.1.10 Input use in Tenta Woreda

Positive Impact of Fertilizer

In good rainy years, proper fertilizer applications with improved varieties will increase productivity /ha, return credit payments on time and alleviate food problem at household level. In the crop seasons of 1998/99 and 99/00, proper fertilizer applications with improved variety of 'tef' has increased yield to 8.6 and 9.3qt/ha compared to 3.3 and 5.4 qt/ha in 1996/97 and 97/98, respectively.

Negative impact of Fertilizer

The farmers of Tenta Woreda generally do not favor fertilizer application as the rainfall pattern and intensity is not reliable. Additional production obtained from fertilizer use can not even cover the cost of fertilizer, and usually due to the erratic pattern of the rain, it is difficult to think of a mere marginal production let alone additional production from input use.
6.2 PROJECTS IN OROMIA REGION

6.2.1 Small Scale Irrigation

Mada Talila Small Scale Irrigation Project

The Mada Talila small-scale irrigation scheme is located in Erer Mude Enchine PA in Goro Gutu Woreda of Eastern Hararghe zone. The scheme was constructed in 1995 with the help of the government. The source of irrigation water is a spring with an approximate discharge of 500 l/sec. The irrigated area is about 100ha and benefits more than 580 households.

The scheme enabled the farmers to grow crops at least twice a year. Using this irrigation scheme farmers grow maize, chat, coffee, sugar beets, onion and sugarcane. Though the farmers are using the irrigation system, they are still unable to be self sufficient in food because of the shortage of cultivable land. Due to over population, land holdings have been fragmented through divisions and re-divisions among the family members for the last several years, and the average land holding of a household is now less than 0.37 ha.

In order to use the existing irrigation system efficiently, it requires rehabilitation and upgrading the structures. Control gates and some parts of the canals are damaged. A canal, which was planned in the initial design, has not been constructed. The farmers are looking for assistance for maintaining the already damaged structures and construction of the canal, which was designed to irrigate more than 50 ha of additional land. Some of the PA members are also requesting a motor pump to irrigate about 35 ha of additional land at the upstream of the existing weir site.

Socio-Economic and Environmental Impacts of the Scheme

Positive impacts:

a) Enabled farmers to increase crop production by producing two to three times in a year;

b) Helped some farmers of the area from being dependent on rainfall;

c) Increased food security level to some extent in the PA in particular, in the Woreda in general;

d) Enable farmers to produce different types of crops and vegetables; and

e) Helped the farmers to develop irrigation skills and awareness towards the importance of irrigation.
Negative impacts

So far, Mada Talila small-scale irrigation has no significant negative socio-economic and environmental impacts. Environmental management has controlled the potential impact of Malaria outbreak due to irrigation. Farmers are fully aware of where and when mosquitoes multiply. They clean grasses and foliage from the weir and canals once in every week. They also drain out stagnant waters and swamps before the peak-breeding season of mosquitoes. During the peak period of malaria infection (May, September, November) responsible members of the community inform the health center in the Woreda to take necessary measures such as timely spraying of chemicals, treating of patients, etc. Generally, the interviewed members of the PA confirmed that there is no significant change in the health status of the people of the area due to the implementation of the irrigation scheme.

6.2.2 Soil and Water Conservation

Madisa Woltea PA’s Soil and Water Conservation Activity

Madisa-Woltea PA is one of the food insecure PAs in Goro-Gutu Woreda. The PA has a total of 5,559 people. Major problems of the PA are:

- Food shortage;
- Shortage of land (0.37 ha per household);
- Degradation of land and loss of soil fertility;
- Erratic nature of rainfall and recurrent drought;
- Crop pests, especially migratory birds, aphids, stock borer, etc.;
- Absence of surface water resources for irrigation;
- Absence of off-farm enterprises to engage excess labor force; and
- Absence of a high school near by.

In order to solve these chronic problems of the PA, government and non-government organizations are conducting some development activities. The major ongoing development activity is soil and water conservation.

Eastern Hararghe Catholic Church Aid and World Food Program have been involved in these activities. The activities include construction of soil conservation structures such as terraces, soil and stone bunds, contours, micro basins, check dams; planting of denuded terrain; biological measures such as inter cropping, and plantation of selected grass species such as vetiver grass for the stabilization of gullies.
Soil and water conservation activities in the Woreda involve community participation. Out of the 5,559 people of the PA, 1,186 people are getting direct benefit from food for work program. Eighty percent of the beneficiaries get food aid for the amount of work they contributed, while 20% get free supply. Those who are getting free food aid are aged and disabled members of the community.

Impact of Soil and Water Conservation in Madisa-Waltea PA

Positive Socio-economic and environmental impacts

- Control of soil erosion;
- Improved crop production by increasing soil fertility;
- Partial solution to fuel wood problem by planting trees on private and communal degraded lands;
- Terraces and contours helped to increase soil moisture;
- Food for work program created job opportunities and food supply for needy people;
- Helped in transferring skill to farmers about soil and water conservation techniques;
- Increased vegetation cover on the target areas of the Woreda.

Negative impacts

The soil and water conservation program has no negative impact on the natural environment. Rather, it has improved soil and land cover on the degraded areas. However, the beneficiaries are complaining about the amount of food grains that has been paid from food for work program. When it is compared with the minimum wage of a daily laborer, what the farmers earn may indeed be less.
Table 41 - Environmental and Social Impacts of Existing and Ongoing Food Security Interventions In Goro Gutu Woreda and Proposed Mitigation Measure

<table>
<thead>
<tr>
<th>Type of intervention</th>
<th>Location</th>
<th>Positive impact</th>
<th>Negative impact</th>
<th>Mitigation measure</th>
<th>Mitigation cost</th>
</tr>
</thead>
</table>
| Small scale irrigation | Erer Meda Enchine PA          | • Increase crop production  
• Enable farmers to grow crops and vegetables twice a year  
• Increase food security level  
• Make farmers independent of erratic rain  
• Develop irrigation skill | No significant negative impact | For efficient use of the scheme, it requires  
• Maintenance of broken structures  
• Construction of additional canal  
• supply of motor pump | 10,000  
20,000  
100,000 |
| Soil & water conservation work | Madisa-Wallet PA | • Prevent soil from erosion and increase soil fertility  
• Increase soil moisture content  
• Reduce soil degradation  
• Increase forest and land cover  
• Reduce fuel wood shortage | No significant negative impact | • To make soil conservation more sustainable on degraded communal land, it is better to distribute these lands to individuals and give proper extension survives and some incentives such as long term landowner ship and exemption of tax. | |
| Employment generation schemes(EGS) by governmental & non governmental or organizations | Madisa Walta PA | Mobilize farmers for development activities create Job opportunities  
Supply food for work | • Very low payment  
• Unnecessary dalliance of payment | Improve amount of payment (food for work)  
Effect payment on time. | |


6.2.3 Existing & Ongoing Interventions in Chiro Woreda

Two sample PAs were selected for the purpose of the social and environmental impacts of food security interventions in Chiro Woreda. The PAs are Bechesa and Ijefara. The two PAs are located at about 20 and 30 km away from the Woreda center, Asebe Teferi, respectively.

Ijefara PA

Ijefara is one of the food insecure PAs in Chiro Woreda. There are about 1,677 households in the PA. The total population of the PA in the year 2001 is about 8,104 (4,202 male and 3,900 female).

In this PA, there are few development activities run by Care Ethiopia and the Government. Two years ago Care Ethiopia constructed a veterinary service center and developed two springs for drinking water supply in the PA. There is a school and a clinic established by the government and the community.

Being one of the food insecure PAs, the major problem is the absence of an all weather road that connects to other parts of the Woreda. All the interviewed community members including women prioritized road construction as their major problem to be solved. The absence of a road, coupled with erratic rainfall; degraded land and shortage of farmland are the major constraints faced by the people of the PA.

The absence of access to bring what they have produced to the market places such as Aseba Teferi forced them to sell their products at very low prices in local markets. It is also one of the obstacles to developing off-farm activities. Therefore, the primary need of the community is the construction of all weather road.

Though, there is a perennial river in the PA, Ijefara River, lack of suitable land (rugged and steep slope) to irrigate hinders the exploitation of the resource.

Agricultural extension services are provided through Development Agents. However, members of the farm community complain that the extension packages are always incomplete. When there is improved seed, there will be no fertilizers or pesticides. Furthermore, the increasing prices of inputs (fertilizers, seeds, and pesticides) and the moisture stress prevailing in the area make the extension service unattractive.

Off-farm activities are very limited. Land less farmers and youngsters go to other places to look for work. The absence of development projects such as soil and water conservation, employment generation schemes and local labor participating programs force them to go to far away places.
Bechesa PA

Bechesa PA is also one of the selected food insecure PAs in the Chiro Woreda. It is located at about 20 km away from the Woreda center, Aseba Teferi. It is situated adjacent to Ijefara PA. The PA has about 1,442 households with a total population of 6,970 (3,553 male and 3,417 female).

The average land holding is 0.5 ha / household. Regarding the existing infrastructures, there are 2 springs, which were developed by Care Ethiopia and an elementary school (1-4th grade). There is no clinic or health post in the PA and sick people travel to Ijefara clinic for treatment.

Like Ijefara PA, the main problem of Bechesa is the absence of all weather roads. Other problems of the PA are shortage of food, absence of health facilities and absence of schools. Most of the problems of Bechesa are similar to that of Ijefara and any development intervention proposed for Ijefara PA will be applicable and important for Bechesa PA, as well.

6.3 Projects in SNNPR

6.3.1 Irrigation Projects

Of the small-scale irrigation schemes known to be existing in the Region, three are located in the Boloso Sore Woreda. These schemes and their features are given in the following table.

Table 42 - Features of Irrigation Schemes in Boloso Sore Woreda

<table>
<thead>
<tr>
<th>Name of the Project</th>
<th>Type</th>
<th>Construction completed</th>
<th>Command Area (ha)</th>
<th>No. of Beneficiary Households</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Weybo</td>
<td>Diversion on Weybo River</td>
<td>1995</td>
<td>150</td>
<td>500-600</td>
<td>Not fully utilized due to technical environmental and social problems.</td>
</tr>
<tr>
<td>2 Soke</td>
<td>Diversion on Soke River</td>
<td>1998</td>
<td>90</td>
<td>320</td>
<td>Not started operating due to problems in headwork structure.</td>
</tr>
<tr>
<td>3 Megera</td>
<td>Diversion on Megera River</td>
<td>2001</td>
<td>60</td>
<td>240</td>
<td>Construction being completed</td>
</tr>
</tbody>
</table>
The Weybo small-scale irrigation project (SSIP) is a good example of an irrigation development scheme with significant environmental and social impacts. Therefore, a rapid assessment of the environmental and social effects of this scheme was made and main findings are described below.

**Positive Impacts**

Although the development scheme could not be utilized to its full capacity due to technical, environmental and social problems, it has introduced irrigated farming to an area affected by recurrent drought and famine. As indicated by the consulted local people about 30 to 40 households have benefited from the scheme by growing cereals (maize), root crops (sweet potato), and vegetables, as well as by irrigating fruit trees (mango and avocado) and coffee in the dry season.

The other benefit of the scheme is the provision of irrigated pasture (grasses mainly growing along the canals and at waterlogged areas) for livestock feed in the dry season.

**Negative Impacts**

A number of adverse environmental and social impacts have been identified in the course of the construction and operation of the irrigation development. The major impacts include:

*a) Increased Health Risks*

The most significant adverse effect of the irrigation scheme was the increase of malaria incidence in the area, often in epidemic forms. Malaria was endemic in the area before the implementation of the project. However, a significant increase in its rate of transmission was observed starting from the construction phase. During the construction of the diversion weir, stagnant water points or pools in the river course were created that became suitable for vector breeding sites. The multiplication of vector mosquitoes ultimately resulted in a malaria epidemic that, coupled with famine, caused deaths of many people in the area (1994). Since the beginning of the operation of the project, the risk of malaria has changed from being seasonal to perennial, and the area is known for its recurrent malaria epidemic causing a major risk to human health. The problem is aggravated by the fact that large portions of the main canal and other secondary canals run along densely populated settlement areas and the irrigable areas are in the vicinity of the settlements.

*b) Siltation*

There is a high rate of siltation at the diversion weir and in the main canal due to high sediment load in the river water. Most parts of the catchment area are characterized by intensive cultivation that exposes the soil to runoff erosion. The
weir site and main canal were heavily silted up before they were cleared or desilted in 2000/2001 through a food for work program.

c) Waterlogging

Waterlogging is a significant problem in some parts of the project area. It is mainly related to design (slope) problem. The main canal was broken at several places by the people who were not provided with secondary and tertiary canals. Cattle, drinking from the canal water or crossing over the canal, damaged canal banks. Lack of a drainage system for removal of excess water from the irrigated areas, siltation of the main canal resulting in overflow of water, seepage losses through the unlined canals, and poor water management practices are the main causes of waterlogging in the area.

d) Impediment to Movement of People and Livestock

The main canal (which is about 9km long) was not provided with passageways, cattle corridors or crossing structures. This has become a barrier to movement of people (particularly to children) and their animals. The local people indicated that one child died and two children became handicapped by falling in the canal. The inhabitants also indicated that the overflows from the main canal sometimes enter into some houses located along the canal.

e) Vegetation Growth

Although notorious aquatic weeds have yet not appeared in the area, there are dense growths of grasses and herbaceous plants (weeds) along the canals and in waterlogged areas.

f) Social Problems

The households whose irrigable plots are located along the upper and lower sections of the main canal could not get water as these parts of the project area were not provided with secondary and tertiary canals. As a result they often try to divert water into their farms by breaking the main canal.

Information obtained from various sources indicate that most of the irrigation schemes implemented in the Region in general and in the food deficit Woredas in particular have these and other environmental and social problems.

6.3.2 Road Projects

The existing road network and availability of market places in the sample Woredas is relatively good. The main roads serving Damot Gale Woreda are the Addis Ababa- Shashemene-Sodo Road (asphalt) and Boditi-Shanto Road (all weather gravel road). There are also a number of rural roads linking every peasant association in the Woreda. Boloso Sore Woreda is also linked by a number of all
weather roads including Sodo-Areka-Hossaina Road (main road/RR50), Areka-Bombe (Route-I), Areka-Bombe (Route-II) and Sodo-Gununo-Areka. Most of the peasant associations in this Woreda are also linked by a road network, most of which is all weather road.

The existing roads and future road developments have many beneficial and adverse social and environmental impacts. The main impacts of the road projects are discussed below.

**Positive Impacts**

Among the positive impacts of road construction and operation, the major ones are the following:

- Construction and operation of road projects facilitates the improvement and development of the local economy by providing access to market outlets and supply of agricultural inputs. With easy access, the potential availability of agricultural inputs will increase and input costs reduced due to lower transport costs.
- Construction of a road or its improvement would promote the transport of agricultural produce and other homemade products to market centers enabling the local farmers to sell at a better price.
- Improved access helps the easy transport of relief food in food shortage areas.
- Improved access helps to promote extension services, as it makes possible increased mobility of extension workers.
- A good road provides opportunities for commerce, trade and other off-farm activities.
- Labor intensive road projects would bring employment opportunities and income benefits for the local people during the construction phase, as well as indirect job opportunities by creating possibilities for new markets and services.
- Improved accessibility creates opportunities for the improvement of social services such as health, education, potable water supply and other social services.
- Road construction would likely help to improve the living condition of the local people especially women, by offering opportunities to reduce their physical burden of head loading due to the opportunities to use transport rather than to walk. Some women could also be engaged in income generating activities during the construction period, some of which could be running restaurants and bars.
Negative Impacts

The main negative environmental and social impacts of the existing roads and future road projects to be implemented in the food deficit Woredas in general and in the sample Woredas in particular are discussed below.

a) Soil Erosion and Contamination

Soil erosion can be a major environmental problem in road projects. Usually it is more serious in new road developments where the road construction affects productive land by removing soil from the affected areas.

The degree of soil erosion along most parts of the existing roads in the sample Woredas is minor as the soils are well stabilized (vegetated or grassed) and they mostly run along gently stopping terrain. The recently constructed main roads such as the Sodo-Chida Road are provided with erosion protection structures such as concrete lined sideditches and diverting drains in erosion prone areas. However, it is severe at some localities particularly along the Sashemene-Sodo Road (along the section between Alaba and Boditi) and along the Sodo-Hosaina Road (along a steeper gradient), as well as at drainage channels (streams, rivers and runoff ways intercepting the roads).

Road construction may aggravate soil erosion by diverting and concentrating runoff water and creating larger water harvesting areas. The water concentrated in the diverting drains mostly causes severe gulley erosion downstream, particularly on steeper slopes. Erosion could be serious where the road construction involves considerable cut-and-fill especially in hilly and mountainous terrain. Construction of drainage structures that involves excavation for foundation will temporarily disturb the topsoil and subsoil, and aggravate soil erosion at those sites. Excavations at borrow pits and quarry sites will also expose the soil to erosion.

Adverse impacts on soils could also arise from contamination by disposal of used lubricants and spills of oils and fuel from engines of vehicles and diesel operating machinery particularly during construction.

b) Impacts on Slope Stability and Landscape

Along the existing roads in the sample Woredas, there is no major slope instability problems observed. However, there are some landsliding problems on the banks of streams at nearby crossing structures (bridges or culverts).

Construction of new roads may trigger slips and landslides in steep areas due to cutting and grabbing by heavy equipment. The degree of the problem depends on the geological formation of the land, extent of vegetation cover, angles of cut-and-fill and mitigation measures taken to protect vulnerable slopes.

Construction of new roads can cause some aesthetic intrusion or landscape deterioration in the region impacted by the road construction. This impact could
be more prominent in sections of cut-and-fill, at quarry and borrow sites, at depots of waste disposal, and at localities where side casting of materials from road cuts is practiced. In addition, scars from road cuts particularly on steep slopes could also be formed at several sections. Scars and induced landslides are prominent along the recently constructed Sodo-Chida Road that mostly traverses rugged hilly and mountains terrain.

c) Impacts on Water Resources

Adverse impacts on water resources are mainly related to flow modification and increased erosion due to the road construction. Road construction usually modifies the natural flow of surface water and drainage patterns along the route by concentrating flows at certain points and in many cases increasing the speed of flow. These changes can contribute to soil erosion, flooding, channel modification and siltation of streams. Among the impacts of road construction on water resources and drainage, the main ones include:

- Interruption of subsoil and overland drainage patterns in areas of cut and fill;
- Increased suspended sediment in streams affected by road cut erosion, decline in water quality and increased sedimentation downstream;
- Pollution of streams intercepted by the road from spills of chemicals and cement slag during construction of drainage structures;
- Encroachment in groundwater aquifers, affecting local ground water recharge and quality, and
- Reduction and/or pollution of source of water supply for the local people due to water use for construction works and collection of sand from river courses.

d) Impacts on Flora and Fauna

In the sample Woredas there are no significant areas of natural vegetation and wildlife habitats that could be affected due to operation of the existing roads or construction and operation of future road projects. However, there are some remnant trees and man-made plantations (mainly eucalyptus) in most places that could be affected.

There are some Woredas which have major forestlands or areas of important vegetation cover and wildlife reserves that deserve preservation. These areas include Woredas in South Omo and Bench Maji Zones, and Kemba Woreda in Gamo Gofa Zone. In general the degree of impact needs site specific assessment. Possible impacts could include:

- Destruction of vegetation available on route alignment or in the right-of-way at borrow pits and quarry sites, depots for waste dumps, and construction camps;
• Fragmentation of habitats that provide protection for fauna and flora, where they are intersected by the road alignment; and

• Disruption of habitat use patterns of wild animals or impediment to movement of wild animals.

e) Loss of Productive Lands

Road construction requires consumption of land for the road right-of-way, selected materials (borrows), quarries, etc. The narrow, linear character of roads makes the impact of lost land seem minimal, but when the width of the right-of-way is multiplied by its length, the total area of land removed from production becomes more significant especially in the densely populated Woredas. As the local economy is based on agriculture and there is shortage of land in many of the Woredas, the loss of this productive land may have significant socio-economic implications.

Soil productivity could also be reduced due to compaction with heavy machinery and side tipping of spoil materials from road cuttings during construction. In addition, erosion induced by the road construction could affect the productivity of adjacent lands especially in steep areas.

Furthermore fragmentation of individual plots in areas traversed by new roads can have significant socio-economic impacts especially in the densely settled Woredas.

f) Destruction of Buildings and Commercial Trees

Construction of new roads or rehabilitation/upgrading of existing roads may require demolishing of buildings and cutting of trees located on the alignment. Particularly, this could be a significant impact in the densely populated Woredas.

g) Environmental and Social Disruption by Construction Camps

The establishment of construction camps usually causes some negative impacts on the local environment and the nearby communities. Spreading of communicable diseases, conflicts between the locals and the campers, deterioration of environmental sanitation, encroachment into the local flora and fauna are among the potential problems.

h) Public Health Issues

The potential public health problems related to road development include:

• Health hazard and nuisance caused by dust blown by vehicles moving on unpaved roads;

• Spreading of sexually transmitted diseases mainly due to the relations between the construction workers and local women especially commercial sex workers;
• Creation of stagnant water pools in borrow pits, quarries, roadside ditches, etc. that are suitable sites for breeding of malarial mosquitoes. As malaria is prevalent in most parts of the food deficit Woredas due attention need to be given in the design and construction of road projects.

6.3.3 Crop Production and Input Use Interventions

Positive Impacts

• Sustainable household food security-anticipated for about 907,028 target population in the five-year program;

• Increased agricultural production through provision of agricultural inputs, strengthening of extension services, planning and implementing of small-scale irrigation schemes, improvement of livestock development and watershed development;

• Improved adoption of modern agricultural technologies;

• Adoption of improved farming and livestock development practices promoted;

• Soil fertility and soil moisture maintained through promoted development activities (soil erosion reduced);

• Increased availability of fuel wood and construction materials;

• Reduced sedimentation in streams and rivers that drain the catchments treated by the watershed development program. This is an advantage for irrigation schemes depending on these streams and rivers at downstream, as the rate of siltation will reduce.

Negative Impacts

• The use of improved seeds (improved varieties of crops) may bring genetic erosion of the native cultivars, i.e. the diverse low yielding varieties could be displaced by a few new improved varieties. This is a disadvantage in terms of the conservation of bio-diversity.

• The afforestation (that could be part of the watershed management) and agro-forestry programs mostly use or depend on exotic tree species that usually displace the indigenous plant species especially the lower plants. This condition also may reduce biological diversity.

• In the agro-forestry development program the exotic species such as eucalyptus trees that are commonly planted due to their fast growing characteristics and preference for fuel wood and construction purposes, could be widely planted. These species are sometimes alleged to have negative effects on soil fertility and soil moisture, in immediately adjacent lands.
6.4 Projects in Tigrai Region

6.4.1 Environmental Impacts

Irrigation Schemes (Tanqua Abergelle Woreda)

'Hibret' Irrigation Scheme

The scheme has commenced recently and the agricultural activities are under way. It is too early to observe the impacts of the scheme. However, the following impacts may be anticipated in the future:

a) Although the source of water for the irrigation mainly comes from rain, the storage period is limited to the rainy season. However, if the stored water stays for longer period, breeding of malarial mosquitoes is a possibility (Malaria is the major disease affecting many people in the area).

b) If the condition stated in (a) prevails, salinization of the soil is possible.

'Lemlem' Pond for Livestock

This pond also collects water from the rainfall and stays for sometime after the rain ceases. In this case also, there is a possibility for mosquito breeding.

Agbe Irrigation Scheme

According to the opinion of the people benefiting from this scheme, there is no health hazard reported; however, like any irrigation schemes, spread of malaria and salinization of soils may prevail.

Roads and Market Places

Roads leading to all sites in the Woreda are all tracks and in some sections the tracks are non-existent. In the sample Woreda, about 140 km of rural roads/access is required. Taking into consideration the climate and soil condition of the Woreda, unless precautions are taken, the following impacts may be expected from road construction activities:

i) Erosion from cut and fills;

ii) Water contamination especially from erosion of soil;

iii) Trees and shrubs within the construction limit will be removed;

iv) If there are detours, additional destruction of shrubs (trees) may occur;

v) If there are access roads to quarry sites, these also take additional land, trees and shrubs;

Since the sites are not very far from the Abi Adi-Sekota road that passes through Yechilla and if the access roads are connected to this road, access to major market centers will be improved.
Soil Conservation

Soil conservation is undertaken to improve the environment itself. The objectives of soil conservation activities are:

i) Reduced soil erosion;
ii) Increased soil fertility;
iii) Reduced sedimentation problems;
iv) Stabilizing gullies and river banks,
v) Rehabilitating degraded lands, and
vi) Improving ecological balance of the area.

Therefore, there are no adverse effects resulting from such activities.

Crop production & Agricultural Impacts

From the group discussions made on the sites, farmers are aware of incremental yield from application of fertilizers. Nevertheless, they complained about the escalation of fertilizer prices, which they found unaffordable to apply annually.

On the other hand, the sandy soils of the area are not responsive to fertilizers to raise yields to satisfactory level. Although fertilizers may increase crop yields, there is the danger of contamination of drinking water that may be washed away into the ground, if fertilizers are used to excess.

Off -Farm Activities

Off-farm activities in the area (existing as well as potential) are mainly cattle trading and other activities like honey and dairy production. An adverse environmental impact that may occur is overgrazing of the land and creating a favorable condition for land degradation.

Irrigation Schemes (Wukro Woreda)

I) Abrha Atsbha

This irrigation scheme is found 15km away from the town of Wukro. It operates from water to be obtained from the wells of approximately 10m deep currently being dug. The system of irrigation is an overhead sprinkling type. If the wells are kept clean and safe, there will be no substantial adverse effect on the environment.

II) Mesano Irrigation

This existing irrigation scheme is located at a distance of 15 km from the town of Agula. According to the information obtained from the Agriculture Office of the Woreda, salts are affecting the scheme and if unchecked this could be disastrous.
Roads and Market Places

The sampled sites in Wukro Woreda have better access and are connected to the nearby towns like Wukro and Agula. No significant adverse conditions were observed on these roads. However, new road constructions may have the following adverse impacts:

a) Erosion at cut and fill sites and side slopes;
b) Contamination of soil and water, and
c) Removal of trees and shrubs.

Regarding market places, there are several villages and urban centers to which people have adequate access. In Wukro Woreda, although there is no problem of road connecting the rural with the urban centers, since the vehicular traffic using these roads is minimal.

Soil Conservation

This intervention is being undertaken to restore/upgrade the quality of the environment itself. Soil conservation activities have positive impacts to the environment.

Crop Production and Agricultural Impacts

Farmers in the area use chemical fertilizers. The cost of fertilizers, however, is beyond the affordability of the farmers. Crop yields are also low and fertilizers (at current prices) do not pay significantly.

Chemical fertilizers, if used to excess, especially in irrigated areas, may pollute water and soil, which may be hazardous in water supply schemes and to downstream settlers/users.

Off-farm Activities

The off-farm activities in Wukro Woreda are petty trade activities and wage labor in construction sites and urban areas. There are no adverse environmental impacts of such activities.

6.4.2 Socioeconomic Impacts

Irrigation Development

The use of irrigation agriculture is a must and irrigation schemes are core development resources to bring sustainable food and pasture crops (if possible) production to achieve tangible food security where rainfed agriculture is unreliable. However, the water flowing in irrigation systems is a social product of humans as much as it is a natural product and is a public commodity. There are socioeconomic issues that are embedded in the operational process of all irrigation systems.
In irrigation schemes, people who are beneficiaries must organize socially in order to secure water, transport it, divide it into equal shares, enforce rules for its distribution and dispose of the unused portion. Therefore, the in-depth understanding of technical and agronomic problems of irrigation is important. In the region, there are water users associations, where such irrigation schemes are functional at ‘Agebe’ and ‘Messano’ irrigation sites. Such associations must be strengthened, to improve operation and maintenance of the physical infrastructure, improve performance of irrigation schemes, and avoid adverse environmental effects arising from water borne diseases. These unintended effects often result from inattention to the social association of the water users.

The main tasks of the water users associations are:-

i) Water acquisition, which is the task of obtaining water for irrigation system;

ii) Water allocation that involves the task of dividing and distributing the systems supply to its users;

iii) System maintenance - the task of repairing, clearing and otherwise reconditioning the physical apparatus of the system. In this case the water users association of ‘Messano’ in Wukro and ‘Agebe’ in Abergelle, Woredas are weak, which leads to decrease of water flows and the reduction in numbers of households who use the schemes. This decreases production and has a negative impact on the food security objective;

iv) Resource mobilization, the duty of activating and accumulating labor, materials, funds and other resources needed to implement tasks like system maintenance;

v) Conflict management - when disputes and disagreements arise from operations such as water allocation.

Rural Roads and Markets

Rural roads facilitate profound socioeconomic effects in rural communities, among them significant changes in rural production systems and productivity per unit of resource. But most of the irrigation schemes produce cash crops which often become more profitable than food crops, and the resulting decline in local consumption food production may create a potentially dangerous dependency on external sources of supply. Access to credit, extension, and marketing services will be facilitated if rural roads are constructed. Rural roads will help to structure population growth and settlement in rural areas. Households cluster in the vicinity of roads and crossroads may place excessive pressure on local resources such as water and wood. Thus, if a road (roads) opens access to good agricultural land, significant in-migration of new farm families may occur, reducing the pressure around the previous road. Rural roads also provide local residents with access to opportunities outside their locality causing significant temporary or permanent out
migration, which will have major consequences for the social structure of the rural areas near the road.

In Kenya, road improvements in densely populated areas provide access to urban job opportunities for men leaving farm management largely in the hands of women. (Putting People First, 1991).

In addition to the short term job-opportunities in rural roads work and the broad opportunities for increased employment in agriculture, rural road improvement also encourages the growth of off-farm employment opportunities in commerce, services and rural small scale cottage industries.

The rural road improvement provides a powerful inducement for service providers to extend into rural areas. Rural communities may build schools and clinics. But they will not receive adequate service until the center is staffed by professionals with ready access to supplies, supervision, and support, and these service providers tend to come to rural areas with improved access. This is the problem faced at Wukro and Abergelle, whose health and education sectors appear to be under staffed both in quantity and quality of skill. On the other hand road accessibility alone cannot ensure successful service delivery, since the service providers as well as the communities must have the (access) funds to support travel costs. This is the problem of the community in which donkeys and human power are used to transport their products and goods. Also, the service provided must be appropriate to the needs of the community if they are to have a positive impact on rural development.

The term market would normally refer to marketplaces as open spaces where commodities are bought and sold. However, marketing is a process in which ownership of goods and produce is transferred from sellers to buyers who may be final consumers or intermediaries. To achieve this requires sales locations, sellers, buyers and transactions. Thus, markets of products (agricultural) consists primarily of moving products from production sites to points of final consumption by procedures retailers, wholesalers and even processors. With accessible marketing systems, food insecure areas will buy food crops from food surplus areas through marketing. There are also many remote areas far from markets, which in effect cannot supply their product and buy what they need.

As observed in the region, marketing activity is the main and potential sector of off-farm income activities. Then the development of markets is one of decreasing the pressure on farmland as many people may switch to trade and market. The development and emergence of markets are positively related to road developments. As roads open the way to a closed society in remote areas, many markets will be visited and constructed. Thus, the people will have access to market information, what to produce, where and when to sell their products. Therefore, the farmers will have a strong bargaining power due to the access to market information of price, increasing their power in price determination of their product and goods they bought, avoiding being merely price takers, and holding the position of price makers.
Soil and Water Conservation

Farmers are seriously aware of the need for conservation of soil and water. Due to their very high awareness, farmers are participating in problem identification, planning, implementation and evaluations of various types of soil and water conservation without imposition, using the techniques (PRA and RRA) with the subject matter specialist (SMS) and development agents (DAs) to help them. Furthermore, there is a good understanding that, a good vegetation cover minimizes the impact of heavy rain drops (in some area) on the surface and the detachment of soil particles. Vegetation is also believed to maintain soil infiltration capacity, which reduces run-off of rainwater. Thus, planting trees around the gullies to stabilize the checkdams, and materialization of area enclosures are becoming well known soil and water conservation measures. Therefore, there is a positive fertile ground to implement food security projects as the participation and perceptions of the people are already appreciable.

The comment raised as negative impact on soil and water conservation is that women approaching child delivery and those recently delivered are to be treated differently from the rest of the community. Their suggestion is ‘women who are at this condition would be given easier work and complete rest for some months but be paid equally with the rest. This is a notion to reflect maternity leave like the urban civil servant women.

Agricultural production and use of Agricultural inputs

The area is dominated by crop and livestock agriculture. It is the main economic activity with very small land holdings (1.2 ha per household) coupled with extremely poor fertility of soil. Due to this, the average crop yield per hectare is 5.3 quintals and is about 2.75 quintals per household (from close to half a hectare of cropped land). This clearly shows that there is a critical shortage of land. The rainfall pattern is erratic and unreliable. Pressure on land use is high, which leads to degradation of land. Therefore, alternatives of production sector could be facilitated to decrease the intensive use of agricultural land. One of the measures may be to use livestock-forestry integrated production systems with promising markets for livestock and livestock products. The second measure is to increase and support, systematically, the employment of farmers in off-farm activities and eventually some may leave their farming practice, for good.

The third measure is to introduce systematic and well-studied approach of settlement programs from high-degraded areas to sparsely populated low lands. For example, in the Woreda of Tanqua Abergelle, farmers in ‘Yekere Tabia’ are willing to accept community settlement elsewhere, due to the tabia’s poor productivity.

Crop production is induced with industrial fertilizer input to boost yield per hectare of land. Its application is well accepted by the majority of the farmers. But, the fertilizer application has got a negative image in the farmers mind, since they
believe that land under production this year with fertilizer will not yield as much next year without fertilizer. As an alternative to this inorganic fertilizer, the production of organic fertilizer (compost) is well understood and has got acceptance at this time. It has an advantage over the inorganic fertilizer that, the land treated with it can produce for 3(three) years without reducing the yield.

The second advantage is said that, it did not require water like the industrial fertilizer. The problem mentioned is, there is scarcity of compost production materials, as well as the transporting of it to the farmland is laborious and tedious.

Most of the households are without farm oxen. This is a major constraint not to prepare farmlands on time. If the farm is not prepared on time with best response to moisture content to production, weeds will dominate the crop. Pests at early or maturity age will also affect it. Therefore, the food security projects could give attention for the provision of access to farm oxen.

**Gender Issues**

Besides women’s responsibility for household reproduction and food preparation, most of the agricultural activities are not performed without the involvement of women. The domination of women by men is still unsolved issue in all aspects, even though that, the degree of domination defers from area to area and household to household. Therefore, the food security project would give more attention to changing the role of women and men in food production, particularly to the constraints to women access to and production of food. Then, there is a need to increase women’s access to:

i) the means of production (knowledge, land, labor, inputs and credit) in order to grow more food with less time and effort;

ii) participation in appropriate technology generation through training and access to participate workshops;

iii) the means and knowledge to store, preserve and process loss, including improved access to fuel and water supplies;

iv) the means and knowledge to transport it to market and to sell without hindrance and specific products.

v) Sufficient income to be able to purchases food where it is not produced within the household and to ensure a nutritionally adequate diet.

**Off-farm Enterprises (Activities)**

Off-farm enterprises are the development of income generating activities through economic diversification approach outside crop production contributing to diversification of the economy. This diversification of economy includes the development of various services like trade, transportation, tourism to be open to farmers as well as to private investors. Over 86% of the region’s population are employed with an age- old agricultural production system.
The development of off-farm enterprises is not only desirable, but it is a necessity. Because the rate of population growth is accelerating at proportion of around 3% per annum and the man-land ratio is increasing year to year. On top of this, soil erosion and other forms of environmental degradation are reducing the carrying capacity of the region's land resources. If no immediate development (off-farm enterprise) are initiated, many people will be forced to leave agriculture in the coming few years. Even with improved production techniques, massive soil and water conservation programs and better yields, per hectare, agricultural development alone can not ensure sustainable social and economic development at this rate of population and land degradation.

**Credit Service**

Rural credit service promotes the growth of agricultural production though the provision of access to buy production inputs such as fertilizer and high yield seeds. But this credit service is constrained by poor harvest of crops or crop failure from moisture stress. This in turn affected the return of the credit on time in effect many farmers refrain from being the beneficiaries of the credit. The credit service is also available for trade of livestock and crops to cover the farmers consumption food scarcity gap.

The credit cash flow mechanism to the farmers through agricultural office and farmers associations. This system is said to be inefficient to reach to the users due to bureaucratic and administration failures. The credit is administrated and loan repayment is the responsibility of the farmers association.

To make more efficient the credit service directly to the individual, a better financial flow channel could be established. The best community organization to serve as credit handling will be 'Idir' than the farmers association.
7. ANALYSIS OF ALTERNATIVES AND SUSTAINABLE RURAL LIVELIHOOD

7.1 Analysis of alternatives in Bati Woreda (Amhara Region)

Small scale irrigation

Where there is limitation of water resources, ways and means to develop the existing sources or new sources need to be investigated to address the problem of conflict over resources and moisture limitation, be it surface and/or ground water sources. In the case of Salmunae Kebele, spring development works can increase the volume of water and irrigable time of the area. Constructing dikes and treating the catchment area can minimize the sudden flood hazard in Salmunae Kebele.

The Bira reservoir can be improved by controlling the leakage, treatment of the watershed and catchment area, and by introducing a buffering zone immediately in the upper part of the reservoir.

Irrigation studies or projects should be based on water threshold capacity so as to determine the area to be irrigated, the number of beneficiaries, effective cropping pattern and intensity and proper farm management practices. Proper targeting of beneficiaries (up stream and down stream users) should be studied to curb the conflict over resources. The Woreda has several rivers, which can develop about 996 ha of land. These potential resources need to be investigated and developed (Table-43).

<table>
<thead>
<tr>
<th>S/N</th>
<th>Name of potential rivers</th>
<th>Irrigable area (ha)</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chelekka</td>
<td>347</td>
<td>in 3 kebeles</td>
</tr>
<tr>
<td>2</td>
<td>Miawa</td>
<td>380</td>
<td>in 4 kebeles</td>
</tr>
<tr>
<td>3</td>
<td>Yene</td>
<td>38</td>
<td>in 2 Kebeles</td>
</tr>
<tr>
<td>4</td>
<td>Salmunae</td>
<td>24</td>
<td>in 1 Kebele</td>
</tr>
<tr>
<td>5</td>
<td>Billo</td>
<td>9</td>
<td>in 1 Kebele</td>
</tr>
<tr>
<td>6</td>
<td>Harbu</td>
<td>64</td>
<td>in 1 Kebele</td>
</tr>
<tr>
<td>7</td>
<td>Hagamsa</td>
<td>45</td>
<td>in 1 Kebele</td>
</tr>
<tr>
<td>8</td>
<td>Karkaro</td>
<td>28</td>
<td>in 1 Kebele</td>
</tr>
<tr>
<td>9</td>
<td>Lencha</td>
<td>30</td>
<td>in 1 Kebele</td>
</tr>
<tr>
<td>10</td>
<td>Habile</td>
<td>12</td>
<td>in 1 Kebele</td>
</tr>
<tr>
<td>11</td>
<td>Motuma</td>
<td>9</td>
<td>in 1 Kebele</td>
</tr>
<tr>
<td>12</td>
<td>Salawa</td>
<td>10</td>
<td>in 1 Kebele</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>996</td>
<td>18 Kebeles</td>
</tr>
</tbody>
</table>

Source: Woreda Agriculture Office, 2001
Off-Farm Activities

At present, many farmers of the area are engaged in petty trade activities to generate additional income for the household to cope with during drought periods. Additional off-farm activities suggested by the community include weaving, pottery, masonry, and carpentry. These activities require a capacity building component combining finance (micro financing) and training. The regional government, NGOs, and private investors can create rural employment opportunities by establishing medium and small-scale enterprises, and rural employment generation schemes.

Roads and market places

Roads

Development of roads is an important part of addressing food insecurity problems. Therefore, community-based inter-Woreda networks need to be supported so as to improve access and mobility of Intra-woreda and Woreda-zonal road connections. The main road passes through Bati Woreda town but Kebeles in the Woreda do not have inter-Kebele road networks that can easily reach the Woreda town. Community access road committee should be established to participate in resource contributions of finance, labor, and materials.

Market places

Market places of drought affected areas may not be attended by buyers that have strong purchasing capacity or sellers may not bring required commodities to market places particularly in areas where accessibility is a problem. Inter-Kebele road networks will improve access to market places within and outside of the Woreda.

Market information dissemination by radio on prices of selected crops and commodities is of crucial importance for farmers to decide where and when to buy and sell commodities. The farmers may be required to have a transistor radio to have access to market information, or farmers associations can have a radio and disseminate the information to their members. Market information disseminated by the regional radio programs needs to be encouraged.

Input use

Fertilizer

Drought affected areas (shallow soils, poor moisture retaining capacity) are generally not responsive to fertilizer application. Therefore, instead of introducing the same extension package as surplus growing areas, special extension packages focusing on natural resource conservation and crop diversification need to be prepared and introduced. The introduction of early maturing crop varieties should be investigated closely.
Moreover, fertilizer provision should be based on the will of the farmers, not as a prerequisite for other extension service support. The distribution of fertilizers should be made to areas where there is a demand for it, and it should be distributed in time.

**Population pressure**

Bati Woreda is dominantly inhabited by Muslims (98.7%). They practice polygamous marriage, which has an impact on the food security status of each household. The women know about family planning practice. However, proper family planning practice is constrained by unwillingness by husbands to use contraceptives. Furthermore, users complained about side effects of taking contraceptives. They said that the households are obliged to cover additional expenses due to side effect illnesses.

Therefore, proper monitoring of family planning service is required to bring about meaningful results. Otherwise, simple distribution of contraceptive may not be enough to sustain family planning services in the area.

**Soil and water conservation activities**

Through Food for Work activities of the World Food Program (WFP), farmers of the area have been constructing terraces and check dams. Planting of trees has been practiced with low survival rates. The farmers, however, complained about the daily work norm set to get the daily ration (3kg/capita). The work norm set per day does not consider the health status, sex, and working environment. Therefore, this requires further consideration to accomplish the aims of the programs.

The existing 15 nurseries are not adequate to produce sufficient seedlings. Thus, more nursery sites and the distribution of seedlings at homestead level should be encouraged to bring about improved survival rate and minimize the effect of open grazing.

**Nutrition**

Nutrition is a very important component of the food security program. The community, in particular women, should be aware of balanced diet preparation and the effect of poor nutrition on children. It is necessary to train parents particularly women on financial management from the point of view of saving money for food expenses of the household.

**Bati Sustainable rural livelihood**

In analyzing sustainable rural livelihood, the livelihood assets should be closely investigated, which include human capital, natural capital, financial capital, social capital, and physical capital.

**Human capital:** human resources of the area can be more productive with appropriate service provisions such as health, family planning, nutrition and basic
education. The service coverage needs to be increased to bring about meaningful and sustained change.

**Natural capital:** natural resources, which mainly comprise vegetation cover and land, have been dwindling. Therefore, the resources of the area should be rehabilitated before resource stocks are used up and aggravate environmental degradation problems.

**Financial capital:** there are two main sources of financial capital, available stocks and regular inflows of money. Therefore, the rural human resource can be gainfully be engaged in any rural development programs.

Available stocks can be in the form of saving and liquid assets such as livestock. These form of financial capital can be retained through credit-providing institutions. Where as, regular inflows of capital can be expressed in the form of pension and remittance, which can be considered as reliable financial sources.

Micro-financing institutions should reach the needy people particularly women to generate additional capital, be it in the form of saving or liquid assets.

**Social capital:** the social capital of the target community needs to be closely studied and harnessed. Improving internal functioning of groups in the areas of leadership and management can strengthen norms and values of the community. The participation of the community in the planning, implementation, monitoring, and evaluation of the development processes should be encouraged. In introducing any development interventions, the social capital of the community with respect to the culture of credit and saving, experience in coping mechanism, cultural food utilization, culture of technological adoption and tolerance, etc. need to be assessed and harnessed for development endeavors. Moreover, traditional institutions such as *edir* and *ekub* can be considered as entry points.

### 7.2 Analysis of alternatives in Tenta Woreda (Amhara Region)

**Small-scale irrigation**

The Woreda has several rivers, which can develop about 155ha of land. These potential resources need to be investigated and developed (Table-44).
### Table 44 - Potential Rivers in the Woreda

<table>
<thead>
<tr>
<th>S/N</th>
<th>Name of potential rivers</th>
<th>Irrigable area (ha)</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adela</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Gedelas</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Beshlo</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Kechina</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Kurkur</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Ankerkit</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>155</td>
<td></td>
</tr>
</tbody>
</table>

Source: Woreda Agriculture Office, 2001

### Off - farm activities

Petty trade activities are the main off-farm activities that farmers in the area practice to cope with drought periods. Additional off-farm activities suggested by the community include blacksmithing, weaving, pottery, masonry and carpentry. These activities require capacity building in terms of finance (micro financing) and training.

In introducing new Off-farm activities, potential market outlets should be studied. Questions including where to dispose of the products, who are the potential buyers, other competitive sources that supply the same market and other environmental and social implications should be studied before committing any resources.

### Roads and market places

#### Roads

Community based inter-Woreda networks need to be supported so as to improve access and mobility. The existing road that links Dessie and the Woreda center can exemplify this. However, more Intra-woreda and Woreda-zonal road connections should be constructed to exchange commodities. Kebeles in the Woreda do not sufficiently have inter-Kebele road networks that can easily reach the Woreda town.

The limitation of transport services of the area, which is mainly manifested by high transportation cost should be considered and addressed in view of short and long-term solutions. The short-term solutions can be viewed from the point of view of utilizing the potential pack animals as prime and intermediate means of transportation. Micro-financing institutions need to consider this aspect and provide credits for rearing and selling pack animals.
Market places

Market places are limited and the main centers are inaccessible. Inter-Kebele and intra-woreda road networks will improve access to market places within and out of the Woreda.

Input use

Like that of Bati Woreda, the response of fertilizers is not satisfactory due to shallowness of soils and moisture stress. Special extension package which focuses on natural resource conservation and crop diversification need to be prepared and introduced.

Agricultural research stations that work at National and Regional level are mainly engaged in Meher growing areas. Belg growing areas like Tenta Woreda have their own peculiarities and research findings and recommendations of Meher growing areas are not applicable to these areas. Therefore, agricultural research stations need to consider and focus on Belg growing areas in order to come up with results that can alleviate the limiting factors to agricultural productivity.

7.3 Development alternatives for the selected food insecure PAs in Oromia

Erer Meda – Enchine PA

Erer Meda-Enchine PA is one of the food insecure PAs in Goro Gutu Woreda. By analyzing the existing problems and the available natural resources of the PA, the following development alternatives are considered. An integrated implementation of these development options will improve food security in the PA.

Rehabilitating & upgrading the existing small-scale irrigation scheme

As there is excess water to irrigate additional areas, rehabilitation and upgrading of the existing irrigation scheme seems to be one of the feasible options to increase crop production in the PA. This is the first priority that has been suggested by the community while discussing their interests. If the construction of the canal is to be made as designed, an additional 50 ha of cultivable land could be irrigated. This will at least bring benefits to some 200 families of the area. If a motor pump is provided with this program, a further 35 ha of land can be irrigated.

Family Planning

One of the major problems of the PA is over population. This is manifested by the inadequate size of land holding per household. In this particular PA the average land holding per household is only 0.25 ha. Even intensified agriculture (inputs and technology) invested in this area would not produce sufficient food from such a small land holding for a household with average family size of 5. Therefore,
family planning, which focuses on limiting the family size would be very important.

**Establishing high school at the nearby area**

High school education is one of the major problems not only for this PA but also for the Goro Gutu Woreda as a whole. There is no high school at Woreda level. For this reason, students either have to go long distances or join the family’s agriculture after completing 4th grade. Interviews with youngsters of the PA revealed that most of them are drop outs from 4th grade and had gone back to their farms. The implication of this is further fragmentation of land holding and greater severity of food insecurity.

**Soil and water conservation activities**

Topographically, the cultivated lands are on very rugged and steep terrain, which is prone to soil erosion hazards. Although the farmers practice soil and water conservation including construction of check dams, terraces and planting trees to stabilize gullies, their efforts have to be sustainable, and have to be supported by extension services.

**Introduction of drought resistant and early maturing crops**

Introducing some drought resistant high yielding crops such as Enset vantricosum, cassava and other root crops will be important to overcome recurring drought and erratic rainfall. Therefore as a development alternative, introduction of these and other high yielding crops, and providing extension services to teach how to grow, manage and prepare these crops for food must be one of the important areas of concern.

**Madisa – Woltea PA**

In a similar manner as that of Erer Meda Enchne PA, development alternatives of the area could include voluntary resettlement, sustainable soil and water conservation practices, introduction of drought resistant and early maturing crops, establishing high school education in near by areas, and fostering access to credit and family planning.

**Voluntary resettlement**

One of the major problems of the PA is shortage of farmland. The average land holding per household in the PA is only 0.37 ha. There are also several landless farmers in the PA. Those landless are leading their life either as daily laborers or by other means. Voluntary resettlement into other places where there is surplus farmland and a better environment should be considered as an option for the highly populated area of Medsa-Woltea PA. The interviewed members of the PA also suggested voluntary resettlement as one of the priority options to solve their food insecurity problem.
Ijefara and Bechesa PAs

Road construction
Neither Ijefara nor Bechesa PAs has a properly constructed all-weather road linking to the Woreda center or the main market centers. These PAs are situated at about 20-23 km away from Asebe Tefferi town. There are footpaths and a very rough dry-weather road that connects them to their Woreda town. Transportation in these areas is on foot and on pack animals. Absence of roads forced the farmers to sell their farm products for very low prices in the small local markets. Therefore, the development of access for these PAs contributes to reducing the food security problems of the area.

Dairy Goat and Poultry development
The intervention by Farm Africa could be implemented in more areas. The experience has shown that the promotion of dairy goat and poultry farming in the area is a promising development intervention for poor food insecure farmers so that they can increase their income and nutritional status. In addition to dairy goat and poultry development interventions, provision of credit for cattle fattening could also be a promising alternative for generating cash income for the food insecure community members.

7.4 Development Alternatives for the Sample Woredas in SNNPR
The two Woredas are very densely populated. The population density for Boloso Sore and Damot Gale is 610 and 476 persons per km², respectively. The population is recurrently affected by drought or food shortage. A number of development interventions with substantial resource investment need to be implemented in order to alleviate the food insecurity and population pressure. Some of the possible intervention programs include:

- Improving the existing small scale irrigation scheme, and implementing the newly constructed schemes on a sustainable basis;
- Implementing sustainable soil and water conservation programs;
- Implementing family planning and educational programs to reduce population growth;
- Establishing secondary and technical schools;
- Expansion of off-farm activities;
- Implementing disease control programs, for both human and livestock diseases;
- Promoting root crops, preferably drought resistant varieties.
Small-Scale Irrigation Schemes

Existing Scheme

The improvement of the existing Weybo irrigation scheme could help to increase crop production in the two Peasant Associations, Metella Hembicho and Gedala. There is adequate perennial flow in the Weybo River that can be utilized to irrigate substantial land in this area. This scheme has a potential irrigable area of about 150ha and about 500-600 households may benefit from the scheme. Establishing efficient water management system will help to minimize the existing environmental and social problems.

New Schemes

The new schemes include Soke and Megera, which have a potential irrigable area of about 90ha and 60ha, respectively. These schemes would benefit about 560 families. The Soke scheme was reported to have some technical problem in its headwork structure. Therefore, assessing the problem and finding a solution is required.

7.5 Analysis of Alternatives for Tigrai Region

The following interventions can be looked at further as alternatives. The interventions are based on the assessment of potentials in the areas of study.

a) Livestock-forestry integrated projects, which will contribute to the sustainable livelihood of the communities.

b) Motivation and encouraging of organic fertilizer production (compost) by the households with adequate support and better preparation technology. Introduce efficient means of transportation of compost to farm plots.

c) Focus on economic diversification to avoid further pressure on degraded lands (farmlands).
8. REHABILITATION and POTENTIAL DEVELOPMENT INTERVENTIONS

The existing and anticipated (potential) projects are assessed for their social and environmental impacts in terms of current status, possible enhancement/rehabilitation and mitigation measures for adverse effects.

8.1 Irrigation Schemes

8.1.1 Rehabilitating Existing Irrigation Schemes

Maintenance of Reservoir and Water Distribution Structures

Objective: To store water at designed capacity and distribute efficiently the required amount at needed times.

Current situation: Many of the reservoirs operate below their designed capacity because of siltation and water leakage. Main and secondary canals are damaged or poorly maintained and growth of weeds along the side canals is common hampering water flow and serving as vector-breeding sites.

Positive Impacts: The reservoirs have facilitated many beneficiaries to produce high value and staple food crops.

Negative Impacts: The low supply of irrigation water has negative impact on crop productivity and has resulted in low food availability. Moreover, leakage of water from the reservoirs harbors vectors and water borne diseases.

Mitigation: Periodic maintenance of reservoirs and water distributing channels and where possible cement lining of canals and drains depending on soil types.

Re-enforce Earth Dam’s Buffering Zones

Objective: To minimize crop farming, soil erosion and livestock movement around the reservoir so as to reduce sediment transportation, slow down run off and stabilize reservoir/main diversion banks.

Current situation: Much of the land around the main diversion/reservoir sites are under cultivation and grazing. Grass strips and planted vegetation are damaged. The buffering zones of many sites were damaged during the 1990-1994 transitional period and rehabilitation work has been inadequate.

Positive Impacts: Proper buffering zone enforcement has reduced sediment transportation and filtered silt deposits before they reach diversion and reservoir compartments.
**Negative Impacts:** Improper design and implementation resulted in reduced reservoir capacity. This made seasonal distribution of irrigation uneven and reduced volume of crop production expected by beneficiaries.

**Mitigation:** Consultation with Water Users Associations (WUAs), PAs, Woreda Council and Irrigation Development Agents (IDA) to delineate the buffer area is required. Spatial buffering zones should be defined with descriptive sketches, and community by-laws and guidelines enforced for its proper implementation. Monitoring is required quarterly, with spot-checking and correction by the experts & communities (Monitoring Team) is necessary.

**Strengthen the Capacity of the Water Users Associations**

**Objective:** To administer water distribution equitably and other related activities of irrigation at small-scale irrigation schemes.

**Current situations:** There is poor coordination, management and utilization of the irrigation resources. Planned production and market promotion is weak. Regular maintenance of canals and diversion/reservoirs is inadequate. WUAs are not actively and efficiently serving the members and their associations.

**Positive Impacts:** In properly managed irrigation schemes, the users organize, plan and devise means to produce, sell and generate income to bridge food shortages for some months. This eventually secures food at HH level and reduces food-aid months.

**Negative Impacts:** Poor equity in water distribution and absence of incentives for WUA executives to spend extra time and devotion affected the sustainability of the project.

**Mitigation:** Involve community participation to select fairly groups of WUAs' executives. Train the executive members and equip them with minimum facilities. Organize operation & maintenance (O&M) groups, arrange experience-sharing tours, establish service cooperatives, and strengthen farm management and marketing teams.

8.1. 2 Potential Irrigation Development/Interventions

**Establish and Maintain Flood Protection Structures in SSI Schemes**

**Objective:** To protect the schemes' headwork (diversions/reservoirs) and other infrastructure from flood hazards.

**Positive Impacts:** Protects the schemes/farms from sudden flooding catastrophes, thereby saving money, time, labor and minimizing health and property risks.
Negative Impact: Cost of establishment and preventive maintenance of dykes/flood channels will be high. Without them, life and properties around the farm will be endangered.

Mitigation: Establish dykes/flood routes at main and flood prone sites. Introduce watershed management and catchment treatment through active SWC, area closure and afforestation schemes.

Watershed Management to Protect Irrigation Schemes

Objective: To treat main catchment areas to control land degradation, run off and sediment transportation. Conservation of bio-diversity, integrated afforestation and area closure are some of the activities included in watershed management practices.

Positive Impact: Properly handled watersheds will decrease erosion, reduce siltation and minimize flood hazards. Area closure at watershed areas encourages the utilization of cut-and-carry method.

Negative Impacts: It requires trained personnel from various cross-sectoral groups to fully support the program. Initial costs for assessment, inventory, sketching and delineation will be high. The return from water shed management is a long-term benefit and is affected by land-use and tenure policy and follow up capacity. It is not easy to implement at food insecure areas and where drought is a recurrent phenomenon.

Mitigation: Create awareness and mobilize community participation within and among the Kebeles and get support from various stakeholders and cross-sectoral groups. The technical and financial support from the NGOs is important. Various medium and long-term plans and schedules need to be prepared for watershed management practices.

Construct Community Based Water Harvesting Ponds to Develop Irrigation

Objective: To construct small ponds with earth dams to harvest surface run-off and use for short period (one cycle) irrigation and other related activities. To motivate communities to prepare earth dams in small groups for their vicinities and make this system part of a new farming practice (supplementary irrigation).

Positive Impact: Pond construction at village level with proper surface water harvesting techniques will improve food security and bring sustainability at household level. It also helps to recharge ground water resources and stabilize the microclimate of the area.
**Negative Impact.** Water borne vectors and disease may increase. The cost of annual/periodical removal of silt material is high. Prime grazing lands may be inundated and or intensively cultivated.

**Mitigation.** Allow proper drainage and desilting facilities around the ponds. Plant wider canopy trees to reduce evaporation from ponds. Establish grass and small shrubs around the pond to filter and trap sedimentation. Work with health and veterinary experts with full participation of communities to control water borne diseases and vectors in the surroundings.

### 8.2 Road Construction

#### 8.2.1 Rehabilitation

**Improve Inter Kebele Road Network and Crossing Structures**

**Objective:** To create physical access and mobility between Kebeles/PAs

**Current situations:** Many of the community access roads lack minimum standard requirements. Moreover, some of them lack periodical maintenance and form deep gullies. Wooden bridges are frequently ruined and communities have difficulty going to markets during rainy seasons.

**Positive Impact:** Roads improve physical access and mobility. Improved mobility facilitates the provision of goods and services to communities through access to market centers.

**Negative Impact:** Road construction entails high demand for labor and may compete with agricultural operations. During road construction, erosion may be increased and some farm plots may be taken over by structures. Improper cut-off-drains, side ditching and check dams may divert flood to the farmlands.

**Mitigation:** Devise specifications and follow ERA standards (RR 10, RR20, RR30, RR40, and RR50). Prepare community access road manuals that are supported by simple sketches and options of road types for various agro-ecological situations. Make communities aware of participation in road construction and maintenance with proper SWC structures and tree/grass plantations along the roadsides.
8.2.2 Potential Projects

Open Inter Woreda/Zone Roads between Food Surplus and Shortage Areas

**Objective:** To create physical access and mobility between food surplus areas and food deficit Woredas.

**Positive Impact:** Physical access and mobility will be increased. Food prices will be reasonable and people can easily move between areas to get employment. Farm inputs will be distributed easily and in timely fashion, while farm products will be sold at attractive prices.

**Negative Impact:** Cost of construction of standard roads may be high. Borrow pits, soil erosion and land sliding may increase. Compaction of crop fields (during detouring) may be inevitable. In some places dense vegetation and wet grasslands will be affected.

**Mitigation:** Proper road design and alignment is required. It is proper to construct the roads during the non-rainy season. Full participation of the communities is a pre-requisite for sustainability.

Train and Capacitate the Communities on Construction & Maintenance of Roads

**Objective:** To provide technical training to the community (youth, women, etc.) on access road surveying, alignment, construction and maintenance aspects.

**Positive Impact:** The training will create job opportunities and increase income of certain members of the community. Access roads will be properly constructed and periodically maintained.

**Negative Impact:** There is no negative impact from this activity.

8.3 Provision of Inputs

8.3.1 Rehabilitation

Improve Recommendations on Fertilizers and Improved Seeds

**Objective:** To increase productivity at a faster rate and secure food at household level in moisture deficit areas.

**Current situation:** Blanket recommendations of fertilizers and locally untested varieties of crops are widely used. There are few proven recommendations of fertilizers and improved seeds in moisture deficit areas.
Positive Impact: Properly tested fertilizers and improved seed varieties will increase productivity and improve the current food situations of moisture deficit areas.

Negative: Local landraces may be replaced by improved varieties and endanger the germplasm population of the area. The use of fertilizers may reduce the practice of crop rotation and induce mono cropping and increase pest outbreaks. Sometimes, the costs of fertilizers and improved seeds may not be financially rewarding (market prices for farm produces are usually low) and farmers may not be enthusiastic.

Mitigation: Promote local landraces by selection; use integrated soil fertility management with proper IPM (integrated pest management); establish demonstration/trial sites; and stabilize market prices.

8.3.2 Potential Projects

Strengthen Research and Extension for 'Belg' and Dryland Farming

Objective: To increase the productivity of 'Belg' (small rains-February to April) and dry land farming areas through strengthening of research and extension activities.

Current situation: There are many food-deficit Woredas that produce crops under 'Belg' rains. There is no extension package that provides recommended use of fertilizers and improved seeds. Many dryland ecologies lack adaptive technology to over come moisture stress problems with early maturing varieties.

Positive Impact: Fertilizer and crop variety recommendations by agro-ecology and soil types will be available for Belg growing and moisture stressed areas through strong support of research and extension linkage.

Negative Impact: Insufficient and erratic rain may affect the research and extension effort.

Mitigation: Establish research stations that will cater to the problems of 'Belg' areas and dryland farming (early maturing varieties; fertilizer type, rate and application techniques).

Diversify the Traditional Cropping and Food Values of the Areas

Objective: To create diversity in traditional farming, food utilization and improve coping mechanisms at the time of vulnerability in various agro-ecological zones.

Current situations: Traditional crops, farming systems and food utilization practices (taboos) do not allow full exploitation of possible food items in times of
human suffering. The limitations aggravate famine situations and increase vulnerability.

**Positive Impact:** Increases food security and income and promotes farmers’ behavior towards the use of diversified food preparation and intake in volume and quality (high nutrition value crops).

**Negative Impact:** May take longer time to adapt until proper types and utilization methods are found. Some resistance may be encountered in changing traditional food habits and in the use of introduced crops.

**Mitigation:** Strong extension and home economics support with continuous efforts on behavioral change are required. Women and youth training may reduce the resistance coming from the adult groups. High value crops & livestock will promote diversification in generating cash and immediate income.

### 8.4 Soil and Water Conservation (SWC)

#### 8.4.1 Rehabilitation

**Rehabilitate and Upgrade the Current SWC Techniques**

**Objective:** To improve the existing SWC techniques and operational approaches.

**Current Situations:** Many SWC structures were not fully accepted by communities and were demolished in many instances. The existing structures are not functional either. Techniques were not improved over the last 20 years and some of them are not applied according to the land terrain, availability of resources and farming system of the area.

**Positive Impact:** Increases depth and improves moisture retention of soils. It generates employment and improves food security at household level.

**Negative Impact:** There is no negative impact in improving soil and water conservation techniques. However, farmers may be reluctant to participate in the rehabilitation program.

**Mitigation:** Community consultations and village level seminars should be intensively carried out in order to overcome previous misunderstandings. A sense of ownership and rural development concepts should be addressed by arranging community panel discussions.
9. PROPOSED INSTITUTIONAL FRAMEWORK

9.1 Existing Institutions

At present there is no independent agency responsible for environment protection in all Regions. The existing institutions and bodies involved in some aspects of environment and social management and their responsibilities and duties are briefly described below.

Regional Food Security Coordination Offices

The Regional Food Security Coordination Offices in the four main Regions are newly established. Their main task is to oversee food aid programs and employment-generating schemes in food deficit and drought affected areas. In the future, the units' roles will include (i) technical support for Project Coordinating Units at Woreda level, (ii) periodic review of project progress with a view to identifying emerging policy issues and proposing measures to address them, and (iii) ensuring that food aid programs and employment-generating schemes supported under other projects compliment rather than compete with investments undertaken in this project. Regional Food Security Coordination Offices have already been established in Amhara, Tigrai, Oromia and SNNP regional states.

Regional Environmental Coordinating Committees

Regional committees were established in 1997, mandated to deliberate upon matters concerning environmental protection in the respective Regions. Each committee's chairman is the head of the Economic Sector of the Regional Council, and its secretary is the head of the Planning and Economic Development Bureau. Sector Bureaus and offices are members of the committee.

Regional Bureaus of Planning and Economic Development

The Bureau is generally responsible for coordinating the planning, implementation and monitoring of economic and social development programs in each region. It acts as secretariat for the Regional Environmental Coordinating Committee (RECC). There is a focal person assigned to carry out assignments on environmental matters and assist the Bureau Head in RECC's activities.

Regional Commissions for Sustainable Agriculture and Environmental Rehabilitation

The Commission is responsible for the study, design and construction of small-scale irrigation projects in the cases of Amhara, Tigrai and SNNP. In the case of Oromia, however, the responsible agent is the Oromia Irrigation Development Authority (OIDA). The Commission has several departments to deal with study and design of small-scale irrigation projects and environmental and socio-economic studies.
Regional Bureaus of Agriculture (BOA)
The BOA is responsible for extension services, soil and water conservation activities, rural women development activities, etc. The Bureau has branch offices at zonal and Woreda levels. There are separate departments at Regional level and teams at Zonal and Woreda levels representing each sector (extension services, soil and water conservation, rural women, etc.). The Development Agents (DAs) at Kebele levels are responsible for all sectoral activities.

The quality and quantity of the technical staff at Woreda and Kebele levels is not adequate especially in the areas of irrigation, catchment management and crop protection. In particular, the quality of the DAs (level of training and skill), and the facilities and incentives provided need to be improved.

Cooperatives Promotion Bureau (CPB)
The CPB is empowered to assist the establishment of any form of local level organization in the agriculture sector including water users associations or cooperatives for irrigation users. It has offices from Regional to Woreda levels.

Administrative or Council Offices
The administration or council offices at different levels of the government structure (regional to Kebele levels) are responsible for administration affairs including administration of land and other natural resources in accordance with the government's laws and regulations. They have the power to resolve conflicts over resources such as land, water, etc.

Regional Rural Roads Authority
The authority is responsible for the development, maintenance, administration and regulation of rural roads in the Region. The authority is now making efforts to include environmental impact considerations in the design and construction of road projects implemented or commissioned by the Authority. It has included an environment unit in its revised (new) organizational structure to take care of environmental management of road activities and carrying out or commissioning environmental impact assessments (EIAs), as well as ensuring the incorporation of EIA recommendations into the design and mitigation plans.

Community Level Organizations
At present there are a few effective community level organizations at Woreda level. In areas of existing small-scale irrigation schemes Water Users Committees (WUCs) have been established. Water Users Associations (WUAs) or Irrigation Cooperatives (ICs) are being organized in some Regions. However, in most cases, the committees are not strong enough to effectively carry out their duties as there is little assistance given by the newly established Cooperatives Offices and the committees have no legal recognition or Bye-Laws.
9.2 Proposed Institutional Frame Work

The proposed institutional arrangement recognizes the existing Government structure, organizations and line ministries in the Regions. Regional Food Security Steering Committees would be established as proposed by IDA, and the Food Security Units (RFSUs) would play a key role. The present study, however, gives more emphasis to community level institutional aspects that may be pertinent to the implementation of the proposed Food Security Project.

Community Based Development and Management System

Sustainable development at the grassroots level needs to achieve primary environmental care (PEC) with a 'bottom up' community based development (CBD) approach and involvement. This includes satisfying basic needs (economic demand), optimum environmental protection and use and the empowering of groups/communities with traditional knowledge and cultural values.

PEC is necessary to ensure that the local people are the major development agents of change and not just recipients of aid. The community should be involved in designing, implementing and monitoring the various interventions in its locality. Community consultation and participation in decision-making process are key to empowerment and ownership by the communities. They are essential for achieving sustainable livelihoods in the rural community. Environmental and social assessment approaches are recently gaining importance in development planning. Nevertheless, baseline survey and reliable data are not yet adequate to enable thorough assessment of various expected outputs at project planning level.

Establishment of Appropriate Community based Institutions

Communities’ organizations that support the design, planning, implementing, monitoring and analyzing of given interventions and programs are necessary. The active participation in decision-making process by the community with development based stakeholders will bring integrated and cross-sectoral development to the area. Among other organizations, the following are recommended.

Irrigation: a Water Users Association (WUA) administered by a Water User Committee (WUC); the latter would be a sub-committee of the Kebele Development Committee (KDC), if the irrigation scheme was entirely within the bounds of one Kebele. The Water User Associations would work with Regional institutions developing irrigation, such as the Commission for Sustainable Agricultural and Environmental Rehabilitation in Amhara Region (SAERAR), and the Oromiya Irrigation Development Agency (OIDA), to design, construct/maintain irrigation schemes; and the Bureaus of Agriculture (BOA) for extension, irrigation operation, production and marketing.
Road: a Community Road Committee (CRC) and community road survey and maintenance agents (CRDA) equivalent to Development Agents (DAs) of the BOA at Woreda and Kebele levels. CRCs would work with the Regional Road Authorities (RRAs), and with the Regional Environmental Management Branches (REMBs) of the RRAs.

Inputs: a Community Agricultural Committee (CAC), which would be a sub-committee of the Kebele Development Committee. CACs would work closely with the Cooperatives Promotion Bureaus, Microfinance Organizations, BOA, and NGOs.

Off-farm Activities: Community committees that collaborate with the respective Regional Offices to register and train people in the private sector as well as planning how to create jobs/opportunities.

Rehabilitation scheme: SWC, afforestation and access to watershed areas can be implemented through Kebele Development Committees (KDCs) working with the BOA and NGOs.

Child-Mother Care: a Women’s Integrated Development (WID) Committee at community level, together with Community Child Growth Promotion workers (Nutrition Animators) would work with the Bureaus of Health (BOH) and with NGOs.

Community Capacity Building
Initiatives taken to capacitate communities under different interventions will improve the quality of the program during the implementation phase and will make it sustainable.

Irrigation: Irrigation structures, operations and maintenance need periodical workshops/training and provision of updated manuals. Water User Committees, irrigation agronomists and extension agents need training and logistic support, integrated pest management, environmental management, etc.

Road: Community Road Manuals need to be prepared with specifications, and training is needed for community organizations.

Inputs: For farmers to achieve proper fertilizer and seed rate application, proper date of planting, etc. there needs to be experience sharing at various demonstration trials and sites.

Off-Farm Activities: Assistance may be needed to equip communities for identification of local resources and opportunities, arrangements of credit facilities, organizing market and follow-up activities.

Rehabilitation schemes: SWC, afforestation, nursery operations, access roads to watershed areas and management of area closure need new and improved technical tools. Innovative methodology for monitoring and quick evaluation need
to be revised and redesigned. Hence, training and village seminars on these aspects to capacitate the community are required.

*Child-Mother Care:* This aspect includes family planning, and using homegrown products for improving nutrition of children, lactating and pregnant mothers. The proper food utilization and child management needs strong house-to-house Women Development Agents (WDA). Behavioral change and transformational development would bring significant social-environmental change.
Table 45 - Proposed Institutional Framework for the FSP (key to acronyms below)

<table>
<thead>
<tr>
<th>Interventions and their activities</th>
<th>GoE</th>
<th>Community Based Institutions</th>
<th>Examples of NGOs*</th>
<th>Private Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Small Scale Irrigation</strong></td>
<td></td>
<td></td>
<td>Africare, GAA,</td>
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<td></td>
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<td>ORDA, Save(UK),</td>
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<tr>
<td>Design &amp; Construction</td>
<td>SAERAR, OIDA, BOA</td>
<td>WUC, WUA</td>
<td>Farmers</td>
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<tr>
<td>(Earth dams/diversions)</td>
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<tr>
<td>Water Distribution &amp; Administration</td>
<td>BOA</td>
<td>WUA</td>
<td>Farmers</td>
<td></td>
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<tr>
<td>Periodic Operation &amp;</td>
<td>SAERAR, OIDA, BOA</td>
<td>KDC, WUC, WUA</td>
<td>Farmers</td>
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<tr>
<td>Preventive Maintenance</td>
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<tr>
<td>Irrigated Farming</td>
<td>BOA</td>
<td>WUA</td>
<td>Farmers</td>
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<tr>
<td>Market Promotion</td>
<td>CPB, BOA</td>
<td>WUA</td>
<td>Farmers</td>
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<tr>
<td><strong>2. Community Access Roads</strong></td>
<td></td>
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<td>WVE</td>
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<tr>
<td>Design, Alignment, Detours,</td>
<td>RRA, RRA-REMB</td>
<td>KRC, CRDA</td>
<td>Contractors</td>
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<td>&amp; Construction</td>
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<tr>
<td>Quarry Sites, Borrow Pits &amp; Soil Disposal</td>
<td>RRA, BOH</td>
<td>KDC, KRC</td>
<td>Contractors</td>
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<tr>
<td>Cut-off Drains, Ditches, Side</td>
<td>RRA</td>
<td>KRC</td>
<td>Farmers,</td>
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<td>Drainage, &amp; Rural Crossing</td>
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<td>Contractors</td>
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<td>Structures</td>
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<tr>
<td>Preventive Maintenance</td>
<td>RRA</td>
<td>KRC, CRDA</td>
<td>Farmers,</td>
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<td>Traffic Safety</td>
<td>RRA</td>
<td>KRC, CRDA</td>
<td>Contractors</td>
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<tr>
<td>**3. Agro-Inputs, SWC &amp;</td>
<td></td>
<td></td>
<td>Concern, GAA,</td>
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<tr>
<td>Afforestation</td>
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<td>LWF, ORDA, Save</td>
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<td>(UK), SOS-Sahel,</td>
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<td>FarmAfrica,</td>
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<td>CARE, OSHO,</td>
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<td>WVE</td>
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<tr>
<td>Fertilizers</td>
<td>EARO, BOA, DA</td>
<td>KAC</td>
<td>Farmers</td>
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<tr>
<td>Pesticides</td>
<td>EARO, BOA, DA</td>
<td>KAC</td>
<td>Farmers</td>
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<tr>
<td>Seeds</td>
<td>EARO, BOA, DA</td>
<td>KAC</td>
<td>Farmers</td>
<td></td>
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<tr>
<td>SWC, Gully Protection, Check</td>
<td>BOA, DA</td>
<td>KAC</td>
<td>Farmers</td>
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<tr>
<td>Dams, Cut-Off Drains</td>
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<tr>
<td>Nurseries, Agro-Forestry,</td>
<td>BOA, DA</td>
<td>KAC</td>
<td>Farmers</td>
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<tr>
<td>Community Forestry</td>
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</tbody>
</table>

*These are examples of NGOs – there are many other NGOs working in these sectors. Those listed as examples include: ACDI/VOCA, Africare, CARE, Concern, FarmAfrica, German Agro Action (GAA), Lutheran World Federation (LWF), Oromiya Relief & Development Association (ORDA), Oromo Self-Help Organization (OSHO), Save the Children (UK), SOS-Sahel, World Vision Ethiopia (WVE)

BOA – Bureau of Agriculture (Woreda Level)  BOH – Bureau of Health (Woreda Level)
CPB – Cooperatives Promotion Bureau        CRDA – Community Road Development Agent
DA – Development Agent (Agricultural Extension) EARO – Ethiopian Agr. Research Organization
KAC – Kebele Agricultural Committee         KDC – Kebele Development Committee
KRC – Kebele Road Committee
OIDA – Oromiya Irrigation Development Authority
RRA – Regional Roads Authority
RRA-REMB – Regional Roads Authority–Regional Environmental Management Branch
SAERAR – Society for Agricultural and Environmental Rehabilitation in Amhara
SWC – Soil and Water Conservation
WUA – Water Users Association

WUC – Water Users Committee
10. MITIGATION MEASURES and COST ESTIMATES

The most effective approach to adverse environmental impacts is to avoid them in the first place, thus saving the rehabilitation costs needed after adverse effects occur. The following tables indicate interventions, their possible environmental and social impacts, appropriate mitigation measures, who would carry them out, and cost estimates.
### Table 46 - Mitigation Table for Small-Scale Irrigation Schemes

<table>
<thead>
<tr>
<th>Small scale irrigation (SSI) main &amp; focal components</th>
<th>Potential Environmental Impacts</th>
<th>Potential Social Impacts</th>
<th>Mitigation Measures &amp; Who Would Carry Them Out [key after Table 48]</th>
<th>Level of Significance</th>
<th>Percentage of total project Cost</th>
</tr>
</thead>
</table>
| • Design and Construction (Earth dams & Diversions) | - Year-round water may encourage water borne vectors/disease  
- Construction may disrupt land use for crops and pasture  
- Drainage problems may cause swampy sites, bad odours, and localized gully erosion | - Increased cost of redesign & prevention of prevalent vectors  
- Construction may compete with agricultural labor  
- Reduced livestock numbers & productivity  
- Disputes and conflict over water use rights | - Proper design and site selection [SAERAR, OIDA, BOA, WUC]  
- Involve community in decision-making [SAERAR, OIDA, BOA, WUC]  
- Prepare reallocation plan and back with restocking and forage production program [BOA, KDC, WUC]  
- Manage conflict and share resources fairly with neighboring communities [KDC, WUA] | xxx | 0.33 |
| • Water distribution and administration | - Poor canal structure may induce sedimentation, increase flooding and lower yield  
- Uneven flow regimes may cause ecological imbalance in down stream & wet land areas | - Increased cost of administration and more pressure on WUAs  
- Reduced aquatic habitats and livestock husbandry & grazing  
- Increased inequities in water use | - Arrange periodic inspection and preventive maintenance schedules, construct dykes and use cut-off drains to reduce flood risks [WUA]  
- Use hydrological data to determine riparian rights & the demand of downstream users; conduct training for farmers in water management [BOA, WUA, Farmers] | xx | 0.27 |
| • Periodic operation and preventive maintenance | - Water leakage may cause swampy sites, bad odour and localized gully erosion  
- There may be delays in the treatment of catchment areas, with related flood hazards | - Delays in maintenance may increase rehabilitation costs & adversely affect public health  
- Untimely preventive action may make eventual treatment more costly | - Use of appropriate materials, compaction of earth dams & lining of canals and structures, with frequent cleaning and monitoring, mobilization of funds for maintenance [SAERAR, OIDA, BOA, WUC]  
- Proper soil & water conservation techniques [BOA, KDC]  
- Implement appropriate watershed management action plans [BOA, KDC] | xxx | 0.33 |

135
<table>
<thead>
<tr>
<th>Small scale irrigation (SSI) main &amp; focal components</th>
<th>Potential Environmental Impacts</th>
<th>Potential Social Impacts</th>
<th>Mitigation Measures &amp; Who Would Carry Them Out [key after Table 48]</th>
<th>Level of Significance</th>
<th>Percentage of total project Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Irrigated Farming</td>
<td>Improper planning may result in limited diversity in commodities produced, reduced use of local organic inputs, &amp; increased dependency on introduced technology</td>
<td>Possible lower prices in local markets, increased dependency on outside resources, &amp; discouragement of savings</td>
<td>Diversify irrigated agriculture with relay planting and follow seasonal market demand in production [WUA, Farmers]</td>
<td>x</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>Poor drainage management may adversely affect quantity &amp; quality of ground water</td>
<td>High costs of reclamation</td>
<td>Diversify crops according to the market demand and promote high nutrition value for household consumption [BOA, WUA]</td>
<td>x</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>Mono-cropping may lead to pest &amp; disease problems, and chemical responses may lead to pollution</td>
<td>Increased cost of controlling pests/diseases, and increased human health problems</td>
<td>Build capacity in the irrigation extension system and conduct training courses in integrated pest management [BOA, WUA]</td>
<td>xx</td>
<td>0.27</td>
</tr>
<tr>
<td>• Integrated Market Promotion</td>
<td>More marginal land may come under cultivation due to increase in crop prices</td>
<td>High competition may reduce crop prices</td>
<td>Arrange training and workshops for WUAs and irrigation extension agents to promote &amp; monitor awareness of, and response to market signals, as well as environmental consciousness and protective measures [CPB, BOA, WUA, Farmers]</td>
<td>xx</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td>Possible increased pollution from packing materials</td>
<td>Increased cost of refuse material disposal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Irrigation mean percentage of the project cost</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td>0.26</td>
</tr>
</tbody>
</table>

**Level of significance**

x = Requires notification  
xx = Needs attention  
xxx = More attention is required  
xxxx = Serious attention, and pre-requisite for the project to proceed
<table>
<thead>
<tr>
<th>Components of the Community Access Road (CAR)</th>
<th>Potential Environmental Impacts</th>
<th>Potential Social Impacts</th>
<th>Mitigation Measures &amp; Who Would Carry Them Out [key after Table 48]</th>
<th>Level of significance</th>
<th>Percentage of total project cost</th>
</tr>
</thead>
</table>
| • Design, Alignment, Detours, and Construction | - Construction may disturb and fragment farms  
- Construction may damage vegetation & disturb wildlife | - Road completion may increase population migration, induce an influx of people & lead to conflicts  
- Construction may compete with agricultural labor & lower productivity  
- More checkdams may increased operation management costs | - Proper design and site selection with active participation of the community [RRA, KRC, CRDA]  
- Set specifications and standards for various types of access roads [RRA]  
- Prepare sketches supported by manuals in local languages [RRA, KRC, CRDA]  
- Enforce SWC and plant trees and grasses along the new roads [KRC, RRA-REMB] | xxx | 0.33 |
| • Quarry sites, borrow pits & soil disposal | - Excavation may disturb & fragment farms, & remove fertile top soil  
- Excavation may damage vegetation  
- Year-round water may encourage water borne vectors/diseases and removal of fertile top soils | - Possible increased distances to grass and fuel wood sites for communities  
- Public health and treatment costs may increase | - Proper design and site selection with active community participation, and location of alternative sites with similar accommodative characters, but less likely damage [RRA, KRC]  
- Refill borrow pits and devise protective mechanisms [KRC]  
- Treat water borne vectors/diseases [BOH, KDC] | x | 0.18 |
| • Cut off drains, ditches & side drainage | - Failure to include them may result in flooding farms & villages and accelerated erosion | - Possible reduced number of vehicles/day & higher repair costs  
- Possible floods and lower crop yields | - Place/construct culverts/pipes at short intervals [RRA, KRC]  
- Use checkdams and protect embankment slopes [RRA, KRC] | xx | 0.27 |
<p>| • Rural crossing structures | - May lead to more big trees being cut for | - May uses more labor &amp; require frequent repairs | - Use concrete bridge and limit movement of animals in dry | xx | 0.27 |</p>
<table>
<thead>
<tr>
<th>Components of the Community Access Road (CAR)</th>
<th>Potential Environmental Impacts</th>
<th>Potential Social Impacts</th>
<th>Mitigation Measures &amp; Who Would Carry Them Out [key after Table 48]</th>
<th>Level of significance</th>
<th>Percentage of total project cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Preventive Maintenance</td>
<td>- wooden bridges,</td>
<td>- Increases river bank erosion</td>
<td>- season on the bridge [RRA, KRC] - Restrict load limits and place sign posts [RRA, KRC]</td>
<td>xx</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>- Earth moving and filling may disturb the natural landscapes</td>
<td>- High cost of maintenance</td>
<td>- Prepare budget &amp; schedules [RRA, KRC] - Minimize soil disturbance [RRA] - Organize monitoring team RRA, KRC, CRDA</td>
<td>xxx</td>
<td>.33</td>
</tr>
<tr>
<td>- Traffic safety</td>
<td>- Traffic may disturb &amp; kill livestock and disturb wild life and habitats - Traffic may cause noise and dust pollution</td>
<td>- Possible increase in pressure on children and herdsmen with increase in accidents</td>
<td>- Train communities &amp; schools in traffic safety and precautions [RRA, KRC, CRDA] - Set specification and standards for safety &amp; signs for community access roads (CAR) and conservation centers [RRA, KRC] - Use sign posts to limit speeds, identify crossing points, control axle weights on CAR &amp; bridges [RRA, KRC, CRDA]</td>
<td>xx</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>xxx</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>xxx</td>
<td>0.60</td>
</tr>
</tbody>
</table>

Mean Percentage of total project cost (CAR) 0.29%

**Level of significance**

- **x** = Require notification
- **xx** = Needs attention
- **xxx** = More attention is required
- **xxxx** = Serious attention, and pre-requisite for the project to proceed
Table 48 - Mitigation Table for Agro-Inputs, SWC and Afforestation

<table>
<thead>
<tr>
<th>Main Components</th>
<th>Potential Environmental Impacts</th>
<th>Potential Social Impacts</th>
<th>Mitigation Measures &amp; Who Would Carry Them Out [key after Table 48]</th>
<th>Level of significance</th>
<th>Percentage of total project cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Increased Use of Inorganic Fertilizers to improve soil fertility</td>
<td>• May reduce the use of organic fertilizers &amp; decrease water quality</td>
<td>• Fertilizer not applied properly may result in low productivity and poor credit repayment</td>
<td>- Specify recommendations by area, soil fertility status, &amp; crop types [EARO, BOA]</td>
<td>xx</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Adopt integrated nutrient management with both organic and inorganic fertilizers, and train farmers [BOA, KAC, DA, Farmers]</td>
<td>xx</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Enhance traditional manure, compost, green manure and related uses [EARO, BOA, DA, KAC, Farmers]</td>
<td>xx</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Devise recycling &amp; waste disposal mechanism [BOA, Farmers]</td>
<td>xx</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Use IPM and train farmers in safe use of pesticides [BOA, DA, Farmers]</td>
<td>xx</td>
<td>0.27</td>
</tr>
<tr>
<td>• Pesticides</td>
<td>• Possible increased pollution from packing materials</td>
<td>• High costs of disposal</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Possible toxicity to humans, animals and beneficial insects</td>
<td>• Increased hazard to public health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Improved seed (Hybrid seed)</td>
<td>• May reduce the use of local land races and promote mono-cropping</td>
<td>• Possible increased cost of crop protection &amp; family labor</td>
<td>- Use field gene banks, land race preserving strategy on farms; prepare site maps for monitoring newly released seeds [BOA, Farmers]</td>
<td>xxx</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>• May reduce tolerance to drought and diseases</td>
<td>• May reduce variability and increase risk of food insecurity</td>
<td>- Periodically replace varieties &amp; establish community seed revolving mechanism [EARO, BOA, KAC]</td>
<td>xxx</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>• May introduce weeds to the area</td>
<td>• Possible increased cost of hand roguing and herbicide use</td>
<td>- Introduce quarantine and phyto-sanitary certificates</td>
<td>xx</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Mean % of Project Cost: 0.29%
<table>
<thead>
<tr>
<th>Main Components</th>
<th>Potential Environmental Impacts</th>
<th>Potential Social Impacts</th>
<th>Mitigation Measures &amp; Who Would Carry Them Out [key after Table 48]</th>
<th>Level of significance</th>
<th>Percentage of total project cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Rehabilitation Schemes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Soil &amp; Water Conservation</td>
<td>- Poorly applied old techniques and SWC structures may harbor pests and restrict oxen-plowing</td>
<td>- Old approach inefficient and uses more labor</td>
<td>- Revise earlier techniques, prepare manuals and train community &amp; DAs [BOA, DA]</td>
<td>x</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>- May reduce bottom land fertility and water availability</td>
<td>- Reduce yield and increase cost of pest control</td>
<td>- Involve upper and lower stream users in design and implementing SWC [BOA, DA, KAC]</td>
<td>x</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>- May reduce water flow to downstream users and affect traditional dry grazing lands</td>
<td>- Possible arid land encroachment &amp; drying of lakes</td>
<td>- Train communities &amp; support implementation of water management [BOA, KAC, Farmers]</td>
<td>xx</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td>- Low sense of ownership &amp; less accountability to natural resources</td>
<td>- Induces conflict</td>
<td>- Train &amp; empower communities to own &amp; be accountable for common assets [BOA, KAC, Farmers]</td>
<td>xx</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Afforestation</td>
<td>- Poorly not contain enough indigenous species</td>
<td>- Fewer fuel wood sources</td>
<td>- Integrate indigenous and diversified tree species, and promote private nurseries [BOA, Farmers]</td>
<td>x</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>- May take more agricultural land under trees &amp; change land-use</td>
<td>- Possible reduction in staple foods for home consumption</td>
<td>- Establish and categorize low and highland agro-forestry &amp; fruit production [BOA]</td>
<td>x</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Possible reduction in grazing areas, with restrictions &amp; less change for home consumption</td>
<td>- Arrange fair share &amp; equity in use of community assets [KDC]</td>
<td>x</td>
<td>0.18</td>
</tr>
<tr>
<td>Main Components</td>
<td>Potential Environmental Impacts</td>
<td>Potential Social Impacts</td>
<td>Mitigation Measures &amp; Who Would Carry Them Out [key after Table 48]</td>
<td>Level of significance</td>
<td>Percentage of total project cost</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------------------------</td>
<td>--------------------------</td>
<td>---------------------------------------------------------------</td>
<td>----------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sense of ownership</td>
<td>- Inspect and allow selective use &amp; cut-and carry methods with delineated buffering zones</td>
<td>xx</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Mean Environmental Rehabilitation Scheme % Project cost

0.23%

- BOA – Bureau of Agriculture (Woreda Level)
- BOH – Bureau of Health (Woreda Level)
- CPB – Cooperatives Promotion Bureau
- CRDA – Community Road Development Agent
- DA – Development Agent (Agricultural Extension)
- EARO – Ethiopian Agricultural Research Organization
- KAC – Kebele Agricultural Committee
- KDC – Kebele Development Committee
- KRC – Kebele Road Committee
- OIDA – Oromiya Irrigation Development Authority
- RRA – Regional Roads Authority
- RRA-REMB – Regional Roads Authority–Regional Environmental Management Branch
- SAERAR – Society for Agricultural and Environmental Rehabilitation in Amhara
- SWC – Soil and Water Conservation
- WUA – Water Users Association
- WUC – Water Users Committee
11. MONITORING PLAN and MONITORING INDICATORS

11.1 Monitoring and Evaluation

To monitor and evaluate mitigation measures, appropriate teams need to be assigned and equipped with the necessary facilities. Periodic and timely monitoring of the project work flow will minimize further adverse effects at an early stage. The monitoring team will endeavour to correct noticeable problems on the spot and in some cases recommend new technologies. Problems unforeseen during design and planning will be addressed through scheduled monitoring processes. The aim will be to learn from one intervention and improve the next.

11.2 Monitoring Team and Responsible Groups

Monitoring teams or responsible groups should be formed from various organizations and stakeholders (including subject matter experts) and will have a timetable for follow-up and inspection activities. Monitoring teams should be formed by intervention, with the following proposed membership:

**Irrigation:** Community, WUA, BOA, SAERAR (and similar organizations in other regions), NGOs;

**Community Access Roads:** Community, R-RRA (R-REMB)/Zonal; BOA, Woreda Council, NGOs;

**Agro-Inputs:** Community (PAs), BOA, BOH, EARO, NGOs;

11.3 Facilities Required in Monitoring

Facilities that are required for monitoring activities include:

- Transport vehicles,
- Perdiem & labor costs (for sampling and data collection),
- Sampling tool kits,
- Computers and stationery for data processing and compiling.
11.4 Methodology Envisaged in Monitoring

Interviews and group discussion using RPA techniques, inspection of construction and catchment sites, and checking of soil and water samples will be used. Senior villagers and opinion leaders will be interviewed to establish benchmark responses.

11.5 Monitoring Indicators

The priority monitoring indicators, and measuring units, will be as follows.

Small Scale Irrigation Schemes

Minimum ecological flow: Critical and dry season water flow m/sec will be read and/or determined from hydro-meteorological stations.

Leakage/water logging: Water loss in lt./day as compared to amount of water stored and used by farms.

Prevalence of water borne Vectors/diseases: Identification of standing water sites, and association with morbidity data where possible.

Incidence of conflicts in water use: The availability/scarcity of irrigation water in relation to crop demand and number of complaints (recorded) coming from users.

Incidence of canal breakage: Number of times and intervals observed in canal breakage, maintenance needs and costs.

Water management and quality: Salt and mineral content of water in irrigation canals and drains, and progress of training farmers in water management.

Community Access Roads

Road Construction: New roads constructed in km & number of beneficiaries.

Crossing structures made: Wooden/concrete bridges & other pipes/culvert made and impacts.

Prevalence of water borne Vectors/diseases: Identification of standing water sites, and association with morbidity data where possible.

Erosion-causing water flows: Recording of the incidence of erosion problems.
Accidents: Incidence of accidents and their outcomes.

Average Traffic flow/day: Number of various vehicles/day using the route.

Technological Inputs

Input types & distribution: Types of agro inputs and their timely distribution.

Soil Fertility management and soil and water quality: Ground water contamination from over-use of fertilizers, and progress in training farmers in fertilizer use and integrated nutrient management.

Integrated pest management: Progress in development of IPM packages and training of farmers in their use; ground water contamination from pesticides.

Trees: Progress in integrating indigenous species into nurseries and catchments, and progress in improving their survival rates.

Nurseries: Area, numbers of tree species and seedlings raised, areas covered.

The interventions, monitoring indicators, measures, methods, timing, and responsibilities are summarized in Table 47.
### Table 49 - Interventions, Monitoring Indicators, Methods, Frequency and Responsibilities

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Indicators</th>
<th>What would be measured</th>
<th>Methods of monitoring/inspections</th>
<th>Frequency &amp; Time of Monitoring</th>
<th>Responsible Monitoring Team</th>
<th>Cost Estimate (percentage of the total Project)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Irrigation</td>
<td>Minimum ecological flow</td>
<td>Dry season flow m/sec</td>
<td>Check flow randomly at various spots &amp; community responses</td>
<td>Annual (Feb-April)</td>
<td>Irrigation Monitoring Team</td>
<td>0.035%</td>
</tr>
<tr>
<td></td>
<td>Leakage/water logging</td>
<td>Water loss lt./day</td>
<td>Measure night loss and increases of aquatic vegetation at various spots</td>
<td>Quarterly (Dec, Mar, Aug, Nov.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prevalence of water borne disease/vectors</td>
<td>People affected by Malaria or Schistosomiasis</td>
<td>Check clinic records and community responses</td>
<td>Quarterly-Nov, Feb, Mar, Aug</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Incidence of water use conflicts</td>
<td>Complaints to WUA/month</td>
<td>WUA responses &amp; records on conflicts resolved</td>
<td>Dec-May at 3 weeks intervals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Community Access Road</td>
<td>Newly constructed roads, Bridges &amp; culverts</td>
<td>Km &amp; numbers constructed, and numbers of beneficiaries</td>
<td>WC Records and Site Visits</td>
<td>Bi-Annual Jan./April</td>
<td>Roads Monitoring Team</td>
<td>0.038%</td>
</tr>
<tr>
<td></td>
<td>Prevalence of water borne disease/vectors</td>
<td>People affected by Malaria or Schistosomiasis</td>
<td>Check clinic records and community responses</td>
<td>Quarterly-Nov, Feb, Mar, Aug</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Erosion and runoff</td>
<td>Incidence of erosion &amp; runoff; establishment of protection trees &amp; ditches, check-dams and grass planted</td>
<td>Check community and RRA records</td>
<td>Bi-Annual – March, Sept.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interventions</td>
<td>Indicators</td>
<td>What would be measured</td>
<td>Methods of monitoring/inspections</td>
<td>Frequency &amp; Time of Monitoring</td>
<td>Responsible Monitoring Team</td>
<td>Cost Estimate (percentage of the total Project)</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>-----------------------------------</td>
<td>-------------------------------</td>
<td>----------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Traffic flow</td>
<td>Av. No. vehicles per day on road types RR 10, 30, 50</td>
<td>Observation &amp; KRC records</td>
<td>Bi-annual Apr.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Av. Accident /yr.</td>
<td>Deaths, injuries, vehicle &amp; property damages/yr with locations</td>
<td>Traffic police records</td>
<td>Annual (May)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Technological Inputs</td>
<td>Decline in Biological control</td>
<td>Pest outbreaks and low yield/ha responses</td>
<td>Sample test, Pas and DAs</td>
<td>Biannual (Nov &amp; Apr)</td>
<td>Input Monitoring Team</td>
<td>0.033%</td>
</tr>
<tr>
<td>Fertilizers</td>
<td>N &amp; P Eutrophication of water quality in aquatic habitats</td>
<td>Change in water color &amp; bad taste</td>
<td>Sample test and aquatic vegetation</td>
<td>Biannual (Nov &amp; Apr)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pesticides</td>
<td>Exotic pollution from fertilizer bags</td>
<td>Distribution of bags and containers in rural areas</td>
<td>Accumulation of bags and community responses</td>
<td>Biannual (Nov &amp; Apr)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ground water contamination from pesticides</td>
<td>Progress in development of IPM packages and farmer training</td>
<td>Records of DAs and BOA</td>
<td>Biannual (Nov &amp; Apr)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NB: The motoring cost is estimated at 10% of the mitigation cost interventions.
12. RECOMMENDATIONS and CONCLUSIONS

12.1 Amhara Region

Recommendations

Most of the food deficit areas of the Amhara Region are located in the traditional ‘Belg’ crop growing areas. More than 70% of the crops are grown under Belg and any failure in Belg reduces food supplies by around three-fourths. On the other hand, there are few extension packages that are targeted to Belg growing areas. There are no specific recommendations of fertilizers and improved seeds (of short life and frost tolerant varieties) and other technologies for the area. Even the present extension package program overlooks the Belg growing areas. The remaining 30% of rainfed crops are grown in the Meher season and these too are less supported by research technology and extension programs.

Moreover, the food deficit areas are located in the severely degraded zones and many of them have lost their natural vegetation cover and soil fertility. Reclamation and conservation extension is weak at rehabilitating these degraded areas. Lack of feed and severe drought are major threats to oxen and other livestock. The Tenta area is traditionally known as a mule and donkey breeding area. Proper harnessing and training will put donkeys and mules to plowing. They require less feed, and graze over a wide variety of poorer forages. Mules and donkeys can be adapted to small plot farming on SWC terraces.

To bring low cost food from self-sufficient areas to deficit places is an alternative strategy, which entails road network development between Zones and Woredas. For instance, the current prices for tef, barley, wheat and maize in Gojam (Adet, Mota, Bichena, Fenoteselam and Kossa) is 120, 50, 80 and 30 Birr/qt, respectively. On the other hand, the same commodities cost 220, 150, 180 and 80 Birr/qt, respectively, at Tenta, Mosha and Gimba markets. The surplus areas are less than 150km distance from Tenta, Mosha and Gimba over the Abay River. Therefore, to reduce food prices at the market for food-deficit Woredas roads would play a major role.

To relieve current pressure from the farming community, family planning and off farm activities are some of the alternatives envisaged. Thus awareness about family planning and the disasters of AIDS (HIV) need support and follow-up.

Rural job creation through rural housing and related rural infrastructure should be part of area planning to absorb the present school leavers and other rural youth. Masonry, carpentry, plumping and other appropriate skill training interventions could be appropriate. Credit provision for such interventions to purchase tools and equipment should be encouraged.
Legalized Co-operatives need to be organized according to group preferences to provide guarantees for borrowed money through credit. Community and labor based roads and crossing structures can absorb many rural laborers. Cottage crafts and tourism activities need attention and training to accommodate some of the youth in tourist guiding and artifact marketing.

Saving, food utilization, home economics aspects and breaking food taboos and promoting coping mechanisms need detailed studies. Furthermore, raising awareness through village and opinion leaders regarding harvesting, saving and consumptive use of crops/food require great efforts to bring behavioral changes. Traditional customs in funerals, wedding & other ceremonies, which lead to mis-use of scarce resources need to be changed to minimize gaps in food availability.

Irrigation scheme construction, maintenance, agronomy and extension need further strengthening in all aspects of operation and management. Members of the Water Users Associations (WUA) and irrigation agricultural Development Agents (IDAS) need periodical training on water administration, crop selection and market promotion.

Unreserved support should be given to private investors in food production input distribution (fertilizers, seeds, farm tools, etc.). Rural infrastructure should be improved to attract private investors.

NGOs should be encouraged to take initiatives in rural development and EGS through SWC, afforestation, nursery operations, access roads & crossing structures. These activities will narrow the food deficits at community and household levels and will rehabilitate the rural environment.

**Policies and guidelines that require Government’s attention**

a) Land use and tenure, water rights, and rehabilitated scheme utilization.

b) Regional cross-sectoral policies, conservation strategies and implementation.

c) Research formulation and implementation for food deficit areas.

d) Community participatory resource conservation and management plan initiatives.

e) Community monitoring and evaluation on environment and social improvements.
Gaps requiring improvement

- Frequent and unstable institutional/professional changes have made many of the social and environmental data incomplete.

- Many development studies are started, only to be discontinued before full implementation.

- Regional, Zonal and Woreda reports show vulnerability and areas under food deficit, are increasing every year.

- Population is increasing, while land size and productivity/ha is declining every year. Thus, planned voluntary settlement schemes need consideration.

Concluding Remarks

- Many of the Amhara food deficit areas produce on the Belg rains (70% of regional crop production). Hence, support for Belg Research and Extension Packages are required.

- In the lowlands like Dati, bordering the Afar Region, the encroachment of desertification needs attention. Initiatives on earth dams and water harvesting techniques to develop irrigation are needed.

- Enormous efforts should be put into rural access roads between Zones and Woredas to obtain food, services and industrial goods at cheaper prices.

- Rural jobs and cottage crafts should be provided to give relief to the rural landless poor.

- Social services like education (illiteracy is high) basic health care, safe water and mother-child care are at a low ebb and are frequently disrupted.
12.2 Oromia Region

Conclusions and Recommendations

The limited Food security Project implemented has provided overall benefits to the residents in the selected Woredas, in the form of increased agricultural production. The development of irrigation facilities has provided irrigation water to an area which was previously only rainfed agriculture. Irrigation has allowed the full use of the land during the dry season, when cultivation was not possible under the past farming practices. The benefits of this project include:

- Increased crop production through the irrigation project has increased farm income in the project area. In addition, extra production has reduced local food grain deficits;
- Farmers’ risks are considerably reduced through irrigation and increased production has protected them against shortfalls in food production;
- Reliable water supplies have also encouraged farmers to diversify their cropping patterns to take advantage of market conditions;
- The implementation of the irrigation project and the soil and water conservation project has created additional employment opportunities in the area.

There is clear evidence that female headed households, the poorest members of the community, have substantially increased their current low income level through the use of improved goat breeds (the Farm Africa project) by increasing milk and goat production for the family as well as the market. Increased cash income from increased production has resulted in higher family consumption of a greater variety of foods. This in turn has resulted in improved nutrition levels in the project area.

The project has also improved the health status of the local inhabitants through construction of new health facilities in the Woredas and provision of water supply sources. The spring design in these areas did not, however, take into account the risk of contamination of the spring water. To prevent direct contamination, additional measures are recommended in the vicinity of the water sources.

Health service coverage in the Woredas visited is low and cannot meet local needs. Therefore, the clinics must be provided with technical and operational support from zonal health offices.
The livestock resource is underutilized. Veterinary services need to be provided with qualified staff and necessary equipment, chemicals and drugs.

There is a great need to provide all weather access to affected Woredas. This would facilitate better access to markets and an increase in local trade, as well as encouraging the local economy.

Achievements of many of the objectives of the various projects are largely dependent on the full participation of the beneficiaries. It is, therefore, imperative that effective rural institutions are in place to facilitate this involvement.

It is noted that the Woreda offices have a serious shortage of personnel with skills and experience required for the project identification, preparation, development, and operation and management of the Food Security Project. This will be a crucial constraint to effective realization of the project. The deficiency in the Woreda offices visited is evident in all activity areas and the issue is identified among the most serious problems hindering development. It is therefore strongly recommended to take necessary steps to train people in various disciplines.

It is recommended that monitoring programs be established to evaluate the success of the Food Security Project and resolve problems arising from project implementation. The information from the monitoring program will be used to refine the scheme planning and implementation process and to update/reconsider different aspects of the developments to ensure the success of the proposed projects.

In the absence of efforts to help farmers increase their yields in a sustainable farming system, crop yields will progressively decline, and in the face of a rapidly rising rural population, will lead to critical food shortages. Therefore, it is important that the Region gives high priority to this FSP since the general food production in the sampled Woredas is typical of the status in many other similar Woredas. Successful implementation of this project will provide valuable experience to expand such activities on Regional basis.

12.3 Southern Nations Nationalities Peoples Region

Conclusion

In the SNNP Regional State, 32 or 33 Woredas were identified in 1996 as chronic food deficit areas. These Woredas are located in drought prone areas, and the number of people suffering from food deficiency has been increasing continuously. In addition, it is well documented that a considerable proportion of the Region's population is food insecure.
The main causes of food deficiency are recurrent droughts, erratic rainfall pattern, backward agricultural practices, inadequate supply of inputs and credit, low levels of infrastructure development, population pressure that has resulted in small or fragmented landholdings and land degradation, human and animal diseases (mainly malaria and trypanosomiasis). Therefore, it is indispensable to plan for intervention programs and call for substantial resource investment to tackle these frustrating problems.

The proposed intervention programs, mainly targeted for the drought prone areas that are chronically food deficit, can enhance the agricultural production and income generation opportunities provided that the projects are planned, designed and implemented on a sustainable basis. Besides the increase in agricultural production and income generation, which contributes to food deficiency alleviation efforts, they can bring substantial environmental and social benefits provided that environmental and social considerations are given due attention in the planning, designing and implementation of the programs. The potential environmental and social benefits of the programs would be associated with:

- Increased production and improved income to help alleviate food shortages and improve living and health standards;

- Protection of forests and marginal lands as a result of intensification of production on a smaller areas; in this way soil erosion will be reduced and ecological balances maintained;

- With wider employment opportunities, acquisition of new skills and knowledge, increments in income, and acquaintance with better technology, pressure on natural resources and the environment would be reduced;

- Watershed developments and soil and water conservation practices would help to reduce soil erosion and sedimentation in streams and rivers and enhance soil fertility and soil moisture retention;

- Increased availability of fuel wood and construction materials through the afforestation program has economic, social and environmental benefits;

Activities, among others, that have major environmental benefits may include:

- On-farm and off-farm soil and water conservation practices;

- Carefully planned afforestation programs;

- Properly designed watershed development activities;
- Maintenance or rehabilitation of previously implemented irrigation schemes and rural roads;
- Proper cultivation and land preparation practices;
- Inter-cropping and crop rotation practices;
- Use of organic fertilizers (e.g. manure) in a proper mix with inorganic fertilizers; and
- Use of Integrated Pest Management (IPM) which reduces reliance on synthetic chemical pesticides.

In general the environmental and social benefits of the intervention programs are expected to outweigh the adverse effects provided that adequate environmental protection or mitigation measures are integrated in the planning, designing and implementing of the programs. Serious negative impacts are not anticipated, and most of the potential negative effects are capable of being reduced to an acceptable level through implementation of appropriate mitigation measures.

**Recommendations**

While designing and implementing the programs that are intended to alleviate food shortages due attention should be given to their environmental and social impacts. This will help to ensure their sustainability, social acceptability and environmental compatibility. The programs should be designed and implemented so that they will not have significant negative effects on the natural environment and the communities; rather they should enhance both the environmental context in which they are implemented, and the communities that they are meant to serve.

To avoid or minimize the adverse environmental and social effects of the programs or projects and maximize their efficiency and longevity, appropriate preventing or mitigating measures including those proposed in this document should be included in the project plan or design, and implemented at the right time, while follow up of their effectiveness is made through a monitoring and evaluation system.

Among the issues that should be given due attention are:

- In the irrigation sub-sector, priority should be given to maintenance or rehabilitation of the existing schemes. Rehabilitation or improvement of most of the existing schemes will require much less resource investment and less time to realize. In addition, this will have the advantage of avoiding or minimizing the existing environmental and social problems.
- The design, implementation/construction and operation of physical infrastructures for development schemes should integrate environmental and social mitigation measures and extension services so that the schemes would be sustainable and fruitful.

- Effective cooperation among the program stakeholders and coordination of their activities is essential.

- A monitoring and evaluation system/program to follow up the proper implementation of the programs including environmental and social aspects should be established and provided with budget resources.

- The programs should be formulated and developed through close consultation with, and participation of the local authorities, stakeholders and the community.

- Assistance should be given in capacity building of the communities and stakeholders in order to enable them to carry out the various activities.

- Due attention needs to be given to strengthening extension programs with more emphasis on educating and training of the communities and technical assistance by the local stakeholders (mainly Agriculture, Cooperatives, Micro Finance, and Health Offices).

- ESA findings and recommendations should receive due attention by the program planning, designing and implementing bodies so that environmental and social issues are considered as an integral part of the program.

12.4 Tigrai Region

Conclusions

After document review, discussions with key informants and beneficiaries and field assessment, the following general observations and deductions were made.

a) Land degradation is alarmingly high in the region in general and the 16 food insecure Woredas in particular. The rainfall is highly erratic and as a result of these factors, crop production is very low.

b) Acceptance of the interventions by the community is very high.

c) The willingness of the people in co-operating with the implementing agencies is promising.
Recommendations

Food security is one of the components of food policy analysis. It is related to both price policy and technological change in agriculture and could be addressed within a framework that takes account of the linkages among the various sectors of the economy, such as agriculture, roads, markets (both domestic and international), education, health, water supply, and energy supply.

The Food Security Project should focus on identified problems of the Region, particularly the problems of the food deficit Woredas. These problems are:

1) Inadequate and erratic rainfall: Crop production is mainly dependent on rainfed agriculture. The rainfall pattern is mono-modal and erratic (with late onset, small amounts, uneven distribution and early withdrawal). Irrigation should be undertaken where possible.

2) Environmental Degradation: The natural resources of the Region are under extreme stress. Natural forest areas are diminishing, soil erosion is serious, and water resources are inadequate. Energy resources (fuel wood) are scanty. Environmental rehabilitation should be a major intervention.

3) Low Level of Agricultural Yield: This is due to diminishing soil fertility, small and fragmented land holding/household, lack of oxen, poor livestock development, low human labor efficiency due to health problems, and inefficient as well as poor farming practices.

4) Crop and Livestock Pests and Diseases: Crop pests are among the major production constraints significantly contributing to low crop yields. Livestock productivity is constrained by bacterial, viral as well as parasitic diseases.

5) Low Health Service: Health institutions and facilities are not adequate. Morbidity and mortality rates are high due to malnutrition, lack of potable (clean) water supply and poor sanitation.

6) Poor Rural Infrastructure: Infrastructure like roads, transportation facilities, markets, schools and essential services are not adequate.

7) Inadequate Off-Farm Enterprises: There are few opportunities of employment, other than agriculture, for the majority of the population.

9) Limited Access to Credit Services: Although credit facilities are operative, limited funds are a constraint.
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3. OROMIA

1. Abu Yadeta, Head Food Security Unit, Oromia National Regional State.
3. Habtamu Mamo, Expert Food Security Unit, Oromia National Regional State.
10. Amohamed Ibrahim, Head Economic Development Sector, Goro Gutu Woreda Administrative Council, Oromia National Regional State.
11. Abdi Amin, Member of Erer Mude Inchinae PA.
12. Mohamed Yasine, DA for the Erer Mude Inchinae PA.
13. Mohamed Razak, Member of Erer Mude Inchinae PA.
14. Amane Yousef, Member of Erer Mude Inchinae PA.
38. Aweke Ngatu, Representative of Food Security Unit for West hararghe Zone of Oromia National Regional State.
39. Mohamed Ibsa, Head Chiro Woreda Agricultural development Office.
40. Gizaw Mengesha, Chiro Woreda Agricultural development Office.
41. Bizualem Adamu, Care, Head Administrative and Finance Head of the Asebeteferi Branch.
CHECKLIST for DATA COLLECTION

I. General Bio-Physical & Socio-Economic Background Information

- Location of sample Woreda (Region and Zone);
- Agro-climatic condition; topography & natural resources;
- Land use pattern of the Woreda;
- Total Population and density per unit area;
- Major economic activities of the Woreda;
- Major income sources (crop production, livestock husbandry, etc.) of the population;
- Major limitations of the agriculture sector (crop & livestock production);
- Available social and economic services present in the Woreda;
- Potable water supply coverage of the Woreda;
- Type and number of health institutions present in the Woreda;
- Available academic institutions present in the Woreda;
- Access to credit service;
- Type and number of food security projects present in the Woreda;
- Community management capacity of the Woreda;

II. Vulnerability Context of the Area (Woreda)

(Vulnerability context refers to the extent to which different groups are exposed to particular trends/shocks/seasonally; and the sensitivity of their livelihoods to these factors, this relates directly to resilience)

- Events and trends that cause stress in the Woreda population (key informants);
- The existence of trends and sudden changes in such trends (key informants);
- Historical occurrences of floods, droughts, epidemic, local environmental trends and cycles (Timelines);
- Level of food stores across the year, rainfall pattern, crop planting and harvesting schedules, food prices, changes in health status (seasonal diagrams);

- Relative importance of vulnerability factors to different groups, trends (preference ranking, secondary data);
  - rainfall, temperature (link to participatory data-meteorological data);
  - producer and consumer prices across the year(price, economics);
  - population density(demographic);
  - degradation/ renewal situation(resource stocks);
  - morbidity, mortality(health);

III. SMALL SCALE IRRIGATION

- Availability of suitable land & water (rivers, streams) for irrigation;
- Potentials for ponds, dams and diversion construction;
-Existing schemes and potential for expansion (extent);
-Level of community participation in planning, design, and operation of the schemes;
-Adequacy of the extension services given to the farmers;
-Number of beneficiaries and stakeholders in the projects;
-Establishment of Water Users Association (WUA) and its mandates;
-Main crops grown on the irrigated farms (before/after the project situation);
-Level of utilization of the irrigation schemes by the farmers;
  - Are the schemes fully utilized? If not, Why?
  - Have the schemes improved the food production/ accessibility of the area?
  - Have the schemes improved marketing facilities /situation in the area?
  - Have the schemes created better employment opportunities in the area?
  - Have the projects brought changes in the land-use pattern of the area?
    What are the major changes?

- Major problems related to water abstraction, distribution and utilization and measures taken to resolve the problems;
- Has the irrigation scheme caused or intensified water born diseases?
- What types of conflicts exist over water use?
- Is the water charges levied within the paying capacity of the farmers?
- Has the project caused or increased erosion on the farm or in the vicinity of the farm?
- Has the project caused increase in size of an existing wet land?
- Is sedimentation of canals and fields causing major problem?
- Do aquatic weed and algae infestations exist in canals and rivers?
- Has there been a trend in crop yield decline? Can this be related to soil salinity?
- Are pests/diseases observed (crops, livestock, human) due to the scheme?
- Any conflict prevailing over resource use?

- Impacts of the irrigation schemes;
  - What are the impacts of the project on the community, vegetation or animals?
  - Impacts on the general environment of the area;
  - Impacts on crop production/food security;

IV. ROADS AND MARKET PLACES

- Available all weather roads that link major market places;
- Proximity of market places to the residents of the area;
- Markets linkages with important regional and national market centers;
- The impact of development interventions in the area of roads and market places on women's work load by giving easy access to the services;
- The contributions of the available market places for the improvement of the livelihood of the community of the Woreda;
- Is there any problem related to roads and markets places? What should be done to improve the marketability of the products considering linkage at Zonal and Regional level?
- Assess the regional road development programs;
- Assess the development of market places of the region;
- Assess appropriateness of existing and future constructions;
- What is the perception of the community towards road and market projects?
- Do communities participate in the construction and maintenance activities of road and market projects?

V. CROP PRODUCTION AND INPUT USE (before and after the project)

- Type of crops and yield (time series data);
- Area of land covered by food and cash crops;
- Area of farmland covered by irrigation scheme;
- Annual total agricultural production;
- Proportion of agricultural production sold in the market;
- Estimated income generated from sale of agricultural production (crop & livestock);
- Price and trends for agricultural production, inputs, and other consumer commodities (time series data);
- Agricultural production trends (time series data);
- Is there enough cultivated/grazing land for a household?
- Is there enough amount of produce for home consumption and surplus for market? If no, how do you compensate the annual household food requirement?
- Use of agricultural inputs including fertilizers in the area; benefits (increased production) from input application;
- What are the possible limitations that deter production increase regardless of fertilizer application?
• Are the following major issues pertinent to be addressed to increase total production and productivity in the area?

  • drought;
  • food insecurity due to shortage of land, land tenure, etc.;
  • soil erosion and land degradation;
  • deforestation and overgrazing;
  • poor infrastructure facilities;
  • Lack of coordination in undertaking integrated development endeavor by government, NGOs, and other international institutions.

VI. OFF-FARM ENTERPRISE

• Enumerate existing and potential off-farm enterprises in and around the area?

• Estimate income generated from off-farm activities/per year/HH;

• Identify participation of women in income generation activities;

VII. OTHER SECTORS

(Afforestation, soil & water conservation, health & nutrition, social and economic infrastructure)

• Afforestation activities in and around the project area; major sources of fuel/energy;

• Erosion problems of the area and major causes;

• Soil & water conservation development interventions;

• Community’s access to primary health care;

• Community based child growth initiatives;

• Child mortality and morbidity rates;

• Family planning exercised by the community;
VIII. POLICY ISSUES

- Review National and World Bank Environmental Policies;
- Review Government's Food Security Strategy;
- Review Ethiopia's Economic Reform Program (ERP);
- Other relevant National and Regional development policies and strategies.

**Environmental and Social Impact Analysis by Project Interventions**

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Positive Impact</th>
<th>Negative Impact</th>
<th>Mitigation measures</th>
<th>Cost Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small scale Irrigation</td>
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<tr>
<td>Road and market places</td>
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<tr>
<td>Provision of fertilizer</td>
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<tr>
<td>Off-farm enterprise devt.</td>
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<tr>
<td>Other development activities</td>
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</tbody>
</table>

**Table Institutions to be Contacted at Regional and Woreda level**

<table>
<thead>
<tr>
<th>Regional level</th>
<th>Woreda level</th>
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<tbody>
<tr>
<td>- Food security office;                                                        - Woreda Administration;</td>
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<tr>
<td>- Bureau of Agriculture( crop production, soil &amp; water conservation, irrigation, Small scale rural technologies, women &amp; development);</td>
<td>- Agriculture office;</td>
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<tr>
<td>- Bureau of Economic planning &amp; development;                                    - NGOs/ food security projects;</td>
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<tr>
<td>- SAERAR, OIDA, SAERT, etc.;                                                   - Community ( focus groups: elders and women )</td>
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<tr>
<td>- NGOs working in the area of food security                                    - Food security projects</td>
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<tr>
<td>- ERA office</td>
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